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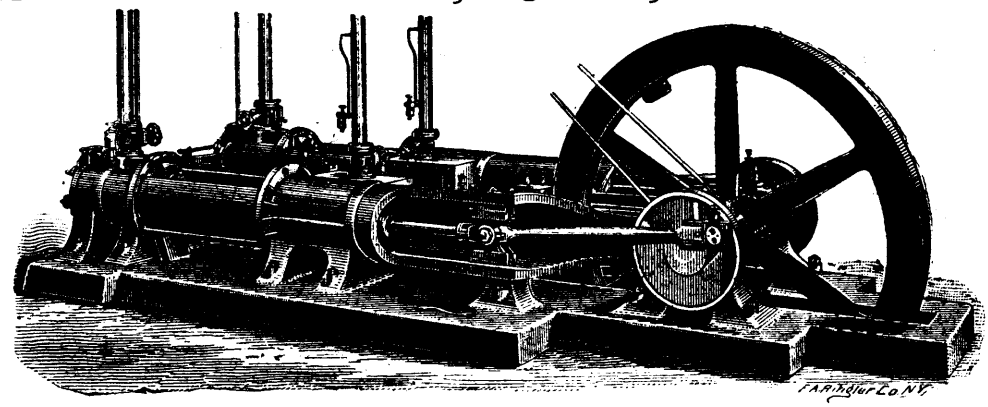
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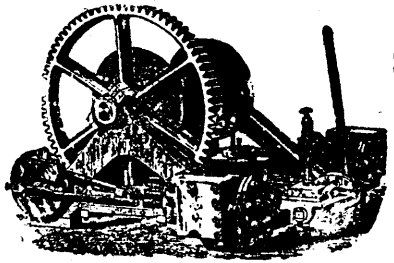
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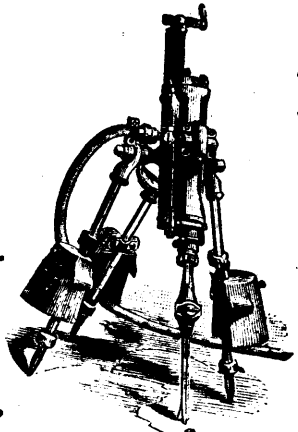
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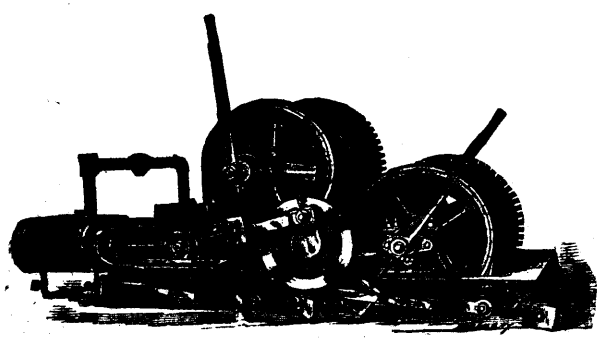


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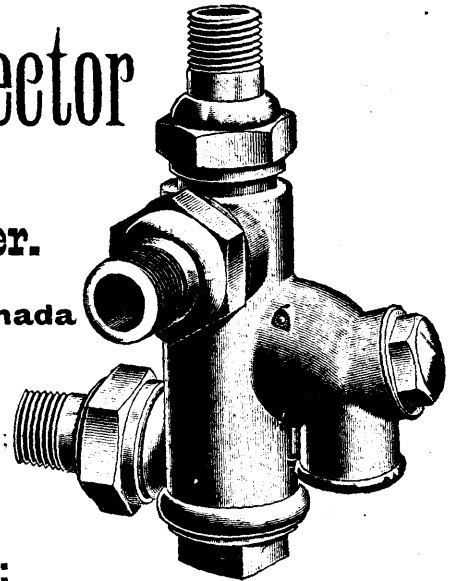
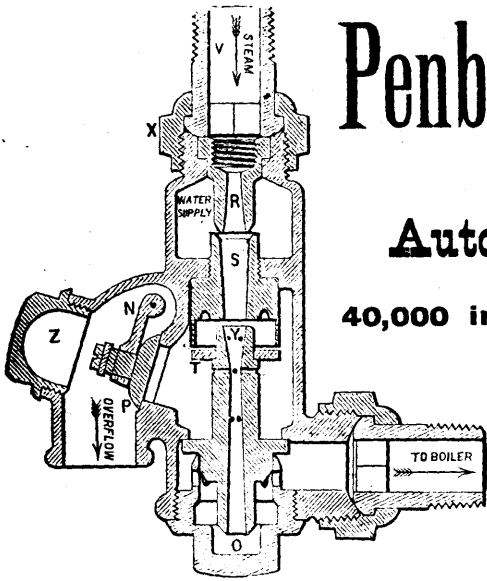
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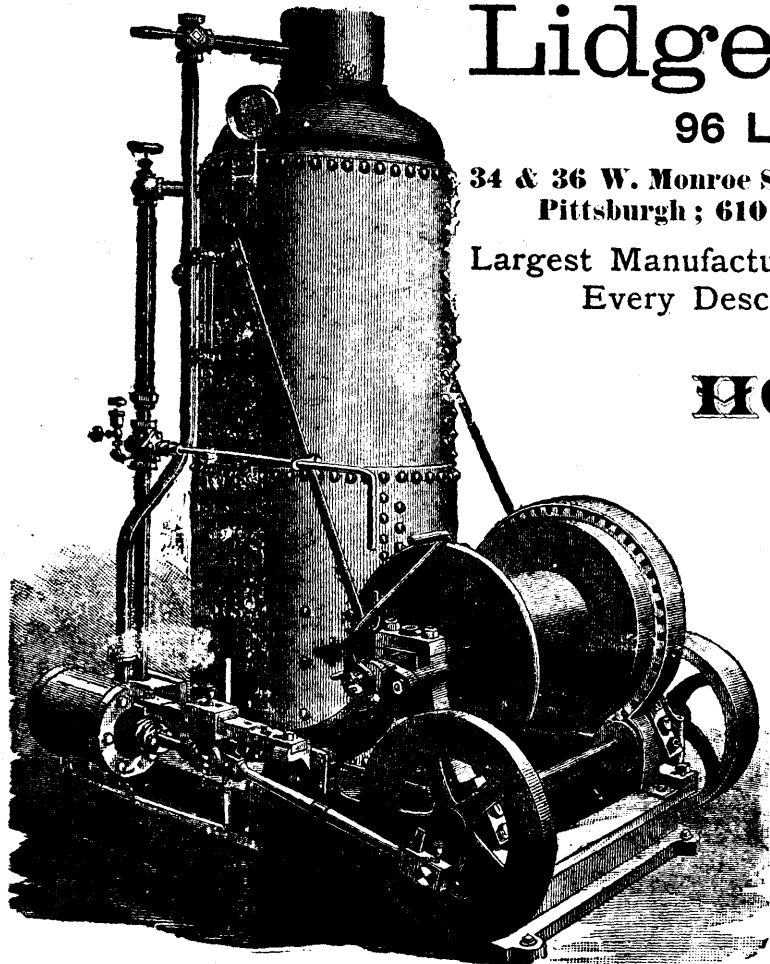
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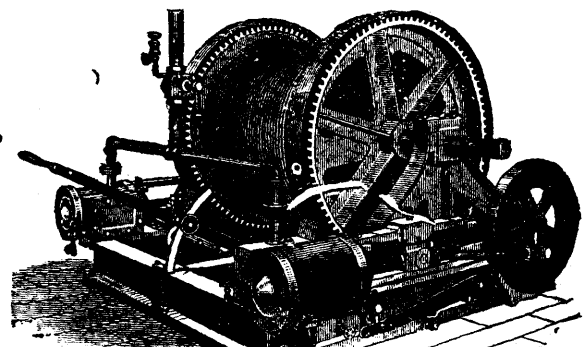
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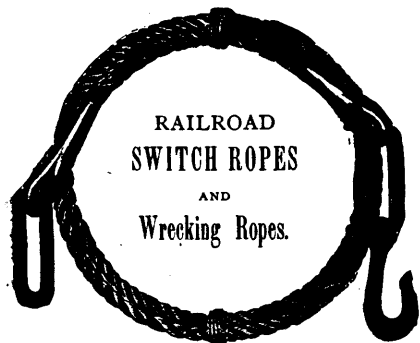


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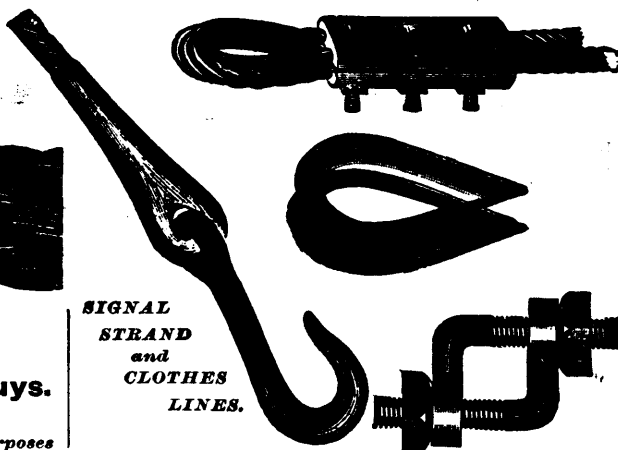


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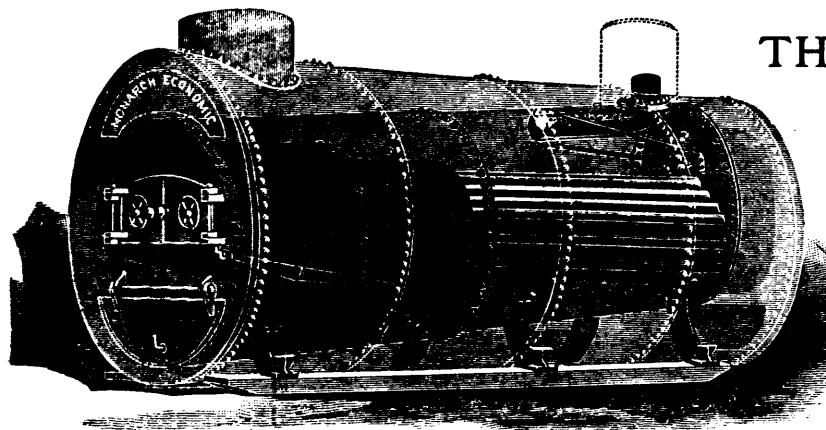
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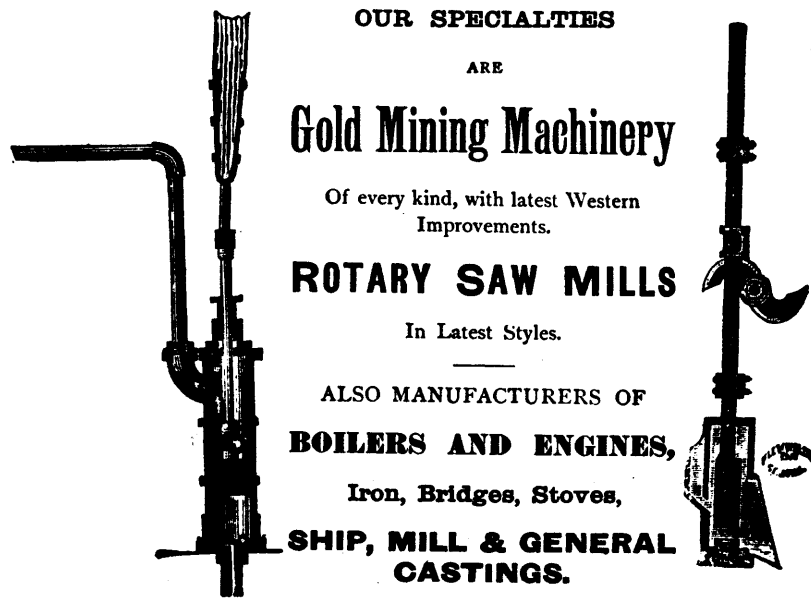
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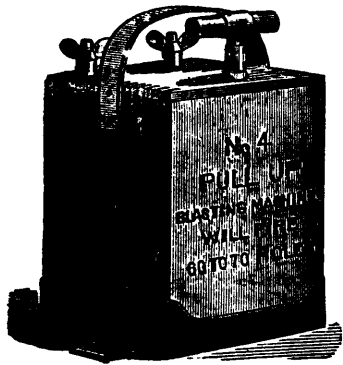
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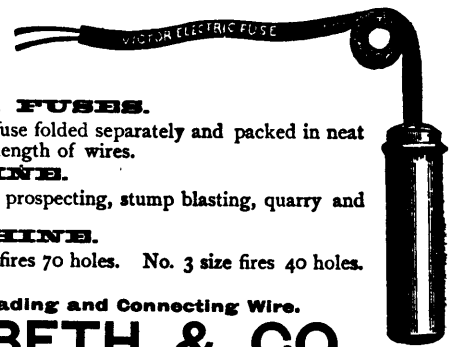
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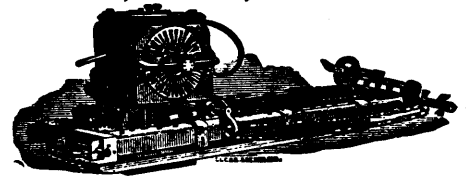
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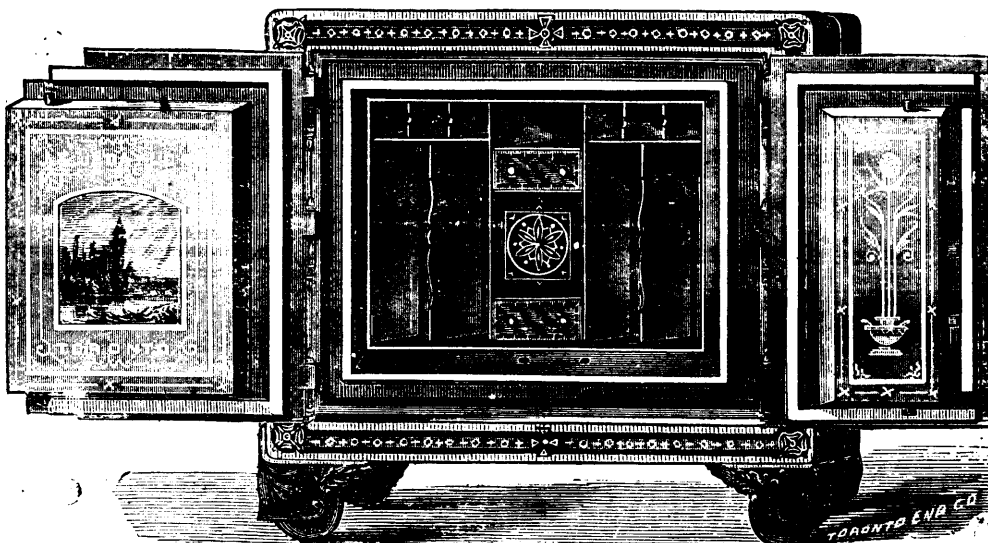
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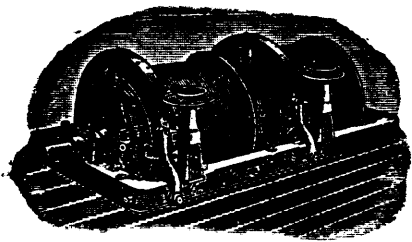
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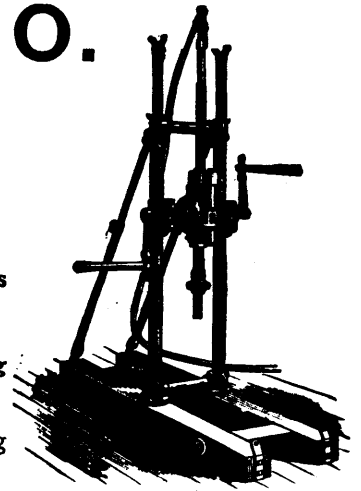
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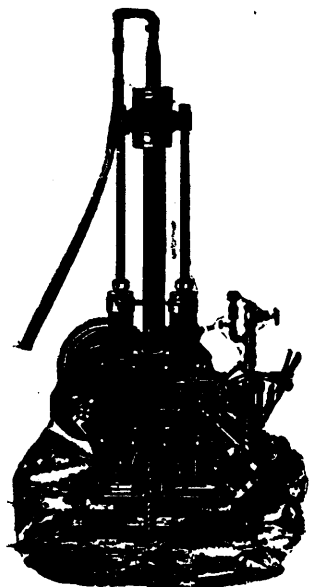
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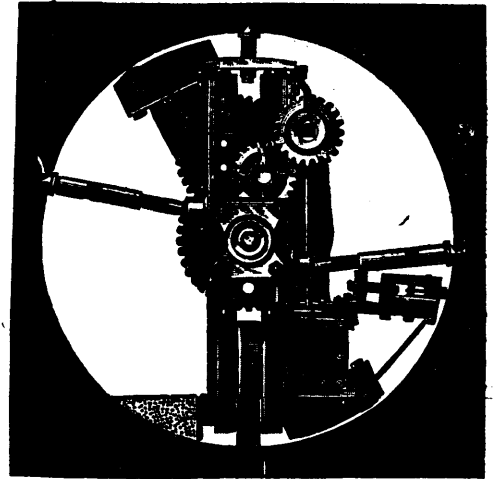
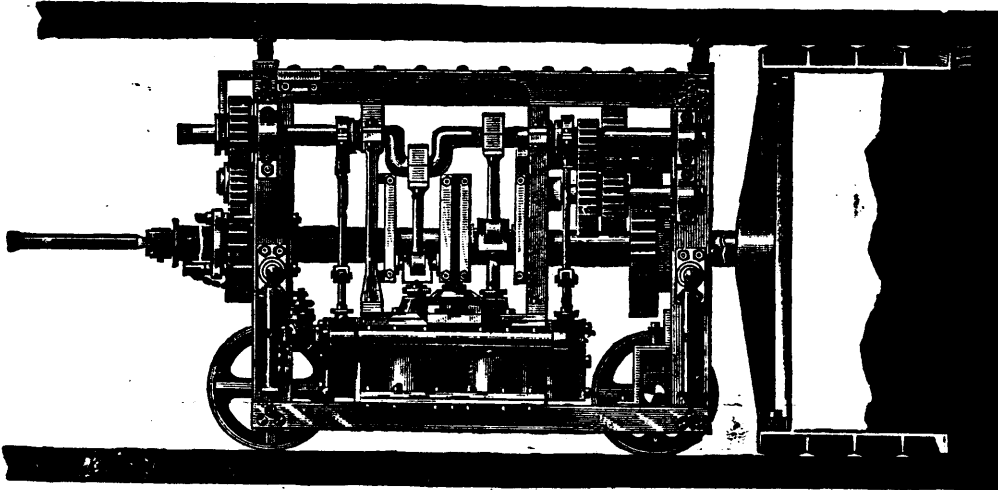
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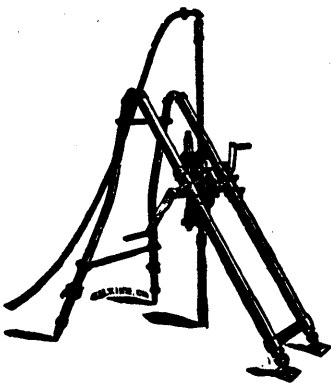
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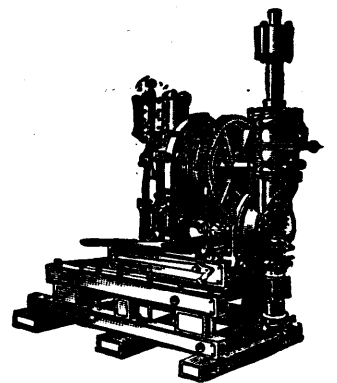
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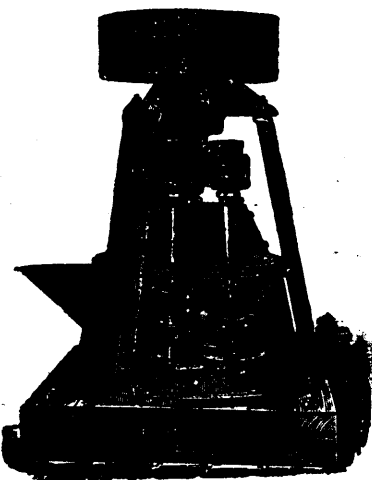
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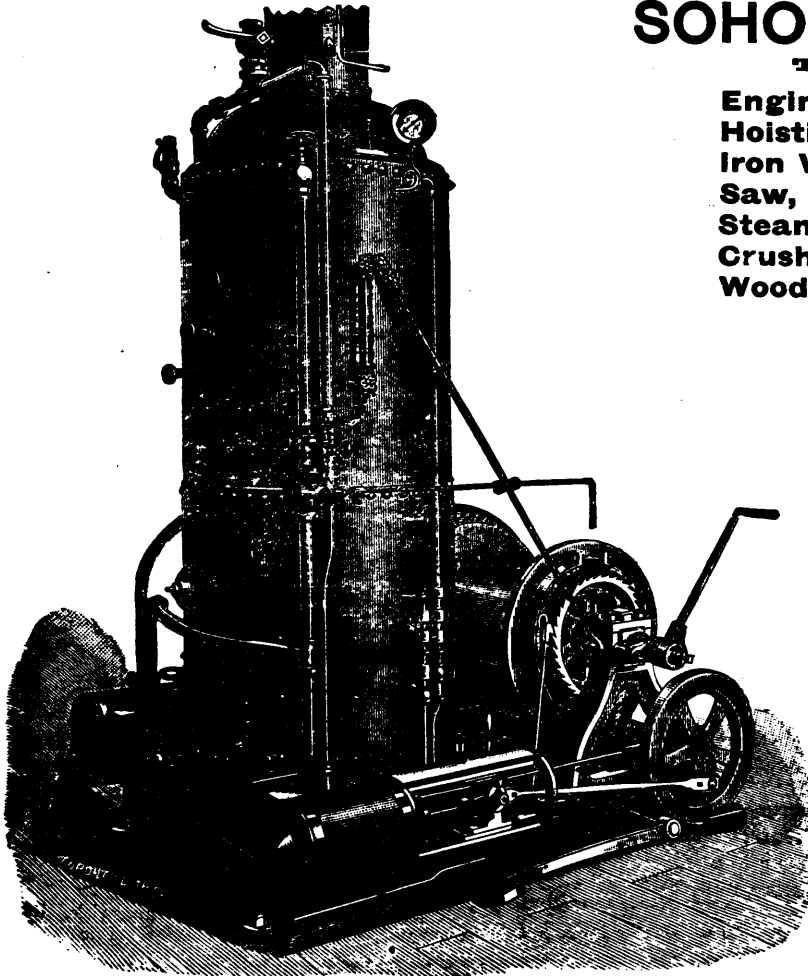
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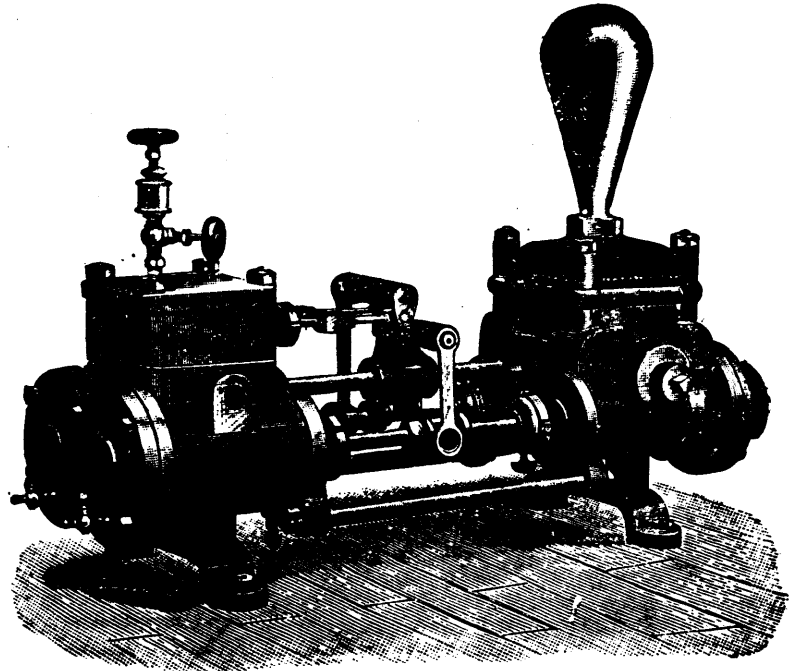
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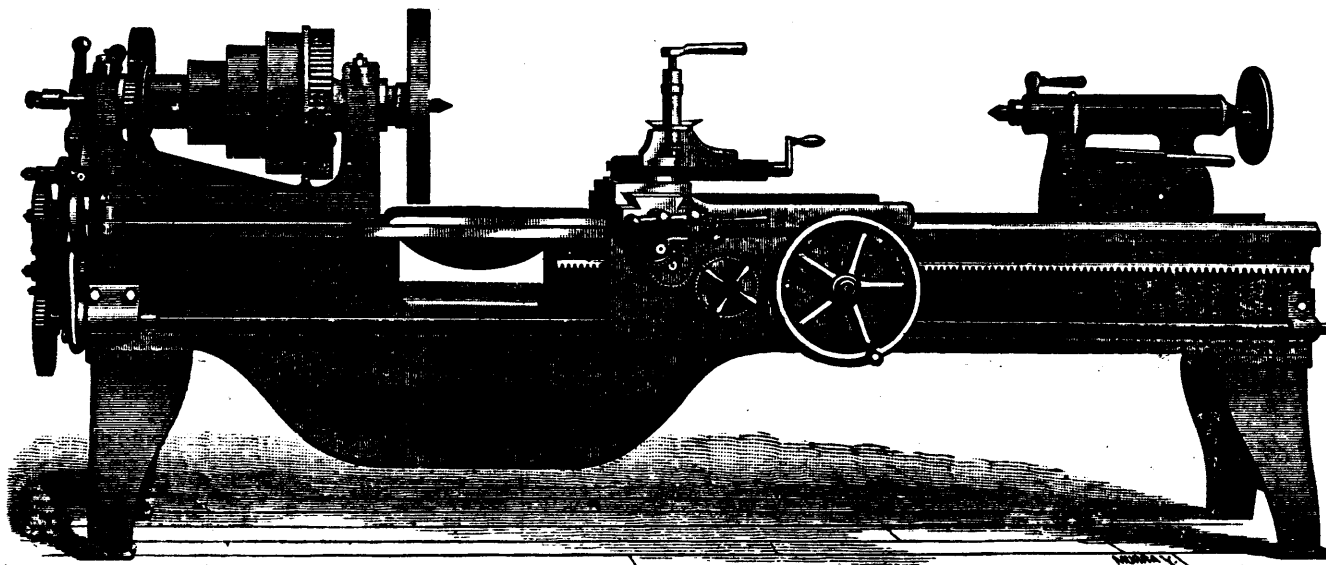
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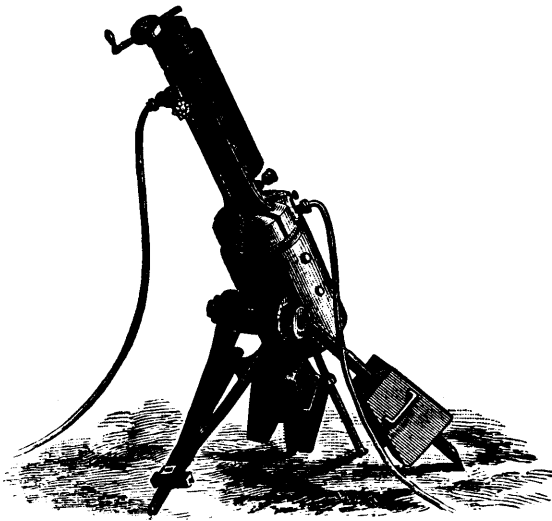
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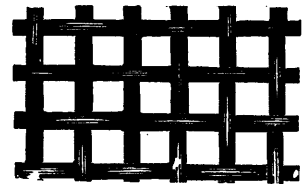
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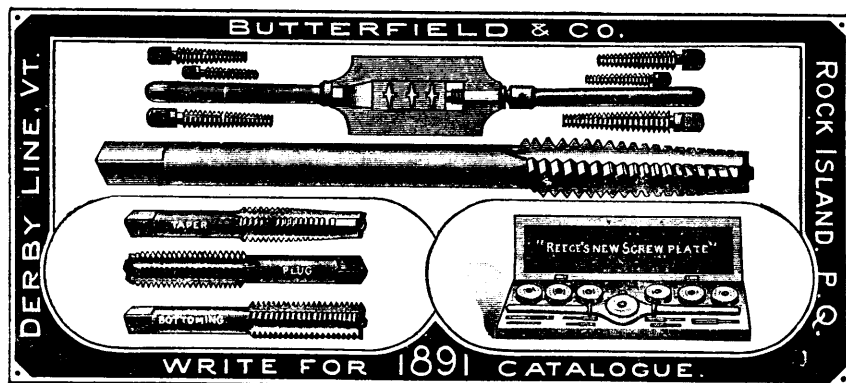
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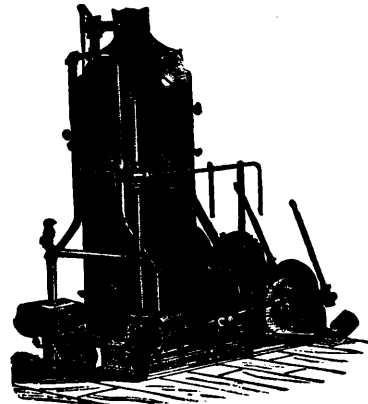
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The Phosphates of America.

A work which is of great interest and information to the miners and agriculturists of Canada, has just been issued by the Scientific Publishing Company, New York, entitled "The Phosphates of America; where and how they occur; how they are mined; and what they cost: With Practical Treatises on the manufacture of Sulphuric Acid, Acid Phosphate, Phosphoric Acid, and Concentrated Superphosphates, and selected methods of Chemical Analysis," by Francis Wyatt, Ph.D. The book is profusely illustrated, is elegantly printed upon the best of thick paper, and physically speaking is one of the weightiest books for its size that we have ever handled. The price is \$4.

Every person interested in the production or use of phosphate will desire to peruse this comprehensive compilation of facts, and in the technical parts of the book many useful hints and suggestions will doubtless be of service to manufacturers and amateur chemists. The only general treatise upon phosphates published in America previous to the issue of this work was Bulletin No. 46 of the United States Geological Survey, entitled "The Nature and Origin of Deposits of Phosphate of Lime," by R. A. F. Penrose, jr., Ph.D., with an introduction by Prof. N. S. Shaler. Dr. Penrose, who became very favorably known in Canada by his connection for two years with our phosphate industry, wrote this essay of 100 pages as his thesis for the degree of Ph.D. It was published in 1888, and contains a graphic and accurate summary of all the known sources for the supply of phosphate that had up to that time received attention commercially. Since then the opening up of the Florida phosphate deposits has created a subject of interest which has literally become of overwhelming importance, as mainly owing to their competition the Canadian mines are for the moment in an embarrassed position and the prices of phosphate have been forced down to an unremunerative point for any but the most prolific and favorably situated properties. Many pamphlets have appeared describing the Florida phosphate fields, one of which, by Mr. C. C. Hoyer Millar, of London, was of interest and value; but there was a general desire for a scientific and impartial account by a skilled observer; and this need the work of Dr. Wyatt appears to have supplied.

After a general introductory account of the nature and use of phosphate, with some speculations upon its origin, the book gives a detailed description successively of the phosphate deposits of Canada, Carolina and Florida, with some account of the various mining operations, all illustrated by very instructive photographic views. These themes occupy 83 pages of the book, and the remaining 95 pages are devoted to chemical and mechanical topics relating to phosphates, such as the manufacture of sulphuric acid, superphosphates and phosphoric acid, and the description of machinery for grinding phosphates. Various formulae for chemical analysis are given, with an elaborate list of the articles required for the outfit of laboratories connected with phosphate mines and fertilizer factories. A copious index completes the book and renders easy access to its treasures.

The portions of the book which are of special interest to Canadian readers are these which treat of the phosphate deposits of Canada and Florida. The deposits of Carolina have long been known, and, being so much lower in grade than the Canadian deposits, do not excite so much concern from a commercial standpoint. As to the Canadian deposits, it is interesting to know the impressions and opinions of so skilled and intelligent an observer as Dr. Wyatt, although the necessary limitations of his occasional professional visits to Canada for the purpose of reporting upon special properties prevent the thorough acquaintance with the practical side of the subject only to be attained through residence and intimate connection with the operations. But the absorbing topic of interest is that of Florida phosphates, and every Canadian phosphate miner to-day is anxiously asking: Are the Florida deposits large and permanent? Are they of high grade? Are they suitable in every way for manufacture? Are they easily and economically obtained? Are they likely to crowd Canadian phosphates entirely out of the world's markets? These important questions are fully considered by Dr. Wyatt, and he justly gives the largest space and fullest treatment to this latest comer into the field of phosphate production. A few of Dr. Wyatt's valuable opinions and descriptions may be given here to intimate to our readers the nature of his conclusions and the importance of his work.

In the introductory chapter a very concise and interesting geological sketch is given as to the processes by which the earth has developed to its present condition, with some account of the formation of soils and the growth of plants. Tables of food products and their mineral constituents also convey important information. It is stated that the quantity of phosphoric acid yearly removed from the soil in the United States by the cereal crops is 2,714,585,473 lbs., equal to 19 lbs. per acre-cultivated, while the hay crop removes in addition, 468,795,600 lbs., or 12.5 lbs. per acre. To supply this loss the application of mineral phosphate to the soil is clearly a necessity, and the author gives some

important testimony in favor of the opinion that some phosphates on certain soils "are extremely valuable in the raw state, if very finely ground, as a direct manure." He regards the effect of the sulphuric acid upon the raw phosphate, in converting it into superphosphate, to be a subdivision of particles, and any mechanical means of securing equal fineness of pulverization would attain the same end. He also says that "superphosphates are only soluble in water so long as the sulphuric acid with which they have been manufactured retains its ascendancy, and that when they reach the soil, especially where carbonates are in abundance, the sulphuric acid is at once overpowered, and the phosphoric acid, instead of remaining, combined with one molecule of lime and two molecules of water, at once undergoes reversion." He states that the effectiveness of raw phosphates depends upon the activity of the soil. The farmer should apply it as finely ground as possible. "If his land be tolerably acid he will get a rapid return; but if it be not, the phosphate will not decompose, and he will have to wait perhaps several years before obtaining any appreciable results for his "outlay."

A word of comfort is given to the phosphate miner who at present is depressed by the glut of phosphates in the markets of the world. "Nothing can stem the demand for artificial manures; it will go on increasing with such steadiness and rapidity that the visible sources of supply will soon become inadequate. Especially is this true of phosphate of lime, and the recognition of this fact by those engaged in the fertilizer industry explains the eagerness with which fresh deposits of the material are being sought for all the world over."

Dr. Wyatt recognizes the fact that "there is a great and regrettable divergency in the results of phosphate analyses made by different chemists." He says: "To the uninitiated this is an unaccountable fact, to be explained only by a very excusable and popular conclusion that analytical chemistry is not a reliable or exact science, and that it cannot produce in practice what it expresses by equation. Nothing on earth could cast a greater aspersions on the highest of professions than this state of affairs, and yet nothing on earth could be more easily and perfectly remedied. All that is necessary is for chemists to come together and agree upon certain methods, and to invite purchasers and sellers of phosphates and manures to regulate their settlements on a prescribed basis." It is to be hoped that this advice of Dr. Wyatt's will be followed, for anything more scandalous than the present system of analysing does not exist. While the analyses of the buyer's chemist are almost invariably lower than those of the seller's chemist, "the uninitiated" will persist in believing either that "chemistry is not a reliable or exact science," or else that some of the persons concerned do not possess "a reliable or exact" morality.

In the chapter on "The Phosphates of North America" the history of Canadian phosphate mining is but very briefly given, with a description of the deposits, illustrated by a detailed

account of the North Star Mine in Portland East, P.Q. The author says:—

"As one of the most interesting results of the extensive and costly mining operations carried out during the past few years, it has been demonstrated that the apatite does really traverse the entire stratum in which it is found, and that if it is extremely pockety and deceptive in its occurrence it nevertheless is perfectly persistent. It hence follows that all the deposits may be mined by the same method, and that since we are called upon to deal with invariably mixed up lodes, the quantity of apatite produced will be in direct proportion to the amount of rock removed." He estimates this proportion of pure apatite to other material to be about 7 per cent., and places the average net cost per ton at the mines at \$10 for phosphate from 70 to 85 per cent. He says that only one-third of the total production is shipped, and that "the balance has been lost in the cobbing—a state of affairs probably unprecedented in the history of any mining operations. That few if any of the enterprises have paid any dividends on the capital, is not a matter for surprise under such circumstances as these." Dr. Wyatt's remedy is as follows: "The custom of throwing the entire cost of production upon the high grades is unfair and should be discontinued. In its stead a rule should be established of setting aside for foreign shipment only such portions of the pure apatite as may be obtained directly from the lode without hand cobbing at the surface." This, he thinks, might be one-fourth of the total output. The balance, averaging, he supposes, 60 to 65 per cent., should be ground and made into "an excellent superphosphate, containing at least 14 per cent. of soluble or available phosphoric acid." The sulphuric acid required, he thinks, could be procured from "several abundant deposits of pyrites in the immediate vicinity" of Buckingham. We cannot now enter into comment upon these conclusions further than to say that experience has shown that the phosphate deposits of Ontario differ somewhat in character from those of Quebec, and somewhat different methods of mining are found advisable; it will require years of education to produce a market in Canada for the amount of superphosphate that would be produced by the above method, and it is doubtful if our "abundant deposits of pyrites" will permit us to produce sulphuric acid as cheaply as it can be imported. Further, it is certainly incorrect to imply that two-thirds of the phosphate produced from the mines is lost in the cobbing, and has been thrown into the dumps. Under the present system of hand cobbing at well conducted mines, a large proportion of all the phosphate produced is saved, and where this method is supplemented by machine processes of separation, as practised in the mills at Buckingham, the loss becomes comparatively small. There is but little phosphate that does not require some hand cobbing, though the labor would be slight in this respect if Dr. Wyatt's suggestions could be followed. It would probably be difficult to cull from the dumps of

the well conducted mines any considerable amount of phosphate rock that would analyze over 40 per cent. If a cheap chemical process could be found by which the phosphoric acid could be extracted from this lowest grade refuse it would save the life of many a languishing mine.

The most interesting, because the most novel part of the book, is that which treats of the phosphates of Florida. A theory is given as to the geological formation, and the deposits are divided into three classes:—

1. Original pockets or cavities in the limestone filled with hard and soft rock phosphates and debris.

2. Mounds or benches, rolled up on the elevated points and chiefly consisting of huge boulders of phosphate rock.

3. Drift or disintegrated rock, covering immense areas, chiefly in Polk or Hillsboro' Counties, and underlying Peace River and its tributaries.

Of the latter, drift or "pebble" phosphate, it is said that over an area of many hundreds of miles "Florida is virtually underlaid with a nodular phosphate stratum of a thickness varying from a few inches to thirty feet, and covered by an overburden that may be fairly averaged at about eight feet." Where these occur in the river bed they are pumped up at a cost of \$1.40 per ton, ready for market, and they pay a royalty to the State of 50 cents per ton for 55 per cent. and under; 75 cents for 55 to 60 per cent., and \$1 per ton for over 60 per cent. The average quality of 84 samples of pebble from Peace River was 61.75 per cent., and of 92 samples from drift beds in Polk County was 67.25 per cent.

It is the deposits of high grade rock that excite the interest and concern of Canadians. Of these we learn that there are three classes: 1. Boulders of hard rock phosphate or cleaned high grade material, of which 120 carefully selected samples averaged 80.49 per cent. of phosphate of lime, and 2.25 of iron and alumina. 2. Boulders and debris of unselected material, merely freed from dirt, of which 137 samples gave 74.90 per cent. of phosphate of lime, and 4.19 per cent. of iron and alumina. 3. Soft white phosphate in which no boulders are found, of which 148 samples averaged 65.15 per cent. phosphate of lime and 9.20 per cent. of iron and alumina. These rock deposits are described as being "pockety," but in many cases they extend over several acres. Under an overlying burden, principally sand, averaging about ten feet in depth, are enormous boulders of hard phosphate rock, cemented together with clay, or the deposit is sometimes in the form of a white plaster or friable mass resembling kaolin. The deposits vary much in thickness, but are known to be in one case 50 feet. It not only varies greatly in quality, but also in colour, being white, blue, yellow or brown. Much of it is soft when damp, but becomes hard upon exposure, and has been used for building stone before its other values

were known. The presence of iron and alumina in it varies greatly, and as European buyers often limit this to 3 per cent., much of the output is unsuitable for export.

A very interesting account of machinery and methods of working is given, and several pictures greatly help the comprehension. A list of companies formed shows "a paper capital of fifty odd millions of dollars." Great difficulties exist from the unsettled condition of the country, poor facilities for travel and transport, and the inefficiency of negro labor. Dr. Wyatt sums up his account of the phosphates of Florida by saying: "The natural difficulties and impediments are at present rather discouraging, but the deposits themselves are of such immense extent, and the demand for them is likely to be so great and continuous, that all obstacles to their exploitation must of necessity be cleared away. With the disappearance of the obstacles, the material of all grades will come forward in large quantities, and as its chemical composition is very satisfactory, it will soon compete favorably for superphosphate making with any other phosphates now popular with fertilizer manufacturers."

The book would have been still more valuable if it had given fuller statistics of the amount of production up to date, and a better idea of the geographical location of the rock deposits.

The question of grinding phosphates is one of great importance, and Dr. Wyatt calls attention to four methods:—

1. French burr mill stones fitted with revolving screens up to 90 or 100 mesh.

2. The Sturtevant mill, in which the rock grinds against its own material. With the attachment of a set of stones to grind the tailings, which amount to 30 per cent., "the average milled product of 70 mesh may be fairly taken as about two tons per hour."

3. "The Griffin mill, which is of the class known as a roller and die mill, in which the material is reduced by being crushed by a roll running within and against the inner surface of a ring or die." It is stated that four tons of Carolina phosphate 75 per cent. of which would pass through a 70 mesh screen, may be ground in an hour.

4. The Frisbee-Lucop mill, in which heavy rollers revolve upon the inner surface of a steel ring, and which is said to grind fifteen tons of rock to a fineness of 150 mesh in 10 hours. Dr. Wyatt estimates the average cost of grinding to 70 or 80 mesh to be \$1.50 per ton.

The growing interest in phosphates makes the issue of this book a timely event, and it will find a place upon the shelves of all public or scientific libraries as a standard book of reference. Its perusal cannot fail to be of interest and service to the phosphate miners and manufacturers, and it would be of untold benefit to this country if every farmer could be prevailed upon to read the portions relating to the value of phosphatic fertilizers.

The Smelting of Copper-Nickel Ores.

Dr. E. D. Peters, jr., well known to Canadians as the first manager of the copper-nickel mines of the Canadian Copper Co., at Sudbury, where he demonstrated the feasibility of smelting these ores on a large scale in water jacket furnaces, has issued through the medium of the Scientific Publishing Co., New York, the second edition of his well known and widely read work, "Modern American Methods of Copper Smelting." The book, apart from its great value as a reference to metallurgists generally, is of particular interest to Canadians, inasmuch as it contains the latest addition to the literature of nickel metallurgy. As Dr. Peters assisted in the opening of the mines, and the first smelting works were built under his direction, he speaks authoritatively of such matters as came under his personal observation, and within the sphere of his own practice. A few excerpts from his references to the mining of the nickel in this country will not be out of place: "On an average the ore treated at the principal mines carries some 4 per cent of copper, though, if selected, it could easily be brought up to 8 or 10 per cent. But up to the present time, experience has shown that it pays about as well to mix all the ores and smelt them as they are, as to try to make two grades of matte, one rich in copper and poor in nickel, and the other high in nickel and low in copper. By pursuing the latter course, a slightly better price can be obtained from the refiners, but the metallurgical operations are seriously embarrassed, as, if the heavy nickel ore is smelted alone, it produces far too basic a slag; while if the richer copper ore is fused by itself, the slag is too siliceous to smelt easily. By mixing the two varieties of ore in their proper proportions, a good slag is obtained without the addition of flux, not a pound of the latter being used during the time I was in charge of the work. Besides, the ores roast much better when mixed than if separate." Dr. Peters then fully describes the methods of roasting the ore, in which he calls attention to the vital importance of having a proper and well-drained roast ground. "In the severe climate of northern Ontario, it was sometimes necessary in inaugurating a new plant, to build a heap on frozen ground, or ground that was not thoroughly drained. In both cases the results were miserable, the escaping steam seeming to completely impede the combustion, and the resulting heap, when torn down, revealing isolated spots, each containing many tons of ore that were not roasted at all, only the surface being slightly scorched, though the greatest pains were taken in building and managing the heap." He points out that an absolutely dry and unfrozen ground is essential to success, and if snow falls, it must be carefully cleared away before laying the wood down, and after the wood is once in place, no snow or rain must fall upon either the fuel or ore. Where the ground is frozen, the results of the roasting are always unsatisfactory. "A few hours after lighting the heap, water begins to

flow out from under it, and for a day or two, a continuous stream will pour out from the lower side of the pile, generating steam in quantities, and extinguishing the fire as soon as the lumps of ore are scorched a little on the outside." Dr. Peters then goes on to discuss the treatment of the nickel-matte, and the subject is so attractive that we cannot refrain from giving his remarks in full:—

"In nickel smelting, when the matte is obtained it still remains to be refined, and only those who have been through such an experience realize the difficulties of disposing of it.

"In the first place it becomes a question of calculation whether it will pay better to ship the matte at about a grade of 25 per cent. as it is produced from the furnace, or to concentrate it on the spot by a second series of roasting and smelting operations. Until the local condition, wages, scale, on which the operations are conducted, exact character of ore that is treated, etc., are known, this question cannot be answered. The matte is enriched by roasting it and re-smelting it in a water-jacketed cup furnace, with quartzose flux to take up the iron. It is a question to be determined by circumstances, whether the roasting should be executed in heaps, as with the ore, or whether it should be crushed and calcined in a few hours in calcining furnaces. Heap roasting of matte takes about as long as the ore, because it has to be re-roasted 2 or 3 times, as it does not roast freely like the ore. But as there is only about one-sixth so much to handle as of the raw ore, the expense of ore per ton is not heavy. A matte of about 50 to 60 per cent. of nickel is produced by the so-called concentration smelting.

"This concentrated nickel matte has a high point of fusion and easily forms crusts and accretions.

"It is impossible to smelt it in a furnace with brick fore-hearth, as may be advantageously done with the ore, for it soon fills up the front crucible, necessitating its substitution and leaving a "salamander" weighing a ton or two, that is difficult to break up.

"After much experimenting I have returned to the old practice of using "steep," or a mixture of pulverized coals and clay, for a fore-hearth, cutting in it a small crucible connected with the furnace crucible by a deep groove. Out of this crucible the rich nickel matte can be either tapped or ladled into moulds, and as this method of procedure involves frequent, though very slight, repairs, it will save much delay to make the fore-hearth broad enough to permit of two such crucibles, side by side. Thus one can be repaired and dried while the other is in use.

"The further treatment of the nickel matte, according to the old practice, is well known and its description would be of little value in this connection.

"Being expensive and slow, efforts are being made to improve upon it, and one of the principal nickel-smelting companies at Sudbury is erecting a plant to Bessemerize this rich sulphide of copper and nickel.

"According to the laws of chemical affinity, as modified by the high temperature employed, we know that the iron still remaining in the matte ought to oxidize first, forming with silica a slag that may be poured off. Next the nickel should oxidize and slag away, leaving behind the pure copper.

"But whether such accurate results will be reached in practice seems to me rather doubtful.

"In the Bessemerizing process, as applied to iron, the entire mass of metal remains homogeneous throughout the operation, the impurities being gradually oxidized until it is all converted into steel. And the total amount of these impurities is only four or five per cent., so that the mass of fluid metal operated upon is not perceptibly lessened.

"But in Bessemerizing a mixture of the sulphides of iron, copper and nickel, the number of different chemical compounds being differing specific gravities and tending each to form its separate stratum in the converter, is too great to even enumerate.

"As soon as sufficient sulphur is removed to correspond to the iron present, we shall have a layer of oxide of iron (combined with silica from the converter lining) on top, while below, the sulphides of nickel and copper will remain comparatively unaltered. Then may come a period when we have the same silicate of iron on top, followed by a little silicate or oxide of nickel, whilst some metallic nickel has formed and sunk to the bottom, and the rest of the nickel, in its original condition of sulphide, forms a stratum below the unaltered sulphide of copper.

"These reactions and products increase in number and complexity as the operation advances, and remembering the great difficulties encountered in Bessemerizing even so simple a substance as copper matte, one cannot help feeling some curiosity as to the practical success of this operation.

"That nickel and copper can be rapidly reduced from the condition of a matte to that of separate metals, the author has convinced himself. But business considerations prevent the further elucidation of this subject.

"The final treatment of the nickel-copper alloy, or of the already separated metals, does not fall within the scope of this work.

"But it must be evident to every one familiar with the facts, that the commercial electrolysis of copper on the one

hand, and an electrolytic deposition of nickel in our nickel-plating establishment on the other hand, point out a path to follow that is too plain to be neglected.

"And as our chemists find no difficulty in precipitating with the electric current, chemically pure copper from a solution containing both copper and nickel, and then, by slightly altering the conditions, precipitating all the nickel in absolute purity, from the same solution, and with the same current, it would seem that our refiners might reasonably expect to effect the same results on a commercial scale, especially as there is practically no loss of acid in the operation.

"Nor can I see any reason why nearly all our metallic nickel should be offered to the trade in little cubes less than an inch square. Of course this peculiar form has resulted from the practice of the nickel refiners to reduce the oxide of nickel obtained by the methods now in use, to metallic nickel. Being mixed with rye meal, as a reducing agent, it is formed into these little cubes, and a number of these packed in crucibles are exposed to a sufficient heat to reduce the nickel to a metal without fusing it. This makes a small porous fragment of metal suitable for solution in acids and where nickel is to be used in minute quantities. But it adds materially to the expense of refining and there is really no more reason why nickel should be so treated than copper or iron.

"Although the fusion point of nickel is rather high, yet a sufficient temperature to make nickel pour as readily as copper, is obtained without difficulty, in metallurgical practice, and there is little doubt that before long nickel will be refined in bulk and cast into suitable ingots, as is copper or lead.

"Indeed at Vivian & Co.'s nickel works in England, a small reverberatory, heated by gas, has been in use for several years for refining nickel, some 2,000 pounds being refined at a charge; and the superb display of solid nickel articles and ingots made by Joseph Wharton, of Philadelphia, shows that he experiences no difficulty in melting and casting nickel like other metals."

Another feature of Dr. Peters' book, of interest to Canadians, is the detailed plan of the large reverberatories now being constructed by the Eastern Development Company at their mines at Coxheath, C.B. These drawings cover nine full size pages, and probably form the most complete and detailed working drawings of a modern reverberatory furnace that have yet been published. They are accompanied by exact estimates of the cost of every detail of the furnace. The book is nicely gotten up and in every sense merits the careful attention of everyone interested in the metallurgy of copper.

EN PASSANT.

In the *Empire* of Dec. 1st there appears a remarkable contribution from the pen of Mr. W. J. Morris, of Perth. Mr. Morris quotes our article in the November issue referring to the singular condition of foreign markets, where a rush of Florida 75 to 80 per cent. phosphate has forced its price below that of the more scantily supplied and firmly held 60 per cent. phosphate. Referring to this, Mr. Morris says:—

"It seems to me extraordinary that a paper purporting to be the exponent of the mining interests of the country should think that our business men are for one moment foolish enough to believe that shrewd, keen British manufacturers will pay a higher price for an inferior article than for a better one." It goes on to say:—

"I cannot believe that these extracts of letters are genuine; or, if they are, are evidently written by some shipping agent who has 'sold long' and now wants to bear Canadian high grades to the advantage of his own pocket."

He further states that "the REVIEW letter says that the market is flooded with Carolina and Florida high grades." As to this last point, we will merely remark that the letter says no such thing. Our correspondents and the Editor of this paper are sufficiently well informed to know that no high grade phosphate is produced in the Carolinas. Mr. Morris, we believe, was one of the earliest in Canada to be connected with the phosphate industry, and he has shown on many occasions a zealous concern for

the advancement of Canadian mining interests. But of late years, we understand, he has occupied the position of Government Inspector on "the raging canal" at Perth, and it is quite possible that while calmly smoking the beloved pipe on board his dredge his field of vision has been too limited to permit him to form wholly accurate opinions as to what is going on in the world at large. The REVIEW is a medium of thoroughly trustworthy information. When we desire to ascertain the depth of water in the Tay Canal we shall probably write to Mr. Morris as to an undoubted authority, but when we wish to learn the price of phosphate in England we shall ask the men who are working the mineral in Canada and selling it in London. The imputation which Mr. Morris makes that miners of phosphate have an interest in spreading false reports in order to break down the markets, is lacking, not only in courtesy, but in common sense. Canal business, under Government subsidies, may perhaps be run contrary to the laws of trade, but all commercial producers try to get the most for their goods, and the insinuation that the authorities quoted, who are practical Canadian miners, would attempt to bear the market price of their own goods is too absurd for further notice. Advices from London dated Nov. 25th, report sales of Canadian 80 per cent. phosphate at 10½d per unit, with offers of higher grade from a well known Templeton mine, at 1s. As Mr. Morris cannot believe that 75 per cent. phosphate has sold below 60 per cent. in London, it may interest him to know that so astute an authority as the *Engineering and Mining Journal* of New York entertains this delusion, and alluded to the anomaly in its market reports for the month of September last. The only charge heretofore made against this journal in connection with the phosphate industries has been that we were, if anything, too eager to promote its interests. It is rather refreshing to learn that we have become the dupe of "wooden nutmeg" and "basswood ham," bears, "who wish to boom foreign produce at our expense." Our mission is neither to boom nor depress, but to tell the truth, and our interest is in every legitimate way to promote the phosphate and all other Canadian mining industries. We most sincerely hope that this prophetic from the Tay Canal will prove to be a wise seer by the fulfilment of his final prediction—"I am certain that next June will see Canadian high grade phosphates in large demand, and at as high prices as have ever ruled."

The establishment of Institutes of Mine Officials in Cape Breton, Pictou and Cumberland Counties, is inaugurating a good work in the establishment of mining lectures of an elementary character for the benefit of the workman. The men ought to be encouraged to express their views at these meetings, *sans ceremonie*. At the last meeting of the Pictou Institute, Mr. H. S. Poole, F.G.S., manager of the Acadia colliery, gave an interesting address on the subject of explosives.

At the Abercarnid colliery in South Wales, an electric hauling plant, capable of handling 500 tons a day and doing away with the work of 27 horses and many haulers, has recently been put into successful operation. There is a generating plant on the surface and several electrically-driven hauling and pumping engines underground, connected by cables carried down the shaft and along the roadway for some 1,200 yards or more. The generating plant consists of a 40 h.p. compound engine, with cylinders 13 and 21 inch diameter, and 24 inch stroke, working at 110 revolutions per minute. The dynamo, built on a wrought iron girder bed-plate, is horizontal, compound-wound and is capable of giving 180 ampères, at 500 volts pressure, and 550 revolutions per minute. There are 3,200 yards of conducting cable, which is carried down, attached to the side of the shaft, and is run underground along the roadway, from the shaft to the hauling engine. This cable will stand a shearing strain of 10 tons per square inch. It is composed of 37 strands of No. 14 high-conductivity copper wire, highly insulated with vulcanized bitumen, double taped and served, with two layers of jute yarn compounded between each. It is protected by a double sheath of No. 8 steel wires, the first stranding being of 30, and the second of 36 wires laid reversely, the current density being only 337 ampères per square inch, and the resistance of the 3,200 yards of cable being 3192 ohms, giving a loss of potential of 51 volts, an equivalent of 10 per cent. In the combination of motor and hauling drum for a main and tail rope system it was not only necessary to make the plant very compact, but also to construct the motor so that the several operations of starting, reversing, or stopping could be effected with the least possible trouble. These operations are carried out as easily as they are performed by machinery worked by steam or compressed air.

Some recent remarks by Mr. Alex. Brown on "Unloading Ore at Cleveland" by means of machinery, contained the following statements: In 1880 there was a demand for better facilities for handling and storing ore. Nine-tenths of it were taken out of the vessel by horse or steam power in small buckets and wheeled to the ore piles. There had been opposition by the wheelers to the use of any but hand power, and the early engines were thrown into the water. So, again, there was the same opposition to unloading machinery. But when they found they made more by its aid, they desired contracts for the season. Under the old regime it cost 35 cents per ton to unload ore; now hoisting and piling cost less than 1½ cents per ton. The shovelling in the hold of the vessel is the great expense, and the shovellers were on a strike then for 13 cents as against 11 cents per ton. He thought unloading should be reduced to 6 cents per ton. At Milwaukee the pay was 10 cents per hour, and the men are steadily employed. As to improvements in the speed of unloading, he stated: "Before the introduction of machinery it took 12 hours to un-

load 500 tons of ore. The same number of men can now unload 1,000 tons in 10 hours. The trouble is that the ore handlers will only work when they feel like it. The value which the machinery has been to the ore trade was proved by the fact that in 1883 the total tonnage of ore to the lower lake ports was 1,962,000 tons, while in 1890 it reached nearly 7,000,000 tons.

In a paper on "Coal Mining, Past and Present," read by Mr. Moses Morris before the Lancashire branch of the National Association of Colliery Managers, he described his first entrance to the mine, 55 years ago, when his uncle carried him down a ladder pit. He described the ladder "as not being quite a ladder," it having 18 staves broken, so that before they could get down they had to learn how to slur. The men had to carry their picks, hammers, candles, oil for their tubs, cuts, etc., in the best manner they could. He described the system of cuts or tallies for their coal, and showed the meeting some specimens that were in use at that period. Mr. Morris said it was impossible for any person who had not known those days to imagine even the changes for the better that had taken place. They sharpened their picks at the bottom, and, noticing the superstition of the miners, he remarked that a man wearing a felt hat could cause a play day in the district, as no collier would go to work if he met a man wearing a felt hat. Their tubs had no wheels, whether heavy or light, and had to be dragged upon skids with the belt and chain, a specimen of which he held in his hand. They used pieces of spinning wood to show where the turning-over places were, and it was quite common for tubs to be dragged eight score yards with the belt and chain. They went at three and stopped until eight or nine for 3s. 6d. per day. Some would stop down all night, as it was not worth while going home. And every day a tub was taken for the good of the brow as it was called; pay day was every six weeks, and they had to go to Bolton to get a note cashed, and then to divide it. Mr. Morris then described the method of getting their props, and showed how at that time the men were paid for it. Every man had to draw his own props. He got 1½d. for two if they were good ones, and 1½d. each for bad ones, but if they lost two they deducted the price of 10 props. He showed the method of lighting and putting out their candles, proving that it required a certain amount of knowledge to light or put out a candle properly. As to education, they never got any. The schoolmaster had not got up when they went down the pit, and he (the schoolmaster) had gone to bed when they ascended.

During the fiscal year ending June 30, 1890, Ontario imported 800,000 tons of anthracite and 1,500,000 tons of bituminous coal and coke, and the demand grows greater year by year. During the nine months ending September 30, Canada imported 1,236,702 tons of coal from the United States, against 1,049,857 tons during the corresponding period of 1890.

In another place our readers will find the verdict of the court in the appeal of the Anglo-Continental Guano Co. vs. the Emerald Phosphate Co. The contention of the appellants was sustained and judgment given in their favor with costs. The decision upon the merits turned upon the simple rule that an action of trespass is premature until the boundaries are established—a principle that has become so well established by precedents in the Province of Quebec that it should not have been necessary for the appellants to go to appeal to have it applied.

Australia and New South Wales, ever alive to their commercial and industrial interests, have appointed their Commissions to the World's Fair, but enquiries at headquarters fail to enlighten us as to what is being done by the Canadian Government, or if any move has yet been made in the matter at all. Now we have everything to gain by the infusion of American capital for the development of our mines, and the mining industry demands a Canadian exhibit at Chicago which will eclipse in its completeness all previous exhibits, either at Philadelphia, London, Paris, or elsewhere. Surely it is full time that our authorities were making a decided move in this matter.

Further tests have been made by the United States navy to ascertain how plates of American make compare with those of European manufacture. The plates tested on the present occasion were of high carbon nickel-rolled steel, made by the Carnegie-Phipps Company, low carbon nickel-rolled steel, "Harveyised," made by the same company, and high carbon nickel-forged steel, "Harveyised," made by the Bethlehem Iron Company. Each plate was 10 1/2 in. thick, 8 ft. high, and 6 ft. wide, with an oak backing. The plates were struck at each corner by a 100 lb. Holtzer steel shell, fired from a 40 calibre 6 in. gun. The Carnegie plates were then hit by a 250 lb. Carpenter steel shell, fired from an 8 in. gun, while the Bethlehem plate was struck in the centre by a 210 lb. Firminy steel shell from a gun of the same calibre. The resistance offered by all was regarded as very satisfactory.

In a paper read before the British Association at Cardiff, a method of sinking shafts through water-bearing strata was described. In the ordinary plan of doing this work a sump is kept in advance of the full shaft and the difficulty to be met with is in the sinking of this sump. It is proposed to locate the pump in a bore hole made before the shaft is commenced. The chief novelty is in adapting the pump to this service and the prevention of rubbish from passing down the hole and choking the pump. The writer provides against the latter by a heavy taper shield of cast steel surrounding the pump and resting on the edge of the bore hole. This shield is perforated with holes to allow the water to pass down, but so arranged as to exclude debris. This shield is very heavy and it follows the excavation around the pump and protects

the latter from injury in blasting. The pump is made without a foot valve, the rod of the bucket working through the seating of a valve which rests on the top of the working barrel. By this arrangement the drawing of the bucket also draws the valve; and should the bottom of the bore hole be filled by sand this can be removed by lowering a scoop such as is used in making bore holes. The bore hole is supposed to be sunk deep enough to provide a place for this sand below the pump. He recommends duplicate pumping engines and bore holes. These holes would be 30 inches in diameter, but he does not describe his plan for sinking them.

As far as we can ascertain, the moneys subscribed for the relief of the sufferers by the explosion at the Springhill Collieries will aggregate a little over \$100,000. An approximate estimate of the receipts is something in the following ratio:—

Province of Quebec.....	\$25,000
" Ontario.....	8,000
" New Brunswick.....	15,000
" Manitoba.....	453
" British Columbia.....	3,570
" Prince Edward Island.....	1,235
North-West Territories.....	1,687
Great Britain.....	3,416
United States.....	1,883
Province of Nova Scotia.....	40,000

These amounts do not include a sum of some \$12,000 subscribed by the citizens of Halifax, and \$2,770 held in Ottawa on deposit, pending a more satisfactory explanation of the allocation of the funds at Springhill. The following letter from Mayor Macpherson explains the situation very clearly:—

HALIFAX, N.S., Nov. 28th, 1891.

In reply to your letter of the 20th inst. I beg to say that the citizens of Halifax subscribed about \$16,000 for the relief of those *triste* widows and orphans by the explosion at Springhill Mines. About \$4,000 of this amount was forwarded in April last. On the 15th April I received a letter from Mr. McLeod, secretary of the relief committee, asking me to deposit whatever money I had of that fund in the Bank of Montreal to the credit of Sir Donald Smith, Hon. Geo. A. Drummond, Mr. E. D. Clouston and Mr. Robert Cowans, in trust. At that time there was good deal of dissatisfaction about the way money was being used. I wrote to Mr. McLeod and told him I had heard that the money forwarded to Springhill had been deposited and made part of an old relief fund and used for the same purposes, and if such was the case I must decline to comply with his request. Mr. McLeod never replied.

Mayor Hall, of Springhill, also told me I had better not forward the money I then held until the matter was made more satisfactory.

In September a number of the local committee came to Halifax to discuss the matter, when it was decided that if they (the committee) would make a declaration of trust of the fund and a statement of how it was being expended, the money held here would be paid in—to which they agreed; but when the declaration of trust came to hand I found it was only for the money held by me, instead of the whole fund; therefore, I declined to hand over the money until they had complied with the resolution passed at our meeting, and which they have not yet done.

The balance of the amount subscribed over and above the \$4,000 paid in is on special deposit and pending a satisfactory settlement by the trustees.

Yours truly,
DAVID MCPHERSON, Mayor.

The strike at the Wellington collieries, inaugurated eighteen months ago, was declared off on the 14th ult. Although the strikers have secured reduced working hours, their main object, namely, the recognition of the Union, has not been attained. The Dunsmuir have started proceedings in the courts against Tully Boyce, president of the union, and T. Keith, M.P.P., for conspiracy, and both parties have been committed for trial. The proceedings created a sensation.

From returns received, we compute the ocean shipments of Canadian phosphates during the season just closed, as follows:—

Millar & Co.....	Tons.
Lomer Kohr & Co.....	1,428
Wilson & Green.....	7,148
Irwin & Hoopert.....	4,310
J. & R. Esdaile.....	1,282
Anglo-Canadian Phosphate Co.....	407
McKee & Co.....	402
.....	110
Total ocean shipments.....	15,087

We are not yet in a position to quote the quantities exported to the United States.

The production of Canadian phosphates in previous years has been:—

YEAR	QUANTY — TONS.	VALUE.	YEAR.	QUANTY — TONS.	VALUE.
1877.....	2,823	\$47,303	1884.....	21,709	\$424,240
1878.....	10,743	208,109	1885.....	28,069	496,293
1879.....	8,446	122,035	1886.....	20,440	343,007
1880.....	13,060	190,806	1887.....	23,152	433,217
1881.....	11,968	218,456	1888.....	18,776	298,609
1882.....	17,153	338,357	1889.....	29,987	394,768
1883.....	19,716	427,668	1890.....	31,753	361,045

Ocean freights during the season might be fairly averaged as follows: Liverpool, from 2/ to 7/6 per ton; London, 4/ to 10/6 per ton; Glasgow, from 5/ to 7/6; Hamburg, 12/6 to 17/6.

"With regard to prices," one of the leading buyers writes, "we think the great bulk of the phosphate shipped was on last winter's sales, and what was sold here was purchased by parties over-sold on last year's prices, and they therefore could afford to pay high prices. Any sales that came under our notice were of this nature, and to quote these figures would give a wrong impression of the market during the past season."

About 2,000 tons of phosphate from the pits of the High Rock Mines are lying at Hochelaga for next year's shipment. Several thousand tons are also held by the other companies at Buckingham wharf.

The shipments of crude asbestos over the line of the Quebec Central Railway are reported to be in excess of last year's returns, but the exact figures will not be known for a few weeks yet.

The returns of the imports of coal by water, published elsewhere, are interesting as showing a marked increase in the consumption of Canadian coal and a diminution of foreign imports. The International, Reserve, General Mining, Caledonia and Gowrie, each show a lead over last year.

The New Vancouver Coal Company has declared a dividend of five per cent. on its operations during the past half year. The output for that period amounted to 253,296 tons, and the sales to 254,025, against 217,338 tons, and 215,000 sales in the previous half year. The balance sheet is the best ever submitted to the shareholders.

The second Annual General Meeting of the General Mining Association of the Province of Quebec will be held in the new club room of the Windsor Hotel, Montreal, on Wednesday, 13th January next. Two sessions will be held. After the election of officers, council, and other routine, papers will be read by Capt. R. C. Adams, Dr. R. W. Ellis, J. T. Donald, M.A., Sir William Dawson, Prof. W. C. Carlyle, Dr. Harrington and others. The annual dinner will be held in the same place in the evening.

As the Mercier Mining Bill must be reported on during the present month, the report of the Privy Council on the petition praying for its disallowance will, in all likelihood be submitted at this Meeting. The members of the Association, while not over-confident, entertain hope of a successful issue of their appeal against this unconstitutional interference with their rights.

The Montreal *Gazette* is aggrieved at the idea of the Dominion Government interfering with the Mercier Mining Bill. It says: "It is most unlikely that the Dominion Government will take any such action. A province's administration of its financial affairs is its own concern, and when its legislators make blunders it should be left to the people to settle with them. The Dominion administration will have plenty to do to attend to its own finances. If individuals are aggrieved they have the courts to apply to." Well, it may be so; but the question at issue is not quite one of provincial finances, although in all conscience that is serious enough, but rather one essentially of constitutional administration. It is the bounden duty of the Federal Government to step in and disallow this Bill, for apart from its other objectionable features, it virtually amounts to the confiscation of all the mines and mining rights disposed of without reserve on private lands. There is no question that the whole jurisprudence of the country establishes that where such lands were granted without a reserve of the minerals, all base metals become the property of the grantee. We would suggest that our contemporary should ascertain the facts before ventilating its ignorance in this ridiculous manner.

The mines in the rich mineral districts now being opened up in the Kootenay country are to a unit in favor of a substantial increase in the present duty on imported lead. With the home market, consuming now about 18,000 tons and which is steadily increasing, assured to the mine owners of British Columbia, they would feel that their industry was on a satisfactory basis. They would have an equal opportunity with producers in the United States in outside and neutral markets. There is not much probability of the United States Congress abolishing its duty on lead ores in face of the strong opposition which such a measure would meet with from the mine owners of Colorado and other States. The only alternative, therefore, is for us to preserve the Canadian lead market for Canadian producers, and then let them seek outside markets for any surplus stock.

The article on the Nova Scotia Gold Fields, by Alfred Woodhouse, F.G.S., in the October number of the REVIEW, is attracting considerable attention. The article was republished in the Halifax *Herald*, and James McDonald, an old gold miner, writes to that journal as follows:

"The article in gold mining in Nova Scotia, is one of the best articles on mining I have ever read in any paper in the Dominion. The mine owners and managers should read it carefully and put it into practice as much as possible, for any persons visiting the mining camps in our province will soon see for themselves the truth of the engineer's assertions, when he said that you were struck by the large number of small pits and trenches on the surface of the veins. It is seldom one sees a shaft over 150 feet deep. Of course there are some, but they are few and far between—like angels' visits—and the cause of the most of it is lack of capital. How many places all over the country do you hear the same old story, "lost the lead" or vein. Of course on the surface the veins are more or less thrown about and displaced, while if there was a vertical shaft sunk from 200 to 500 feet, and a cross-cut made across the formation, the veins would be found in place, and then, by careful surveying the gold shutes could be located at the exact point where it would cross the tunnel, and then followed up as it raised to the surface, instead of taking everything up hill as it is done in most of our mines, and be troubled with the water. Mining is like most any other business—it needs careful attention to make it pay; and a mine that is worked by gopher holes, as they are called out west, can never be a paying mine for any length of time. For an illustration of this, look at the old mines of Mexico that were worked on the surface and down to water level, and abandoned as worthless. Now these same mines have been bought by Americans and are paying handsome dividends to-day, and will continue to do so for years to come. Now the time is not far off when lots of old mining properties that to-day are considered worked out, will be worked by large companies and improved machinery, and will give the stockholders handsome returns for the money invested. One thing more, and that is, the royalties on copper and lead are entirely too high. On lead it is just double what it is on gold or silver; and on copper it is worse, or about one third of the market value of the ore. Now, our copper and lead mines can't stand to mine the ore and give up so much in royalties, and compete with other countries, where they pay no royalty, besides paying a high price for the areas. Besides, our Local Government should take some steps to have the royalties on lead and copper put on the same basis of gold and silver. Then there are lots of copper mines that are lying idle at the present time that would start up and give employment to hundreds of miners, and put thousands of dollars into the local treasury, and bring the Province of Nova Scotia, rich in all kinds of minerals, to the front as one of the greatest mining countries on the face of the globe."

In a paper contributed to the *American Journal of Science* by Prof. B. J. Harrington, of McGill University, the discovery of amber deposits at Cedar Lake, Man., is explored. He says: "Though resembling amber in some of its characters, the Cedar Lake resin may here be classed provisionally as "retinite," on account of its differing from amber in its deportment with solvents, in not yielding crystals of succinic acid on distillation, and in having a somewhat different ultimate composition. The name 'retinite,' as used by some mineralogists, is a convenient general term to include such substances as Walchowite, Krantzite, Jaulingite, Rosthornite and the Cedar Lake resin, which last, by way of distinguishing it from other retinites, may be called Chemawinite (from Chemahawin or Chemayin, the Indian name of a Hudson Bay post, not far from where the resin occurs. Though the origin of this substance is not certainly known, there can be little doubt that it has been derived from one of the tertiary or cretaceous lignites occurring on the Saskatchewan. Some of these are known to contain resins, one of which, examined by the writer, was not essentially very different from the Cedar Lake material. It behaved similarly on heating, had a hardness of over 2, a specific gravity of 1.066, and dissolved in absolute alcohol to the

extent of 29.30 per cent. Some of the larger pieces of the Cedar Lake resin might perhaps be employed for ornamental purposes (beads, etc.), and possibly the material might be utilized by the varnish maker. This question will be discussed when the examination of the resin is completed."

At the opening meeting of the South Staffordshire Institute of Iron and Steel Works Managers, the president pointed out the difficulty to name any metallurgical appliance which, during the last fifty years, has made such rapid and continuous progress as the blast furnace. At one time 100 tons a week, with a coke consumption of 40 cwt. or thereabouts, was considered a good production, whereas, at the present time, outputs of 700 to 900 and even 1,000 tons per week was not unusual. Such an extraordinary change in outputs and economy had only been obtained by vast changes in blast furnaces, plant and equipment, and in many cases by a total revolution in ideas of furnace practice. The influence of American practice was making itself felt more and more in England, and it was only a question of time when in England they would adopt the American system of separate furnaces, separate blowing engines, separate blast mains, separate stoves and separate lifts. He claimed that the great makes of America were, however, obtained at the expenditure of fuel which would in England be considered an ample profit, being 1½ cwt. of coke per ton over and above the consumption in England. The furnace doing the best work was that turning out about 1,000 tons per week, 17 feet high and 76 or 70 feet bosh.

A writer in the *Colliery Guardian* suggests the use of blast furnace slag for road-making. Having seen what a slag-lined road would stand he would prefer it to any substance other than granite or whinstone, as it is a substance which wears with a good face and is practically untouched by frost, a desideratum which gravel and flint do not largely possess. Besides the rough metal for the roads, all less than inch in diameter could be used for concrete or tar paving, the latter being a purpose for which it is specially suited. In addition, the slag could be moulded roughly into blocks for kerbing, and in fact paving, also, if necessary, the whole being in a molten state as it issues from the furnace.

Accustomed as we are to the collapse of great concerns and the eclipse of noted personalities, few will have read without regret the details which have been published of the fall of the great financier, Mr. Cyrus W. Field. Equally with Lear he trusted, and worse than Lear, he has involved others in his fall. Solon said well when he told the exultant Croesus to "call no man happy till he is dead." The deplorable occurrence is notable from the fact that Mr. Field is a heavy stockholder and a prominent director of the Acadia Coal Co., while his son, now, we are pained to learn, under arrest, is also on the board of the Nova Scotia company. How far the failure will affect the company, or whether it will seriously affect it at all, can only be conjectured at present.

Our Portrait Gallery.

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

No. 14.

Bernard J. Harrington, B.A., Ph.D., Greenshield's Professor of Chemistry and Mineralogy, McGill University, Montreal.

Few men have done more, in an unostentatious way, to advance the mining industries of our Dominion than Dr. B. J. Harrington, who has not only afforded accurate and reliable information concerning our mineral deposits in his various exhaustive reports, but has also trained many able young men now engaged in professional work in various parts of the Dominion.

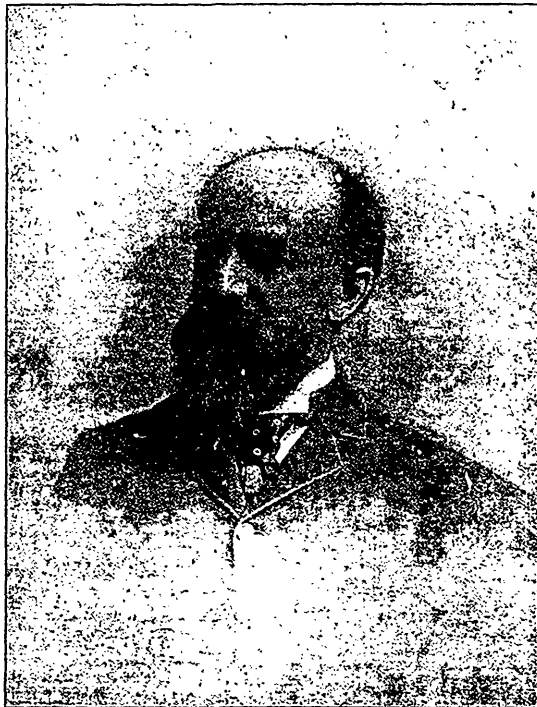
He was born at St. Andrews, P. Q., where his father's family have resided for several generations, on the 5th of August 1848. His mother, who was a Miss Seymour, was also a Canadian, having been born in the Eastern Townships of the same Province. Owing to weak eyesight, from which he suffered while a boy, he was not sent to school, but received his elementary education chiefly from private teachers. At the age of 17, however, he matriculated at McGill University, and four years later graduated as Bachelor of Arts, obtaining first rank honours in natural science and the Logan gold medal. He then continued his studies in the Sheffield Scientific school of Yale College, New Haven, Connecticut, where he remained as a "post-graduate" student for two years, devoting his attention principally to chemistry, mineralogy and metallurgy, and at the end of that time graduated with distinction as Doctor of Philosophy, obtaining also the prize in mineralogy. Dr. H. S. Williams, now Professor of Geology at Cornell University, obtaining this degree, which has been but seldom granted, at the same time. Dr. Harrington took as the subject for his thesis the "Siemens Martin process for the production of Steel."

Shortly after this Principal (now Sir William) Dawson was appointed by the Government of Prince Edward Island to examine that province and report upon its economic resources, especially as to the possibility of finding coal on the Island, and Dr. Harrington was selected as his assistant. The results of this survey are to be found in a report published by the Government of Prince Edward Island.

In the summer of 1871, Dr. Harrington was appointed Lecturer in Mining and Chemistry at McGill University, and the following year crossed the Atlantic and spent several months

in the principal mining and manufacturing centres of the mother country. On his return he was appointed Chemist and Mineralogist to the Geological Survey, which position had been just rendered vacant by the resignation of Dr. T. Sterry Hunt. The Survey was at that time located in Montreal, and for the following seven years Dr. Harrington discharged the duties of both positions. The present chemist to the Survey, Mr. G. C. Hoffman, was engaged to act as his assistant.

In 1876 he was married to Anna Lois Dawson, eldest daughter of Sir William Dawson, and in 1879, increased duties at the University



Sincerely Yours
B. J. Harrington

obliged him to resign his connection with the Geological Survey. Since that time his attention has been devoted exclusively to University work, the rapid growth of McGill University, and especially the greatly increased number of students in the Faculty of Applied Science, necessitating every year more extended courses of instruction.

In 1883, he was appointed David Greenshield's Professor of Chemistry and Mineralogy, retaining at the same time, the position of Lecturer in Mining and Metallurgy. This latter position, however, he retired from during the present

year. Mr. W. C. Carlyle, B.A. Sc., a young mining engineer who has had extended experience in Colorado, having been appointed as special Lecturer in these subjects, leaving Dr. Harrington to devote his whole time to chemical and mineralogical work.

We are indebted to Dr. Harrington for many contributions to science, especially in the domain of Canadian mineralogy. One of his earliest papers we believe, was that entitled, "Notes on the Botany of the Counties of Hastings and Addington, Ontario," published in the *Canadian Naturalist* in 1870. "Notes on Dawsonite, a new Carbonate;" "Notes on a few dykes cutting Laurentian Rocks;" "Notes on a few Canadian Rocks and Minerals;" "Notes on Chrome Garnet, Pyrrhotite and Titaniferous Iron Ore;" "Notes on the composition of Dawsonite;" "Notes on Gothite, Serpentine and other Canadian Minerals;" "On Canadian Spessertite and Mountain Cork," are to be found in the same journal.

To the *Transactions of the Royal Society of Canada*, Dr. Harrington has contributed the following papers: "On some Minerals new to Canada;" "On some Canadian Minerals;" "On the sap of the Ash-Leaved Maple (*Negundo Aceroides*);" "Notes on specimens of Nephrite from British Columbia." He has also published a valuable paper on the Grantham Iron Works of Drummondville, P. Q., in the *Canadian Magazine of Science and the Industrial Arts*, as well as one on the Pyrrhotite from Elizabethtown, Ont., and quite recently another "On the so-called Amber of Cedar Lake, North Saskatchewan, Canada," in the *American Journal of Science*.

Dr. Harrington is also the author of many Reports on our ore deposits and minerals of economic importance. These are to be found in the publications of the Canadian Geological Survey. The most important of these are "The Iron ores of Canada and their development," published in 1874-75, and the Report on the Minerals of some of the Apatite-bearing veins of Ottawa County, P. Q., which appeared in 1879. The former was reproduced as a series of articles in the London journal *Zoon*, while the latter is the best account which we possess of the nature, mode of occurrence and probable origin of our apatite deposits. He is the author of the "Descriptive Catalogue of the Economic Minerals of Canada," prepared for the Paris exhibition of 1878, as well as of the greater part of the similar catalogue prepared for the Philadelphia exhibition. His principal contribution in other fields than those of science is his Life of Sir William Logan, a large

LEGAL.

Putnam vs. Hardman et al.

The second trial of this action was concluded on 3rd ult. at Halifax, N.S., before Mr. Justice Townshend, with a jury.

In addition to what was claimed at the first trial in May, 1889, the plaintiff claimed an interest in certain gold areas purchased by defendants in September, 1887, and now known as the "Standard Gold Co." Upon these new issues the jury found for the defendants. The questions submitted to the jury were decided, in the main, in favor of the defendants, and the result is practically a victory for them, although the verdict was a mixed one. The issues and answers are as follows:—

1. Does the draft memorandum made about the 14th October, 1884, contain the true agreement between the parties, as alleged? Ans.—Yes. (In favor of plaintiff).

2. If it does, was it a further term of the understanding between the parties that there was to be a further agreement between Putnam and Taylor as to their interests as between themselves, apart from Hardman? Ans.—Yes. (Favor of defendants).

3. Was the draft memorandum entered into subject to a favorable report from Taylor on his return from Nova Scotia? Ans.—Yes. (Favor of defendants).

4. Was such favorable report made by Taylor on or about the 21st October, 1884? Ans.—Yes. (Defendants' favor).

5. Did plaintiff agree to become a partner in the enterprise until after Taylor's return from Nova Scotia? Ans.—Yes; subject to Taylor's favorable report.

6. If not until after his return on the 21st October, 1884, did plaintiff thereafter agree to become a partner before the 5th Nov. 1884? Answered by the fifth answer.

7. If there was to be a further agreement, was the agreement alleged by the defendants as made on the 5th of Nov., 1884, the true one, whereby plaintiff was to lose all his interest in the co-partnership if he failed to supply all the capital for the purchase of the properties and \$10,000 working capital, and to relieve defendant Taylor from all liability on his notes before December 1st, 1885? Ans.—No. (Plaintiff's favor).

8. If yes, did plaintiff furnish all such moneys and relieve defendant Taylor of liability on his notes before December 1st, 1885? Answered by previous answer.

9. Did defendant Hardman obtain the power of attorney at the time he did with intent to defraud plaintiff of his title in the property, or was it obtained with the bona fide purpose of preventing the forfeiture of the leases? Ans.—Not with any intention of fraud. (Defendants' favor).

10. Were the properties mentioned in page 4, paragraph 14, of the statement of claim, and purchased about September, 1887, purchased with money belonging to the alleged co-partnership? Ans.—Not proved. (Defendants' favor).

11. Were the properties mentioned in paragraph 15 of the statement of claim, and purchased about September, 1887, purchased with money belonging to the alleged co-partnership? Ans.—Not proved. (Defendant's favor).

This verdict probably settles a case which has been in the courts for nearly five years, and which has been of much interest in Nova Scotia. The properties involved were sold by order of the court eighteen months ago, and are now being worked by the Oldham Gold Company.

Dowsley vs. Odell.

A case of some interest to our readers was heard before Chancellor Boyd on the 28th and 29th days of October last at the Chancery Sittings held in the City of Ottawa.

The action was one brought by Thomas Dowsley, a real estate agent of the City of Ottawa, against the executors of the late H. C. Odell, to recover from them the sum of \$500, which Dowsley claimed to be entitled to for the sale of phosphate lot No. 17, in the 6th Range of Portland West, in the County of Ottawa, under the following agreement between him and Odell:

THOMAS DOWSLEY.

Dear Sir,—If you sell for me, or through your influence I sell, my mining right of lot No. 17, in the 6th Range of Portland West, for the sum of \$10,500, I will pay you a commission of \$500 on completion of sale.

(Sgd.) H. C. ODELL.

Ottawa, 19th Sept., 1889,

On the same day on which this agreement was entered into between the parties Odell gave Dowsley an option in the name of one John Vansickle for the same property, at \$10,500, which was to remain in force from the 3rd to the 13th day of October, one Dwyre having an option for the property expiring on the 3rd October.

A short time prior to the above dates, viz.: about the latter part of August and the beginning of September of the same year, one James Grant, of New York, was negotiating for the purchase of the property in question, and in the beginning of September he came to Ottawa, and in company with Dwyre went over and inspected the property, but returned to New York without purchasing.

For some time after his return to New York, Grant corresponded with both Dowsley and Dwyre in reference to the property, but finally, in October, when Dowsley's option in favor of Vansickle was about to expire, he entered into negotiations with and purchased for \$10,500, direct from Odell, the owner of the property, the transfer of which to Grant was completed a few days after the expiry of the option.

In addition to Dowsley's own evidence at the trial, on

behalf of the plaintiff was read the evidence of James Grant and L. H. Connant, taken on commission in New York.

As Odell was the only one who really knew all the circumstances in connection with the transaction, and as his executors personally knew nothing whatever about the negotiations which brought about the sale, they were at a serious disadvantage in regard to their defence, the only evidence which they had to offer being that of Dwyre, who claimed the sale was brought about by him, and that of C. H. A. Grant, of Montreal, through whom the purchase was completed on behalf of James Grant, his uncle.

After hearing the evidence the Chancellor held that the purchase, though completed after, was made before the expiry of Dowsley's option in favor of Vansickle, that Dowsley assisted in bringing about the sale, and that Odell, when negotiating with Grant for \$10,500 contemplated giving Dowsley \$500, and judgment was accordingly given in favor of Dowsley for the amount of his claim, with interest and costs.

Anglo-Continental Guano Works Co. vs. Emerald Phosphate Co.

Judgment in this case was given by the Court of Queen's Bench, Montreal, on 26th ult. Present: Chief Justice Lacoste and Justices Bosse, Blanchet and Wurtele.

CHIEF JUSTICE LACOSTE said the respondent was working a phosphate mine on lot 19 of the 12th Range of the Township of Buckingham. The appellant was working on the south half of lot 18. The respondent petitioned for an injunction against the appellant to prevent him from encroaching on lot 19 in his mining operations, and based his demand on a possession, dating from 1875, up to a line drawn in that year by Rainboth, surveyor. The appellants pleaded to the form that the plaintiffs were described in the writ as having their place of business at Buckingham, whereas it was in the State of New York; that the nature of the demand did not justify the adoption of summary proceedings applicable to the writ of injunction, and that the delay for summons was consequently insufficient; that the day for the return of the writ was not fixed by the judge; and lastly, that the affidavit and petition were vague and did not disclose a right to an injunction, or show that the respondent would suffer serious or irreparable damage if the writ was refused. On the merits the appellant denied any encroachment, and pleaded that the proper remedy was an action of *bornage* to determine the true boundary line. As to the exception, the decision of the court below was correct. As to the merits it would appear from the pleadings that the encroachments complained of occurred on part of respondent's land adjoining appellant's. The question of encroachment could not be decided before the true boundary line was determined, and a *bornage* was the mode of determining this line. Our courts had often refused to adjudicate upon the rights of parties as to disputed limits until a *bornage* had taken place. It had also been decided that a petitory action could not be brought for encroachment until the boundaries had first been settled. His Honor cited Fraser vs. Gagnon, 4 Q. L. R. 381, and Milliken vs. Bourget, Montreal Law Reports, 5 Q. B. 300. The remedy for injunction should not be granted where the right alleged is open to dispute, and especially in a case like the present, where the proper course is to proceed by an action *en bornage*. The following is a complete translation of the verdict:—

"The court, after having heard the parties by their respective counsel upon the appeal taken in this cause, examined the record and proceedings and upon the whole maturely deliberated.

Considering that it is unnecessary to adjudicate upon the appellant's petition for suspension of the injunction, seeing that it was adjudicated upon at the same time as the merits of the writ of injunction;

Considering that the judgment appealed from adjudicated properly upon the plea to the form filed by appellant in the court of first instance as well as upon the motion to have appellant fined \$2,000 made by respondent's petitioner in the court of first instance;

Doth confirm the judgment appealed from, to wit, the judgment rendered by the Superior Court sitting at Aylmer, on the third day of June, one thousand eight hundred and ninety-one, in so far as it rejects the said motion of respondent to have appellant fined as well as the said plea to the form filed by the appellant.

And adjudicating upon the petition of the said respondent for injunction and upon said injunction,

Considering that it is established that appellant's mining operations, which respondent wishes to stop by an injunction, were carried on at the border of the properties of each of the parties respectively;

Considering that the division line between these properties has not been established by boundary proceedings; Considering that under these circumstances there was no case for the granting of an injunction, and accordingly that in the judgment appealed from there is error upon the merits of the demand for an injunction;

Doth maintain the present appeal with costs as to that part of the judgment which declares the injunction good and valid, and doth in consequence quash the said writ of injunction and dismiss the petition for the same, with costs; and

The Court upon motion of Messrs. Lafamme, Madore, Crosse & Larochelle, attorneys for appellant, doth grant them distraction upon the present appeal.

It is understood that the Emerald Co. will carry this case to the Supreme Court at Ottawa in appeal.

Wilson Pyper vs. Thomas Keith, M. P. P., and Tully Boyce.

This was an action raised in Nanaimo, B.C., charging defendants with having conspired together as representatives of the Miners and Mine Laborers Protective Association of the Island of Vancouver, to prevent complainant from following his calling as miner. Judge Harrison, S.M., on the bench. D. M. Eberts, Victoria, appeared for complainant, and J. Campbell, Nanaimo, for defendants. The trial occupied several days.

The Judge carefully went over the various depositions. He considered that the defendants had gone beyond the objects stated in the rules of their Association. They had dictated to men, who were not members. It seemed to him that they had used more than moral persuasion. Under such proceedings the rights of the coal miners were completely lost. The Association was not properly organized, and was not recognized by any law in the land. He thought it would be a very violent thing to stretch the regulations of the Association to include what had been done in this case. They had not simply gone to the New Vancouver Coal Co., and said we will not work for you, if you employ these men, but they went to the men, and said you must join our Association and pay assessments, besides this they insisted on their paying back assessments before they could put a pick in the ground. This is not what could be called a trade combination,—it went beyond that. The defendants had no authority whatever to make the agreement with Mr. Robins, nor to enforce it, which they had done by the most stringent means. He would commit the two defendants, Thos. Keith and Tully Boyce, for trial.

The third defendant, Arthur Wilson, against whom there was very slight evidence would be bound over to answer to any indictment that might be brought against him.

Bail for the defendants, Keith and Boyce, was placed at \$1,500, themselves in \$750, and two sureties of \$375 each.

In the case of Arthur Wilson, bail was fixed at \$500, and two sureties of \$250.

Bail was immediately furnished in each instance, and the proceedings closed.

Ritchie vs. The Canadian Copper Co.

Suit has been brought into the Court of Common Pleas at Cleveland, O., by Samuel J. Ritchie and Sophronia J. Ritchie against the Canadian Copper Company, Sudbury, and the Anglo-American Iron Company, whose head offices are in Cleveland, asking for dissolution and the appointment of a receiver. Ritchie being the owner of more than one-fifth of the capital stock in each of these companies is, under the laws of the State, enabled to place the corporations in liquidation on account of the failure of the management to make any account to the stockholders. The Canadian Copper Company has a capital of two and one-half million dollars, and the Anglo-American Iron Company a capital of five million. These two companies are the owners of the famous Sudbury nickel mines from which the United States Government purchased its supply of nickel for armor plates for use in the navy.

J. Lanson Wills vs. Stewart.

An action between these parties has been entered for trial at the Superior Court at Aylmer, Que. Wills avers that defendant, who was the vendor of the High Falls phosphate properties to the General Phosphate Corporation, is indebted to him to the extent of £1,000, being a 2½ per cent. commission on £40,000, the purchase price of the said lands. Stewart refuses to pay Wills more than £560 sterling, being 2½ per cent. on £17,600 sterling. The parties to this suit are prominently identified with the General Phosphate Corporation, and some interesting revelations are promised when the case is called.

Johnson Asbestos Co. vs. Bell's Asbestos Co.

A verdict in the *bornage* suit of these companies has been granted in favor of the plaintiffs. The Bell's Company will take the suit to appeal.

A New Weldless Steel Chain.—The process of stamping chains out of a bar of mild steel, to work which a company was formed in Birmingham, Eng., about 18 months ago, has just been perfected by the inventor, M. Rougier, of that town. The chain is formed from a specially rolled bar, of which the section is a cross with arms of equal length. This bar is cut into egg-shaped links with solid studs. These studs, the absence of welds, and the homogeneity of the chain combine to make it strong, and its resistance is enhanced by subjecting the links to pressure. There are ten processes, of which all but two are automatic, and all are applied to the cold metal. A short time ago, when a number of gentlemen interested assembled at the works at Aston to see the chain made, it was subjected at one stage to torsion for the purpose of separating the links, but as this was found to fatigue the metal too much, a simple process of direct fracture has been substituted, which is said to answer admirably. The tools at present mounted are making ½ inch chain, which, according to tests made at Lloyd's, is reported to be as strong as a 1 inch welded studless iron chain. The future of the new process will be watched with great interest.

Nova Scotia Gold Fields.

By GEOFFREY F. MONCKTON.

The gold fields of Nova Scotia cover 6000 square miles, about 50 of which are being, or have been, scratched. The rocks in which the lodes are contained are supposed to be Cambrian, and are quartzites and slates. The slate sometimes contain gold, and one case at least occurs where the sides of a crack in the quartzites were lined with specks of gold. The lodes are quartz, and generally follow the strata in dip and strike, but occasionally cut them, when they are called "anglers." The beds having been tilted, form anticlinals exactly similar to the saddle formation of Australia and California. On the question of the permanence of the lodes, Professor B. Silliman said: "There is no reason to fear that there will be any failure in depth in gold product or strength. The formation of the country is on too grand a scale geologically to admit of a doubt on this point so vital to mining success. Some of the lodes may be traced for miles.

The province of Nova Scotia has not produced as much as would be expected from thirty years' work, but the causes are not far to seek. It is for the most part covered with thick woods, intersected by deep and rapid rivers, and the surface soil is generally deep and wet. Its inhabitants are not a speculative race. Those among them who are enterprising invest their money in shipping, which yields an immense profit, and the capital required to build wooden ships is not large. The law renders it easy for a man to obtain a good title without working a property, and the consequence is that large areas are held by men who cannot or will not work them.

Mining is usually carried on in this manner: The owner of a property leases it to a company for six months or a year. These tributaries will comprise a few working miners, a storekeeper who pays his calls in provisions and supplies at a modest 300 per cent. profit, and perhaps a small capitalist who pays in £10 or £20. They begin at the top, and take out everything that holds gold as they go down. They use as little timber as possible, and if the lode is wet only work on fine days. If the lode does not pay from the start one or two months will see the end; if it pays, they surrender the mine at the end of their lease to the owner of the property, and he demands an exorbitant rent which results in the mine being shut down. In rare cases he works it on his own account. Yet in spite of this system many mines have reached a depth of 300 feet, and the Wellington was worked to a depth of 1000 feet along the pay streak.

It is generally supposed that there is only one pay streak on a lode, but this is because the companies have not sufficient funds to explore the lodes, but are obliged to confine themselves to the rich part that they happen to strike on the surface. Where sufficient capital has been available, more than one pay streak has been found. The divining rod is in constant use. It is not, however, the hazel wand, but an arrangement of whalebone and brass (this last indispensable). Very large sums of money have been wasted on it, but the profitable mines found by means of the divining rod do not exist. Romantic stories are told about the discovery of several of the mines. That at Salmon River, which has yielded £140,000 in ten years, was found in this wise: A woman lose her cow. Thinking it had strayed into the woods for food, as the cleared land in that district forms only a fringe along the shore, she hired an Indian to look for it. He set out with a white man, and after searching five miles back they sat down on a boulder to rest. The white man amused himself with knocking the corner of the boulder with the back of his axe. A broken piece contained a yellow lump, which he contemptuously tossed away. The Indian picked it up, and asked him to lend his knife to cut out the yellow lump, but the other refused to allow it to be blunted by cutting rocks. So the Indian said it was no use looking for the cow any more, and carried the piece home. Apparently he sold his right to his discovery to every man he met, which resulted in several lawsuits. The boulders lying round were so rich and plentiful that for the first month all expenses were paid by breaking them up and mortaring gold out by hand. The lodes dip north and south. The main south one is 8 to 4 feet wide, and the north one 12 to 24 feet thick. Another large lode underlies this one, and there are doubtless many others on the property. The deepest shaft is 250 feet, and the length of the pay streak 700 feet horizontally. The mine is efficiently equipped with hoisting gear driven by cable by water power of 120 horse power, and there is an old 29 and a new 40 stamp mill driven by water power also, which is supplied by a fall from 140, which horse power could be obtained. The rich mines of Molega, which have for some years yielded about £10,000 annually, were found in a still more remarkable way. An American lady, who was in the habit of consulting the spirits, for several years used to come to Nova Scotia and camp out in the woods in summer with a few men to dig wherever the "spooks" kindly directed her. In 1885 they ordered her to go to Molega Barrens [the word barrens signifies a place over which forest fires have swept], and put a blast in a boulder which they revealed to her. Then large nuggets would appear in it. She went, and had the shot fired, but the gold that showed was finely disseminated. So she thought she had better wait for another revelation. Now, it happened that a man, who was not burdened with too much unearned increment, was in the woods and heard the people talking. Hiding behind a rock he watched the whole proceedings. Having no qualms about spirits, he

promptly took out all the gold he could, and took up the mining rights. It is said that he made £400 in a fortnight by mortaring. The Americans have lately invested largely in this district.

The other principal gold mining localities are Golden-ville, which has produced £500,000; Waverley, £212,000; Oldham, £152,000; Montague, £133,000; Renfrew and Wine Harbour, £117,000. The total product has been £2,050,000, but scientific men say that from one-half to one-fourth as much more has been wasted, as no concentrators are used. The tailings are always reworked at a considerable profit on the removal of a mill. Mines are hardly ever tested unless they show a good deal of visible gold. Yet it is recorded that a lode at Oldham, showing no gold, yielded six ounces to the ton in a mill. J. A. Phillips said that the Nova Scotian lodes were richer in visible gold than those which he had seen in any part of the world. Cases have been known of mines in the Western United States having been "salted" with Nova Scotia specimens. Of bonanzas, that at Carribou, where a stope 40 feet long, 120 feet deep, on a small lode, gave 12,000 ounces, and one recently struck at Oldham 30½ tons from which yielded 875 ounces, may be cited. There can be no doubt that gold mining in this province has, on the whole, been very profitable, as, since there is a tax in proportion to the amount of gold produced, the output recorded is not likely to be overrated, but on the other hand, the returns of work done by which many of the claims are held, and which therefore are not likely to be too low, show a cost of £1,300,000. All titles are registered in the Crown Office, mining leases and licenses being held direct from the Government, and are perfectly secure as long as the lessee complies with certain very simple conditions.

What the mining industry requires is enterprising capitalists; the workmen themselves have no superiors. Mines cannot be made in hard rock without the expenditure of some capital first. One of the great advantages of the mining districts is the number of lodes lying parallel and generally within two or three feet of one another, so that a company with plenty of capital has several strings to its bow. Large lodes or "belts" of lodes exist holding 10 to 40 feet of ore. Shafts cost on the underlie 30s. to 50s. per foot; tunnels 10s. to 35s. per foot. Milling by waterpower costs 3s. and by steam 5s. The actual cost per ton altogether is 80s. in a 3-inch lode, 18s. in a foot lode, and 10s. in a 4-foot lode.

Progress of Protective Measures for the Coal Miner.

The progress of protective measures for coal miners has been slow. Indeed, only within the last half century has any considerable advance been made, though in no other field could the genius of man have found more important work. With the exception of efforts to secure the excavation from falling in, protection against explosions was the chief question with early managers, as it is to-day in the public mind. Health demands received but little consideration. Naturally, since they were ignorant of the nature of fire-damp, knew only that its ignition caused an explosion, and did not know the great part that ventilation (of which they understood little) could perform in reducing the destructive power of the gas, their efforts were directed towards the obtention of a safe light. Phosphorescent fish skins, mirrors for reflecting sunlight into the mine, Carlisle Spedding's "steel mill,"—a device for obtaining a continuous stream of sparks from flint, and the cause of numerous explosions, instead of a safeguard—had their terms of service, until Sir Humphrey Davy produced his well known lamp in 1815. It is interesting to note that the miner owes the noblest gift he has ever received to men wholly unconnected with mining affairs. Davy was a chemist; Dr. Gray, his friend, through whose immediate efforts Davy's genius was enlisted in the miner's behalf, was a clergyman; and Mr. Wilkinson, who, in the face of popular distrust, organized the society for securing an intelligent study of explosions, was a London lawyer. The safety lamp will, alone, keep Davy's memory green as long as mines of coal endure. But no "safety lamp" is absolutely safe, except in careful hands, and, as has been shown by Lieutenant H. Hutchins, U.S.N., and others, the proposed electric substitute, the glow lamp, is but little, if any safer.

Efforts for the prevention of explosions have, therefore, followed various other lines. An early method was to explode small accumulations of the fire damp as they formed, a lighted candle, travelling on a cord, being sent into the collection. In Saxony efforts have been made to consume the gas as it issues from the coal, before an explosive mixture can form, but with very limited success. Other means, but each one defective in some essential, include (a) the occlusion of the issuing gas by palladium, thus securing a constant combustion without danger of explosion—Koerner's apparatus of red hot palladium asbestos being used; (b) the suction of the gas from the bed, as the mining advances, and its removal to the exterior by means of pipes and exhaust pumps; and (c) the saturation of the atmosphere with carbonic acid gas before making a blast, it being known that the presence of carbonic acid, in the proportion of seven to one, will neutralize the explosive tendency of the fire damp. But experience has demonstrated that, precautions being observed as to blasting, and safety lamps being used as special safeguards, the only convenient and trustworthy means for contending with explosive gas is thorough ventilation. This is, indeed, the chief factor of all efforts for rendering a mine generally secure as well as healthful, for in order that perfect ventilation may be maintained, the

bank must be kept in good condition in all respects. As hitherto stated, the present tendency is to place coal dust on a parity with fire damp as an explosive element; but the precautionary measures are simpler than those which are necessary when the gas is present. The remedy is either to keep the roadways and working places sprinkled with water or salt, or, as proposed by Meissner, to saturate the solid coal with water before blasting, so that no dry dust may be formed. It is unnecessary here to elaborate the precautionary measures taken with reference to spontaneous fires, fragile roofs and floods of water.

It is not singular, in view of the many fatalities that yearly occur in mines, even where inspection laws are most stringent, and inspectors are numerous, that the layman should inquire: "Does State supervision protect after all?" An affirmative answer, well fortified with facts, may readily be given, but must here be stated only in brief fashion.

Since the work is based upon the maxim that to prevent is better than to cure, its utility cannot readily be perceived by the superficial observer. Frequently-recurring or great disasters are widely advertised, but we do not, nor could we well expect to, hear of the innumerable instances of budding disaster that have been prevented from maturing; nor, when disaster has come, do we learn to what extent State intervention had reduced the dangerous conditions, so that the event was confined to narrower limits than would otherwise have been the case. How many of the smaller accidents occur, which are in fact purely accidental, while relieving the high tension that would surely conduce to greater casualties, we have no means of knowing. But if we turn to the history of fatalities in countries and States where the inspection laws are good and the inspection force sufficient, we find a gratifying story. For England, the *Colliery Guardian* says: "The ratios of the fatal accidents and the deaths to the number of persons employed in and about mines, under the present and former Coal Mines Acts, show that the occupation of the miner is now more than twice as safe as it was at the commencement of the inspection." The average ratio for the first Act was one death for every 233 persons employed; for 1890 it was one death for every 530. In this country, Pennsylvania has in every respect the most comprehensive and the strongest law, and yet more fatal accidents are reported from that State than from any other section of the Union. Still the *Colliery Engineer* asserts that "there is no doubt that two tons of coal are mined now per life lost in the mines to one ton mined before the Mine Law was passed. In the region under the writer's immediate care, the fatalities have been reduced from one to every 330 persons employed underground in 1888, to one for every 405 in 1889 and one for every 604 in 1890."

Economy in Engines as Effected by Unbalanced and Leaky Valves.

One of the principal essentials of an economical engine is a tight valve, and one that will remain so for a reasonable length of time, and can be repaired at a minimum expense. The distribution of steam and the friction are also important factors, but the latter not to the extent generally supposed.

In an instance which recently occurred in the writer's practice, a cross-compound, having large unbalanced and riding cut-off valves, after running three years, was developing an indicated horse power on one and three-quarters pounds of coal per hour, while a new modern piston valve engine taking its supply of condensing water from the same source, and running under the same general conditions, used three and one-quarter pounds. By advocates of the piston valve, it is claimed that the unavoidable leakage past the valve, and many of them will not admit that such leakage exists, is a trivial affair and of minor account as compared with the friction; also that when packing rings are used the general effect is the same. This is hard to substantiate, and it is doubtful if ever proven in practice; and while it may be figured that the power required to overcome the friction is considerable, yet when the calculations are made from the coal used and the dollars and cents required to pay the difference, it will be found against the leakage and in favor of tight valves, even though their being and remaining tight is largely due to friction.

The power consumed in running an unbalanced slide valve on a small vertical engine was lately demonstrated in a way that was very surprising to the owners and even to the builders of the engine themselves. Word was sent to the builders that the engine had a broken valve stem and required a new one, but the surprising part of it was that the engine was running and continued to run until the new valve stem arrived ready to put into position. On arrival of the builders' men it was found that on the upward stroke of the valve the two broken ends coming together pushed the valve up at the proper time, and that the downward stroke was accomplished simply by the weight of the valve and that part of the stem remaining with it.

In a series of tests for one of the large electric companies, in which a large number of different types of engines and boilers were concerned, it was found that, outside of the Corliss, an unbalanced slide valve and riding cut-off engine required less steam than any of the others. This was a compound condensing engine, and the others with which it was compared were also compounded and condensing, using balanced valves. The general conditions were the same. In all the tests the runs were divided and the water used and power developed, as well as all the other conditions, were taken through the time of

maximum and minimum loads separately, therefore, the comparisons could be easily and correctly made. These engines had been running but a few months and were considered by their builders to be in best possible condition. The best results obtained in a Corliss were from an engine which had been running for about two years without having the valves out or the cylinder heads off. With this engine the consumption of dry steam was 13.6 pounds per indicated horse power per hour, while another Corliss now undergoing engine, which should use less than thirty pounds of actual dry steam per horse power, is at 13.7 per cent more, more than it should require, from the fact that the exhaust valves leaked this amount.

Improvements in Drawing and Loading Coke.

By C. M. PERRY, M.Eng., Inst. Mech. Eng., E.G.S.

A few days ago I received an invitation from Mr. A. M. Chambers to visit the works and collieries of Messrs. Newton, Chambers & Co., Limited, Thorncliffe, Sheffield, for the purpose of seeing in operation the patent apparatus of Messrs. Chambers and Sons for drawing and loading coke. Any improvement in mining or iron and steel manufacture or coke production is to me, and to every body interested in these great industries, of great interest, and I gladly accepted the invitation.

The patents comprise "the patent coke extractor," and arrangements for "loading the coke from coke ovens into waggons."

The patent coke extractor consists of a small vertical steam engine actuating bevel gearing at the top of a vertical shaft on which is a pulley working into a rack attached to a long iron bar which slides in a movable rest and is supported on rollers, and provided at the outer end with a shovel or inclined plate which is forced into the oven on the floor, under the coke. On the bar being withdrawn from the oven the coke is forced out by the back of the shovel. The shovel is pushed into and out of the oven as often as is necessary, or until nearly the whole of the coke is withdrawn. The rest on which the rack and bar slides, is made by hand gearing, so that the rack and shovel can be directed at any angle, or into any part of the oven. By this means nearly the whole charge can be extracted, very little being left in the oven for removal by rakes.

The engine and gearing are mounted on wheels with self-acting travelling motion so that the extractor can be run up rails in front of a row of ovens and be brought into position in front of any one of the ovens. A small vertical boiler mounted on wheels is coupled up to the extractor, so that the machine has its own independent steam supply.

The patent coke extractor can be applied to either beehive, square or rectangular ovens.

The rails on which the extractor runs are placed at a sufficient distance from the front of the ovens to allow of the coke from each oven being drawn out upon a travelling or endless belt level immediately below the oven mouths. The coke is thus conveyed to an inclined elevator which raises it to a suitable height. The coke on leaving the elevator is made by hand gently upon a vibrating screen by means of a revolving drum with partitions exactly corresponding with the elevator buckets, and moving in the reverse direction, so that the coke is not allowed to fall, but the contents of each bucket are taken by the drum and placed upon the screen with the least possible amount of breakage.

In cases where it is not convenient to use the travelling belt, nearly equal results are obtained by drawing the coke into corves or small waggons running on rails close to the front of the ovens, and removed by means of rope haulage to a small steam hoist, where they are raised to a suitable height and tipped into a screen or shoot.

The advantages obtained by the adoption of these appliances are as follows:—

(1) By the use of the system a beehive oven containing three tons of coke can be drawn in less than ten minutes. One such machine is now actually drawing twenty-five ovens per day.

(2) In consequence of the time saved in drawing the ovens, fully 20 per cent. more coke is put down upon a track is obtained, and this being so, the cost of the extractor and the whole of the extra plant required is saved by the lesser number of ovens necessary for a given output of coke.

(3) Owing to the small time occupied in coke-drawing the expansion and contraction of the ovens is very much less, and consequently the charge for repairs is very much reduced.

(4) An enormous reduction in the cost of working is effected. In a block of fifty beehive ovens now in operation the entire cost of coking, including the charging of the ovens, the drawing and loading of the coke, and repairs to ovens and machinery, does not exceed 6d. per ton. How much less this is than the cost of drawing and loading in the usual way, all coke makers will know. I offer no figures as to ordinary cost of drawing and loading in the old fashioned way. Coke makers need no figures, they already have them.

(5) The whole of the coke from a range of ovens being loaded at one point can be under the supervision of one man, and greater cleanliness and regularity of loading is secured.

I spent a pleasant and instructive day in making a careful inspection of the whole of the appliances in actual operation. I saw an oven drawn in eight minutes and with scarcely any one in attendance. The coke is drawn

and conveyed and screened and placed in waggons. I was not surprised that the apparatus is being applied throughout the extensive coke making appliances of Messrs. Newton, Chambers & Co., Limited, nor was I surprised to hear that other eminent coke producers in various parts of the United Kingdom had adopted and were adopting the apparatus. I shall be very much surprised if all our coke makers do not specially give their attention to so simple and efficient and cost reducing an apparatus with a view to its general adoption.

Certainly the mode of arrangement in coke manufacture in ordinary ovens which does the work so well and at so little cost. —*Colliery Guardian.*

MINING NOTES.

(FROM OUR CORRESPONDENTS.)

Nova Scotia.

Cumberland County.

The production for 1891 of the Springhill Collieries, owned and operated by the Cumberland Railway and Coal Company, will show a considerable increase over last year. The total output for 1890 was 410,012 tons; for 1891 it will probably be 459,000 tons, an increase of 49,000 gross tons. From the following statement of the monthly production of the collieries, it will be seen that there was a falling off in the output during February and March, caused by the disastrous explosion on Feb. 21st:

January	44,889 tons	July	33,718 tons
February	28,816 "	August	40,936 "
March	29,885 "	September	39,368 "
April	40,716 "	October	41,667 "
May	38,788 "	November	39,000 "
June	39,970 "	Dec. (est.)	43,500 "

The sales for the year from these collieries will aggregate 405,000 tons—an excellent showing.

As pointed out in the last issue of the REVIEW, there is great activity among the prospectors of Cumberland County. Those who made money out of the lucky discoveries at Springhill twenty years ago are spending their money freely in search for coal in other parts of the county. This is notably true of the Stanley Coal Co., of Amherst.

After January 1st, 1892, the employees at all the collieries are to be paid fortnightly. The new Act relating to the fortnightly payment of wages was passed at the last session of the Legislature. Heretofore there has been a system of semi-monthly payments at Springhill, and the Drummond Colliery in Victoria. The system was given a trial by the Acadia Coal Co., but abandoned with the consent of their workmen.

THE REVIEW learns that it is the intention of the Local Government to at once appoint a number of examiners of engine drivers employed at the different collieries. A board of examiners of miners, to whom certificates of competency or service must be issued at the beginning of next year, must be appointed soon.

At the Joggins Colliery, operated by the Canada Coal Co., under the efficient management of Mr. James Baird, long-well working continues to prove successful. It has greatly reduced the cost of production, and largely increased the output per man over the best land-pitlar system. Other changes have lately been made. Formerly the coal was sent to the water over a track 1½ miles long, operated by an endless cable; this required a rope over 11,000 feet long, and was a source of great trouble on account of its liability to get out of order. The coal is now sent from pits to water by gravity, and the empty cars are brought back by single rope attached to drum on

GOLD MINING SUPPLIES.

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

H. H. FULLER & CO.'S

41 to 45 Upper Water St., Halifax, N.S.

Our line comprises Explosives, Fuse, American and English Mill and Hammer Steel, Bar and Bolt Iron, Steel Wire Hoisting Rope, Hemp and Manila 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.

stationary engine at pits. Previously the coal, on arriving at the water, was emptied into a chute 12½ feet long, lying at an angle of about 23; this chute was provided with doors for the purpose of easing the coal down the vessel, but the compact of the coal with the doors had a tendency to break the coal and the vessel get a large percentage of slack, no matter how carefully the coal was handled. This chute has been taken out and an incline built to the wharf, over which the coal is now lowered to a wharf by a counterbalance and then emptied into a chute with but very little drop, thus doing away with the large amount of breakage, and allowing the vessel to turn out a much better grade of coal at her port of discharge. The loading wharf has been re-constructed, and now vessels drawing from 15 to 17 feet of water can be loaded with dispatch. The Government improvements to the break-water have proved beneficial; it now affords a greater protection to the vessels. From 250 to 300 men and boys are employed by the company.

Mr. Hugh Fletcher, of the Geological Survey staff, has completed an examination of the Fairbore shore. He left for Londonderry to carry on some explorations in the Colquhoun Mountains.

William Madden, Deputy Inspector of Mines, has, it is stated, resigned to accept the position of manager of a gold mine in Gainsboro County, in which he is interested.

At the time of the Springhill explosion the school children of Cumberland County raised a little fund of their own. At the suggestion of Inspector Lay they expended it the money on two gold medals, which were suitably inscribed, and presented to Daniel Robertson and Daniel Beaton, the boy heroes of the disaster. It will be remembered that Beaton saved the life of his brother, who was badly injured; and Robertson rescued a little trapper named Farris. Robertson was badly burned, and his face is disfigured probably for life. His head was seriously burned, and there are spots on which the hair has not yet grown. He is now attending school. Both boys are about fifteen years old.

Cape Breton.

The East Bay Coal Company has been formed to develop coal lands in Cape Breton. The company has acquired the mining rights to a tract containing ten square miles of land, situated about two miles of East Bay, being the eastern end of the Great Bras D'Or Lake. The company has here forty feet of water and a water way leading to the Atlantic ocean and the St. Lawrence river. The mine is situated so that a gravity tramway will carry coal to the ore chutes, one and a half miles from the present shaft now being sunk. The development work done so far is a shaft about 100 feet deep, which was sunk in coal all the way. At a depth of 50 feet, a cross-cut of 15 feet each way was made without touching the walls. The coal exposed in this shaft about ten per cent. to each 20 feet sunk. A blacksmith shop has been built, a hoist rigged and a pumping plant put in. A new shaft is soon to be sunk on the widest vein about two miles from the present workings. The work is in the charge of Mr. Wm. N. Voang, an experienced miner, whose reports are extremely flattering to the present stockholders. It is expected to begin the shipment of coal on or about the first of July next. The officers of the company are Ashley W. Cole, president; W. H. Clarkon, vice-president and W. A. Powell, treasurer.

Mr. H. N. Paint, on behalf of the incorporators, gives notice of an application to Parliament at next session, for an act to incorporate a company to build, equip, maintain and operate a line of railway in the Island of Cape Breton, Province of Nova Scotia, connecting with the present Dominion railway now under construction in said island, from a point known as Orangecole, in the County of Inverness, touching Whycocomog, on the Broad Cove Coal Mines, a distance of 34 miles; from thence to Margaree, 20 miles; from thence to Chatham, 10 miles; to Baddeck, Victoria County, 35 miles, all in Inverness and Victoria Counties. Also for a line of railway from a point known as the Richmond Coal Mines, there joining the present Cape Breton Railway, proceeding via St. Peter's to Louisburg, 78 miles; with power to acquire coal mines or any railway companies.

Colchester County.

The Halifax Chronicle reports the discovery of a three-foot seam of coal a short distance from Truro, in Colchester County. A quantity of the coal has been mined and sold. A number of Truro capitalists are interested.

Hants County.

Your correspondent, in conversation with Mr. George Churchill, head of the ship-owning firm of E. Churchill & Sons, of Hantsport, learned that the Messrs. Churchill are preparing to develop their valuable manganese mine at Walton, in Hants County. Mr. Churchill has refused a large sum for the property. Hitherto it has not been worked except on a small scale, but \$8,000 worth of manganese has been mined and exported, and it is likely the production next year will be large. The manganese is found in pockets, but the extent of the deposits has never been tested.

Stormont.

Considerable excitement prevails in Isaac's Harbor over the discovery of a valuable lode of gold-bearing quartz in the "Mammoth" which is a small valley lying to the eastward of the main district. The lode has been opened in four different places and is reported to show gold in each opening.

The reported find of a lode in Seal Harbor appears to be without foundation, the find consisting of a belt of slate more or less interbedded with quartz, which, however, shows no gold. The North Star Co. report all their workings in good ore and prospect good for its continuation.

Molega.

On the 1st of November the Parker-Douglas Co. closed down its mines for an indefinite period. It is reported that October's crushing showed a small profit, and that the mine will reopen; but this report lacks authenticity. This mine has been extensively equipped with air compressor, drills and hoisting gear, and also has a 20-stamp mill; but the public generally will be surprised to learn that no depth has been reached, although the mine has been working more than three years. The average depth of the workings will not exceed 100 feet.

Montague.

With the exception of the Anand Mine, no work is doing in this district. A few tributaries are working spasmodically. The Anand mine continues its usual good yield.

Waverley.

The Lake View Co. is running regularly, and the quartz is reported to be higher in grade than formerly.

Nothing is doing in the Windor Junction Mine, but tests are being made at the surface gravel by crushings in the mill, and experiments are to be made with a new percussion table on the large pile of tailings lying on the mill dump.

The West Waverley Co. started fires under the new boiler plant on the 19th ult.

The Sophia Co. have gone back to their first line, and are again opening on the "Nigger" lode. Some quartz is being stopped on the Tudor also.

Mount Uniacke.

The Alton Co. have temporarily discontinued work, it being found that the recent rich strike dips off to adjacent property very rapidly. A consolidation will probably follow.

Pictou County.

Work on the iron areas owned by the Pictou Charcoal Iron Co., has been actively commenced. An office, blacksmith's and carpenter's shops have been erected, and road graded 1,400 feet to connect with New Glasgow & Midland Railway. Ore will be mined and some 7,000 cords of wood got out this winter for charcoal, and such work done as can be advantageously performed in the winter.

Mr. W. B. Moore, formerly superintendent of the Vale Colliery, is in charge, assisted by Mr. Sjøstedt, a thorough "iron man," formerly chemist to the Bethlehem Steel Co., of Pennsylvania, and afterwards manager of iron mines in Alabama and Virginia. The company hopes to have a furnace of a capacity of 25 tons per day in full blast by the 1st of July.

Quebec.

Eastern Townships.

The Eustis and Albert Mines at Capelon pursue the even tenor of their way. The other mines and quarries at work include the Howard property, the Jeffrey Asbestos Quarry, the New Rockland Slate Co. and the Stanstead and Moir Granite Companies. We are glad to learn that the large number of men thrown out of work by the closing of the asbestos mines are finding work for the winter in the lumber camps.

Mr. J. Olavski, M.E., Government Inspector of Mines, Quebec, will read a paper at the next meeting of the Asbestos Club.

Lievres River.

The High Rock Mines have reduced their working force to 50 men for the winter.

From 80 to 100 tons per week is reported to be the average product of the High Falls phosphate property, operated under contract for the General Phosphate Corporation by Mr. George Stewart and a good force. Mr. Stewart has secured an extension of time and an important increase in working capital with which he hopes to fulfill his agreement with the corporation.

The only other property at work in this district is that owned by the Anglo-Continental Guano Works Company. Since the announcement of the verdict in the law suit

with the Emerald Company the working force has been greatly increased and work is now being prosecuted vigorously. Mr. Smith is at present driving the Aetna, and Squaw Hill tunnels, and reports the work proceeding to his entire satisfaction.

Ontario.

The Provincial Natural Gas and Fuel Co., of Ontario, have made some new developments in their gas field. About a month ago they struck oil. The well was opened last Monday, and at present averages about twenty barrels a day. The oil flows and is of fine quality and amber in color. Manager Coste says it is a regular Pennsylvania oil. The field is in the County of Welland.

There is, say local papers, considerable excitement in mining circles in regard to the Belmont gold mine, some miles north-west of the Marmorra. The ore taken out is reported rich in gold, giving good encouragement to the owners. An English syndicate have the mine in hand. Forty miners are now at work and a shaft has been sunk to a depth of over 60 feet. The ore now taken out, it is claimed, is panning out \$18 to the ton. Expensive crushing and grinding machinery has been imported from England and a large outlay of money is being made. These mines are not many miles from the "El Dorado" and other gold mines near Marmorra, from which gold has been taken for many years but never in good paying quantities.

For the nine months ending 30th September next, the export of mica from Kingston to the United States was of the value of \$4,550. The Stylenham Mica Co. and the agent of the Thomson-Houston Co. are the only operators for export. Rough amber mica is raised in considerable quantity by farmers and sold to the cutting concerns at prices ranging from \$25 to \$100 a ton. A car load of crude material was recently sold to a hardware house in Kingston. Recent discoveries in Bedford and Hinchinbrooke Townships extend the producing area, which has been hitherto confined to the Township of Loughborough. The white mica region in Miller, Palmerston and Clarendon sends in occasional samples of asbestos with actinolite, but no exploration has yet been made to show what these indications signify. It is said that a hawk lights down on every prospect hole, crying large sums of money—\$10,000, \$20,000 and "Styling is good for geese," and with the inevitable result that all reasonable birds are frightened away by these outrageous cries.

Sudbury District.

The ocean shipments of nickel ore and matte from the port of Montreal for the season of navigation just closed, amounted to a little over \$85 tons. This is a portion of the produce of the mines of this district.

Thunder Bay District.

Just as we go to press it is announced that the Belgian Bank, known as the Society General, has purchased a controlling interest in the Atikokan Iron Range. The contract provides that the purchasers shall have until November next year to test the deposits. The railway is to be built within the next year, and when so built the owners deed the bank an interest in the mines, and the bank agrees to mine the ore and pay a royalty thereon. A minimum output of 300,000 tons per annum is guaranteed. The lands under contract cover ten miles in length on the range, including deposits of ore equal to all the mines on the Marquette range. Blast furnaces and rolling mills are, under the contract, to be erected at Port Arthur. We hope to have full particulars of this deal in our next issue.

D. Williams, P.L.S., returning from a tour of exploration, reports having taken up three mining locations in the Township of Miss containing a large deposit of magnetic iron ore. He has also taken up six locations west of the Mattawin Iron Mining Co.'s property, the ore on which is a hard slate hematite, averaging 50 per cent. of metallic iron. In the same region Mr. Williams has discovered carbonate iron ore (siderite) in considerable quantity.

The Palisades Mine, which is situated north of the "Beaver," is working in some rich silver ore, with brilliant prospects ahead. The mine has for some time been under the direction of Mr. Winchell, son of the State Geologist of Minnesota.

A find of rich auriferous quartz is reported from Watigoon Lake.

The Murillo Silver Mine, owned by an English syndicate, is now advertised for sale, together with the frame buildings thereon, loading house, assay office, engine house, etc. Also the plant, consisting of a double cylinder, 8 x 8, Copeland & Bacon winding engine; a 60-h.p. boiler, smaller boiler, 2 duplex mining pumps, pipes, fittings, 400 feet of 3/4 steel, mining implements, stoves, full set of assayer's implements, etc. etc. Offers to be made to Mr. Richard Winder, secretary of the Murillo Silver Mine (Ltd.), 7 East India Avenue, London, Eng., from whom full particulars may be obtained.

Rat Portage District.

There has been continual trouble in connection with the reduction works at Rat Portage ever since the enterprise was begun. The latest is the trouble between the

manager and the company. Mr. Powers lays claim to 23 months' work, at \$100 per month, but the officers of the company say that they know nothing about his claim, as it has never been presented, and that the company is certainly good for any service performed for it. Mr. Linn, the contractor, tried upon two occasions to hand the works over to the company, but Mr. Powers objected. Mr. Powers being interested in the erection and completion of the building, did not see fit to allow Mr. Linn possession to enable him to give up possession to the company. On Wednesday evening last week Mr. Linn went to the reduction works, put the watchman out of the building and off the premises, and handed the works over to the committee appointed to receive it. For this he was arrested and fined in all \$12.50.

In speaking of this matter the *Rat Portage Herald* says: "The works are now in the hands of the company and work will be begun at once. A new man from California, who is thoroughly acquainted with the treatment and reduction of ores, will be employed. The resignation of Mr. Powers, tendered to the company some weeks ago was accepted, so that unless new arrangements are entered into we will no longer be a representative of the company. We learn that the services of Mr. Powers for the company were to begin when the works were turned over and the mill started, and his salary to date from such time. The contractor, Mr. Linn, could not make any settlement with the company until his acceptance and occupancy of the mill; and it is wondered why Mr. Powers should object to the very thing necessary to make the contract complete and enable the company to run the mill. Ore has been on the dock for some days and nothing done. The directors were inclined to push matters, and hence the circus. Unless the opposing factions prevent and annoy too much, the works will be started up this morning. Mr. Linn has brought in his men from L'Anse-au-Loup, and each will take a station in the mill, and it will be run under his direction and supervision until the metallurgist arrives from the States. It is hoped that all will pass off smoothly now. The president is bound to push matters, and if he can have his way things will move along lively. Other directors of the company are expected here soon."

British Columbia.

Thomas Harvey, one of the old time prospectors of Cassiar, returned from the north on the steamer Mexico, after an eventful prospecting trip through the most northern portion of the province. Colbet Creek, he says, is one of the best camps in the portion of the country where he has been, but even there there has been no important find. Seven white men and fifteen Chinese will remain there during the winter. From reports nothing startling has occurred on McDame's Creek during the season, in fact about the same amount of gold has been taken out this year as formerly. The miners have to do well, as provisions are very dear, salmon being sold at 75 cents a tin, and other provisions in proportion. What is wanted is more settlers and roads or trails. The country, said Mr. Harvey, is a rich one, and the Government should open it up. About 100 miners came down from Yukon on the Mexico with Mr. Harvey, and he learned from them that they were also suffering for want of roads and trails to take them to the mines. Some of them had made \$200 to \$300 during the three weeks that they worked. The shortest way to get to the Yukon mines would be by the way of Devcon Creek and Pillar River. A road cut from Devcon Creek to Pillar River, a short distance, would do a great deal of good. The miners could then go down Pillar River in canoes.—*Victoria Times*.

There is little of importance to chronicle regarding mining in Hot Springs district. Eight men are at work on the Skyline, 5 on the Neosho, 4 on the Fourth, and 13 on the Tenderfoot. Manager Jevons has all the hoisting machinery for the latter mine on the ground, getting the last piece up to-day. There is from a foot to a foot and a half of snow on the flat at the Krao, and about two feet at the Skyline. Dr. Campbell claims that work will soon be resumed on the Number One.

Superintendent Robertson reports the main tunnel on the British Bear in about 450 feet, with two shafts at work. One shaft is also at work in the shaft, cross-cutting for the ledge. The cross-cut is in 12 feet, and it is expected that 20 feet more will have to be run. Superintendent Kay expects that the cross-cut tunnel on the Dandy will reach the main or south ledge by the end of the coming week. If that ledge is as good as is expected the Dandy Mining Company will have 500 men on its pay-roll before another year rolls around.

The mine owners in East and West Kootenai district are, we believe, to a man, in favor of the Dominion Government increasing the duty on pig lead from \$8 to \$30 a ton.

The Lanark Mining Company at Illecillewaet will be engaged in packing in supplies to its mine; it will keep two shifts working all winter. This will keep the property in good shape; and when the tramway is completed in the spring it is expected that 40 tons of ore per day will be shipped.

The wire tramway of the Glen Iron Mine Company has not so far been a success. The company is now opening a new lode and is about to build an ore chute and bankers. It has about 600 tons of ore ready for shipment.

The owners of the collier San Pedro, have made a claim on Messrs. Dunsmuir for \$200,000 as salvage money for assistance rendered to the steamer Wellington a few weeks ago, when she was picked up disabled and towed into port.

Although the coal trade is not brisk the New Vancouver Coal Company is not decreasing its activity. At No. 5, the new shaft, three shifts have been put on for the express purpose of opening up rooms for the employment of a large number of men when the demand requires it.

A sample taken from four tons of ore taken out on the stopping on the Le Roi, tall Creek claim, gave \$6.30 in gold, \$2.10 in silver, and 6 per cent. of copper, or about \$77.40 per ton.

In an interview with a local paper, Mr. J. D. Marsden, of Barkerville, who came to the coast about a fortnight ago, taking to Victoria two bars of gold, valued at about \$6,000, for deposit in the bank there, said: "There has been no remarkable incident in mining during the past summer. Some of the claims are showing good results. The Black Jack mine has had a successful summer, and the Forest-Rose Hydraulic has maintained its former profitable yield. The Waverley, a noted hydraulic claim on which about \$10,000 has been spent in development, is this year looking better and prospects are good for a profitable season next year. In quartz mining considerable development work has been done on the Eureka, on Mosquito Creek, and another claim on Williams' Creek has been located on an English firm through Mr. A. D. Whittier, of Victoria, who recently made a trip to England. The other claims show little difference one way or the other from last year, and have been worked with more or less success."

The Lillooet Hydraulic Mining company cleaned up on the 25th ulto. The clean up was about \$2,000 for twenty-four days with five men.

The Great North American placer claim is working three men with rockers at present. The water supply is almost exhausted. The claim pays \$3 per day to the man.

The Seum Seum Mining company, located on the South Fork of Bridge River, are getting out timber to repair their dam which was washed out about one month ago.

The Kootenay Smelting and Trading syndicate is leaving nothing to chance in the erection of its reduction plant at Pilot Bay. The site has been carefully surveyed and accurate soundings made for the wharves. The plans for the buildings were not made until the ground was first carefully examined by a representative of the firm furnishing the machinery. The bricks needed will be made near the site, the brick machines being already on the ground. It is understood that the Chicago Iron Works has secured the contract for furnishing the plant. This is the same firm that erected the Poorman 10-stamp mill on Eagle Creek.

The Mina Placer Company, located on Taughton Creek, a tributary of Bridge River, have shut down for the winter. They expended over \$2,000 on their claim this Fall, but it will take about \$10,000 more to get their claim in working order. The Mina company value their property at \$90,000.

The shipments of coal from the collieries for the month of November, were:—

	TONS.
New Vancouver Coal Co.	15,809
Wellington "	21,243
East Wellington "	2,550
Union "	17,080

The boring for coal on the Harewood Estate, now the property of the New Vancouver Coal company, has been carried on very successfully; the indications have been so good that a shaft is being sunk. The necessary engine and machinery have been sent out to the district. It is believed that Harewood will turn out to be as rich a coal field as Wellington.

The same company has sunk a shaft at the south end of Protection Island, to a depth of 355 feet and expects to reach the coal layers by Christmas. At the depth named, when in a stratum of conglomerate, the sinkers struck soft black sandstone, in which were found some beautiful specimens of clam shells. The coal is expected to be reached at a depth of 620 feet.

An English syndicate, whose purchase of the rights along Williams' Creek, in the Cariboo District, has already been recorded, will, as soon as the formalities are completed, commence shipping in and placing in position the elaborate machinery required to profitably work the property. The syndicate's rights extend down Williams' Creek, through the canyon, from below the old town of Richfield, past Barkerville, to Bellara, a distance of a mile and a half or two miles. The machinery to be brought into service is similar to that in successful use in California, its great superiority being that a strong flow of water is not required to complete the process. For this

reason other machinery would be useless in working the shallow creek and the marshes in which it terminates. The field of operations of the company takes in all the famous old claims on the creek, which is known to still have millions in gold hidden in its sands.

Another company, whose operations promise well, is that of which Mr. Ramsus is manager, and which has been formed to prospect and work Slough Creek. The machinery has been received, and the examination of the creek will be commenced very shortly; the stream is so deep that with ordinary appliances nothing could be done with it. Mr. Ramsus' idea is to drill through the water to the bed, much after the same fashion as one would drill for coal or other minerals on land. If the experiment proves successful, many other creeks will be available for working by the same process.

CANADIAN COMPANIES.

Coleraine Mining Company.—This company was granted its charter on 20th ulto.

Dunnville Natural Gas Company, (Ltd.)—Application for grant of supplementary letters patent for increasing capital stock from \$5,000 to \$20,000, by the issue of 600 new shares of a value of \$25 each.

General Phosphate Corporation.—The first annual meeting of the shareholders of this company since its incorporation, will be held in London, Eng., on the 22nd of this month. A lively time is expected.

Boiler Inspection and Insurance Company of Canada.—This Company will apply to the next session of the Parliament of Canada, for an Act to add to the powers of the company the right to insure against loss of humane life or injury to person or property arising from the use of elevators, hoists or lifts or machinery connected therewith, and machinery used for the production of electricity as a motive power or illuminating agent, and otherwise enlarging the character of the risks which the company may undertake, and for such other powers as may be necessary in the premises.

Spokane and Great Northern Mining Company.—Articles incorporating this company have been filed in the auditor's office at Spokane, Washington. The company is organized to develop and work mines and prospects in British Columbia and elsewhere. The capital stock of the company is divided into 2,000,000 shares of \$1 each. The incorporators are Chester F. Lee, H. M. Hoyt, Arthur B. Keeler, and Howard C. Walters. It is to be hoped the new company will spend money for other development work than printing certificates of stock.

General Mining Association (Limited).—A special meeting of the proprietors took place last month at the head office of the company, in London, to hear a statement concerning the affairs of the company and to elect a director in the place of Mr. C. Bischoff, resigned. Lieut. Colonel W. C. Western presided, and previous to moving a resolution to the effect that Sir Charles Tupper be elected to fill the vacant post, stated that the work at the mines was going on satisfactorily. They had a good supply of labor, and the telegraphic despatches showed that the shipments continued on a fair rate. The prices and sales of their coal had up to the present been better than in 1890, and the outlook was altogether very favorable. Mr. Clark seconded the chairman's motion, and it was at once unanimously adopted. The proceedings then closed with the according of the usual vote of thanks to the chairman.

New Vancouver Coal Mining and Land Company (Limited).—A half-yearly general meeting of the above company was held at the office, 12 Old Jewry Chambers, London, E.C., on Tuesday, 17th ultimo, Mr. John Galsworthy occupying the chair. The secretary, Mr. Joseph Ramsden, having read the notice concerning the meeting, the chairman rose to move the adoption of the report and accounts, first apologizing for the absence of Mr. Fry. He considered the report and accounts were eminently satisfactory, and that the operations of the past half year showed the company was in a fairly prosperous state. The output for that period had amounted to 253,296 tons, and the sales to 254,025, against 217,358 tons, and 215,000 sales in the previous half year. That was a very large increase, in fact it was the biggest output since the establishment of the company. This output had been derived from five sources detailed in the report. The great amount of work carried out during the past half year had over-taxed the strength of the company's superintendent, Mr. Robins, and that gentlemen had taken a short rest at San Francisco to recruit himself. Everything done augured well for the future of the company. The chairman did not hesitate to say that the balance sheet was the best ever submitted to the shareholders, and was now in a better state than it had ever been. As for the dividend, some shareholders considered it should have been larger. It was a small dividend, undoubtedly, but looking at the works carried out, and the fact that the working capital of the company had never been what it ought to have been, he did not see how the directors

prudently could declare a higher. It was better they should increase the reserves, and thus provide a good working capital, than pay a high dividend and be obliged to borrow money at a great rate of interest, without considering the fact that the coming half year could not be so prosperous as the past, owing to the fall in prices at San Francisco. Mr. F. Tendron seconded the motion for the adoption of the report and accounts, and expressed the opinion that it would be prudent for the company to have a good working capital at its back. (Applause). The motion was carried unanimously. Hearty votes of thanks to Mr. Robins, the company's superintendent; to the agents, Messrs. John Rosencroft, Sons; and to the chairman and directors, concluded the proceedings.

Improved Mechanical Coal-Getter.

In a paper read before a recent meeting of the National Association of Colliery Managers, Mr. E. Mould, of the Whiteburn Colliery, said:

"It is with considerable pleasure that I accept the invitation to read a paper in the presence of the members of this branch on the principles and purposes of my improved hydraulic coal-getter. But I must confess that I feel rather diffident in the matter, from the consciousness of my inability to lay my invention before you with that accuracy which a subject of this description demands. I feel, however, somewhat relieved when I remember that many of you have seen my coal-getter at work, and have spoken of its merits with approval."

Dust of itself is harmless, as regards exploding. There must be something else. This being so, it is not a loss of time to aim at many things at once, especially when that evil can be avoided by a process that is positively safe and efficient. We all know it is very important that any new method should be thoroughly considered in all its bearings before it is adopted, as it is very possible, especially in colliery management, that the change may be for the worse.

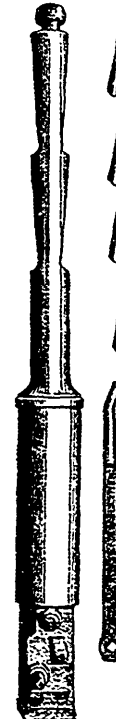
It has already been shown that to lay down water pipes and keep them in working condition is an expensive operation. The water emitted in the form of spray has an objectionable effect on the surroundings, especially in roof roads, and the coal is not so well extracted, and the travelling roads consist of material some of the constituents of which are lime or fire-clay. The timbers of these roadways absorb the moisture, which, as a member of this Association has said, "renders them unfit for the purpose for which they are intended, for if the timbers are not good and well so they become traps and snares." Referring to the water cart, with all its accessories in the form of pumps and brushes, and the cost of transit in our steep mines, is it not very objectionable?

There is a great disadvantage in connection with shot-firing, in the continual cost. And this is not all. By the use of explosives we are constantly producing a more serious evil in dust. The force of the explosive shatters the solids into almost useless matter scattered all round. In my own mind that I have seen more than one explosion by shot-firing when the largest piece that could be found was not as big as a man's hand. The substitute for explosives does its work in a harmless manner, and is efficient in its action, breaking loose the coals in larger blocks, and so lessening the quantity of that dangerous enemy, dust. Our engineers have been conscious of the existence of this deadly foe for a long time, but have avoided dictating to others their own convictions. I remember when the late Orlando L. Lucas read a paper (Dec. 25th, 1877) on "The Destructive Results of the Use of Gunpowder in our Mines," one of our senior engineers gave an instance that resulted fatally, and at the inquest he was actually "poth-pooled" when he mentioned the possibility of the cause being coal-dust. Nevertheless, facts are facts, whether they are accepted or rejected.

I would now ask, is it not time that colliery managers and colliery owners, especially the former, who are held responsible for the safe working of the mines, should take their stand, and say (as one of our colliery owners, Wm. Heath, Esq., of Sneyd Colliery, said in reference to a dusty seam, years ago), "There shall be no more shot-firing on any account in a place where dust can be found." In the course of time—it may be very shortly—this will be considered a step in the right direction, though there may be opposition, as there has been in the case of nearly every innovation.

Permit me to suggest, that from this time we discard

* Professor Clowes as reported in *The Colliery Manager* for 15th May, 1891.



the idea of either laying down pipes or adopting the water-cart, or any similar means of laying dust, and adopt a safe method of working without further hesitation. The method I suggest would render any such system of watering unnecessary. Most of you are aware that I have been working, indeed, persistently endeavoring, for a long time to bring out a mechanical contrivance that would take the place of explosives in dusty and fiery mines, and during that period I have produced designs of almost every description, screws of almost every kind, and hydraulic appliances of various forms. I have had many disappointments, but after them all I can now, with an instrument a little over 60 pounds in weight, break loose, economically and efficiently, almost any coals in the ordinary way of working.

This instrument may be used as an ordinary hydraulic jack for all lifting purposes up to ten tons. It may also be used to considerable advantage in renewing timbers in roadways. Hence, if you have a broken strop or leg, by placing the "coal getter" under the cross-bar or cap, you can, in most cases, force it up high enough to put in a fresh leg or strop, thus preventing the fall of tons of dirt. Or if there should be a broken bar, place a strong sleeper by the side of it, and the "getter" under it; you can then force up the brailers or covering, and so renew the broken bar or cap, thus saving a great amount of labor. I will not endeavor to give you a description of my hydraulic coal-getter: 1st, there is what I call the head; 2nd, the cylinder; 3rd, the mandrel; 4th, the piston-rod, the side pieces and the pump-handle.

The side-pieces and the pump-handle are the only loose parts there are.

The "head" contains the pump, and in part answers the purpose of a reservoir.

The "cylinder" is simply a round, parallel barrel, screw-threaded at each end, and is so connected to the "head" at the top end, and to the "mandrel" at the bottom end. This cylinder is covered by a shell cylinder, leaving a cavity between the two—the inner and outer cylinders.

The inner cylinder is perforated on the sides at the bottom end, to allow the water to pass from the under side of the piston, while it is being forced into the cylinder on the top side of the piston by means of the pump, thus supplying the pump during the operation of breaking loose the material in which it has been placed. I have already said that the inner cylinder was screw-threaded at each end. Now, while it is being screwed together the outer shell is drawn on to faced joints at both top and bottom ends, and is so made water-tight and becomes a portion of the reservoir for water.

Thus you will understand there is ample provision in the head, the cylinder and the cavity. This is to avoid the necessity of continually refilling with water, which may be more or less unclear.

The mandrel is screwed into the bottom end of the cylinder, and is a permanent one. The mandrel is also provided with recesses, constituting incline planes. In these incline planes are placed side pieces or wedges, thus making the mandrel cylindrical in form, in which condition it is placed in the hole prepared for it.

I have said there is a cylinder and a piston; there is also a piston-rod. This rod passes from the piston in the cylinder through the mandrel, and on the bottom end there is placed a collar, so as to enlarge the bearing, because this becomes the base of pressure.

It is very important that the machine should go quite to the far end of the hole (and to ensure this the drill should always be one eighth of an inch larger in diameter than the machine). Now, opposing the machine is in the hole, and quite at the far end, the moment you commence to pump, the piston rod, being at the end of the hole, can-

not go forward; therefore the machine moves outward, and, the friction on the sides of the hole being greater than that of the incline planes, the side pieces become fixed, and the machine moving outward produces lateral pressure by means of the incline planes, thus forcing aside the material in much larger blocks than when exposed to the shattering influence of an explosive, securing better results, and at the same time avoiding all the evils contingent on the use of explosives.

This machine has been severely tested, and, as a result of these trials, I claim the following for it. The merits of this machine are:—

1. Efficiency.
2. Portability.—Being a little over 60 lbs. when charged with water, the same water is used over and over again, it may be for months, so that you see the pump is intact; and this is accomplished by means of a screw. When the operation is completed, by turning the screw the water returns to the under side of the piston. By tightening the screw again you can repeat operations indefinitely.
3. Economy.—Being less in first cost, and less liable to get out of repair, its parts, or loose parts, being so few in number, consisting only of side pieces and pump handle.
4. Simplicity.—Place the side pieces in the recesses of the mandrel, force it to the far end of the hole. If you want to lift the coals up or force them down, the side pieces must be top and bottom; but if you want to force the coals side ways, the side pieces must be right and left. Then commence pumping, and in less time than you can run the hole for an explosive, the coals will be down or on the sprags, ready for dropping as you want them.

An Expert Opinion on Electricity in Mining.—

"It is only a matter of time until electricity will revolutionize the mining industry," said F. M. Carpenter, of Devil's Run, Nev., in the Chicago Herald. "By connecting a motor in the mouth of a shaft or in the Comstock, and then letting it fall to the level of the Sutro Tunnel, a force equal to a pressure of 680 pounds to the square inch was generated; the problem was, how to transfer this power from the tunnel level, where it was not wanted, to the stamp mills, where it could take the place of steam. The problem appears to have been solved by the use of electricity. Electric motors convey the power with a loss of less than 40 per cent. from a point 1,000 feet below the surface of the ground to the mill on the surface, and when the power reaches the stamps it is found to be equivalent to 435 horse power, which would run any stamp mill in the world. With steam as a motive power it is impossible on the Comstock, even with the latest improvements in reduction, to treat economically ore which carries less than \$15 of gold and silver to the ton. Where the ore lies on the surface and can be quarried out in enormous quantities, as in the Black Hills in Dakota, there is money in mining and milling ore which runs a few dollars to the ton. But where the ore has to be hoisted from great depths and considerable expense has to be incurred for pumping, ventilation, crushing, etc., the cost of steam is so great that really low grade ore cannot be handled at a profit. If the new electric motors prove successful in practical use, this cost will be saved. It is estimated that with the power furnished by them the Nevada mill can treat \$10 ore satisfactorily, and with an ample water supply even \$5 ore can be treated with profit."

PERSONAL.

Mr. J. G. S. Hudson, manager of the International Colliery at Bridgeport, has accepted a similar position at the Granite Colliery, Cow Bay, owned by the Messrs. Archibald. Mr. Hudson comes from Bridgeport in high esteem and with the best wishes of many friends and his late employers.

Mr. Charles Fergie, M.E., manager of the Drummond Colliery, has returned from his trip east.

Messrs. H. A. Budden, managing director of the International Coal Co., and Mr. Chas. Fergie, M.E., were in Sherbrooke during the month, conferring with the Jencks Machine Co. respecting further improvements to their large new winding engine.

Mr. J. George Rutherford, jr., assistant manager of the Acadia Coal Company, Stellarton, N.S., is at present in

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GENERAL MINING ASSOCIATION

OF THE
PROVINCE OF QUEBEC.

The Second Annual General Meeting of this Association will be held in the New Club Room, Windsor Hotel, Montreal,

ON

WEDNESDAY, 13TH JANUARY, 1892.

THE FOLLOWING IS THE PROGRAMME OF PROCEEDINGS:

MORNING SESSION.

(Commencing at 11 a.m.)

Report of Council and Financial Statement for the year. Report of the Dominion Government on the petition to disallow the Quebec Mining Act: Amendments to Constitution and By-Laws: Election of Officers and Council, 1892, and other business.

AFTERNOON SESSION.

(Commencing at 2 p.m.)

An address will be given by Sir William Dawson, Principal of McGill University, Montreal, to be followed by a paper by Prof. W. C. Carlyle on the subject of "Technical Education in its relation to Mining;" "Platinum, its mode of occurrence, and uses," by J. T. Donald, M.A., and papers by Capt. Robert C. Adams, Montreal; Dr. Robert W. Ellis, Ottawa, and E. D. Ingall, M.E., Ottawa.

THE ANNUAL DINNER.

The annual dinner of the Association will be held in the Windsor Hotel in the evening at 9 o'clock. Tickets may be obtained from the Secretary, or Mr. A. W. Stevenson, C.A., Montreal, or members of the Council. Tickets (exclusive of wines), \$3.00.

GEO. IRVINE, **B. T. A. BELL,**
President, Secretary.

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Montreal. Mr. Rutherford, we very much regret to say, has recently been affected to some extent in his hearing, and is consulting Dr. Buller. We are sure that every one of Mr. Rutherford's many friends wish him a speedy recovery.

Mr. J. Lainsou Wills, F.C.S., Ottawa, manager of the General Phosphate Corporation, left for England on Thursday, 3rd inst., to attend the annual meeting of his company on 22nd.

Captain Richard Pentate, superintendent of the Albert Mines, is still in New York.

Mr. F. J. Falding, M.E., manager of the Moulton Hill and Howard Pyrite Mines in the Townships, has gone to the head office of his company at Cleveland, O.

Mr. W. H. Irwin, managing director of the Anglo-Canadian Asbestos Co., is now in England to attend the annual meeting of the company.

Mr. E. Grant Powell, the first editor of the REVIEW, now a resident of London, Eng., has been visiting his home in Ottawa during the month. Mr. Powell sailed for England on the 5th.

Mr. J. Keith Reid, manager of the Ross Mountain phosphate property, has gone to England on a brief business trip.

INDUSTRIAL.

Lidgerwood Manufacturing Company, New York.—This enterprising New York company has issued a very handsomely engraved brochure illustrating several of their hoisting and conveying devices, utilized in raising American phosphates. One of the features of this handy little reference is the description of the Locke-Miller patent horizontal cableway. As shown in the engravings two "A" frames or towers are located on the banks of the mine or pit, usually about 500 feet apart. These support a main cable whose ends are securely anchored in the ground. The cable forms a track way for supporting a travelling carriage, from which depends a fall block that rises and falls at the will of the engineer. The load is carried in self-dumping buckets, which hang from the fall block. Two moving ropes are employed in this cableway, one to hoist, called the hoisting or "fall rope," the other to give the horizontal movement to carriage, and is called the endless or traversing rope. This cableway is universal in its movements; the load may be lifted from any point and delivered to any point without shifting stops or catches. No lock or trip is used in connection with it. We strongly recommend our readers, particularly asbestos and phosphate producers, to write to the Lidgerwood Co. for a copy of this pamphlet.

The Dodge Wood Split Pulley Co., of Toronto, have lately furnished the new shops of the Canadian Pacific Railway Co., at Toronto Junction, with an interesting piece of power transmission. The drive in this instance being the conveyance of 35 h.p. from the driving wheel on engine, to the line shaft in wood working shops, a distance of some 400 feet. The transmission consists of a system of ground pulleys and a double wrap of 1" Diam "Firmus" rope, which is carried over the intervening roofs and yard by means of filler pulleys placed at given points between the span, and which are all neatly housed in for protection from weather. The ropes, however, run out of doors without further protection than a good

coating of patent rope dressing, all stretch and shrinkage being directly controlled by the patent take-up device which is controlled in Canada by the Dodge Co. The power is conveyed in a positive and noiseless manner and to the entire satisfaction of the railway company's superintendents. The Dodge Co. invite all who are interested in the economical transmission of power to a distance, to see this drive.

Canadian Rand Drill Company.—During the month we had the pleasure of paying a visit, in company with Mr. F. A. Halsey, the manager, to these excellent machine shops at Sherbrooke, Que. The Rand Drill Co. has equipped its Canadian establishment with a first class working plant, and in consort with the Jencke's Machine Co. now turn out a large and increasing business in mining and quarrying equipment. In our next issue we hope to reproduce a photograph of the large winding engine made in the shops for the Drummond colliery at Westville.

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The rates of pay are as follows:—
Staff-Sergeants \$1.00 to \$1.50 per day.
Other Non-Com. Officers . . . \$5c to 1.00 do

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

Extra pay is allowed to a limited number of Blacksmiths, carpenters and other artisans. Members of the force are supplied with free rations, a free kit on joining, and periodical issues during the term of service.

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

Latest Stock Quotations of Canadian Companies in England.

	Price.
Nicola, Limited, £35,000 fully-paid shares of £1.....	—
Shuniah Weatoh, Limited, £99,888 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.....	3½ 4½
Low Point, Barrasos and Lingan, £509,100 fully-paid shares of £100.....	—
New Vancouver Coal Mining and Land, Limited, £185,000 fully-paid shares of £1.....	¾ ¾
Sydney and Louisburg Coal and Railway, Limited, £50,000 cumulative 10 per cent. first preference shares of £10, £6 paid.....	4 6
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 preference shares of £10.....	—
Bell's Asbestos, Limited, £140,000 fully-paid shares of £5.....	7 7½
Ditto, £68,400 debentures, 5 per cent.; interest January 1 and July 1.....	—
Canadian Phosphate, Limited, £100,000 fully-paid shares of £1.....	¾ ¾
General Phosphate, Limited, 5 per cent. ord. many shares of £10, £2 paid.....	—
Ditto, £5,000 fully-paid founders' shares of £10.....	—
Leeds, Copper, Limited, shares of £1, with 10s. 6d. paid.....	—

Nicola.—Accounts to September 30 submitted in November. No dividend yet. Further capital is needed; and operations temporarily suspended.

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

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.

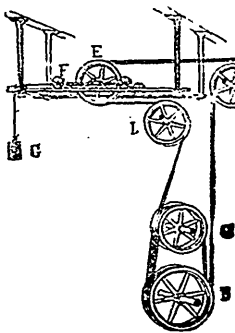
General Mining.—Accounts to December 31 submitted in April, but an interim meeting is held in November. Dividend for 1884, 5 per cent.; for 1885 and 1886, 3½ per cent.; for 1887, £4 13s. 9d. per cent., and for 1888 1889 and 1890, 3½. Reserve fund, £29,850.

Low Point.—Accounts to December 31. For 1887, 1888, and 1889, 5 per cent was paid each year on the ordinary shares publicly held; for 1888 the ordinary shares issued to the vendors got 3½ per cent., and for 1889, 2½.

New Vancouver Coal.—Reconstructed in 1889. Accounts to June 30 and December 31 submitted in November and May. For the two half-years to June, 1889, 5 per cent. per annum was paid; to December, 1889, 4 per cent.; and to June and December, 1890, 6 per cent. Reserve fund, £10,000. Debentures, £60,000.

Sydney and Louisburg Coal.—Accounts to December 31 submitted about May. In respect of 1889 15 per cent.

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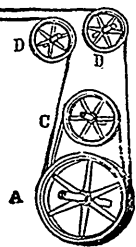
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was paid on the first preference, and for 1890, 10 per cent, leaving arrears of 50 per cent.

Anglo-Canadian Asphalt.—Reconstructed in 1889. Accounts to December 1st submitted in April. At general meeting held on 16th April, a dividend at the rate of 20% per annum was declared. Debentures, £3,450.

Anglo-Canadian Phosphate.—The preference shares rank first for 7 per cent, and after a like rate has been paid on the deferred shares, both classes rank equally. Accounts to November 30, submitted in May. No dividend yet on either class. Deloit to profit and loss on November 30, 1890, £5,749.

Bell's Asphalt.—Accounts to December 31 submitted in January. Dividends for 1888 and 1889, 2 1/2 per cent, each year 1890, 15 per cent. Reserve, £15,000. The debentures are redeemable by 101 1/2 by annual drawings at 115 from a sinking fund, which the directors may increase.

Canadian Phosphate.—Accounts to November 30 submitted in February. The working of the eleven months to November 30, 1888, resulted in a profit of £2,570, which was carried forward. A dividend of 6d. per share was paid November 1, 1891.

Canadian Phosphate.—Registered June 13, 1890. To acquire property in Canada and elsewhere. The founders' shares take one half the profits after providing for 10 per cent. dividends on the ordinary.

Leach Copper.—Registered January 16, 1891. To take over the properties of the Excelsior Copper Co. (Ltd). Authorized capital, £450,000. Accounts to Dec.

Natural Gas Constantly Forming.

Professor W. J. McKee, of the U. S. Geological Survey, in a Washington paper, recently made the following observations regarding Indiana's natural gas supply:

"The origin of the rock gas and petroleum, as well as the law by which they are accumulated, is so well understood that it is as easy to predict the success or failure of any specific bore for gas, as to tell where an artesian well will or will not fetch water. Scientific investigation has made known the cause of the tremendous pressure under which the gas and oil are confined. Every great field in Pennsylvania, Ohio and Indiana is an enormous dome beneath the surface of the ground, filled with porous sandstone or limestone. The natural gas of Indiana is in such a dome, about fifty miles across, formed by the bending out of shape of the strata incidentally to the contraction of the earth's crust. The coarse-grained limestone that is under it is charged with inflammable fluids. On top is gas, beneath it oil, and under the oil is salt water. This dome runs in the middle of a great basin 500 miles in diameter. The rain water falling into this basin is partly absorbed by the rocks, and it floats from all directions toward the centre, driving the oil and gas which are in the rocks towards the dome, and thus compressing it with enormous power.

"Rock gas is the same thing as marsh gas, which is often seen billowing from the muddy bottoms of stagnant ponds. It, and the oil likewise, were formed originally by the slow decomposition of woody or other organic matter contained in the strata of the earth. The making of both is now in progress in all rocks containing partly decomposed organic remains. The question is often asked, 'Is natural gas yet forming?' Undoubtedly, it is. It is only a question of the formation being equal in localities to the drain of consumption.

"All the compounds of carbon upon which the civilized world chiefly depends at present for fuel must be exhausted within a few years. The anthracite of America will be used up in a few decades, while the luminous coal-beds formed in the carboniferous and cretaceous epochs, will be dug out within 1,000 or 2,000 years. Happily, however, the stock of bitumens in the rocks of the earth is practically unlimited, and in them will be found the fuels and illuminants of the future."

The Noble Gold Milling Process.

A new process which, according to the *Australian Mining Standard*, bids fair to be of great importance in gold milling is about to be introduced by the Noble Mining and Milling Company, of New York, a company recently organized for the exploitation of the process, which is the invention of the late Mr. R. G. Noble, ex-Governor of Wisconsin, an experienced chemist, who spent many years upon its development, is designed, our contemporary states, to save the very fine gold occurring in certain ores, much of which is lost as "float" in the ordinary process of plate amalgamation. This desideratum is accomplished by intermixing the pulp and mercury to a degree hitherto unobtainable on account of the danger and consequent loss of flouing the mercury, this difficulty being overcome in the Noble process by the addition of a chemical which has the effect of dissolving the almost infinitesimally fine particles of floured mercury. A series of tests with the process, which has been conducted at the company's testing works, near New York, upon a working scale during the past six months, has given extremely successful results. By the Noble process the auriferous ore is ground so as to pass a 100-mesh sieve, a Fuller mill having been used for this purpose at the experimental works. The pulp, with the necessary amount of mercury for the amalgamation of its gold contents, is then run into a tub called the amalgamator, which is equipped with a stirrer suspended near the iron bottom of

the vessel. The tub, which is 42 inches in diameter, has a capacity of 1 1/2 ton of pulp at a charge. The charge having been run into the amalgamator, the mercury-coalescing chemical, the nature of which is kept a secret, is added, and the stirrer put in motion, rotating at 250 revolutions per minute, the presence of the chemical preventing the flouing of the mercury. During this operation, which lasts 15 minutes, the particles of pulp are brought into contact with those of mercury in the most thorough manner, and the amalgamation is effected. The pulp is then drawn off into a settler, little different from those of the ordinary type, and diluted, whence it is drawn into a second settler and further diluted, from which the tailings are allowed to run away. In the tests which have been made various lots of ore, principally from North Carolina mines, have, the *Australian Mining Standard* states, been run. Ore from one mine which is now being regularly worked by plate amalgamation, furnished the best comparative results. It was a free milling ore, containing a very small amount of pyrite, assaying from 8. to 16. per ton. On the plates but 24 per cent. of the gold value was recovered, while by the Noble process as much as 93 per cent. was saved. Equally satisfactory results have been obtained from various ores. The loss in mercury in experimental runs has been about 1/2 lb. per ton; in continuous runs this would, of course, be considerably smaller. It is claimed that in a 25 ton plant the process can be worked for 4s. per ton.



PROVINCE OF NEW BRUNSWICK.

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

—LEASES FOR MINES OF—

GOLD, SILVER, COAL, IRON, COPPER, LEAD, TIN AND PRECIOUS STONES.

GOLD AND SILVER.

PROSPECTING LICENSES up to 100 acres, (each 150 feet by 250 feet), issued at 50 cts. an area up to 10 acres, and 25 cts. afterwards per area, good for one year. These Licenses can be renewed for second year, by payment of one half above amount.

LEASES for 20 years to work and mine, on payment of \$2 an area of 150 feet by 250 feet. Renewable annually at 50 cts. an area in advance.

Royalty on Gold and Silver, 2 1/2 per cent.

MINES, OTHER THAN GOLD AND SILVER.

LEASES TO SEARCH, good for one year, \$20 for 5 square miles. Lands applied for must not be more than 2 1/2 miles long, and the tract so selected may be surveyed on the Surveyor General's order at expense of Licensee, if exact bounds cannot be established on maps in Crown Land Office. Renewals for second year may be made by consent of Surveyor General, on payment of \$20.

Second Rights to Search can be given over same ground, subject to party holding first Rights, on payment of \$20.

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

ROYALTIES.

Coal, 10 cts. per ton of 2,240 lbs.
Copper, 2 cts. on every 1 per cent. in a ton of 2,352 lbs.
Lead, 2 cts. on every 1 per cent. in a ton of 2,240 lbs.
Iron, 5 cts. per ton of 2,240 lbs.
Tin and Precious Stones, 5 per cent. of value.

APPLICATIONS can be filed at the Crown Land Office each day from 9.30 a.m. to 4.30 p.m., except Saturday, when Office closes at 1 p.m.

L. J. TWEDDIE,
Surveyor General.

Hand-power Diamond Boring Machine.

In *Oesterreichische Zeitschrift für Bergbau und Huttenwesen* Mr. E. Nordstrom writes: "The use of bore holes in underground workings for the discovery of ore deposits, has been practised in Sweden for a considerable time. Thirty or forty years ago the maximum distance attainable by percussion hand-boring was 44 feet. In 1872 the method of diamond-boring was adopted in coal-bearing rocks in Scania, and about 1,100 yards of borings were made by foreign companies at an average cost of £6 5s. per yard, for which price shafts could have been sunk in the same ground. Subsequently an American prospecting machine, driven by compressed air was adopted in the Norberg mines, where a bore inclined upwards at a slope of 1 in 100, was driven a distance of 33 yards through granite, felsone and limestone. The average length driven per shaft was 8 feet 8 inches, the maximum of 16 feet having been obtained in limestone. About 220 yards of borings were done in the district at an average rate of 773 feet per shift, but the cost was, still almost the same as that for which levels could be driven at the rate of wages current in the locality, so that the only saving was in time.

In 1887 a light, simplified manual power machine was introduced. The bore-roads are iron tubes, 1 1/2 inch external, and 1/8 inch internal diameter, and first set long screws twisted. Eight diamonds—four inside and four outside—are used in the boring head, which is of 0.94 inch bore, giving cores of 0.86 inch diameter. The average weight of the diamonds was between 0.75 and 0.8 carat each, and the cost last year about £2 1/4s. per carat. The total weight of the machinery, including 55 yards of rods and the force pump and gear for flushing the hole, is 14 to 15 cwt.

Up to the end of 1888, a total length of 3,250 yards had been carried out by these machines, the longest bore being 200 feet from the face. Most of the borings have been underground, 25 per cent. being vertically downwards, 37 per cent. nearly horizontal, and 38 per cent. varied between 58° upwards and 78° downwards. From four to six men are required for working the machine, and about 1 1/2 gallons of water per minute is needed for flushing out the hole. The rate of advance per shift of 8 to 9 hours, varied from 2 1/2 to 4 1/2 feet. The total cost is from £1 6s. 6d. to £1 8s. 6d. per yard, while that of driving levels, including the lifting of the debris to the surface, varies from £2 15s. per yard in ordinary, to £3 17s. 6d. per yard in very close ground.



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On Money Orders payable abroad the commission is:

If not exceeding \$10 10c.
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For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa.
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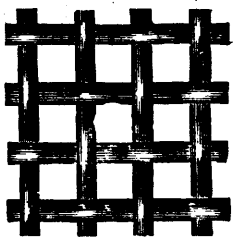
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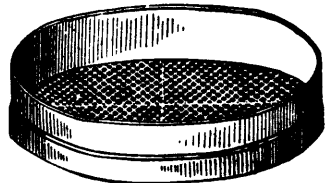
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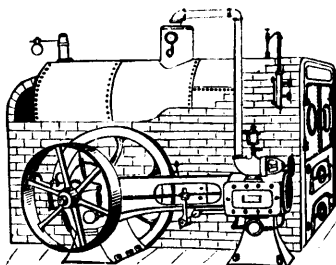
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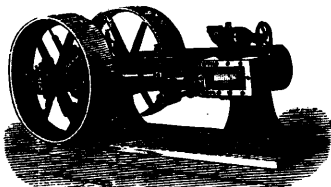
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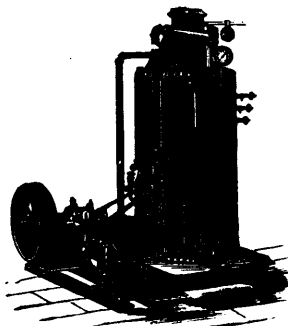


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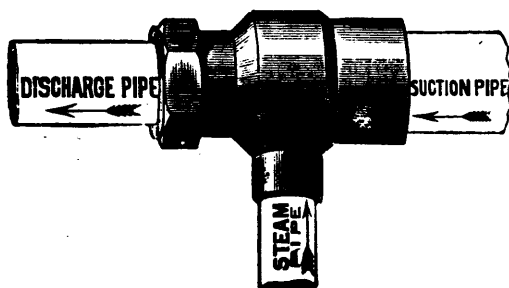
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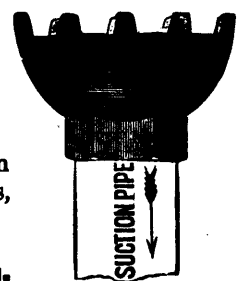
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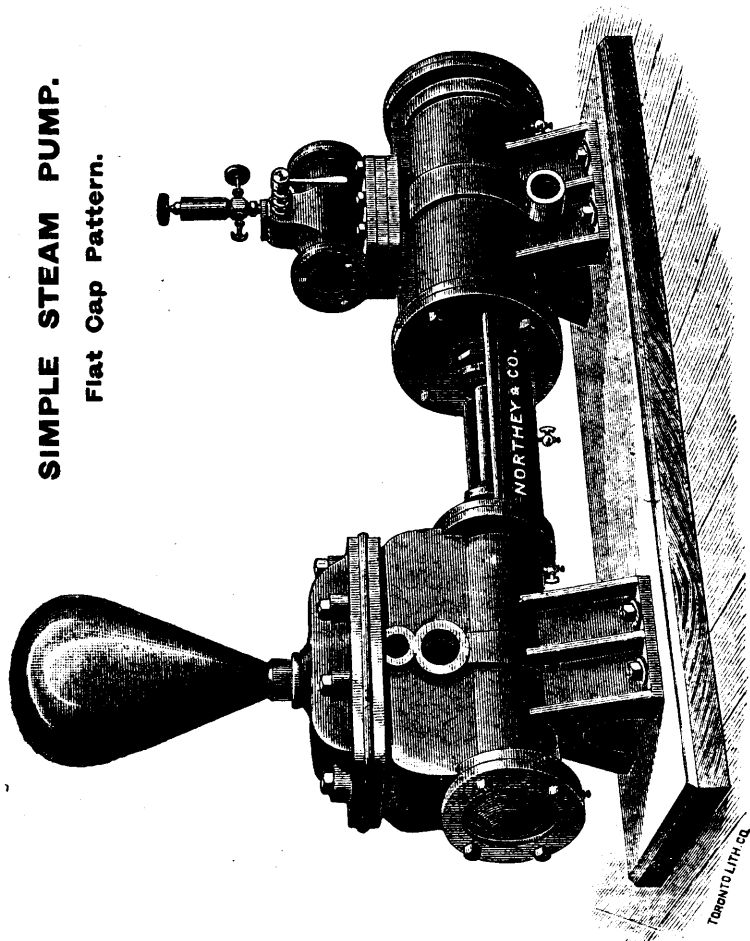
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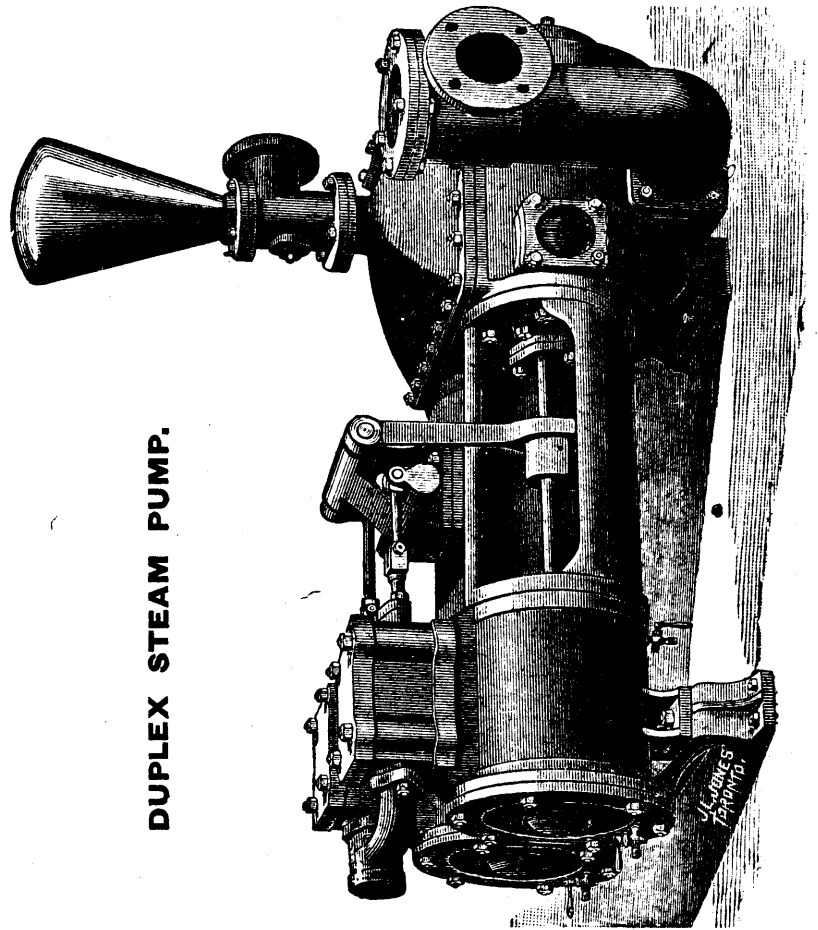
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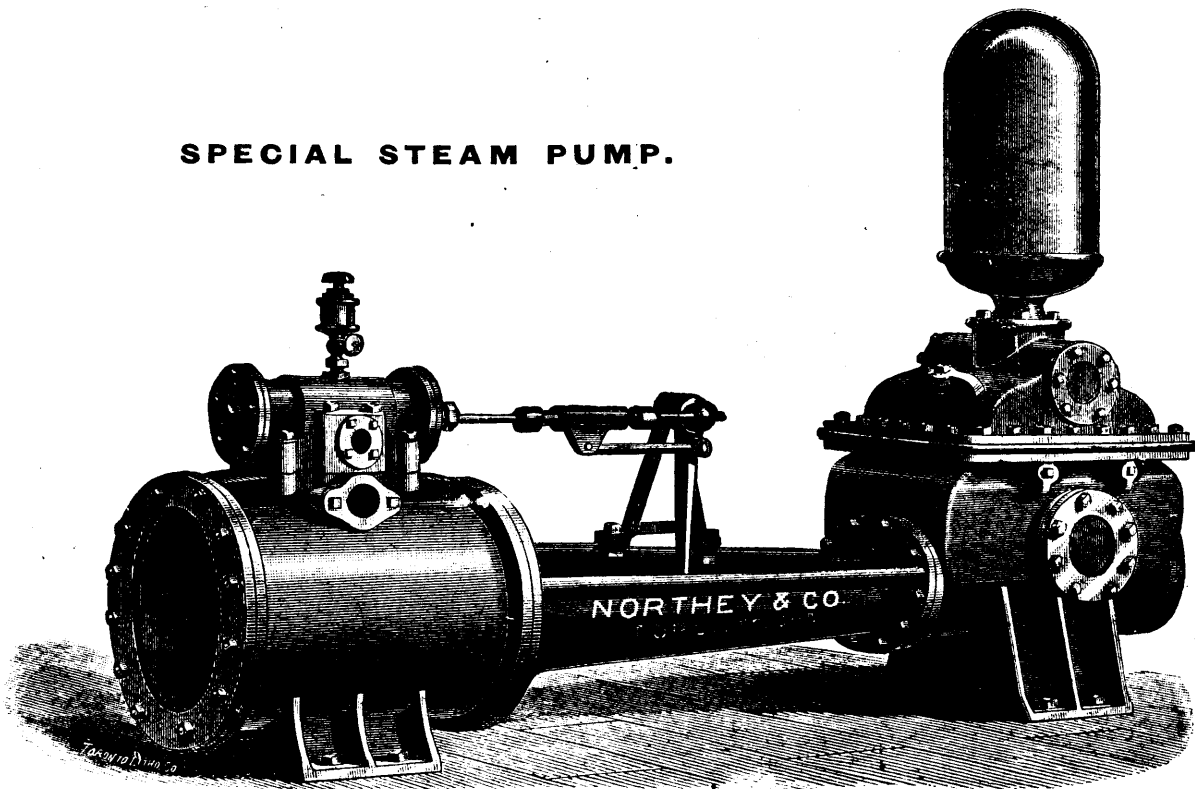
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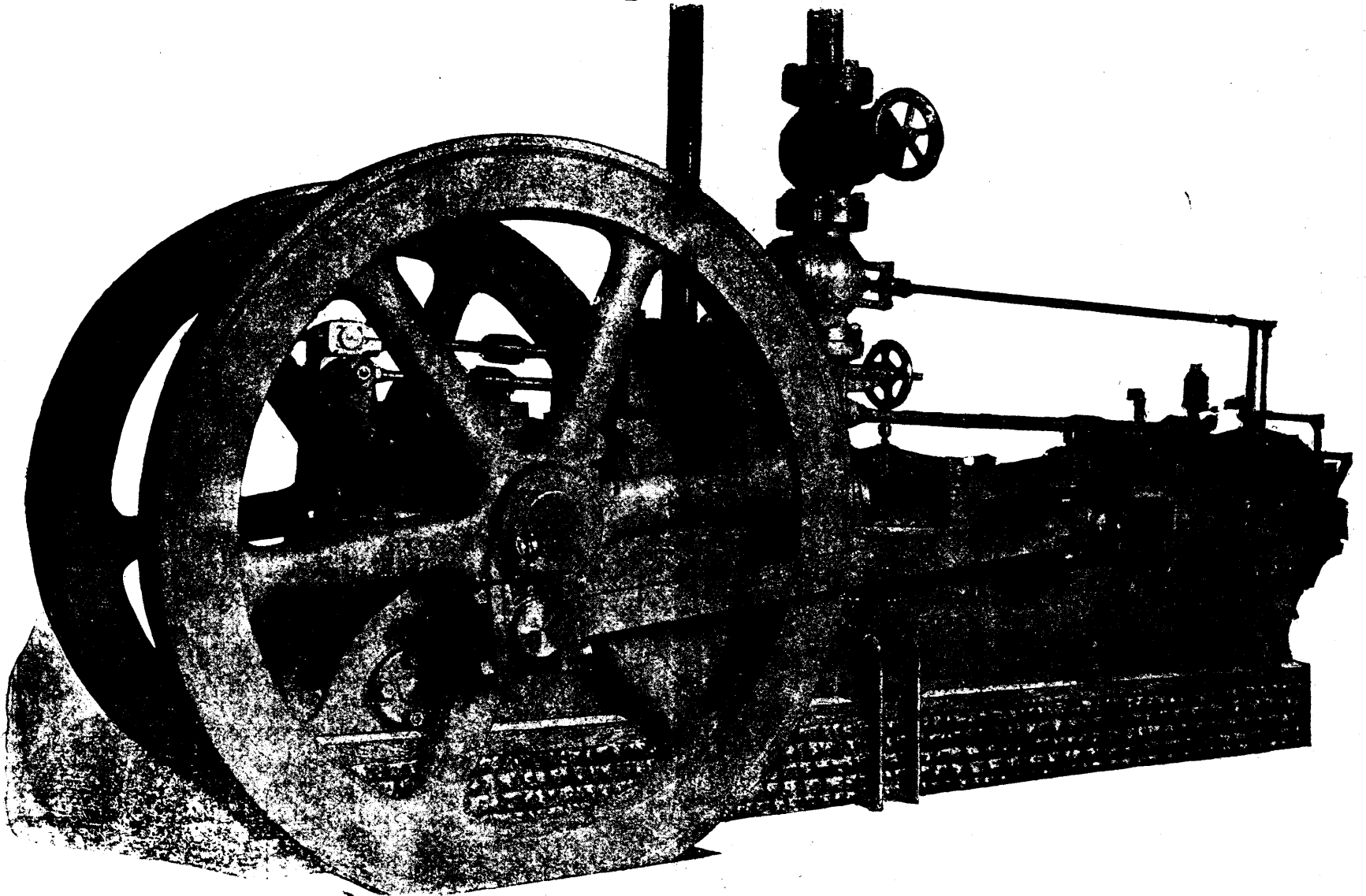
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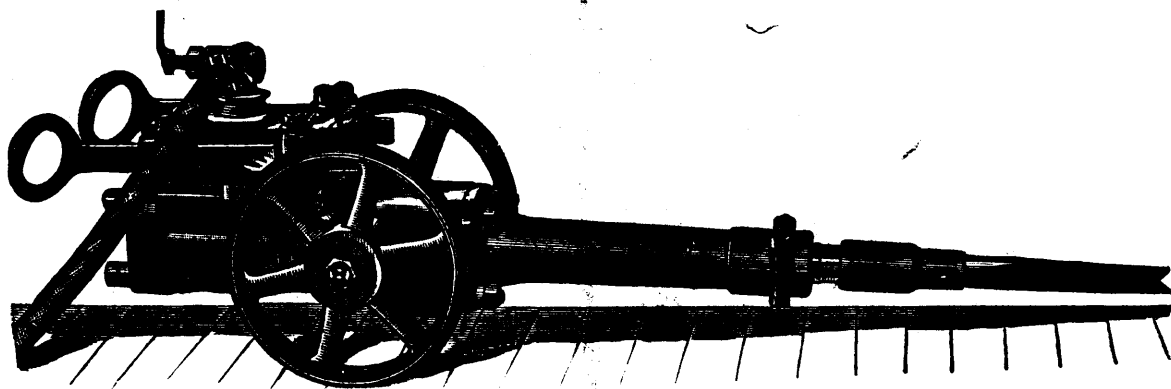
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