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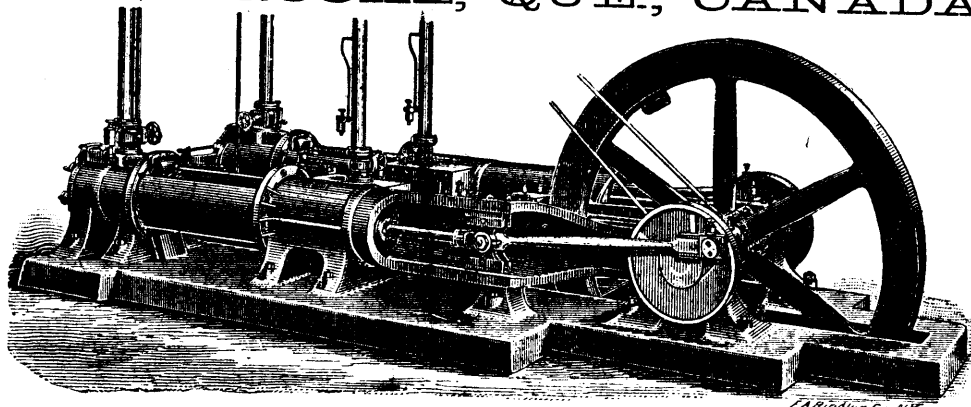
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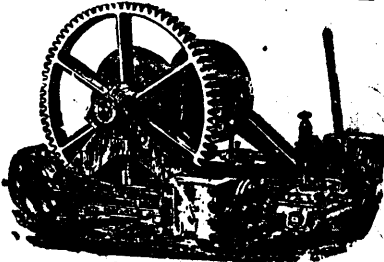
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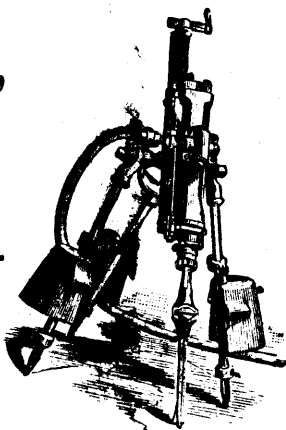
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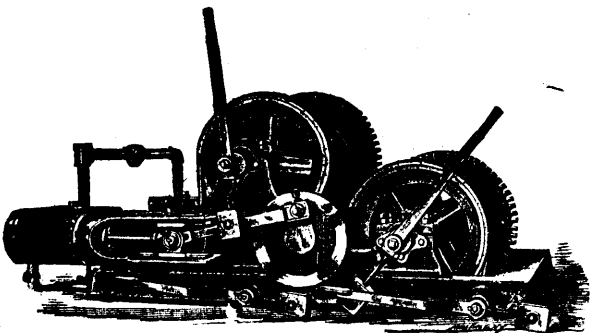
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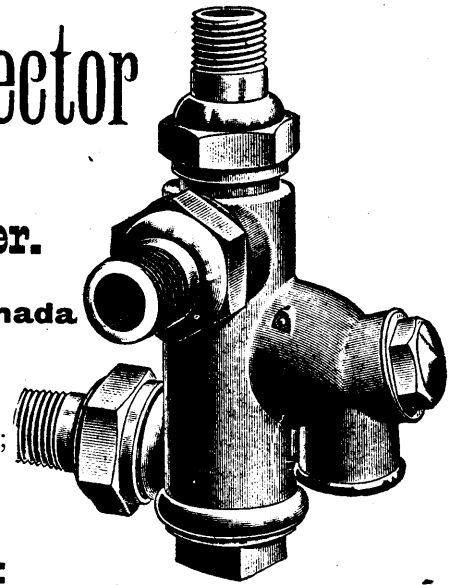
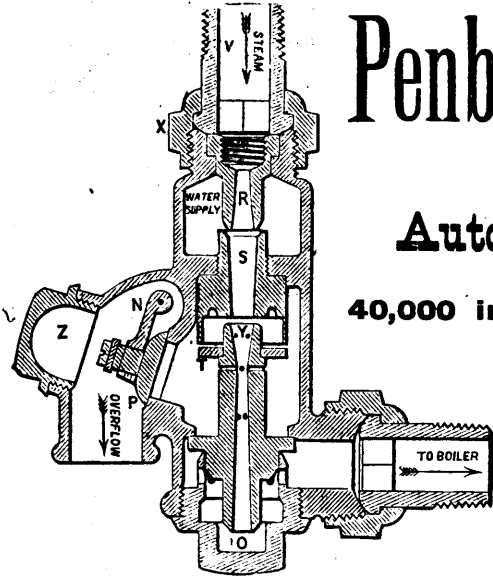


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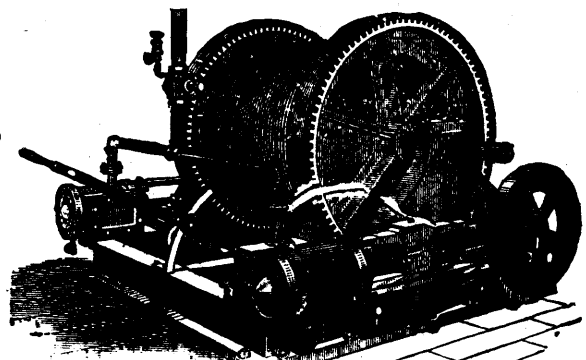
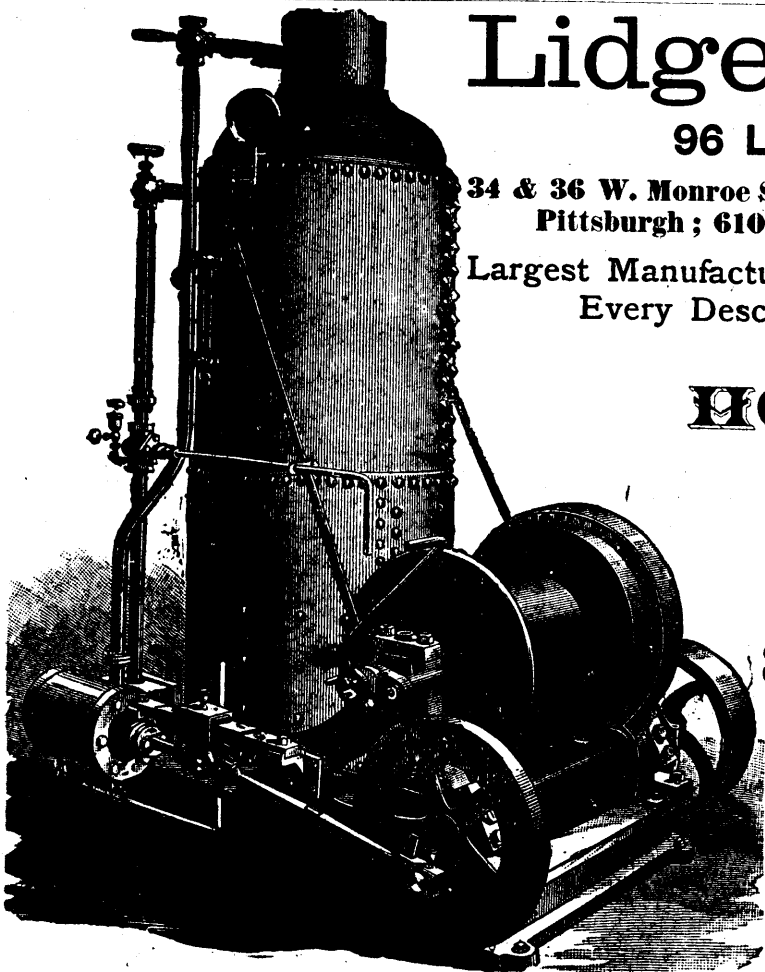
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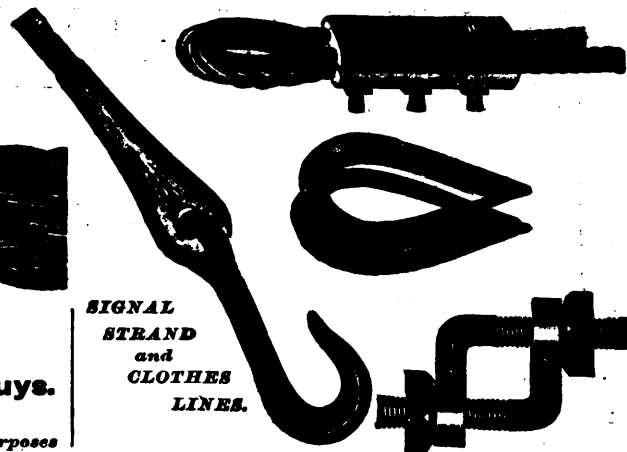
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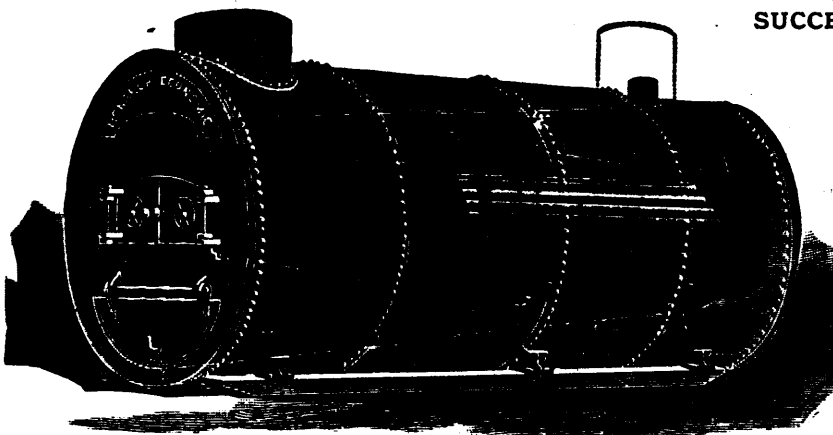
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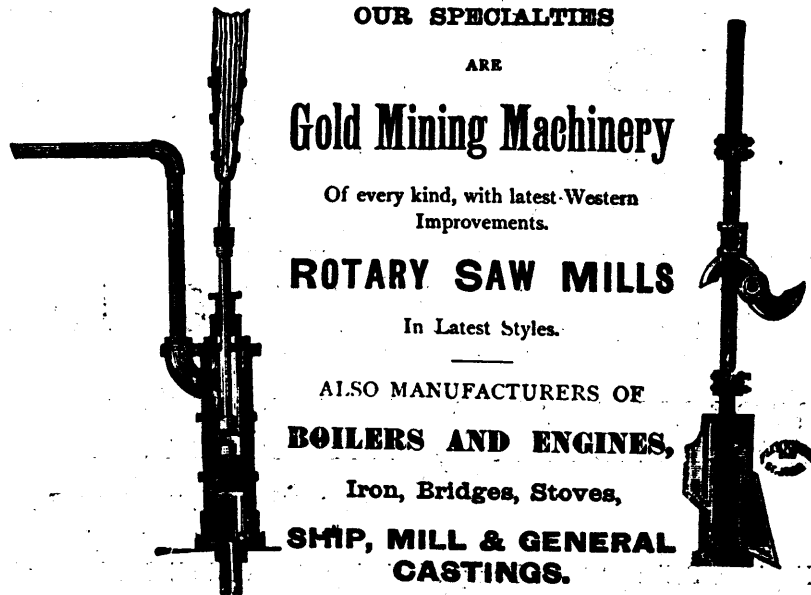
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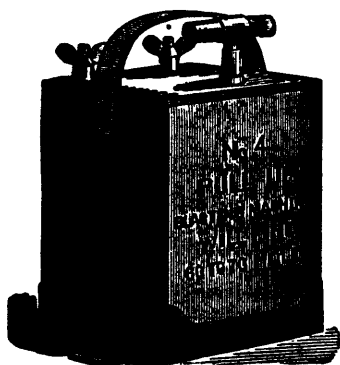
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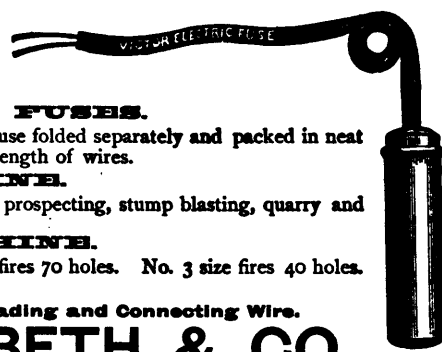
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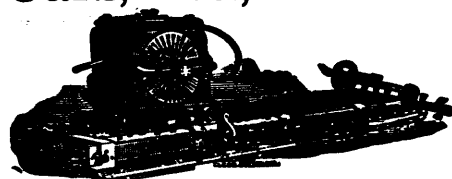
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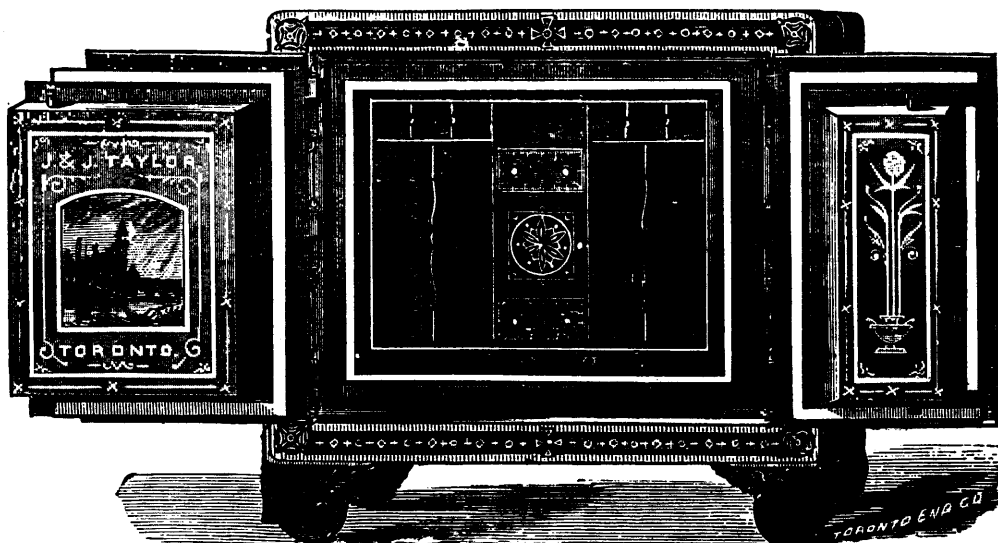
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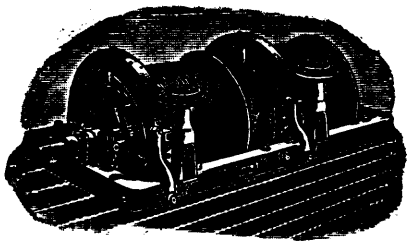
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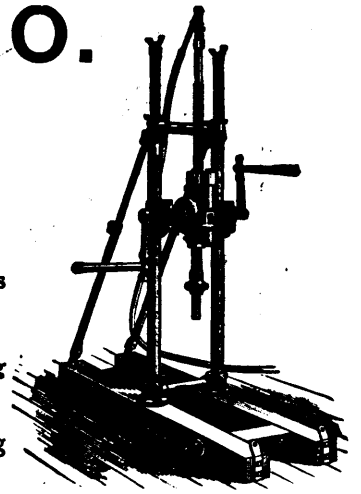
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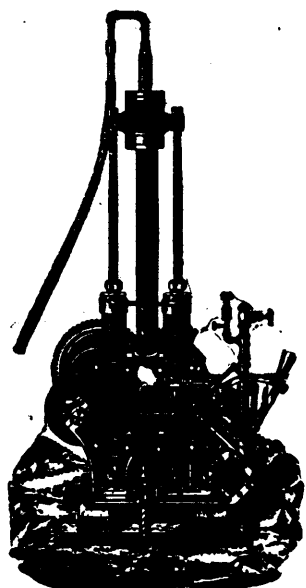
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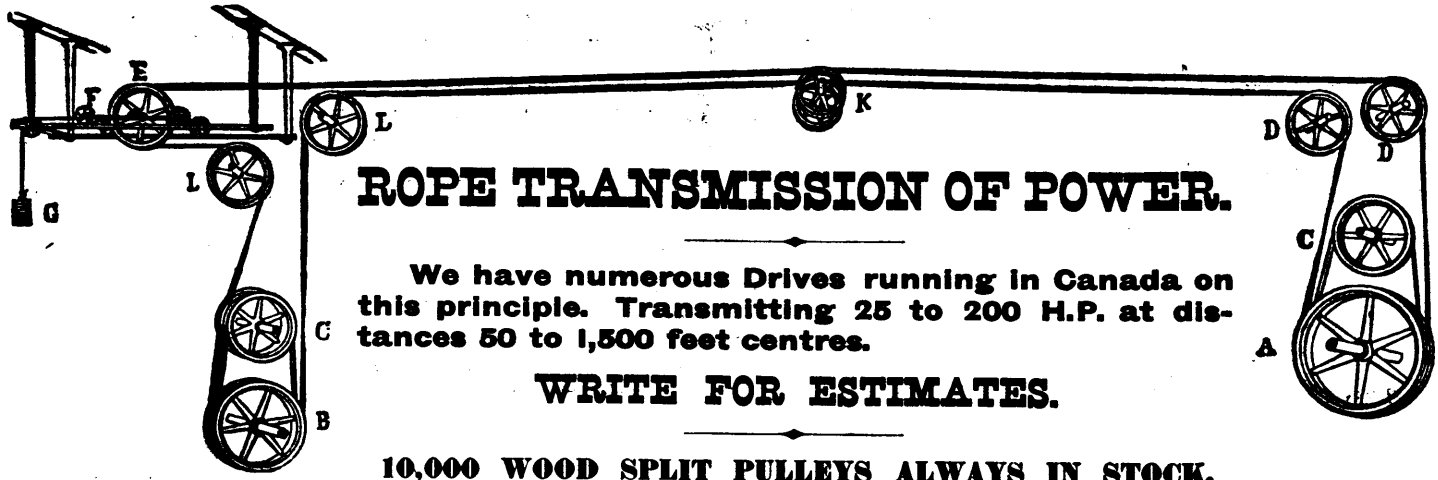
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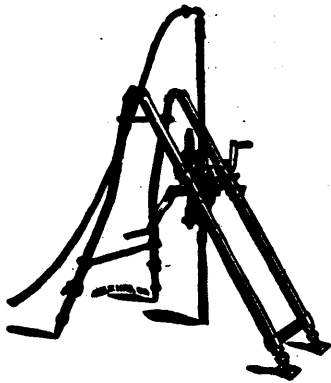
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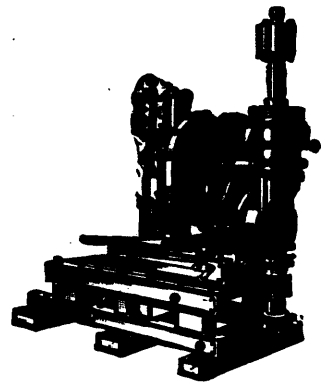
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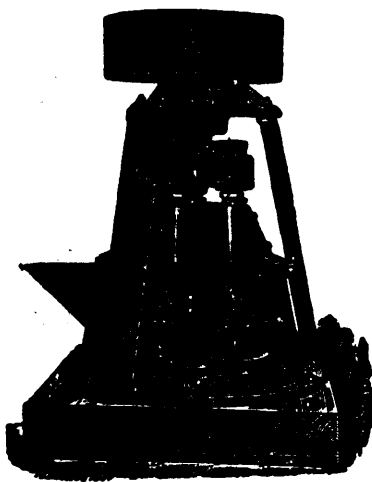
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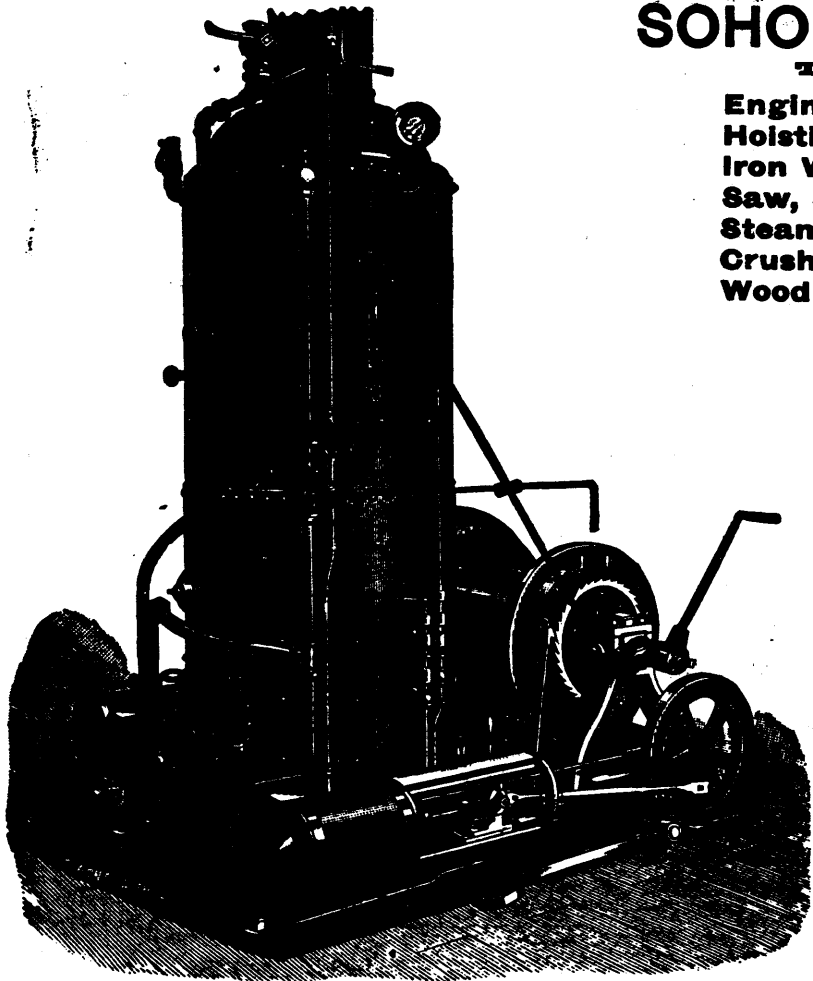
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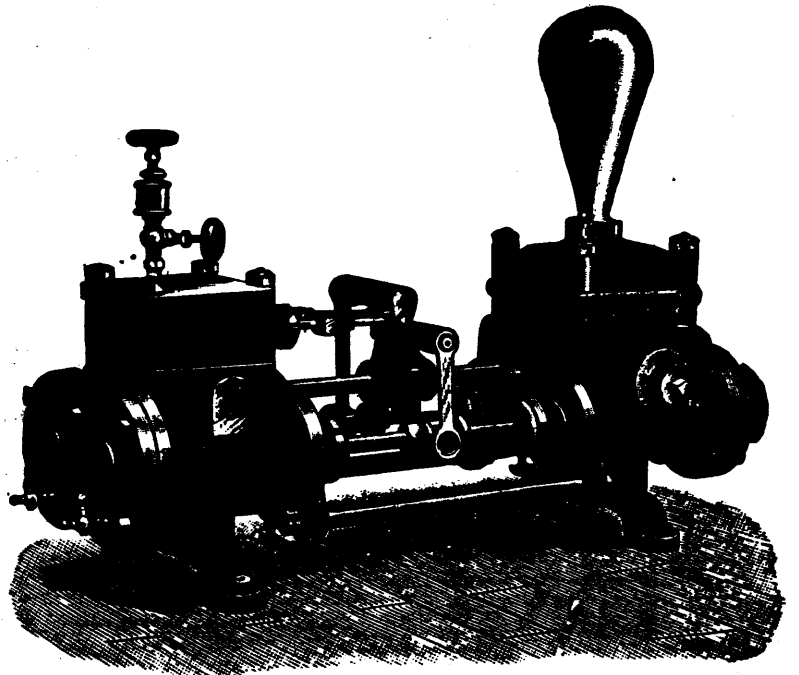
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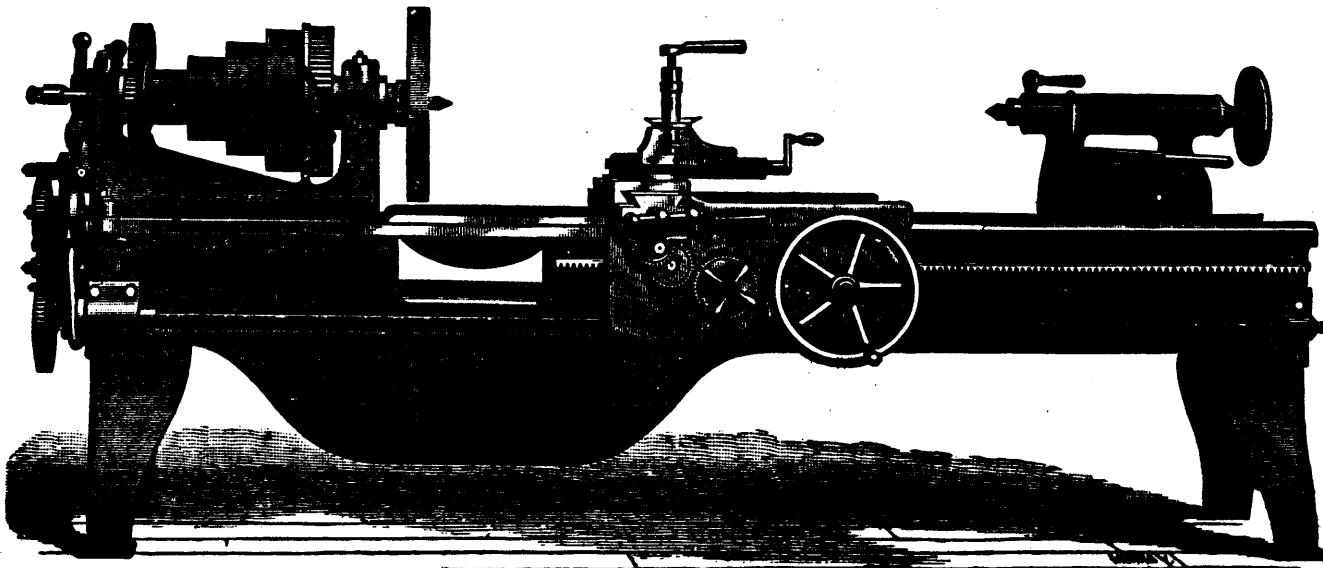
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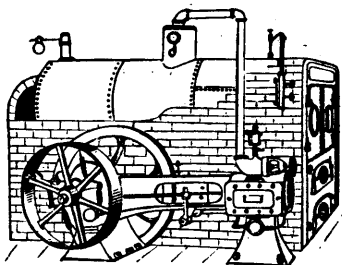
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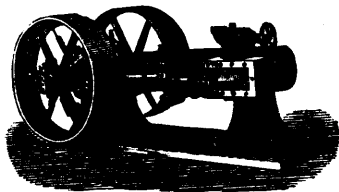
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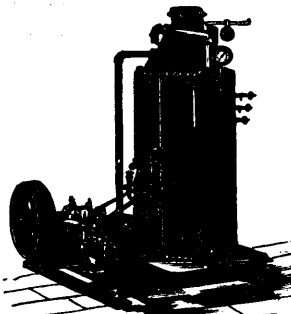
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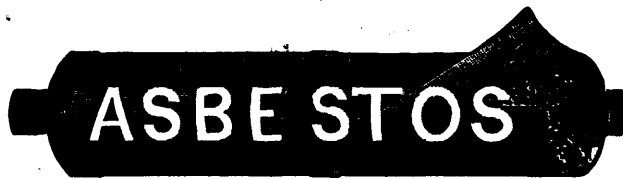


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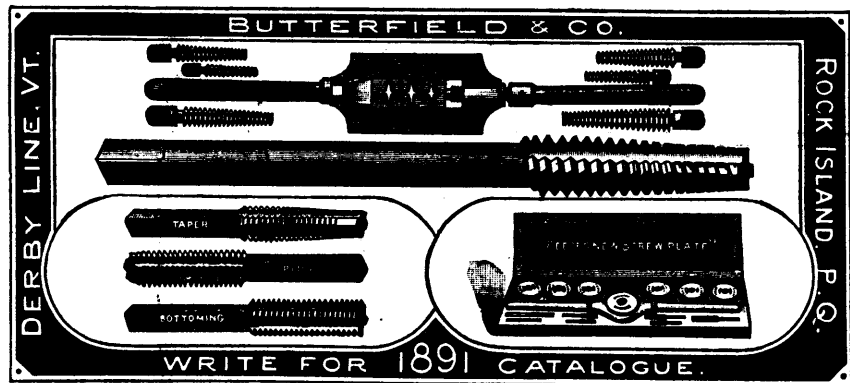
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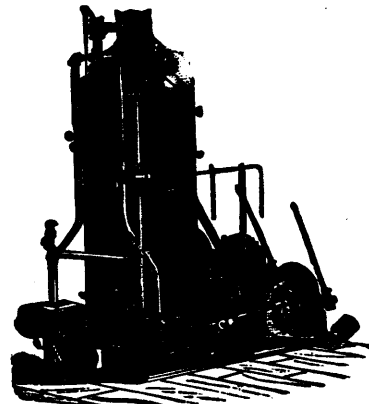
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Vol. XI. FEBRUARY, 1892. No. 2.

### The Gay's River Conglomerates.

In another place our readers will find an interesting letter from Mr. R. R. McLeod, of Brookfield, N.S., in which he takes us to task for our reference to the conglomerate deposits of the Gay's River district, made in our last month's review of the gold mining industry of Nova Scotia. We gladly give space to Mr. McLeod's letter.

Since the discovery in 1862, and the first published notice by Professor Harte in 1864, of the mode of occurrence of the gold of this interesting district in the conglomerate of its consolidated alluvion or indurated sea beach or river bed, no inconsiderable amount of money has been spent in almost continuous mining and prospecting, as detailed in the yearly reports of the Department of Mines; yet "it has never occupied an important position as far as its yield of gold is concerned." Its yield has seldom been included in the reports of the inspectors of mines, notwithstanding the well known fact that gold in considerable quantity has been occasionally found in rich pockets in the position so well described by our correspondent. From the Inspectors' reports we learn that the conglomerate itself carries little or no gold, the portion next the slate being alone auriferous; that little of the conglomerate is consequently "pay dirt," and that the upper part of the slate which underlies the conglomerate—into the cracks of which, now filled with clay, the gold finds its way—is often the most productive. A large quantity of material has to be handled for the moderate yield obtained.

For our opinion of the value of the alluvial deposits as compared with the mining of the quartz leads, we have only the experience of all the alluvial diggings of the province, quickly exhausted, low lying, too expensive to work by reason of the great tenacity of the clayey deposit, the absence of any considerable amount of superficial soil from a great portion of the surface of the gold-bearing rocks, and the insufficient concentration of the gold in the drift.

But as Mr. McLeod reminds us, doctors disagree. Mr. Michel, Dr. Hunt, Professor Hind, Dr. Selwyn and others, who have studied the subject, insist upon the importance of carefully searching in certain parts of Nova Scotia for rich alluvial deposits, asserting that "they have never yet been sought for with that degree of

enterprise, intelligence and perseverance which the investigation demands;" and Professor Bailey, after a survey of some of the Western Counties deposits, has again lately called attention to the subject. A full discussion of this side of the question will be found in Professor Hind's report on the Sherbrooke gold district.

### Phosphate and its Mining.

Perhaps there is no kind of mining at the present time, outside the precious metals and gems, attracting public attention more than that of phosphates.

Affecting as it does the actual food supply of the world, this mineral may be considered more useful than iron, richer than gold, and more precious than rubies. It is the food of p. at life and restores to the earth the virtue which has gone out of it in the process of germination; and from the exhausted soil, impoverished through excessive fecundity, it induces fresh and renewed fertility, and causes the blessed corn and fruit to spring forth in perpetual bloom and abundance to feed and gladden all living things.

In most long settled and long cultivated countries the land has become worn out and weak through the perpetual drain on its fruitfulness. For many centuries the farmers have sown and reaped successive and exhausting crops to stilly the necessities of an ever-increasing population without realizing that this process must inevitably ruin the soil, unless the fertilizing elements of its composition, slowly extracted with the plant's growth, were returned to it in the shape of manure. First it was thought that the land required rest, merely; hence the ancient custom of "fallow." Presently, however, it must have been observed that where the excrement of the cattle fell and rested, there the crops sprung up in greater luxuriance than in other places; and then, by rule of thumb, the custom would be established of spreading the collected and saved up excrementary matter to produce the same good effect over a larger area, without reasoning that these droppings were the undigested and bulky portion of the food taken by the cattle and contained to a large extent the elements of fertility which the economy of nature demanded to be returned to the soil in order that it might recoup itself for loss sustained in bearing fruit and insure perennial rejuvenescence.

It has long been customary in Great Britain to insert a clause in farm leases to the effect that straw should not be sold or removed off the property, in order that what was not used for thatching and like purposes might find its way in the shape of "chop" or bedding to the manure heap and thus help to fertilize the ground from which it was raised.

The effect on soils, too, by their admixture with the surface of the rocks lying immediately beneath them, such as marl, chalk, etc., must have led to similar deductions with regard to the earliest use of mineral manures, and though spoken of generally as mineral, most of them, such as peat, marl, chalk, coprolite, osite, guano,

etc., are of organic origin, but which are now separated from the organic because they have become more or less mineralized and form part of the composition of the earth's rocky crust.

Of late years the light of science has been thrown on the subject, and the geologist and chemist have come to the aid of the agriculturist who now finds that scientific knowledge is as helpful to him as it is to all other producers of the present day. Books have been written on the subject, research and experiment have been made and the results marked in the records of the agricultural societies of the world; and now the sons of the soil realize that it is not enough to be able "to plough and to sow, to reap and to mow, to be a farmer's boy," but that if they aspire to be high class farmers they must have some intimate acquaintance with geological and chemical science.

The result of all this is evident; the progress thus illustrated is the inevitable progression which accompanies the advance of civilization and education.

The increasing demand for a higher yield of food from the earth, as its population becomes denser, will stimulate the efforts of those who seek to supply the want. Land now lying exhausted and useless will again be brought into cultivation by means of artificial fertilizers.

Lands in the United States and Canada and other great food producing countries, which are now being so impoverished by successive crops of cereals without adequate replenishment, will necessitate before long the increased use of manufactured manures in which the use of mineral phosphate stands pre-eminent.

And this means the increase of the demand for phosphate and the prosperity of this great mining industry.

The rapidly increasing consumption of phosphates in the United States strongly corroborates this view.

The exhaustive report of the Anglo-Continental Guano Co.'s London agency, on "Phosphates in 1891," recently issued, estimates the consumption in the United States in that year to amount to 500,000 tons; the consumption of the whole world amounting to 1,625,000 tons.

Enormous as these figures appear at first sight, they are but infinitesimal atoms in comparison with the vast area of land under cultivation in the whole world.

The Dominion of Canada, although herself the fortunate possessor of the most valuable mineral phosphates in the world, does not appear to be a large consumer of this precious product herself.

Probably this may be traced to two main causes, firstly, the vast area of her agricultural land in the Canadian North West is too virgin and young to feel the effect of exhaustion yet, and secondly, the farmers who cultivate the lands of the lower provinces, which undoubtedly stand much in need of fertilizers, find it more expedient to desert an old and used up farm altogether for the rich unimpoverished lands of the North West rather than expend the little capital they

have in rejuvenating their old homesteads. It is much to be regretted, if this is true, that the advantages of scientific farming are not better understood and appreciated, because in spite of the apparent unkindness of the winters here, nature seems to compensate for this by the magnificent growing weather of her summers, when the moist, rainy spring is succeeded by the long warm summer with its heavy night dews, followed by a dry harvest time and Indian summer.

Yet the land of the lower provinces has been terribly neglected and impoverished, and the use of manure of any kind is most exceptional. One can hardly pass through long stretches of such land without thinking how smiling and beautiful it might become under improved cultivation.

The provinces of Ontario and Quebec, possessing as they do the richest phosphate mineral in the world, are probably among the smallest class of consumers of superphosphate.

But however this may be the fact still remains that the mountains of these provinces contain vast deposits of this mineral; and whether its value is appreciated now or later on the phosphate still remains a practically inexhaustible store for the world's future use.

It has been stated, by perhaps not entirely interested critics, that the phosphate mining of Canada has seen its best days and that it will be swamped by the alleged more easily worked mineral of Florida and South Carolina—conclusions which are, however, not proved by the evidence produced in confirmation of this opinion, even though they point to the low prices and general depression of the market as a corroboration.

The Florida discoveries are but of quite recent date, and until we are quite certain of the results of the mining and concentrating efforts now being applied and the cost of production, apart from the prospective estimates and inflated glamour of the "boom," it is quite unsafe to rely on the figures and facts of the exploiters who have phosphate lands to sell, and which perhaps need the admixture of the proverbial grain of salt with the usual caution in regard to speculator's figures.

The present low prices may not be due to large stocks or anticipated flooding of the market at all, but to the remote financial causes which occasionally sweep like a tidal wave over the commercial world without any apparent traceable cause.

It is comparatively easy to form an estimate of the superficial area of the Florida deposits owing to their uniform character of occurrence and comparative evenness of the ground. But it is equally easy to assume too much and overestimate the phosphate area, particularly on the part of those whose wish is father to the thought.

It has been stated on good authority that the mineral costs more to raise and prepare for sale than was so sanguinely counted on even by the most moderate operators.

The character of the ore is that of a mixed and dirty kind, always difficult to concentrate into a large proportion of high grade.

The Canadian apatite, on the contrary, is usually of a very clean kind, and though the very similar specific gravities of the associated minerals requiring to be separated in the process of concentration presents a difficulty and necessitates the use of delicate plant, the experiments already made show that this is not an insuperable difficulty. The clear, bright and distinctive colour also make it comparatively easy to pick out the massive lumps of pure ore which do not need cobbing or breaking up, and the colour is readily distinguishable after wetting. The pure phosphate is also much more friable than most of the associated atoms, and will consequently crush much finer and pass through a much smaller mesh, which will reject the objectionable matter.

The Canadian phosphate, though older than the Floridian, is after all still an infant industry, and how little is the deposit understood and its mode of occurrence and origin accounted for?

These deposits were first discovered and worked by farmers of the locality, and the mining and separating skill brought to bear on the work has been such as might be expected from this class of men. It is only within recent years that practical mining skill has been applied, and that only in isolated instances, and this, following much the example of the earlier workers, has resulted in but very indifferent success.

The physical aspect of the occurrence of this mineral has also been to a considerable extent misrepresented, and the views concerning it are still extremely conflicting.

The belts or zones have been arbitrarily determined and marked down on copies of the Township maps at the sweet will of the local and self constituted experts, whose pecuniary interest in the sale of these properties was not likely to conduce to the scientific accuracy of the belts, which appear rather to have been located by the position of workings already opened at random than by geological indication of the mineral within the limits of these zones.

The discovery of the mineral outside and distinct from such limits, and the frequent disappointment of those who sought only within these magic circles, proves how misleading such evidence invariably is, and how worthless for any purpose whatever.

Most of the mines of any consequence have been opened on the track of other industries, such as the lumber trade, and consequently at the most accessible places by river or road. And it cannot be wide of the mark to assume that but for these arteries of transport the deposits of phosphate might have remained undiscovered for ages, and shows how desirable it is that the Government should take upon itself the responsibility of constructing roads and railways with a view to the development of the vast deposits of this mineral which undoubtedly exist in the enormous volume of phosphate bearing ground lying within the area of the Laurentian mountains.

No one can climb to the top of one of these lofty and commanding ridges and look around

as far as the eye can reach without noting the same grand outlines of its escarpments, troughs and ridges, ever increasing in magnitude and boldness in proportion to their altitude, but retaining throughout the same remarkable geological characteristics, without feeling convinced that as the mineral has been discovered in the comparatively cleared region, so it will eventually be found in the yet unexplored and trackless areas of the same rocks of this immense Laurentian region, and not unlikely in larger and more promising deposits than ever yet discovered.

Judging from the very small proportion of phosphate ground opened out, we may assume that the deposits still unworked and unexplored are practically inexhaustible.

The demands of the phosphate market and competition will most probably result in a better system of working of the mines already opened out. A more scientific method of mining and dressing the ore will have to be adopted.

The exaggerated and unfaithful reports of interested speculators and experts must in future be ignored. The ridiculous estimates of ore which can be raised from untried or superficially prospected ground in the very beginning of a mine must be treated with the contempt they deserve, and which would be accorded at once to such irresponsible statements in any other business but mining.

Freeing ourselves from the primitive methods of mining and dressing, it now rests with the engineers to show us how to deal mechanically and cheaply with the large masses of rock to be removed in order to win the mineral cheaply, expeditiously and without waste. Machinery must be carefully designed to meet the requirements of almost perfect concentration, i.e., to produce the very highest grade the ore is capable of with the least possible sacrifice of any of the mineral. The magnificent water powers of the phosphate region must be compelled to the use of the miner in operating the mechanical methods which the exigencies of the present day demand in order to insure cheap production of the mineral. The distances in no instance are prohibitive to the use of these gratuitous sources of power now-a-days, when the difficulties of transmission have been overcome by the skill of the electrician, or the compression of the atmosphere; the cost of the medium of transmission being often more than compensated for by the diminished cost of the motors used in such methods.

It may be taken for granted that the enlightened and scientific farming of the future will create an ever increasing demand for phosphate. The exhaustion of what was considered inexhaustible supplies of guano in the past with the comparatively small consumption of those days, can by a very simple process of inductive reasoning be made to show that the much larger deposits of phosphates of Florida, South Carolina and Canada, will most likely prove inadequate to meet the eventual demand which is sure to be made on these resources. And it is equally certain that as the quality of Canadian phosphate stands first in the list there will always be a demand in her favour for all she can produce.

J. B. SMITH.

**Imports of Mining Machinery.**

From the trade and navigation returns, just issued, we reproduce the figures there given of the imports of mining machinery into Canada during the fiscal year ended 30th June, 1891. As our readers are aware, the Dominion Government in 1890 admitted free of duty all machinery for mining purposes not manufactured in the country. The returns show a very satisfactory increase which should be more than maintained during the period ended 30th June, 1892. The figures are—

To Ontario.....	\$26,134	From Great Britain.....	\$12,194
" Quebec.....	25,378	" United States.....	66,238
" Nova Scotia.....	14,578		
" N. Brunswick.....	2,583		
" Manitoba.....	4,895		
" B. Columbia.....	4,864		
	<hr/>		<hr/>
	\$78,432		\$78,432

In the previous fiscal year, 1889-90, the imports of mining machinery to the several provinces from Great Britain and United States were as follows:—

To Quebec.....	\$ 6,182	From Great Britain.....	\$ 6,182
" Ontario.....	473	" United States.....	3,768
" Quebec.....	2,555		
" B. Columbia.....	740		
	<hr/>		<hr/>
	\$ 9,950		\$ 9,950
To Ontario.....	11,798	From United States	11,798
		under Order in	
		Council.....	11,798
	<hr/>		<hr/>
	\$21,748		\$21,748

**Canadian Exports of Minerals.**

The following are the mineral exports of Canada as per Trade and Navigation Returns for the year ended 30th June, 1891.

	Quantity.	Value.
Asbestos first class, (tons).....	5,180	\$ 413,231
" second class ".....	1,449	83,639
" third class, ".....	393	17,039
Barytes, ground and unground.....(cwt.).....	170	1,190
Coal.....(tons).....	833,684	2,916,465
Copper ore.....	3,074	269,169
Copper matte or regulus of, and black or coarse copper and copper cement, fine copper contained therein.....(lbs.).....	1,719,990	64,719
Fine copper.....	3,116,508	171,308
Gold-bearing quartz dust, nuggets, etc.....(\$)		554,126
Gypsum or plaster and crude.....(tons).....	172,496	184,977
Mica, crude and cut, (lbs.).....	163,904	19,666
" ground.....(\$)		2,646
Nickel, fine, contained in ore, matte and speiss.....(lbs.).....	5,352,043	249,499
Oil, mineral, crude, (galls.).....	434,699	18,436
Oil, mineral, refined, ".....	1,817	290
Ore, iron.....(tons).....	14,648	32,582
" manganese.....	880	16,218
" silver.....	309	238,367
Phosphates.....	24,257	422,200
Plumbago.....(cwt.).....		163
Salt.....(bush.).....	5,706	1,429
Sand and gravel.....(tons).....	324,120	63,326
Stone, ornamental, granite, marble, &c. unwrought.....	1,189	9,307
Stone, building, free-stone, limestone, etc., unwrought.....	15,048	38,504
Other articles.....(\$)		4,647
Total produce of the mine.....		\$ 5,784,143

Port Arthur has decided to have a mining school, and the city and surrounding municipalities are being approached to furnish the wherewithal to equip and keep it going. Is this not a little premature?

**EN PASSANT.**

The recent issue by the Geological Survey of the new sheet map of Nova Scotia, on the reduced and perfectly useless scale of four miles to the inch, instead of one mile as universally demanded, has, as was predicted, provoked a storm of indignant protest from the miners of that Province. Mr. Hardman's letter, published elsewhere, clearly indicates the situation. We are glad to learn that the matter will be brought before Parliament during the coming session.

A Pennsylvania Commission has been appointed to enquire into the utilization of anthracite coal dust, which accumulates in such enormous quantities around the mines. Numerous schemes for its use have been suggested and a large number of contrivances patented with a view to using this waste product. In round figures, there has been mined in Pennsylvania 700,000,000 tons of coal and of this it is estimated that about 10 per cent. or 70,000,000 tons is in the form of dust or waste.

General I. J. Wistar, President of the Philadelphia Academy of Natural Sciences, makes bold to say that the coal supply of this North American continent of ours will only last 112 years. He states that "after enjoying considerable opportunity of personal observation of the great coal fields of the United States, Nova Scotia and British Columbia," he does "not believe that the entire carboniferous exposures in North America contain 250,000 square miles of actual coal beds, including all qualities and thicknesses." He believes that an average thickness of considerably less than 6 feet will have to be assigned to the workable seams of the country, but assuming 6 feet to be an admissible working estimate, and assuming the received quantity of 800 tons (about 42 per cent.) as that which is on the average mineable per level acre per foot of thickness, we should then, by a simple arithmetical process, get the following, viz: 219,080 square miles equals 40,211,200 acres, multiplied by 6 feet (of thickness) and by 800, the available tonnage per foot of thickness from each acre, which would give the available tonnage as 673,013,000,000 tons. It was learned from the census that the production, and therefore the consumption, during 1889 was 126,097,779 tons, and also that the increase of consumption has been at the rate of 9757, or nearly 100 per cent. per decade. "This rate of known actual increase," explains General Wistar, "applied to the present annual consumption for thirty years, then reduced to 50 per cent. per decade for the next forty years, and further reduced to 33 1/3 per cent. per decade for another forty-two years, would indicate the entire consumption of every accessible ton at the end of 112 years from the year reported on, or say A.D. 2,001." It is probable, of course, that the rate of annual increase of consumption would, during the first half of the period, show a more rapid acceleration, owing to increase of population, exportation and the new applications of steam power. "During the last half of the

period it would decline, in consequence of exhaustion of coal fields, growing scarcity and higher prices. But with any reasonable rate of increase the general result will be about the same—viz: practical exhaustion in little more than three generations." The General does not appear to include in his calculations the great coal areas of our North-West Territories.

In a recent article in the *Colliery Guardian* a Canadian correspondent furnishes some interesting information respecting the coal measures of Cape Breton. Commenting upon the Upper Province markets for Cape Breton coals, the writer says: "During the present year this coal market has reached its greatest proportions, the increase being really remarkable. Cape Breton finds the largest purchasers, no less than 410,000 tons having been required to carry out current contracts, during the past season. In addition 108,000 tons were distributed between Quebec, Sorel and Three Rivers, which swells the St. Lawrence trade of the island to 518,000 tons, an increase of 50,000 tons over last year's consignments. Competing with Cape Breton, Nova Scotia proper shipped 194,000 tons of coal to the St. Lawrence district, a decrease of 8,000 tons over last year. It is evident then, that Cape Breton is driving Nova Scotian coal out of the market; British coal is sharing the same fate. The imports last year were 40,000 tons; during this season only 25,000 tons, a decrease in favour of Cape Breton coal of 15,000 tons, or nearly 40 per cent. British competition is, however, so insignificant that another season or two will probably wipe it entirely out. Cape Breton coal has been largely used on Canadian railways, and comparing favourably with the best imported coal, has in many cases earned a preference. Newfoundland sealing steamers prefer it to all other, owing to the rapidity with which it raises steam, and the port of Sydney has earned a just notoriety as a bunkering depot. Among markets prospective, that of the New England States and Upper or Western Canada are the most valuable. The New England States consume 5,000,000 tons of coal annually, every pound of which is bituminous, and a political agitation is now manifest, which may result in a repeal or modification of the coal duties, thereby broadening the market for the Canadian mineral."

The largest driving belt in the world has just, says London *Iron*, been turned out at the works of Mons. Domanage-Scellos, Boulevard Voltaire, Paris. It has been made to the order of an Amiens manufacturer, and is intended to transmit 1,000 horse power. It is on the homogeneous system, that is to say, it is composed of a large number of leather bands interlaced with each other, and secured by strong cords. It is 120 feet long, seven feet wide, and nearly an inch thick, the weight being a ton and a half; and it is to put a fly wheel 22 1/2 feet in diameter in communication with a pulley over eight feet in diameter. Its speed under ordinary conditions will be 67 feet per second. The steam engine intended to run with this gigantic belt is being built by Mons. Dujardin, of Lille.

Although quite beyond the province of this paper to indulge in matters political, the REVIEW may, we hope, be fairly excused if for once it breaks the rule, to endorse the candidature of Mr. James King, one of the vice-presidents of the General Mining Association, who is running for Megantic County, and Mr. W. J. Poupore, the late and prospective member for Pontiac County, also a member of the Association. Both gentlemen are prominently identified with the mining industry of the Province, and may be relied upon to look closely after its best interests in the Local Legislature if elected. The mining community has not forgotten Mr. Poupore's determined stand, and his magnificent fight almost single handed against Mercier's iniquitous Mining Bill last session. We hope to record in our next issue that both gentlemen have been returned by sweeping majorities.

The report of the first annual meeting of the General Phosphate Corporation will be read with no inconsiderable interest and curiosity by many of our readers. The position of the company is not encouraging, and more than confirms our prognostications when it was incorporated eighteen months ago; this is all the more to be regretted as its ultimate failure must be fraught with serious results to the development of the Canadian phosphate industry. The balance sheet submitted to the shareholders is a wonderful document, and deserves to be filed for reference by those advocates of the introduction of English capital to this country, irrespective as to how it is promoted and managed. Our readers will doubtless draw their own conclusions from the following expenditures excerpted from the accounts:—

*Purchase of Property, including:*

	£	s.	d.
Expert's and surveyor's fees, interest, charges, etc.	98,863	11	1
North Star property de posit.	7,798	10	6

*London Expenditure, including:*

	£	s.	d.
Legal expenses.....	721	16	11
Travelling expenses.....	695	16	8
Charges re-issue of debentures.....	15,526	14	7
Directors' fees.....	3,714	15	10
Interest on debentures.....	1,988	11	2

Amounting in all to..... 23,686 17 7

*Mine Expenditure including:*

	£	s.	d.
Labor.....	4,036	7	11
Supplies.....	2,032	9	9
Provisions.....	1,550	1	2
Mine development.....	1,190	5	9
Buildings.....	1,542	12	4
Plant.....	3,892	16	0
Salaries.....	1,126	2	8
Office furniture.....	99	16	0

Etc., etc., or..... 18,507 10 6

A Manchester firm, Messrs. Sutcliffe & Co., are the inventors of a novel prospecting instrument of interest to those interested in metalliferous mining. It is intended specially for ascertaining the presence of gold and other metals beneath the surface of the earth, and it is said to be more particularly adapted for prospecting for alluvial deposits. The instrument consists generally of a steel tube carrying an inner rod which communicates by means of a

wire with a small battery, easily carried on the person of the prospector. On reaching the locality in which it is desired to operate, the boring instrument is thrust into deposits, beds of rivers, or other situations, and so long as it does not meet with metallic obstruction, such as a gold nugget, or a deposit of gold dust, auriferous ore, or other metal deposits, no electrical communication takes place between the instrument and the battery; the bell therefore remains silent. But should the point of the rod strike against, or enter a metallic obstruction, the electrical alarm is sounded. The instrument is, the makers state, of such accurate construction, that should a piece of metal of less size than a pin's head come in contact, its presence is instantaneously indicated. The core of the instrument is moveable, and when it is wished to take out a sample of the soil into which the instrument has penetrated—as for example when the bell rings, or other indication is given of the presence of metal—the bayonet joint in the head is operated, bringing a "snug" button from the lower slot to the upper, thus causing the core to slide within the outer steel sheath, the latter being then in advance of the prospecting point. This portion of the hollow sheath is pushed, without altering the position of the instrument, into the soil, and withdrawn bringing with it the sample. The sample is pushed out by returning the parts to their normal position, and the soil can then be examined, analysed, or washed in a pan. The instrument is made in lengths within useful practicable limits, but the sizes from 5 to 6 feet long are most recommended by the makers. The steel tube and rod are enclosed in a scabbard made from bamboo, both light and strong, which may, however, be used as a protractor to lengthen the instrument in cases where it is to be used for prospecting in beds of rivers, or other places difficult of access. The whole apparatus is, the makers state, comparatively light, and can be carried by a man for a considerable distance and length of time in the manner of a walking staff, without adding to the discomfort of the person prospecting. It is claimed to entirely dispense with the cumbersome impedimenta which of necessity accompany the prospector of the present day, a claim which, if realised in practice, he will appreciate. The instrument should form a useful part of the outfit of persons proceeding to a new, or unprospected country.

An English firm of engineers has patented an appliance which, while preventing the light from shining directly upon the eyes of the miner, focuses the rays upon the exact spot required. The invention consists of a shield of enamel which covers about three-eighths of the surface of the tough glass cylinder that protects the flame. The enamel softens the rays of light, and, at the same time, acts as a reflector. The cylinder, treated in this way, adds an element of safety and comfort to the work of the miner to which he has been so long accustomed. The glasses may be either cylindrical, conical or any other

shape, and the cheapness with which they can be supplied makes their universal use to be only a matter of time. The glasses have been subjected to a thorough test at the hands of practical miners in the Thorncliffe and other English collieries, and their verdict is very favourable.

The *Canadian Manufacturer* for some time past has advocated that the Dominion Government should take prompt and effective action to secure for Canada the benefit of our nickel wealth, by the imposition of an export duty upon the nickel contained in ore and matte taken out of the country. On this point, as applied to the principle of protection to Canadian industry, the *Manufacturer's* ideas are somewhat mixed. Should an export duty be placed upon our ore and matte, the result would be that none from Canada would be purchased, and no exports would be made to the United States or Europe. The action would have the effect of raising the price of a Canadian product of as yet fluctuating value and of comparatively small sphere of application for industrial purposes, and of which we have a supply in excess of our own very small demands. Export trade is the only means of keeping alive this young industry, and to impose an export duty would be simply suicidal to the industry now started. As Canada has vast supplies of nickel ores, there is no fear of a shortage of that product for Canadian needs, even if the exports were largely increased, and on that account there is no necessity for curtailing this young industry. The United States or other countries are by no means dependent on Canadian supplies, hence the export duty is uncalled for and would only have the effect of crushing this young industry and promoting the mining of nickel ores in other quarters. In other words, we recommend the *Manufacturer* to "shut up."

All the devices in the steel works of Carnegie, Phipps & Co., constructed for the use of natural gas, are to give place to appliances for coal. The work is to cost \$50,000. Among the improvements is a battery of 2,000 horse-power boilers, equipped with the Roney automatic stoker and automatic coal-handling apparatus. The boilers will be in a new and separate house surrounded by a smoke stack 8½ feet inside diameter and 200 feet high. The foundation for this stack will go down 40 feet. The coal which is to feed the smelting furnaces will be dumped from the cars into automatic conveyors which will carry it along overhead and dump it through chutes directly into the hoppers on the stokers. The ashes from the furnaces will fall through into chutes, which will deliver it at once into cars, thus doing away with the manual handling of either the fuel or the refuse. The smoke consumers and boilers are absolutely non-explosive, and so constructed as to save the company at least \$10,000 a year in fuel. The new process of feeding and cleaning the furnaces will enable the company to dispense with the services of 75 men.

## Our Portrait Gallery.

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

## No. 16.

The Late T. Sterry Hunt, M.A., LL.D., etc., the First Chemist and Mineralogist of the Geological Survey of Canada.

Dr. Sterry Hunt, the well-known mineralogist, died at New York, on Friday, 12th inst.

Thomas Sterry Hunt was born in Norwich, Conn., on Sept. 15, 1826, of an old New England family. His ancestor, William Hunt, was one of the founders of Concord, Mass., in 1635. His maternal grandfather, Consider Sterry, of Norwich, was a civil engineer and mathematician and was the author of text books of arithmetic and algebra, published 100 years since, in connection with his brother, Rev. John Sterry, a well-known Baptist divine. Mr. Hunt was destined for the profession of medicine, but after preliminary studies, his love for chemistry and mineralogy led him, early in 1845, to become a special student, and afterward assistant to Prof. Benjamin Silliman, sen., in Yale College. Two years later he was appointed chemist and mineralogist to the Geological Survey of Canada, (just then organized under Mr., afterward Sir W. E., Logan), a position which he held for more than twenty-five years, till his resignation in 1872. His work in that capacity is well known; to him was due the investigation of the petroleum, the salt, the phosphates, the iron and copper ores of Canada; while the literary work of preparing the reports of the Geological Survey was also mainly his. He it was who made the first studies of the lithology and mineralogy of the crystalline rocks of the Ottawa and the upper lakes. For many years he was obliged by circumstances to devote much of his time to field work in geology, and to the administrative duties of the Survey.

To Dr. Hunt we owe the first systematic attempt ever made to sub-divide and classify geologically the stratiform crystalline rocks; a work to which he brought not only his studies throughout Canada and the United States, but also the result of enquiries conducted during repeated visits to the British Islands and to continental Europe. To him we are indebted for the distinctions and the designations of Laurentian, Norian, Huronian, Montalhan, Tacoman and Keweenaw, all of which have long since passed into the terminology of science and the literature of geology. In connection with these studies he undertook the discussion of the great questions of the origin and succession of these rocks. Reviewing and controvert-

ing various hypotheses, including the igneous or plutonic, the metamorphic and the metasomatic, all of which he rejected as irreconcilable with observed facts and as violating chemical theory, Dr. Hunt vindicated what he deemed the essential soundness of the still imperfect Wernerian aqueous view, and advanced what he has named the crentic hypothesis. According to this theory, which is fully explained in his "Mineral Physiology and Physiography," the source of the various groups of crystalline rocks above named was the superficial portion of a globe, once in a state of igneous fusion, but previously solidified from the centre. This portion, rendered porous by cooling, was permeated by circulating waters, which dissolved and brought to the surface during successive ages, after the manner of modern mineral springs, the elements of the various systems of crystalline



Very sincerely,  
T. Sterry Hunt

rocks. These rocks thus mark progressive and necessary changes in the mineralogical evolution of the earth during the pre-Cambrian or Archaean ages. As the author disclosed in 1885, the new hypothesis was "the result of nearly thirty years of studies, having for their object to reconstruct the theory of the earth on the basis of a solid nucleus, to reconcile the existence of a solid interior with the flexibility of the crust, to find an adequate explanation of the universally contorted attitude of the older crystalline strata, and

at the same time to discover the laws which have governed the formation and the changing chemical composition of the stratiform crystalline rocks through successive geologic ages."

Dr. Hunt's contributions to general chemistry are numerous and important, aiming at nothing less than a complete system of chemical theory, the outcome of which, after nearly forty years of thought, and the successive publication of many papers from 1848, was the production in 1887 of a volume entitled "A New Basis for Chemistry," which appeared in a second and augmented edition in 1888. This was translated into French by Professor Spring, of Liege, and published in Paris in 1889, as "Un Nouveau Systeme Chimique." The practical application of these new views to the science of mineralogy has been partially set forth by Dr. Hunt, in numerous papers, and is unfolded at greater length in his "Systematic Mineralogy," published last year.

Dr. Hunt has done much work as a teacher and a lecturer. One of the organizers of Laval University at Quebec, he was professor of chemistry in that institution from 1856 to 1862, during which time he delivered annual courses of lectures in French. He continued to be honorary professor until his death. He was also for several years lecturer in McGill University, Montreal, and was professor of geology at the Massachusetts Institute of Technology, 1872-1878. Among his academic titles were those of M.A., Harvard; Sc.D., Laval; LL.D., McGill; and finally LL.D., Cambridge, England. A Fellow of the Royal Society of London since 1859, he was a member of a large number of other societies, both Canadian and foreign. A member of the National Academy of Science since 1873, he had been president of the American Association for the Advancement of Science, and of the American Institute of Mining Engineers, and twice president of the American Chemical society. He was one of the founders, and the first president by election, of the Royal Society of Canada. One of the organizers of the International Geological Congress, he was its first secretary, and was a vice-president at the Congresses of Paris, 1878, Boulogne, 1881, and London, 1888. In connection with the great industrial exhibitions Dr. Hunt represented Canada as a member of the International juries at Paris in 1855 and 1867 and at the Philadelphia Centennial exhibition in 1876. He was an officer of the French order of the Legion of Honor and of the Italian order of St. Maurice and St. Lazarus.

In 1878 Dr. Hunt retired from public professional life, though much consulted on points of mineralogy, metallurgy and mining law. Within the past three years his health was



impaired, and at times he was very ill. Last fall he was able to resume his accustomed literary duties in New York, but the hopes of perfect recovery and prolonged usefulness thus inspired were unhappily doomed to disappointment.

Besides his various official reports, the list of Dr. Hunt's published papers, beginning in 1846, is over two hundred. An important volume of his, on "Azoië Rocks," was published as Report E by the Second Geological Survey of Pennsylvania in 1878. He has also published a volume entitled "Chemical and Geological Essays," of which a fourth edition appears in 1891. Of his "Mineral Physiology and Physiography," a second edition was published in 1890, and also a third edition of the "New Basis for Chemistry." These new editions, as we had occasion to mention some time ago, have been brought out by the Scientific Publishing Company, of New York, which has also published his latest work, entitled "Systematic Mineralogy," referred to in our last issue. Dr. de Kroustchoff, the eminent chemist and mineralogist of St. Petersburg, is said to have in hand a translation into Russian of a selection from the works of Dr. Hunt. Some of his earlier essays have long since appeared in the French language. Dr. Hunt was personally known to most of the illustrious scientists of the day, and by their work was highly esteemed. His death at a comparatively early age is a loss to science which is sure to be felt. Dr. Hunt married in 1878 the eldest daughter of the late Mr. Justice Gale, who survives him.

It is our melancholy duty to record this month the death of Capt. Thomas Sheridan, manager of the Bell's Asbestos Company, which occurred at Thetford on Friday morning, 12th inst. He died of congestion of the lungs and brain fever. Captain Tom was widely known and universally esteemed by the mining fraternity in Eastern Quebec, more particularly of course in the districts of Black Lake and Thetford, where he was best known. Of him our correspondent writes: "I have had the pleasure of his acquaintance for several years, and to know him was indeed to love him; quiet and unostentatious in manner, his company was ever genial and hospitable; he was one of nature's truest noblemen and will be greatly missed in this district." Captain Sheridan took a lively interest in all matters pertaining to the welfare of the industry in his neighbourhood, and at his death was an esteemed councillor of the Asbestos Club. The funeral took place on the Sunday following his demise. The Asbestos Club contributed floral designs, and many of its members accompanied the remains to their last resting place at Lennoxville. The Bell's Company has lost an efficient and faithful officer, and the mining industry in Quebec one of its best friends.

The anthracite producers of the United States purpose, it is said, constructing a building at the World's Fair entirely of coal. It will contain 50,000 tons of anthracite. This will be a unique feature if carried out.

Our exchanges give particulars of a remarkable disappearance, in transit, of a casting weighing eight tons. The proprietors of the Edgar Thomson Steel Works, some weeks ago, ordered from a Pennsylvania firm a number of steel castings, in which was included a 17,500 lb. plunger to be used in connection with a hydraulic crane. The railway trucks with the castings on reached Braddock on December 15, and the men started at once to put the castings together. All went well until the time came to attach the plunger to the cylinder, when it was found that the plunger was missing. The Company was notified, and it replied that the casting had been forwarded. This puzzled the Braddock people, and greatly annoyed them. The Pennsylvania Railroad Company was accordingly informed of the loss of the casting, and urged to hunt it up as quickly as possible. The railway company was as confounded at the news of the loss of the casting as the Edgar Thomson people. Never in the history of the road, it was said, had a similar miscarriage occurred. The only supposition that could be advanced was that on one of the steep mountain grades and curves between Philadelphia and Pittsburg the big piece of steel had slipped off the car and rolled down into some neighbouring stream. The section-men, however, could not discover the slightest sign of the casting, and not a trace could be found of any damage caused to the roadbed or to any embankment which the sliding of so ponderous a mass assuredly would cause. On December 29, however, the casting was found in the Susquehanna River at Columbia, and delivered to its rightful owners.

"Didn't know it was loaded!" That's what the man with the gun invariably says after accidentally shooting some one. It has often been remarked that he rarely shoots himself by accident. It's quite the same with boilers. A man buys a secondhand boiler full of corrosion and saves money by the purchase. He guesses it's safe enough. Now, if he was to run the boiler himself, he wouldn't be anxious to save money on it, nor be satisfied of its soundness, without a critical examination by experts.

## CORRESPONDENCE.

### The Gay's River Conglomerates.

SIR,—I find a contribution in your last issue entitled, "Nova Scotia Gold Industry in 1891." Will you permit an appreciative reader of your REVIEW space to make reply to that portion of the article mentioned which relates to the Gay's River conglomerates. Allow me at the outset to explain that I was in charge of the prospecting operations there last summer, that I have taken a lively interest in the whole business, and am a large stockholder and one of the directors of the Coldstream Company, that operated at Gay's River. That I am in a position to know can hardly be doubted; whether my education and intelligence and special knowledge have enabled me to make use of my opportunities, must be left to those who know me. I am bound to say that it is difficult to restrain a natural impulsion, here, when a person who knows nothing of this particular locality comes forward to publish, and even, in print, so conspicuously to show what might have been avoided had he or some other competent individual been consulted. Without the slightest need of hesitation I set it down that this contributor has never made the acquaintance of the Gay's River conglomerates. The only key to the situation was the old mines, extending in nearly a horizontal direction 500 feet, and the explorations I made during the last summer. The old

mines have been full of water for nearly twenty years, and until I pumped them dry, they could not be seen, and afterwards there was "no admission." The New York expert was on the ground a small portion of one day, all that he got out of my report was to work at the old works, and went away without the data to make a true report. The report which he did make lies at my hand now, and, although he (Hague), was at the top of his profession, there is not an attempt made to decide the nature and origin of the conglomerates, and he merely cites a report of my own as an adequate solution. At the time I wrote, there was no opportunity to enter the works at the points of decided interest, and I made the mistake of counting two beds of conglomerate for one. In this direction I had some illustrious company, and among them the late Fred. Haite. I know now that at Gay's River we have a most interesting state of things. We have a river bed conglomerate, deposited in the Silurian slates and quartzites, and this formation is uniformly overlaid by a coarse and very hard sandstone, and the sandstone in turn is overlaid by a seashore conglomerate, capped by gravel. This lower conglomerate is gold-bearing. It varies in thickness from fourteen feet to nothing at all; this is due to two causes—one, the inequality of the rock river bed; the other, the uneven surface upon which the sand was deposited.

The upper conglomerate contains varieties of rocks not found in the lower stratum, and contains either no gold or in very small quantities. In a shaft 40 feet through it I never found by panning a particle of gold. This ancient river encountered quartz veins and gold; when it began to run the slates and quartzites were already tilted and fissured to depths of several feet, and into these crevices coarse gold found its way, where the openings directed down stream, but the water was not allowed to stop until it was run for seven years upon one area and a half, and although it was a crude affair, it took out gold enough to more than pay expenses. Enough is known to me to clearly demonstrate the existence of this river. The works thus far indicate a breadth of more than 500 feet—it may be much more. All the work that has been done at this river bed is the extracting of the ore from two areas, and yet I doubt not but it could be shown that the result in gold has paid for all the work ever performed within that limit. I have read in your REVIEW, issue of October, 1891, an address delivered in Halifax by Mr. Alfred Woodhouse, F.G.S., on "Nova Scotia Gold Fields," wherein he says: "I think Capt. McDuff will benefit me when I state that the great point to ascertain in connection with the 'boom' in the mining industry," is to learn where are the beds of the old rivers, and I believe if properly looked for good alluvial fields will be eventually discovered in Nova Scotia."

For one to indulge in such a hope is, to the writer in your last issue, but "partial lunacy," for he says "The partial lunacy now prevailing as to the existence of alluvial gravel-bearing gold in peeing quantities will disappear, we predict, before our REVIEW for 1892 makes its appearance." Doctors disagree, as usual! Gay's river is what Mr. Woodhouse thinks worth looking for, and if the writer above had informed himself about the nature of it, he would never have fallen into the mistakes that I complain of here. The company spent a good deal of money in very unwise and profitless ventures. They were unduly influenced by men who were like a "boom" in that when it breaks they are the gainers; but it remains that the conglomerate in question is a deposit well worthy of further investigation, and its history might easily be equal to the best river bed mines of Australia. Of course I do not know how well equipped the expert might be who ventures to sit in judgment upon a property to which he is a stranger, but it is strange that he should be disposed to compare notes with him in the hope that in the future he would confine himself to the good old-fashioned way of deducting conclusions from facts instead of fancies and prejudices.

ROBT. R. McLEOD.

Brookfield, Queen's Co., Nova Scotia.

### The Geological Survey Again—Some Pertinent Remarks on the New Map of Nova Scotia.

SIR,—The receipt of sheet II S.W. of the map of Nova Scotia, just issued by the Geological Survey Department confirms the facts that have been expressed regarding the reduction of scale to four miles to the inch. One has only to look at this map sheet to realize how much valuable, painstaking labour, and how many important, economical data, are deliberately thrown away and lost forever by the stupid, crass obstinacy of the present Director and Deputy Head of the Department. One intelligent wonderer who has been expressed to take this sheet in one hand and one of the beautiful Cape Breton sheets in the other, and compare them. If any intelligent person will do so, and then admit that there is any basis for future usefulness in the reduced sheet, we should be glad to have it pointed out.

When it is admitted that this small Province (17,500 square miles) contains one-tenth of the whole population of the Dominion, and produces about one-tenth of the third of the total mineral and metallic yield of the Dominion, it is hard to conceive of the state of mind of that individual who can deliberately stultify the costly work of the past ten years, and issue such maps as are referred to, with the sole and only excuse of economy. And such a miserably petty economy!—the saving being only in the hundreds of dollars.

This same economist is the man who wrote in May,

1871. "The need of good topographical maps . . . I well desiring the serious consideration of the Government. Such maps . . . are indispensable, and every dollar expended on their production eventually becomes an annual saving to the country." And yet, after having expended over \$30,000 the past ten years in making just such "good topographical maps," it is now determined to save a few hundreds, and thereby make these maps anything but deserving of the above adjectives.

To the public interested in the mineral wealth of the country there will appear but one remedy for such a complete mental change, and that is—superannuation.

Yours respectfully,

JOHN E. HARDMAN.

Oldham Mines, Feb. 17th, 1892.

\* Report of Progress, 1891-92.

## LEGAL.

McIntosh vs. Stewart et al.

In this case, one of interest to phosphate miners, the plaintiff, John A. McIntosh, who resides at Toronto, claimed to recover from the defendants, Messrs. George Stewart of Buckingham and Alex. Spittal and Newell Bates (as executor of the late C. T. Bates) of Ottawa, \$5,350 as commission on the sale of the High Falls Phosphate Mine, in the County of Ottawa, to The General Phosphate Corporation (Limited) of London, England. Judgment was given at Toronto recently by Mr. Justice Meredith, before whom the same was tried without a jury, at the York Assizes, last week, dismissing the plaintiff's action with costs. Messrs. Pearson & Macdonald of Toronto for the plaintiff. Mr. J. P. Fisher for the defendants Stewart and Spittal, and Messrs. Christie, Christie & Greene for the defendant, Bates.

## Annual Meeting of the General Phosphate Corporation.

The adjourned ordinary general meeting of the shareholders of the General Phosphate Corporation, Limited, was held in London, the 20th. ult., Lord Stalbridge presiding.

The Secretary (Mr. L. J. Languead) having read the notice convening the meeting.

The Chairman said: Gentlemen, I cannot, in opening the proceedings, do more than refer to the sad cloud which rests upon this nation to-day. When we fixed the date for this meeting we little thought that such an event would occur, and, doubtless, some of you like myself, have been considering whether it would not be right and proper to adjourn the meeting. Looking, however, to the fact that it had already been adjourned, and that it was to be held in the middle of the day, we thought it would, perhaps, better meet the convenience of the gentlemen here if there was no adjournment, for, in any case, we would have to meet here. Therefore, we propose to go on with the business; but I am sure that what is present to everybody's mind in this country to-day is also present to ours here, and that is the great loss which the nation has sustained. With regard to the report and balance-sheet, everything is, to the best of our belief, so clear and accurately stated that I have little to add to them; but perhaps I had better call your attention to certain points and amplify certain statements in the report. First of all, I should say that this meeting was adjourned to-day from a date in December, as we were bound to hold it in the course of last year; but the accounts had not come from Canada as we expected, and, therefore, it is in order that these accounts should be put in proper order and laid before you. There is not much to be said in reference to the first paragraph in the report. As I have already said, the accounts were not ready, and this has caused delay in issuing them to the shareholders. With regard to the purchase of the two groups known as the High Falls and the Ross Mountain, doubtless every shareholder had a copy of Mr. Barthe's letter, and the directors' reply. The accusation, if I may call it so, made against us was that we had given too much money for these properties, and that they had been on the market in London at lower price than the amount at which they were purchased by the corporation. We took every means in our power to ascertain the truth of those statements, and I think that the statements which were given by Mr. Colby and Mr. Stewart to the shareholders were the best means that we had of ascertaining the truth of the matter. I think the demands were so clearly put by those two gentlemen that we must believe that Mr. Barthe was under some misapprehension when he made those statements. I believe myself that there were some mistake in the property of Mr. Stewart which was purchased from me, but nothing can be more categorical than the statement which was made, viz., "The claim you purchased from me was never offered in London as low as sold to you. Shareholders cannot protest to the contrary." Mr. Colby also gives a categorical denial to the statement in his case. Of course, it was an exceedingly difficult thing to purchase these properties at the price we should have liked; but we acted upon the statement in this respect, that we would purchase no properties unless they were examined and reported upon by our own engineer.

The provisional contracts for the purchase of those properties were entered into in September, 1890, and we instructed two mining engineers, Mr. George Atwood

and Mr. J. Lanson Wills, to examine and report upon them to the corporation, with the result that the engineers' reports furnished by the respective vendors were verified. We then engaged Mr. Lanson Wills as our representative in Canada, and he has been and still is, our engineer in that country. He has carefully scrutinized every part of the workings as far as lay in his power, and from time to time he has furnished us with reports of the workings and of the properties. Then a contract was entered into with Mr. Stewart to work the mines, and, by that contract, he engaged to deliver in Montreal 1,000,000 tons of phosphate at an average grade of 75 per cent. in May, 1, 1892. That average was to be made up not by adding any phosphate of a lower grade than 70 per cent. Fifteen thousand pounds was to be provided by the corporation for plant and working capital, as that was the figure which Mr. Stewart thought necessary for that purpose. Well, then, certain mishaps occurred. It was found that there was a great deal more work to be done, owing to the virgin state of the properties, also that more had to be done in the way of providing buildings and accommodation for the men, and because of the fact of navigation being blocked, owing to the Canadian Government not having constructed in time the lock and dam across the river. It was known then that Mr. Stewart would be unable to fulfil his contract in the time from our point of view. Undoubtedly there would have been a long and expensive litigation if we had strictly adhered to the terms of the contract with Mr. Stewart. He asserted things on his side, and we asserted things on ours, and most undoubtedly there would have been a great deal of unnecessary delay and expense if we had strictly enforced the terms of our contract with Mr. Stewart. The directors, therefore, thought it advisable to act in a liberal spirit towards him, and a second agreement was drawn up, by which the previous one was extended for three months, namely, to August 1, 1892. It was agreed that Mr. Stewart surrender £10,000 in cash, which was in the suspense account to be paid to him, and for surrendering that we agreed to pay him £1,000 in cash and 300 fully-paid shares of the corporation. He is now undertaking to complete the delivery of the before-mentioned 1,000,000 tons by August 1 next, when a further 300 shares will be issued to him, and he forfeits shares pro rata for every ton of phosphate not produced. We have no objection to complain of the quality of the phosphate which Mr. Stewart has sent over. The great bulk of it has been very high-grade phosphate indeed, and even on the lowest grade which has been sent over there is ample margin for a good profit, but, of course, nothing like so large a profit as what is made on the higher grades. This proves to us that we have got very valuable properties, and that the phosphate is of very high quality—and I hope and believe that Mr. Stewart will complete his contract satisfactorily and finish the delivery of the 1,000,000 tons. Of course, none can be shipped till the spring, when it is hoped that the navigation of the Du Lievre River will be completed by the Canadian Government, and that then the scows will be able to bring it down to Buckingham, where there is rail communication to Montreal. The report shows you that Mr. Stewart has devoted his attention more to the High Falls Mine than to the Ross Mountain gr.-up. If he continues to work on the High Falls Mine, we shall be able later on to develop more fully the Ross Mountain group, which contains equally valuable phosphate, so that I have no doubt there will be ample for the future in both mines.

The directors, as you are aware, issued an appeal for more shares to be taken up. This was not responded to, and as it was necessary and advisable to have more working capital, and also to pay off the mortgages, the directors made arrangements with the Anglo-American Debenture Corporation to raise £100,000 of debentures. That money was raised, and in the first instance the accounts we will come to that point. Of course, the amount on the plate which has been shipped is not large enough for us to declare a dividend now; but, looking at the quality and the quantity pro rata of high-grade ore which has been shipped, we have every reason to be satisfied with the mines, and we believe that the output in future will fully realize our expectations. If you will kindly take the balance-sheet in your hands, first of all you observe the capital, less the calls in arrears; then the first mortgage bonds and the bills payable in London and Canada. I should say that the bills payable in London consist of the balance of bills for part purchase of the Colby property and yet due. Then there is the interest on debentures. That was the reserve taken up to October 31, which has been paid out since. In the Canada account of £10,000 which is £10,000 which I alluded to as put on one share payment to Mr. Stewart. The biggest item in the sundry creditors in London is the directors' fees, which they have not taken. They have had a small amount on account; but the full amount which they are authorized to receive under the articles of association has not been drawn, and therefore it is entered in the sundry creditors' account. The biggest item in the Canada account is the directors' account is an amount in adjustment with Mr. Stewart, which he claims, and which, like the mine expenditure, is subject to adjustment under Mr. Stewart's contract. Then, to go to the other side of the balance-sheet, you have the purchase of property, including experts' and surveyors' fees, interest and charges. A vast amount of that amount was paid off by the money from the Anglo-American Debenture Corporation. There was thought better to have that in one account rather than have these mortgages payable and due at uncertain times; now we know with certainty when the amounts will fall due, and when we will have to pay for them. With reference to the North Star property deposit and expenses, I should like to mention that one of the objects of this corporation, besides

working the properties themselves, was to develop and foster other properties, to help the formation of other companies, and with that view the North Star was taken up as being thought to be a useful and profitable investment. The object of the North Star Company, which has not been brought out yet, but which I believe will be brought out before long, is mainly devoted to the manufacture of super-phosphate. A very large house in New York are the proprietors of sulphuric acid works in Canada, and by those works, and by using the low-grade ore which is not worth while to ship to Europe, we believe a good profit can be made by making super-phosphate. We know that, as time goes on, virgin lands will be exhausted, and fertilizers will be required. That has been found to be the case to a great extent already in the United States, and there is no doubt that in the future there will be a greater demand for fertilizers than there has been hitherto. With sulphuric acid on the spot and low grade ore it is believed that a good profit can be made, and this corporation have taken up with another powerful finance corporation and the house in New York to which I have referred—the North Star property—with a view to the manufacture of super-phosphate. The registration fee was the only fee that we were called upon to pay for the formation of this company, with the exception of course, of the 200 fully-paid founders' shares issued to Mr. Sando, as the promoter of this enterprise, by agreement. With regard to the London expenditure, it is not worth that calls for remark, but the shareholders may think that £15,236 was a high charge for the issue of the debentures. It undoubtedly was, but, unfortunately, we were unable to get it at a less cost. It was important to us to get the money, and, therefore, we were bound to pay that. With regard to the mine expenditure, those are the accounts which are still under adjustment with Mr. Stewart. Some of those accounts may turn out to be a saving and some in aid. I must allude to the note which was given in arrears by the auditors. We regret as much as the auditors do that the accounts were not as well kept as we could have hoped. Our secretary (Mr. Languead) went over to Canada himself last autumn and saw Mr. Stewart, and pointed out to him the way in which he would like the accounts kept and the way in which they should be presented. We have no objection, if they were kept exactly in the way we hoped; therefore, there has been a great deal of trouble in getting them straight; but they are now straight, more or less, with the exception of certain adjustments, which remain to be dealt with hereafter. I do not know that there is any other point to which I need call your attention now, but, of course, I shall be glad to answer any question which any gentleman wishes to ask with regard to the accounts. I shall therefore conclude by moving the adoption of the report and accounts.

The Hon. Cecil T. Parker seconded the resolution.

Mr. Ferguson characterized the charge of £15,236 for the issue of the debentures as outrageous, and said why, if money was absolutely necessary, the directors did not make a call on the 19,598 shares that had been issued.

The Chairman replied that the directors had great difficulty in getting the original calls, and when they had their first meeting they said they would do all that lay in their power to prevent a further call being made; and therefore they adopted the course of issuing debentures. He quite agreed with Mr. Ferguson that the charge was high, but they could not get it for less.

Mr. R. F. Crawley said that at the formation of the company an agreement was prepared which provided that if the directors did not go to allotment Mr. Sando was to get nothing, although he had incurred all expense of the formation of the company and advertising the prospectus. Mr. Sando failed to obtain from the public subscriptions for the full amount of founders' and ordinary shares, and in order to persuade the directors to go to allotment, he found it necessary to subscribe for about 60 founders' shares and 3,000 ordinary shares, which was equal to £30,000. At a board meeting, in the absence, it was understood, of Lord Stalbridge, and against the protests of Sir James Whitehead and Mr. Sampson Lloyd, Mr. Sando and his friends persuaded the other directors to proceed to allotment.

The Solicitor remarked that Sir James Whitehead and Mr. Lloyd were present, and sanctioned the allotment of the shares in the arrangements which Mr. Sando completed his guarantee before the issue of the debentures to the public was made at the direct request of Sir James Whitehead himself.

Mr. Crawley: I apologise for having made that statement, if that is so. He proceeded to refer to the company's properties, and contended that they had been purchased at ridiculously high prices. With reference to the issue of debentures at a cost of £15,000, the obvious way of obtaining the money would have been to have made a call on the ordinary shareholders; but that would not have suited Mr. Sando, who would have been called upon for about £12,000 in respect to the 3,000 ordinary shares standing in his name. As to the chairman of the company, if blame attached to him, it could only be because he had allowed himself to be hoodwinked by the promoters. From the balance-sheet it appeared that in order to £2 the directors had to spend £2 at the mines, in addition to the heavy London expenditure.

Mr. Smallman proposed as an amendment: "That a committee of five shareholders be appointed to investigate the affairs of the company and the purchase of the properties, and report to an adjourned meeting."

Mr. G. Barham seconded the amendment. The Chairman said the board could not accept the



**Improvements in Methods of Prospecting Mineral Lands.**

One of the most interesting features of the advancement in mining processes is the constantly increasing use of the diamond drill in prospecting mineral lands and developing mines. By means of the solid core of rock and minerals removed by the diamond drill, a knowledge of mineral property can be obtained equal to that gained by a large number of shafts, tunnels and cross-cuts; and as the cost per foot of drifting is trifling compared with that of sit-sinking, tunnelling and cross-cutting, and its progress so much more rapid, the tendency now is to use, to explore properties more thoroughly before opening them up, and more completely while developing them, thus reducing considerably the element of uncertainty connected with the old method of prospecting.

The increasing favor in which the diamond drill is held among mining men is especially marked in Colorado, where twenty-five or thirty leading mining companies have purchased "Sullivan" diamond drills within the last two or three years, to be used in formations where it was formerly supposed they could not be used to advantage. Several remarkably rich discoveries of ore have been made in Colorado with the "Sullivan" drill as at Aspen, Leadville and Red Mountain.

As the use of the diamond drill has been extended to all branches of prospecting work, new styles have been built to meet new requirements. The latest "Sullivan" diamond prospecting core drill, is shown in the accompanying cut of the "S" drill, fig. 1. This is designed for either surface or underground work, and will be found especially convenient where it can be used for examining new property, and afterward for developing the mine and locating new ore bodies. It has a hoist and frame for convenient use in surface work, and the "friction" feeding device used on some other types of Sullivan diamond drills, which is the safest, most economical, and most compact for use in underground work.

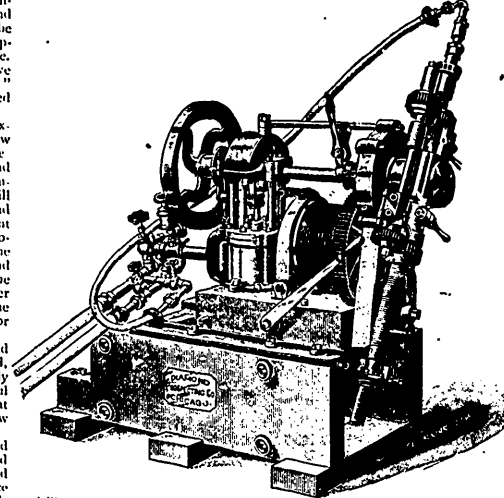
Another recent design of the Sullivan diamond drill is shown in the small cut of the "R" drill, fig. 2, operated by electricity. This is the only electric diamond drill in practical and successful operation, several of the best equipped mines at Aspen, Colo., and other western camps, now using them with very satisfactory results.

These machines, and other Sullivan diamond drills of all kinds, are sold by the Diamond Prospecting Co., whose main office is at 15 and 17 N. Clinton st., Chicago, with western offices at 18th and Market Sts., Denver, Colo., where drills can be seen in stock.

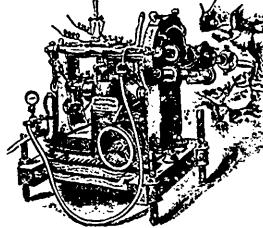
**Something New in Quartz Crushing Machinery.**

A new Australian process of quartz crushing is described in a recent issue of *British Commerce*. Our contemporary says:—The Mullie Brothers of Brisbane, have been for some time perfecting a machine which promises to revolutionize present appliances, inasmuch as it lowers the cost of treatment, pulverises to a greater fineness, and grants facilities for a more thorough amalgamation of the gold. The works are situated near the north end of that line of Elaine gold-bearing reefs, the trend of which is marked by the mullock heaps of the now defunct mines. The Mullie patent is remarkable for its simplicity, and the appliance it is claimed banishes at once any necessity for a precise adjustment of part, and the great wear and tear usually found in all pulverisers, outside of the ordinary gravitation stamper. It is simply an iron cradle. For the sake of illustration, take an ordinary steam boiler, say 7 feet long and 2 feet wide, and have it cut in two—lengthways. Then take one half and have some inch angle iron run across its bottom at 2 feet intervals. In these intervals place rollers, shaped like a large cheese, say 2 feet wide and 1 foot 6 inches in diameter. Below each roller, in the curve of the bottom, and below quicksilver triples in the furrow of the bottom, and below these a grating—after the first roller (say), 30 holes to the inch, the second 80, the third 200, and so on. The greater the number of rollers, the finer the pulverising. In the toe of the cradle have three or four ripples. The half-ton cheese-shaped rollers are very heavy, being about 2 inches difference in the bed levels of the different rollers, and it was very surprising to note the ease with which one man could set the affair in motion, a motion which centred the effects of gravitation, momentum, and the rebound of the rollers on to the quartz, as the water and the rolling bars it along under the different rollers through the silver and the gratings. It was also very surprising to note how thoroughly agitated the quicker became, as it swung backwards and forwards with each roll of the cradle. With a short lever handle one man could work the machine, and Mr. Mullie's estimate is that it will put through 25 tons per week. The whole affair appeared to be perfection itself, offering the maximum facility in return for the minimum effort, both in pulverising and amalgamating. A horse would work it of itself, and (according to Mr. David Mullie's calculations) could get through over 100 tons per week. Of course the ordinary tables or a Frue vanner could be fitted to it, but that would be decided by the nature of the material to be operated on. As far as Mullie's plant is concerned, everything was in a

very crude state, although they have one machine in going form. As with inventive genius all the world over it has been a struggle for them, intensified by want of means, and aggravated by the jeers of the unsympathetic. Patent endurance and continuity of purpose have, however, brought them through, and they have succeeded in perfecting a machine that will enable a small co-operative party to crush 25 tons per week with the aid of one man and a boy (using one machine) or a company to crush over 1200 tons by putting an eight-horse power engine on 50 of them. It is simplicity itself, both in construction, and in mode of action. It requires very little building in, and a child could manage it when in motion. The slightest force keeps its pendulum-like swing going, and its mechanism, the *Balancer Counter*, adds, that the Mullie Brothers have really hit on a most efficient, while exceptionally economical application of power, in association with the desired facilities for gold saving.



"S" DRILL.—FIG. 1.



"R" DRILL.—FIG. 2.

**The Cost of Producing Coal in England.**

The British Board of Trade, has just published a report relative to the percentages of raw material, wages, other expenses and profit, bear to cost of product in the leading industries of Great Britain. The sources of the information on which this report is based are Parliamentary publications and the reports of joint stock companies. The industries discussed that are of interest to our readers are coal mining, iron and steel manufacturing, and ship building and engineering. In this connection we propose to discuss the facts given in connection with the first-named industry—coal mining.

The items as to the expenditure incurred in the production of coal are from the evidence taken by the Royal Commission in Mining Royalties. The evidence of five witnesses are summarized as follows. This includes only cost:—

	Mr. Hewlett.	Mr. Brown.	Mr. Vickerman.	Mr. Cowey.	Mr. Barnes.
	(Wigan.)	(South Wales.)	(Pembroke.)	(Yorkshire.)	(South Wales.)
	%	%	%	%	%
Wages.....	62 39	65 34	65 59	66 67	65 95
Royalties.....	9 22	8 58	7 53	12 74	11 72
Other charges.....	28 39	26 08	26 88	20 59	22 33
	100.00	100.00	100.00	100.00	100.00

Mr. Hewlett is the well known manager of the Wigan Coal and Iron Company, Mr. Brown is a mining engineer, Mr. Vickerman is a proprietor, Mr. Barnes is one of the owners of the Coalbrook Collieries, while Mr. Cowey represented the Yorkshire Miners' Association. The figures given by the five gentlemen named, and others that appear in the report, cover the annual production of millions of tons.

It is pointed out in the report that the proportion of the product directly expended in wages varies from 48 to 59.4 per cent; that the other expenditure, including the royalties which are not always separately distinguished, ranges from 21 per cent to 46.5 per cent, and that what is termed the balance of the cost is in any case as low as 5 per cent, and in another as high as 27.1 per cent. By aggregating the five undertakings out of a total value of product of £739,915, almost one-half, or £370,251, is expended in wages, and £280,407, or 43.1 per cent, in other charges, leaving a balance of so-called profit of £89,257, or 12.06 per cent of the product, to remunerate a total capital of £1,397,502. This capital is, however, partly invested in property yielding an income of £20,900 apart from the actual produce of the mines, so that the aggregate income for the year was £110,157, or 7.88 per cent of the capital employed.

The report states: "Opinions would probably differ, within certain limits, as to the general conclusions to be drawn from the information given, and the materials ought in any case to be supplemented by others before any but a very provisional estimate of the distribution of the whole product could be made. The figures supplied by Mr. Hewlett are those which could, perhaps, be most safely taken as typical of the industry as a whole, and on such a basis the whole production of coal in Great Britain, of the year 1880 would be divisible in something like the following proportions:—

Wages, 55%.....	£30,896,250
Royalties, 8%.....	4,494,000
Other charges, 25%.....	14,043,750
Profit, 12%.....	6,741,000
	£56,175,000

Mr. Hewlett's statement of actual costs for the one-half year ending Dec. 31, 1889, at the Arley mine of 10 pits, are as follows:—

	s.	d.
Average prices of coal.....	6	1
Total wages.....	3	5
Royalty.....	0	8
Materials.....	0	5
Boiler coal.....	0	2
Locomotive charges.....	0	2
Huses.....	0	2
General charges.....	0	7
Depreciation.....	0	7
Salary.....	0	1
Total.....	1	8
Total.....	5	9

Profit to lessee..... 7-9  
Regarding the general table given above of the whole production of 1889, it is noted that the figures thus arrived at very possibly fall short of the facts as regards the amount devoted to wages, and, *per contra*, somewhat overstate the amount of profit. But, as regards the first point, it is to be remembered that the whole product directly for labor requires to be supplemented by a certain proportion, not less than one-fourth, of the other charges, which indirectly include payments for wages, and with regard to the amount of profit, it is also to be borne in mind that the figures given represent the results of a very good year. Some information has already been given as to the difference between the effects of a change of price upon the earnings of the workmen and the profits of the mineowner. "The labor receives an exceptionally large share when the prices are low, in consideration of taking the smaller share when prices are high;" whilst, on the other hand, "the lessee who has to pay higher wages than he economically ought to pay, when prices are low, is recouped when prices are high."

**Depths of Some Butte, Montana Properties.**—For the purpose of giving those not familiar with the mines of Butte an idea of the depths to which a few of the more important properties here are being worked, the following figures have been prepared: Alice, 1,500 feet; Lexington, 1,465; Anaconda, 1,000; St. Lawrence, 1,000; Mountain View, 1,000; Gagnon, 1,000; Mountain Consolidated, 800; Moulton, 700; Parrot, 800; Blue Wing, 700; Magna Charta, 600; Rising Star, 600; Silver Bow, 700; Essex Charles, 600; West Gray rock, 600; Belle of Butte, 500; Parrot Colusa, 500; Ramsdell Parrot, 600; Amy and Silversmith, 500; Karus, 600; Colusa, 500; West Colusa, 500 (new shaft 600); Blue Bird, 700; Matte, 500; Harris Lloyd, 500; Speculator, 400; High Ore, 600; Wake-Up-Jim, 500; Green Mountain, 500; Original, 500. Outside these there are at least 60 more, the depth of which varies from 100 to 400 feet and from which ore in abundance is being extracted. The Ground Squirrel, which is already one of the largest copper ore producers in the camp, has a shaft only 200 feet in depth. The output from this property alone is about 4,000 tons per month.—*Miner.*

Modern Methods of Quarrying.

Mr. Wm. L. Saunders, for many years the engineer of the Ingersoll Rock Drill Company, and hence thoroughly familiar with modern quarrying practices, read a paper recently before the American Society of Civil Engineers on the above subject, containing many interesting points, which we abstract as follows.

As a preliminary to describing the new Knox system of quarrying, which even yet is not universally known among quarrymen, Mr. Saunders gives the following in regard to other methods:

The Knox system is a recent invention, no mention was made of it in the tenth census, and no description has yet been given of it in any publications on quarrying. The first work done by this method was in 1885, and at the close of that year two quarries had adopted it. In 1886 it was used in 20 quarries; in 1887 in 44, in 1888 in upward of 100, and at the present time about 300 quarries have adopted it. Its purpose is to release dimension stone from its place in the bed, by so directing an explosive force that it is made to cleave the rock in a prescribed line without injury. The system is also used for breaking up detached blocks of stone into smaller sizes.

Quarrymen have, ever since the introduction of blasting, tried to direct the blast so as to save stock. Holes drilled by hand are seldom round. The shape of the bit and the irregular rotation while drilling of somewhat triangular section. It was observed, many years ago, that when a hand drilled hole, the rock usually broke in three directions, radiating from the points of the triangle in the hole.

This led quarrymen to look for a means by which the hole might be shaped in accordance with a prescribed direction of cleavage.

The oldest sandstone quarries in America are those at Portland, Conn. It was from these quarries that great quantities of brownstone were shipped for buildings in New York. The typical brownstone from it is all built of Portland stone.

As the Portland quarries were carried to great depths the thickness of bed increased, as it usually does in quarries. With beds from 10 to 20 feet deep, all of solid and valuable brownstone, it became a matter of importance that some device should be applied which would shear the stone from its bed without loss of stock and without the necessity of making artificial beds at short distances. A system was adopted and used successfully for a number of years which comprised the drilling of deep holes from 10 to 12 in. in diameter.

After charging them with explosives placed in a canister of peculiar shape. The drilling of this hole is so interesting as to warrant a passing notice. The system was similar to that followed with the old-fashioned drop drill. The weight of the bit was the force which struck the blow, and this weight was simply raised or lowered by a crank, turned by two men at a wheel. The bit resembled a broadaxe in shape, in that it was extremely broad, tapering to a sharp point and convex along the edge.

Fig. 1 illustrates in section one of the Portland drills, and a drill hole with the canister containing the explosive in place. The canister was made of two curved pieces of sheet tin with soldered edges, cloth or paper being used at the ends. It was surrounded with sand or earth, so that the effect of the blast was practically the same as though the hole was drilled in the shape of the canister. In other words, the Portland system was to drill a large, round hole, put in a canister, and then fill in a good part of the hole. Were it possible to drill the hole in the shape of the canister, it would obviously save a good deal of work which had to be undone. The Portland system was, therefore, an extravagant one, but the results accomplished were such as to fully warrant its use.

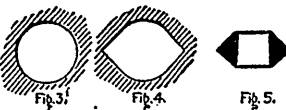
Straight and true breaks were made, following the line of the longer axis of the canister section, as in Fig. 2.

It was found that with the old Portland canister two breaks might be made at right angles by a single blast, when using a canister shaped like a square prism. In some of the larger blazes, where blocks weighing in the neighborhood of 2,000 tons were sheared on the bed, two holes as deep as 20 feet were drilled close together. The core between the holes was then chipped out and large canisters measuring two feet across from edge to edge were used.

It is regarded to another of the older systems of blasting, known as Lewis's, Mr. Saunders says:

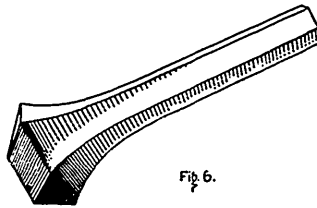
"A Lewis hole is made by drilling two or three holes close together and parallel to each other, the partitions between the holes being broken down by using what is known as a broad. Thus a wide hole or groove is formed in which powder is inserted, either by ramming it directly in the hole, or by putting it in a canister, shaped somewhat like the Lewis hole trench. A complex Lewis hole is the combination of three drill holes, while a compound Lewis hole consists of four holes. Lewis's is confined almost entirely to granite. In some cases a series of holes is put in along the orotch at distances of 10 and 25 feet apart, or even greater, each Lewis hole

being situated equi-distant from the face of the bench. The holes are blasted simultaneously by an electric battery."



After noting another system used to a limited extent, and not to be commended, viz., the use of inserted plugs and feathers (the plugs and feathers being inserted as a sort of tamping, which the blast drives upward to split the rock), Mr. Saunders continues in substance as follows:

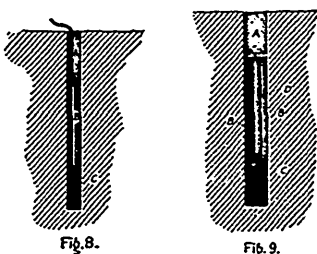
"It is thus seen that the 'state of the art' has been progressive, though it was imperfect. Mr. Sperr, in his



reference to this subject, made in the report of the tenth census, says: "The influence of the shape of the drill hole upon the effects of the blast does not seem to be generally known, and a great waste of material necessarily follows." This was written but a few years before the introduction of this new system, and it is doubtless true that attention was thus wisely directed to the conspicuous waste, due to a lack of knowledge

of the influence of the shape of a drill hole on the effect of a blast. The system developed by Mr. Knox practically does all and more than was done by the old Portland system, and it does it at far less expense. It can best be described by illustrations.

Fig. 3 is a round hole drilled either by hand or otherwise, preferably otherwise, because an important point is to get it round. Fig. 4 is the improved form of hole, and this is made by inserting a reamer, Figs. 5 and 6, into the hole in the line of the proposed fracture, thus cutting V-shaped grooves into the walls of the hole. The blacksmith tools for dressing the reamers are shown in Fig. 7. The usual method of charging and tamping a hole in the new system is shown in Fig. 8. The charge of powder is shown at C, the air space at B, and the tamping at A. Fig. 9 is a special hole for use in thin beds of rock. The charge of powder is shown at C, the rod to sustain tamping at D, air-space at BB', and tamping at A. Let us assume that we have a limestone quarry, in which we may illustrate the simplest application of the new system. The sheet of stone which we wish to shear from place has a bed running horizontally at a depth of



say 10 feet. One face is in front, and a natural seam divides the bed at each end at the walls of the quarry. We now have a block of stone, say 50 feet long, with all its faces free except one—that opposite and corresponding with the bench. One or more of the specially formed holes are put in at such depth and distance from each other and from the bench as may be regulated by the thickness, strength and character of the rock. No man is so good a judge of this as the quarry foreman who has used and studied the effect of this system in his quarry. Great care should be taken to drill the holes round and in a straight line. In sandstone of medium hardness these holes may be situated 10, 12 or 15 feet apart. If the bed is a tight one, the hole should be run entirely through the sheet and to the bed; but with an open free bed holes of less depth will suffice.

The reamer should now be used and driven by hand. Several devices have been applied to rock drills for

reaming the hole by machinery while drilling; that is, efforts have been made to combine the drill and the reamer. Such efforts have met with only partial success. The perfect alignment of the reamer is so important that when powder is used this point is apt to be neglected. It is also a well known fact that the process of reaming by hand is not a difficult or a slow one. The drilling of the hole requires the greatest amount of work. After this has been done it is a simple matter to cut the V-shaped grooves. The reamer should be applied at the center, that is, the grooves should be cut on the axis, or full diameter of the hole. The gauge of the hole which it should be used is  $\frac{1}{2}$  an inch. Great care should be taken that the reamer does not twist, as the break may be thereby deflected; and the reaming must be done also to the full depth of the hole.

The hole is now ready for charging. The powder should be a low explosive, like black or Judson powder, or other explosives which act slowly. No definite rate can be laid down as to the amount of powder to be used, but it should be as small as possible. Very little powder is required in most rocks. Hard and fine grained stone requires less powder than soft stone. Mr. Knox tells of a case which came under his observation, where a block of granite more than 400 tons weight split clear in two with 13 ozs. of FF powder." He compares this with a block of sandstone of less than 100 tons weight barely started with 2 1/2 lbs. of the same grade of powder, and requiring a second shot to remove it.

It is obvious that enough powder must be inserted in the hole to produce a force sufficient to move the entire mass of rock on its bed. In some kinds of stone, notably sandstone, the material is so soft that it will break when acted upon by the force necessary to shear the block. In cases of this kind a number of holes should be drilled and fired simultaneously by the electric battery. In such work it is usual to put in the holes only 4 or 5 feet apart. The powder must, of course, be provided with a fuse, or preferably a fulminating cap. It is well to insert the cap at or near the bottom of the cartridge, as shown in Figs. 8 and 9.

After the charge the usual thing to do is to insert tamping. The improved form of hole the tamping should not be put directly upon the powder, but an air space should be left, as shown at B, Fig. 8. The best way to tamp, leaving an air space, is first to insert a wad, which may be of oakum, hay, grass, paper or other similar material. The tamping should be placed from 6 to 12 ins. below the mouth of the hole. In some kinds of stone a less distance will suffice, and as much air space as practicable should intervene between the explosive and the tamping. If several holes are used on a line they should be connected in series and blasted by electricity. The effect of the blast is to make a vertical seam connecting the holes, and the entire mass of rock is sheared several inches or more.

The philosophy of this new method of blasting is similar to that of the old Portland system. The following explanation has been given. See Fig. 10:

"The two surfaces, a and b, being of equal area, must receive an equal amount of the force generated by the conversion of the explosive into gas. These surfaces being smooth and presenting no angle between at points A and B, they furnish no starting point for a fracture, but at these points the lines meet, as a sharp angle including between them a wedge-shaped space. The gas setting equally in all directions from the centre is formed into the two opposite wedge-shaped spaces, and the impact being instantaneous the effect is precisely similar to that of two solid wedges driven from the centre by a force equally prompt and energetic. All rocks possess the property of elasticity in a greater or less degree, and the principle being extended to the point of rupture at the points A and B, the gas enters the crack and the rock is split in a straight line, simply because under the circumstances it cannot split in any other way."

Another theory which is much the same in substance is then given, and after some general discussion of the theory of the action of the forces under the several systems, the paper continues:

"The new form of hole, therefore, almost identical in principle with the old Portland canister, except that it has the greater advantage of the V-shaped groove in the rock, which serves as a starting point for the break. It is also more economical than the Portland canister in that it requires less drilling and the waste of stone is less. It is, therefore, not only more economical than any other system of blasting, but it is more certain, and in this respect it is vastly superior to any other blasting system. The stone is valuable, and anything which adds to the certainty of the break also adds to the profit of the quarryman."

It is doubtless true that, notwithstanding the greater area of pressure in the new form of hole, the break would not invariably follow the prescribed line but for the V-shaped groove, which virtually starts it. A bolt, when so placed, will break in the line of the groove, and the smaller section or not, because the thread is a starting point for the break. A rod of glass is broken with a slight jar provided a groove has been filed in its surface. Numerous other instances might be cited to prove the value of the groove. Elasticity in rock is a pronounced feature, which varies to a greater or less extent; but it is always more or less present. A sandstone has recently been found which possesses the property of elasticity to such an extent that it may be bent like a thin piece of

steel. When a blast is made in the new form of hole the stone is under high tension, and being elastic it will naturally pull apart on such lines of weakness as grooves, especially when they are made, as is usually the case, with this system, in a direction at right angles with the lines of least resistance.

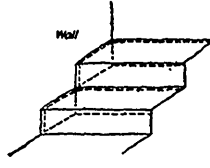


FIG. 11.

"liver" rock the holes must be drilled nearly through the block and the size of the block first reduced.

A more difficult application of the system, and one requiring greater care, is the case where the block of stone is so situated that both ends are not free, one of them being solidly fixed in the quarry wall. A simple illustration of a case of this kind is a stone step on a stairway which leads up and along a wall, Fig. 11. Each step has one end fixed to the wall and the other free. Each step is also free on top, on the bottom and on the side, but not at the back. We wish to show the new form of hole in the corner at the junction of the step and the wall. The shape of the hole is as shown in Fig. 12.



FIG. 12.

It is here seen that the grooves are at right angles with each other, and the block of stone is sheared by a break made opposite and parallel with the bench as in the previous case, and an additional break made at right angles with the bench and at the fixed end of the block. Sometimes a corner break is made by putting in two of the regular V-shaped grooves are sometimes cut in four positions and breaks are made in four directions radiating from the centre of the hole as shown in Fig. 12. In this way a block is divided into four rectangular pieces.

Though the new system is especially adapted to the removal of heavy masses of rock, yet it has been applied with success in cases where several light beds overlie each other. In one such instance 10 sheets, measuring in all only 6 ft., were broken by a blast, but in cases of this kind the plug and feather system applies very well, and the new system, when used, must be in the hands of an expert, or the loss will be serious.

Referring again to our stone step, let us imagine a case where this stairway runs between two walls. We have here each step fixed at each end and free only on the top, the bottom, and on the side. Let us assume, and there is a back seam, that is, that the step is not free at the back. In a quarry, this seam, unless a natural one, should be made by a channelling machine. In order to throw this step out of place it must be cut off at both ends, and for this purpose the V-shaped holes are put in at right angles to the face. It is well, however, to put the first two holes next the back seam in a position where the grooves will converge at the back so as to form a sort of key which serves a useful purpose in removing the block after the blast. In quarries where there are no horizontal beds, a channelling machine should be used to free the block on all sides and to a suitable depth, and then the ledge may be "lofted" by holes placed horizontally.

Where "pressure" exists in quarries, the new system has certain limitations. After determining that there is "pressure" it is only practicable to use the system directly on the line of thrust, or at right angles to it. It is much better, however, to release the "pressure" from the ledge by channelling, after which a single end may be detached by a Knox blast. It is well to bear in mind that the holes should invariably be of small diameter. In no case should the diameter of the hole be over 1 1/2 in. in diameter of rock. This being the case, the blocks of stone are delivered to the market with but little loss in measurement. It is a noticeable fact that stone quarried by the new system shows very little evidence of drill marks, for the faces are frequently as true as though cut with a machine.

A further gain is the safety of the system. The blasting is light and is confined entirely within the holes. No spalls or fragments are thrown from the blast.

The popular idea that the system is antagonistic to the channelling process is a mistaken one. There are, of course, some quarries which formerly used channelling machines without this system, but which now do a large part of the work by blasting. Instances, however, are rare where the system has replaced the channeller. The two go side by side, and an intelligent use of the new system in most quarries requires a channelling machine. There are those who may tell of stone that has been destroyed by a blast on the new system, but investigation usually shows that either the work was done by an inexperienced operator, or an effort was made to do too much.

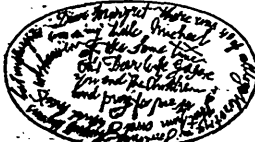
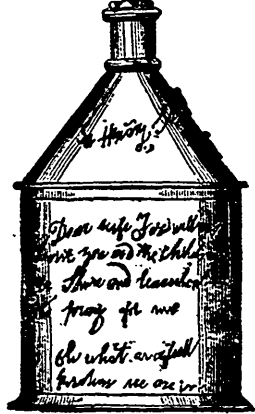
A most interesting illustration of the value of this system, side by side with the channeller, is shown in the northern Ohio sandstone quarries. A great many channelling machines are in use there working around the new form of holes, and when used together in an intelligent and careful manner the stone is quarried more cheaply than by any other process that has yet been devised.

To a limited extent the system has been used in slate. The difficulty is that most of the slate quarries are in solid ledges, where no free faces or beds exist; but it has been used with success in a slate quarry at Cherryville, Pa., since 1888. Among notable blasts made by this system are the following: At the mica schist quarries, at Conshohocken, Pa., a hole 1 1/2 in. in diameter was drilled in a block which was 27 ft. long, 15 ft. wide and 6 ft. thick. The blast broke the stone across the "rift" only 8 oz. of black powder being used. At the Portland, Conn., quarries a single blast was fired by electricity, 15 holes being drilled with 2 lbs. of coarse No. C powder in each hole, and a rock was removed 110 ft. long, 20 ft. wide and 11 ft. thick, containing 2,200 cu. ft., or about 2,400 tons; the fracture being perfectly straight. This large mass of stone was moved out about 2 in. without injury to itself or the adjoining rock.

Another blast at Portland removed 3,300 tons a distance of 4 ins. Seventeen holes were drilled, using 2 lbs. of powder in each hole, the size of the block being 150 x 20 x 1 ft. In a Lisbon, O., quarry a block of sandstone 200 ft. long, 25 ft. wide and 15 ft. thick, was moved about 1/2 in. by a blast. This block was also afterward cut up by this system into blocks 6 ft. square. A sandstone boulder 70 ft. long, average width 50 ft. average thickness 15 ft., was imbedded in the ground to a depth of about 7 ft. A single hole 8 ft. deep was charged with 20 oz. of powder, and the rock was split in a straight line from end to end and entirely to the bottom. A ledge of sandstone open on its face and top ends, 10 x 12 x 8 ft., was moved by a blast about 3 in. without wasting a particle of rock, 8 holes being used, drilled by three men in just one day, and 15 oz. of powder being used in each hole. A sandstone ledge, open on the face and end only, 200 x 28 x 15 ft., containing 24,000 cu. ft. of stone, was moved 1/2 in. by 25 holes each containing 1 lb. of powder.

A Miner's Last Letter to His Wife.

Inspectors W. N. and J. B. Atkinson, in their account of the disastrous explosion at the Seaham Colliery, record the finding of a tin flask on which was scratched with the point of a rusty implement an affecting farewell letter by one of the miners, Michael Smith, to his wife. The drawing is reduced one half. The message was:—



DEAR WIFE—Farewell. My last thoughts are about you and the children. Be sure and have them pray for me. Oh! what an awful position we are in. Dear Margaret, there was forty of us altogether. Some was singing hymns, but my thoughts was on my little Michael, that him and I should meet in heaven at the same time. Oh! dear wife, God save you and the children, and pray for me.

A 2300-Ton Testing Machine.—An hydraulic 2300-ton testing machine has been erected at the works of the Phoenix Iron Co., Pennsylvania. The total length of the machine is 78 feet, and it will take an eye-bar 50 feet in length. It is a modification of the Kellogg machine, and is described in the Iron Age.

New Ore Dressing Floor at Freiberg, Germany.

The *Indus ries* has described in a recent issue a new central dressing floor at the Himmelfahrt mine, Freiberg, Saxony, which has been erected to replace five old floors. The installation was designed by Mr. C. Lühring, whose name is well known in connection with coal washing and ore dressing.

The ores treated in the new dressing floor, says *Industries*, obtained from the various shafts of the Himmelfahrt mine. They consist, as is well known, of argentiferous lead ores, zinc, blende, silver ores and pyrites, whilst the gangue consists of gneiss. On account of the great quantity of iron scales from the stone breaker to the last settling tank, has been constructed in duplicate. It is thus possible to dress ores from other mines without mixing them with the Himmelfahrt ores. This division of the floor into two equal systems is a distinct novelty in ore dressing. The annual production of the Himmelfahrt mine is about 45,000 tons of undressed ore, of which about four-fifths consist of lead ores and the remaining fifth of silver ores. The floor has therefore been designed to dress 150 tons per day of ten hours. The water required is collected in a reservoir with a capacity of 350,000 cubic feet, the average consumption of water being 35 cubic feet per minute. The whole of the machinery is driven by steam power.

At the shaft the best ore and the absolutely worthless gangue are picked out by hand, and the remainder is taken in trams pulled by horses to the dressing floor. The ores contain galena with 0.15 to 0.20 per cent. of silver, iron pyrites, copper pyrites, and, more rarely, zinc blende and gneiss, or quartzose and spathic gangue. Iron pyrites and galena predominate. The zinc blende is black, and contains some 33 per cent. of iron. Its specific gravity, consequently, is nearly the same as that of iron pyrites. On the whole, the composition of the ores being dressing composition, is an exceedingly difficult one to dress.

The dressing floor is arranged in terraces, so as to render the work as continuous as possible. The first building of the washing floor, consists of four floors twelve feet apart and covers an area of 19,300 square feet, 60 feet by 320 feet, of the entire works. The top-most floor, to which the ore is raised by a steam engine, is 35 feet above the lowest floor, on which are situated the stamps, and 48 feet above the floor of the central building containing the jiggling machines, and that of the end building in which the slimes are treated. These three sections are, as has been already remarked, divided into two similar series, in order to treat ores containing different proportions of silver, and to separate the same, requiring separate accounts. Each series of apparatus is able to dress 75 tons a day.

The trucks from the mine, containing 22 cwt., after having been raised by the elevator, are tipped into one or other of four large 6-ton hoppers of four stone breakers. The stone breakers are fed automatically, the fine material under 20 mm., passing through a screen to a hopper below, and the coarse material passes through the stone breaker to the same hopper. Each pair of stone breakers has one of these hoppers as well as a trommel common to the two. The trommel is provided with screens with apertures 16mm., 12mm., 9mm., and 7mm. in diameter. Lumps from 16mm. to 30mm. pass from the trommel to a hand-picking table, which carries the ore for further comminution in the rolls on the third floor, whilst the pure ore and worthless gangue is picked out by hand. Material of smaller sizes passes direct to the jiggling machines.

The material crushed by the coarse rollers is separated into three sizes: 7mm., 9mm., 5 1/2mm. to 7mm., 4mm. to 5 1/2mm. The first of these is treated in jiggling machines, below the trommel. The material above 9mm. falls into the trommel upon the medium rolls whose trommel has apertures of 7 1/2mm. and 4mm. The products are treated in jiggling machines. The material above 7mm. passing through the trommel is further crushed in fine rolls and then passes to the trommel on the lowest floor where it is separated into material above and below 4mm. The smaller material passes to the trommels by the fine jiggling machines, whilst the grains above 4mm. are taken by the elevators to the stamps. There is a continuous comminution from the coarsest to the finest to 30mm. in stone breakers, to 9mm. in coarse rolls, to 7mm. in medium rolls, to 4mm. in fine rolls and to 2mm. in stamps.

The two trommels with which the washing floor for fine material begins, have apertures of 3mm., 2mm. and 1mm. The products of these jigs, with the exception of the coarsest, do not pass through the screens to sand classifiers, where it is separated into three sizes—1 1/2mm. to 2mm., 1mm. to 1 1/2mm., and 3/4mm. to 1mm., which pass to three fine jigs. The material flowing over from the classifier is collected in a reservoir, whence it is pumped up through pipes to the pointed box concentrator, where a further concentration of the fine particles it contains takes place. In this way six classes of sand are obtained. The three first, after 3/4mm., flow from three pointed boxes to a Bihler jig. The three classes of finest sizes deposited in the following pointed boxes, proceed to a jiggling machine, whence the concentrated product passes to six Stein vanners, where a marketable product is obtained. The waste water passes to three large reservoirs, where it is clarified.

The machinery driven by a compound steam engine, which indicates 703 horse power. Throughout the works forty-four workmen are engaged, with three overseers, one engine driver, one stoker, and five fitters. The cost of dressing one ton of ore amounts to \$2.50.

## Meeting of The Asbestos Club.

The monthly meeting of this club, held in the Club House, Black Lake, Que., on 28th ulto, was well attended, Capt. M. Penhale, presiding. After the minutes of last meeting had been read, Mr. A. Klein submitted a very satisfactory report of the council principally dealing with the furnishing of the Club House. It was announced that a donation of fifty dollars had been received from the General Mining Association of the Province. A committee was appointed to arrange for the visit and meeting of the General Mining Association to be held in this district on June 9th. The report of Dr. Moran read an instructive and interesting paper on the subject of "explosives" which was well received. The next meeting will be held at Theford on 25th instant.

## MINING NOTES.

[FROM OUR OWN CORRESPONDENTS.]

## Nova Scotia.

## Cariboo District.

Attachments for debts and unpaid wages were made on the Lake Lode property in January. There is no work doing in the district outside of the Dixon property, which is continuing its steady yield.

## Darrs Hill.

Rumors were current in November of a new and rich strike at this mine, but further developments have shown the lode to be very small, though rich. The cross-cut is still being carried South, and the old workings are reported looking as well as usual.

## North Brookfield.

Work on the mine continues, and the yield is reported as fully up to the average, which means 14 or 15 dwts.

## Molega.

The Boston Gold Mining Co. have been busied during the winter in installing the air drill plant furnished by the Canadian Rand Unit Co. of Sherbrooke, Que. It is reported satisfactory. During Christmas holidays the mill of this company was under slight repairs and during this period the plates are rotated and the mill is being scraped, and from \$500 to \$550 worth of amalgam removed. The thief is unknown. During the same period the property of the Parker-Douglas Co. was entered and some supplies stolen.

## Montague.

For the last three months and more the local papers have been announcing the sale of properties in this district to a London syndicate. The facts of the case seem to be that in October, Mr. Lucius J. Boyl of Dublin, made an examination of the whole Montague District on behalf of himself and his partner Dr. L. Riess of Montreal, and was favorably impressed. Mr. Alfred Woodhouse who was at that time present in the country as consulting engineer to the Nova Scotia syndicate, at Waverley, likewise visited Montague and was impressed with the value of what he saw there. A combination between the three gentlemen was formed and Messrs. Woodhouse and Riess went to London at once. Shortly after their arrival there they cabled for an option on a combination of the Windsor Junction Mine at Waverley owned or controlled by Mr. Hammond. By payment of £25000, cash, the option was secured. This option expired in January, but one or two extensions have been asked for and given. At date of writing (17th) the last option expires and as yet no further payment has been made. The Montague properties are well and favorably known; the Waverley property has not been so favorably known.

## Whiteburn.

The Graves Mine, operated by Smart, Partridge and Reid closed down in January. Several attempts have now been made to operate this mine which have all been unsuccessful. It seems to have been thoroughly demonstrated that the quartz is too poor to pay expenses.

## Waverley.

The month of January witnessed the total collapse of "The Sophie Mining Co." which had taken a lease of the T. J. Wallace property at the western end of the district. This company had been in operation just twelve months. The surface plant and machinery has been sold and disposed of.

The Windsor Junction Mine, Capt. MacDuff, Manager, is entirely closed down awaiting developments in London.

The West Waverley Co. are operating every part of their plant but the mill. This should have been ready the first of February, but it will now be the middle of March or later.

The Lake View, on February 1st, announced another departure viz.—that the whole of the mine was to let on trilite, Mr. Hayward having abandoned his lease.

It is rumored that active operations will be resumed at the tunnel in East Waverley next month. Pipes and rails have been ordered and work will soon be started.

## Mount Uniacke.

The Alpha Company have reached the limit of their line boundary and have stopped work. The mill is now stamping the quartz obtained last month.

Messrs. Madill & Co. are at work and Prince & Co. will resume in the spring.

## Oltham.

The Rhode Island Company has commenced vigorous operations on the Western Dunbrack lode. They have two men, a boy and a horse at work one shift.

The Concord Mining and Crushing Company appear to have wound up business leaving about 51500 of liabilities and no assets. Nothing has been seen or heard of the guiding spirit of this company for two months.

## Quebec.

## Hull Township.

The Thompson-Houston Electric Co. is taking out mica on Mr. Chubbuck's lot, 13 in 15th Range, and also on the McLellan lot. The owners of the Gow mine have had a small force of men mining mica during the winter, and recently sold 40 tons of this mineral in the rough state, to the Thompson-Houston Co. A new discovery of phosphate was made on this lot last fall, and is to be exploited this spring. The opening of the Gatineau Valley Railway, which took place a week ago, will greatly benefit mining in this district.

## Eastern Townships.

Mr. W. H. Jeffrey is taking out between four and half and five tons daily of asbestos at his Danville mine. This is the only asbestos property at work in this section of Quebec.

The Anglo-Canadian Asbestos Co. will resume mining about the 15th of next month.

The end of March will see a resumption of mining at all the asbestos mines at Black Lake and Theford.

## Templeton Notes.

The Netherlands Phosphate Co. closed down on Friday of last week. Dr. Killing expects to sail for Germany early next month. Until he consults with his directors it will not be known when they expect to resume operations. Over 40 men are thrown out of employment.

The Blackburn Mine is turning out about 75 tons lump phosphate weekly. Hundred and ten men are still employed.

The Templeton Asbestos Co. have struck some good shows of first class asbestos this month. They are grinding their dump stuff at Buckingham which is turning out very well. Mr. Kirkel is well pleased with the past few months operations. About 45 men are employed.

The Electric Mining Co. are working 22 men at the Bull Dog Mine. The average output is about 150 tons this winter.

Messrs. McClellan and McTiernan are working phosphate in the 2nd Range of Templeton with ten men. Their output is very satisfactory.

The miners and farmers almost to a man are supporting the Deboucherville candidate, Mr. Tetreau.

## Ontario.

"The Belmont Lessees Ore Co." have been completing and improving their buildings at the iron mine and are preparing for active work as soon as the railway is completed. Ties are being delivered along the line, rock-cuts made, and they are building the railway bridge over Beaver Creek at the village of Marmora. The railway from Belmont mine will strike "The Central Ontario Railway" about three miles from Marmora, a short distance North of the C.P.R. Junction, and the Company expect to have it running during the month of May next.

## GOLD MINING SUPPLIES.

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

## H. H. FULLER &amp; 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 &amp; CO.,

Halifax, N.S.

The Belmont Gold Mining Co. is working night and day and are now drifting on the vein about 80 feet from the surface. The ore is being treated at the Crawford Mill in Marmora, \$1,100 in gold being reported as the result of the first 100 tons, or \$10 per ton, with careful management and a large supply of air, this ought to test a selected sample of arsenical pyrites in which there was no visible gold, when assayed, showed \$32 of gold per ton.

Late developments at the Snowdon iron mines have shown new deposits of ore, which are remarkably free from phosphorus. These developments are opportune at a time of the increasing interest now being taken in the location of a blast furnace either at Toronto or Hamilton; these ores being the nearest high grade bessemer to these cities. The distance is 110 miles by rail to Toronto and 150 miles to Hamilton.

## Petrolia District.

The shipments of crude, refined and crude equivalent from Petrolia, Ont., for the month of January, 1892, and 1891, are given as follows:—

Jan.	1891		1892		
	Crude.	Refd.	Crude Equiv.	Crude Equiv.	
19,910	20,974	79,749	17,441	24,751	79,318

At present all worth on the surface appears fair and profitable. Crude is worth from \$1.29 to \$1.35, according to quality and gravity, and the country is not over flooded with refined illuminating oil, so that the refining trade will be fairly brisk and steady till the beginning of May any way. After that date we shall have three or four months of restricted demand, and then business may be expected to resume activity for the fall and winter months of 1892-93.

The stock of crude is very moderate, but ample for the requirements of the trade, taking into consideration the prospective summer production. If the larger producers take care of the raw material and the market in general is left alone and not influenced by outside considerations, the prospect for values for the raw material may fairly be put at \$1.50 per hll. at the least.

If a new area of production is found by what is termed wild catting, then we must look for cheaper oil. As we have pointed out our stocks are, and will be, ample for the year's business, and it would be but to imitate the folly of our American cousins to encourage greater developments this year. We hear of great preparations for drilling new wells in the spring or as soon as the weather moderates and drillers can move their rigs around with less expense and facility, not alone in our old territory here, but at Oil Springs and elsewhere. Of course, this kind of business is playing right into the hands of the refiner, and there are so few of them that if a large surplus of the raw material is brought up to the surface this year, then good bye to fair prices for the next two or three years to come.

## Sudbury District.

Writing to us under date of 19th inst., Mr. H. P. McIntosh, secretary of the Canadian Copper Co., says: "Nothing new has transpired in the Ritchie suits, excepting that depositions are being taken thereon. The suits against this and the Anglo-American Iron Co's. for their dissolution, instituted by Mr. and Mrs. Ritchie, will come to naught, for they are not owners of one-fifth of the capital stock, as it is necessary there to be to substantiate such suits. About the middle of last month we started our Bessemer works at Sudbury (three furnaces), and they are working very nicely. We expect to push our business very vigorously this year, unless we are hampered by a Canadian export duty, for which some of your journals are howling."

Some jumbling at the Printing Bureau will delay the issue of Dr. Robert Bell's report on the Sudbury district for some weeks yet.

## Port Arthur District.

In spite of the adverse conditions of the present Mining Act the spring is opening up with a renewed activity among explorers and small mine owners, and there is great promise of extensive and varied development of numerous prospects. Several of these prospects have lately been equipped with machinery, and no doubt some of them will gradually develop into first class mines.

It is stated on good authority that the Palisades mine, in charge of Superintendent Middaugh, and originally operated by Prof. Winchell of the U.S. Geological Survey, has changed hands in New York at a very handsome figure. The company recently had a thorough survey made of their attractive embryo mine including underground works. The samples from this mine rival the finest specimens obtained at any of the famous mines of the district.

The splendid showing at the Lily of the Valley workings in Paipouge Township has created a great influx of explorers with the result that several veins have been discovered, and more or less development work is going on at various outcrops, most of them, of course, claiming connection with their wealthy neighbour.

The Badger and Porcupine mine is still shipping rich ore and the much talked of "West End" will erect a mill as soon as the output and ore in sight assure its success as a profitable investment.

The new "Climax" prospect near the Badger mine has been secured by an American company at figures yielding splendid results to the original owners.

Several experts have been up of late examining the iron formation along the Port Arthur, Duluth & Western Railroad. This section, it is claimed, is an extension of the Mesabi iron range which our correspondents inform us is creating a great excitement, bordering on a boom, in the North Eastern part of Minnesota. About forty miles from Port Arthur the Folger, Bros. of Kingston and P. L. S. Williams are steadily at work on a vertical formation of magnetic and hematite ore. Some of the specimens from this neighbourhood yield as follows:—

	1st.	2nd.
Metallic iron.....	60.9	68.
Phosphorus.....	.05	.01
Sulphur.....	.16	.5
Silica.....	13.5	4.0
Titanium.....	none.	none.

The Geological Survey informs us that none of the ores from that region contain titanium. The quality, it will be perceived, is A<sub>1</sub>, and development alone can determine the quantity of this rare metal, in which Professors Pumpelly and Van Dine of the U.S. Geological Survey have invested so heavily.

When the Attkokan Belgian deal is consummated by the building of the branch line and the opening of the mines, as agreed upon, these ores will be valuable to mix with them. Several prospectors are now at work on the various iron ranges, chiefly on behalf of United States capitalists.

The silver lead ores of Black Bay are exciting renewed interest at present, development being pushed at the Ogema mine and on one of the irrepressible Duncan McEachern's locations. At both places the results reported are certainly highly satisfactory, the proportion of silver and gold being away over the average.

The Ontario Government have been trying to make amends for their narrow mining policy by making Township and other Surveys in the mining region and building roads wherever operations appeared to indicate successful results.

We would be pleased to learn that some modifications of the mining laws were made, so that there might be greater use for these roads.

What we want badly is a mining school, towards which all the municipalities adjacent would contribute handsomely, and this matter, we learn, is being pushed by our live practical member, which augurs well for success.

Thousands of dollars are wasted annually hereabouts by ignorant and misdirected effort, to say nothing of occasional frauds, which have done immense injury to the district.

It is rumored that Port Arthur and Fort William will shortly amalgamate under a new name. The result would be most beneficial both to themselves and the District at large.

**British Columbia.**

**Ainsworth District.**

In its review of last year's mining in the Ainsworth District the *Miner* says:—The year 1891 opened with much developing work on the Skyline, Number One, United, Neosho, Tenderfoot, Dictator, and several other claims of lesser note, and closed with men on the Skyline, United, Tenderfoot, Krao, and Neosho. The amount of work done, in the aggregate, was more than during the previous year, and was of a character that went to prove that the ore bodies go down. Ore was shipped from Number One, Neosho, and Tam O'Shanter, the Number One shipments going to East Helena, Montana, and those from the Neosho and Tam O'Shanter to Tacoma. The first transfer of consequent was that of A. D. Wheeler's interests in the Skyline, Krao, Crow Fleming, Blackbird, Maestro, Banker, Pataha, Attended, Bugeboob, Libby, and two or three localities to W. L. Hogg of Anacortes, and, Mr. Wheeler receiving \$5,000 cash on a year bond for \$31,000. Later, a number of sales were made ranging from a few hundred dollars for prospects to several thousand dollars for claims like the Tam O'Shanter, Tenderfoot, and Neosho, the last-named selling for \$10,000 cash. Dr. Coe of Seattle being the purchaser. The Tam O'Shanter was sold to a Montreal company, through Richard Irving, a Colorado mining man, and the work done on it after that, was his judgment good. The Tenderfoot brought \$7,500, Richard Ashwell and Wilfred Jenkins, Montana and Wyoming cattle men, being the purchasers. Since purchasing the property they have expended several thousand dollars in erecting a shaft-house, and putting in hoisting-works, and now have 12 men at work sinking a 2-compartment shaft. While the ore shipped was of a high grade, as that shipped from the Skyline last year, the total amount obtained from its sale was about the same as that realized last year. In fact, owing to the specific wording of the McKinley bill, no ore could be shipped to the United States at a profit unless it was high-grade in silver and low in lead; and, as is well known to mining men, the great bulk of the ores of the division are high in percentage of lead and low-grade in silver. So that the McKinley bill can be attributed the small tonnage shipped during the year, and to

the same measure is ascribed the cause why more work was not done, for owners of claims saw the desirability of erecting ore merely to let it remain piled on dumps. No new strikes of consequence were made in the section of the division adjacent to Ainsworth, but the prospectors who make Ainsworth their headquarters are entitled to all the glory for making the new finds on Kaslo creek and for creating the stampede to the Sklokan Lake country.

On the Skyline, the 2-compartment shaft commenced in the fall of 1890 was sunk 200 feet in all. At 190 feet a station was put in and a cross-cut run 150 feet to the ledge, which, when tapped, was found to be 12 feet wide. An upraise was then made to the old incline shaft, the connection being made in December. Ten men are now at work. Work was not continued on the Krao until late in the fall, and when the hoisting machinery was started it was found that the shaft would have to be straightened and retimbered before sinking could be resumed. The repairs were made and the work of sinking has commenced. When down 200 feet a station will be put in and drifts run both ways on the ledge. As no cross-cutting has been done, the width of the ledge is not known, but as the bottom of the shaft is at least 12 feet below good concentrating ore. The working force is 12 men. Aside from about 200 feet of drifts run in extracting ore, little or no development work has been done on the Number One. Work was entirely suspended in November. The United shaft was sunk 110 feet and drifts run 50 feet both ways on the ledge from the 100-foot station. Work was suspended in December owing to some difficulty with the machinery, and was only resumed in December. On resuming it was found that the 2-compartment shaft would have to be timbered all the way down, and until that work is completed only 6 men will be employed. On the Tenderfoot a working shaft was sunk on the ledge 100 feet, and 12 men found employment in continuing that run. Since purchasing the Neosho, in December, the new owners of that claim have sunk the shaft 60 feet and run several drifts. The shaft is now down 100 feet and the ore body is reported 7 feet wide. Six men are employed. Early in the spring work was resumed on the Fourth, and until suspended late in the fall, over 300 feet of tunnels, drifts, and crosscuts were run, most of the time in ore. The ore extracted is on the dump, and will remain in the wagon run until it is sent to the mine, it being distant about 2 miles southward from the United. Among the prospects on which work in excess of the annual assessment was done were the Dictator, 200 feet of shafts and tunnels; Crescent, 50-foot shaft; Libby, 100-foot shaft; Norman, 50-foot shaft (still working); Lady of the Lake, 50-foot tunnel; Gleanery, 50-foot shaft (blackbird); 50-foot shaft (still working); Snowbank, 75-foot shaft; Ellen, 45-foot tunnel; 40-foot tunnel; On Deck, 75-foot shaft; Delite, 70-foot shaft and open cuts exposing ledge for a distance of 300 feet; Early Bird, 60-foot tunnel; Minneapolis, 150 feet of tunnels. The annual assessment work was done on 150 other claims.

On the east side of the lake, little or no work was done on the Blue Bell, that property being in good shape for ore extraction. On the Kwotena Chief a shaft was sunk 100 feet by contract. On the Tam O'Shanter a 70-foot tunnel was run on the ledge, proving the ore body to be about 8 feet wide. On the Josephine, a claim purchased late in the season by Butte parties, development work is now being done. At Crawford, by K. H. Bond and associates did considerable work on a group of claims that are reported as showing good indications.

**Nelson District.**

The work done during the year on the Silver King proved that the ore body is not only continuous but that it goes down. The main tunnel is now through the Silver King ground and 25 feet into the Kootenay Bonanza, it being in 75 feet in all, with the face fully 300 feet below the surface. A winze was sunk in the tunnel to a depth of 64 feet, and a 100-foot crosscut run from its bottom. Five crosscuts were run from the main tunnel, the last showing the ore body to be 25 feet in width. In all about 1000 feet of tunneling, and crosscutting was done during the year, and including the money expended on the wagon road fully \$50,000 were disbursed for wages, supplies, etc. Twelve men are now employed in the tunnel.

On the Dandy, over 500 feet of tunnels, drifts, and crosscuts were run, at an expense of \$15,000.

On the Grizzly Bear, about 300 hundred feet of tunnels, and crosscuts were run, at a cost of \$9,000, and 8 men are still employed. An aggregate of 1000 feet more of tunnels and shafts were run and sunk on the Whitewater, Wild Cat, Vinita Boy, Royal Canadian, Lizzie C., Hidden Treasure, Democrat, Sunrise, Napoleon, Major, Evening, and other claims in an division. The amount of money expended during the year can safely be placed at \$100,000 for development work, most of the assessment work being done by claim owners themselves. For that expenditure there is fully \$1,000,000 worth of ore on dumps, where it will probably remain until reduction works are erected in the district.

About 50 sales of claims, of more or less value, were made during the year. Early in the Spring E. M. Esler purchased an eighth interest in the Dandy for \$4,000 cash and obtained a bond on the other seven-eighths at a figure up in the thousands. Owing to the delay in beginning work on the wagon road from Nelson to Tead Mountain, which rendered it impracticable to place

machinery on the property, the terms of the bond were re-adjusted late in the fall, almost of the working force laid off. The Troquois was purchased by J. E. Boss for \$14,000 cash. Mr. Boss also purchased the Grizzly bear and Silver Queen, paying \$8,000 for them. Other sales were made at figures ranging from \$250 to \$2,500, the latter price being paid for the Last Chance and the Jim Crow, and for an interest in the Ollie. J. C. Colough transferred his interest in the \$80,000 east, the interest being a twenty-sixth. John Wallace's interest in the Whitewater on Rover creek was also sold during the year, at a figure said to be \$10,000. The sales for the year aggregated fully \$100,000.

**Nanaimo.**

The foreign shipments of coal for January are reported as follows: N.V.C. Co., 17,525; Wellington, 15,567; East Wellington, 2,270; Union, 8,790.

Connection has been made between Protection Island and the Esplanade Shaft of the New Vancouver Coal Co. The distance in a straight line between the Esplanade and the Protection Island shafts is not much over one mile, but the level (and the counter or air level, which runs parallel with all the way) which had to take a circuitous course, covers a distance of over two miles. For the first mile barren ground was mostly encountered. Where the coal should have been, a mixture of coal shafts, and dirt took its place; then several hundred yards the drifts had to be driven through very hard rock, sandstone and conglomerate; this being passed a splendid bed of clean bright hard coal was reached. From that point to the distance of over one mile the coal held good, and in all the drifts going forward the uniform quality of the seam is remarkable. The main level of No. 1 shaft, under Protection Island, has been running two shafts, but will in the future be driven three shafts. An incline will be started to the rise of this level without stoppage. As the outcrop workings of the old Newcastle mine are upwards of two miles distant from the No. 1 level, there is an enormous area of maiden ground to be exhausted, to the line of the level alone. Taking into account the ground lying between the No. 2 and No. 3 levels, which appears to be in same zone as No. 1 coal, the body of coal actually proved is simply enormous. Until the electric tramway is in operation and its capacity tested, nothing will be done to the wharves on Protection Island, nor is it yet decided whether to divide the output between the Esplanade and Protection shafts, or to confine it to one shaft only. A new shaft will have to be sunk on Protection Island before long, and it is simply a question as to the selection of the best site.

Mr. S. M. Robins, Manager of the New Vancouver Coal Co., who has been recuperating his health in the South, has returned to the mines. On being interviewed by a local paper he said:—

After having made careful enquiries from every source possible, I have found, for instance that all authorities, not only in San Francisco, but everywhere down the coast, have no hesitation in declaring that Vancouver Island coal is far better in quality than any other on the Pacific. The three best mines south of the boundary are acknowledged to be the Franklin, Black Diamond and Granville, and the coal turned out even from these can in no respect compare with ours. From hundreds of mines on the other side of the continent, I have seen and felt at one can imagine. I have seen them continually washing their coal to get the dust, which forms the greater portion of the bulk, out of it. After this operation, there is not a lump of any size left in it. The engineers of the Southern Pacific system hate the sight of it, but they are compelled to use it on account of its cheapness. Speaking with a mining official in San Francisco the other day, he told me that they had to consider economy in fuel above all things. He assured me that during the year past the Union Pacific Company had burned \$4,000,000 worth of coal less than had his company in the same time. At present, there is a good deal of difficulty in getting our coal on the Sound, as there is a duty of 75 cents per ton. But I think we will be able to before long, in some instances, to get our coal through a large system of transporation. I tell you, that if that duty of 75 cents on the ton was taken off we would close up every coal mine on Puget Sound in the next two years. We have had enough of getting time charters on steamers and vessels, so in March next you will see a fine collier, the forerunner of a fleet, come out here from Liverpool to engage in our San Francisco trade. We are, at present, handling very extensive cargoes and a brace on a new solid wharf, lately constructed by the Harbor Commission there. We will, of course, continue to run sailing vessels, for if we had nothing but steamers engaged in the trade we could gain nothing. There are only four places in San Francisco where they have facilities for discharging 1000 tons of coal a day, and the time steamers must have to wait to get up all the profits. Now, of course, can tell the turn things will take, but it seems clear that our Island coal can always command its own market in the South, among the many other varieties, all of very inferior quality."

The total output of the Wellington colliery for the year is reported to have been 328,627 tons; and of the Union colliery, Comox, 130,917 tons.

Foreign shipments of coal were, for the year, divided as follows:—New Vancouver Coal Co., 377,561 tons; Wellington, 229,271 tons; East Wellington, 26,085 tons; Union colliery, 94,990 tons.



The output and shipments for the New Vancouver Coal Company, for the year 1891 were as follows:

	OUT-PUT 1891.		SHIPMENTS.	
	tons.	cwt.	tons.	cwt.
Southfield.....	201,027	17	198,965	3
No. 3. Shaft.....	61,235	8	62,310	16
No. 1. Shaft.....	158,320	19	157,494	9
Northfield.....	108,006	10	104,528	15
Total.....	528,590	14	523,299	3

The new shaft in course of sinking at Harewood is down 150 feet. The work is progressing through very hard conglomerate, and is about half completed. The mine is about three quarters of a mile from the old Harewood mine. The first half of the shaft was sunk with steam drills, but the heat became so oppressive for the miners that the company substituted compressed air drills. It is expected coal will be reached in about two months, when a second shaft will possibly be sunk.

#### McMurdo District.

A petition is on the rounds, and has so far been unanimously signed by the Free Miners of the above district, calling for a grant of \$2,500 to be applied during the coming summer in making and repairing trails in their locality. Last summer a liberal grant was obtained, and a lot of work done, but there still remains much to do, and it is hoped, when more have signed, that Col. Baker, to whom the document is addressed, will on receipt do his best to meet the requirements of the miners and prospectors.

#### Texada Island.

On the land belonging to the San Juan Lime Company on Texada Island there is a large deposit of marble. The marble is of two shades, one white and the other grey, of excellent quality and which when worked and polished, are equal to any of the qualities of marble brought from the East. The quarry has been leased to Messrs. P. Wade & Co., who now have men on the ground doing the preliminary work for opening up the quarry. The specimens of the marble which have been shown to various architects and builders have been generally admired, and there is no doubt that this material will be largely employed in the Province for ornamental work (both internally and externally) on the better class of buildings, whether of a residential or business character.

#### Miscellaneous.

A recent letter from the manager of the Grizzly Bear mine, owned by the Stadacona Silver-Copper Mining Co., states that "the cross-cut from the heading of the tunnel to the hanging wall, is all quartz and full of mineral, and improves the further it goes into the cross-cut." The weather at the mine was good, though the snow was seven feet deep.

The Westminster Slate Co. have secured carrier pigeons with which to begin message service between the quarries on Jervis Island and the company's head office in Westminster. The birds will be trained and a sufficient number kept at each station to supply requirements. It is expected the system will work satisfactorily.

### CANADIAN COMPANIES.

The Newport Plaster, Mining and Manufacturing Company (Limited) give notice that application will be made at the next session of the Legislature of Nova Scotia for the incorporation of this company.

The Vancouver Dynamite and Powder Company (Limited) desires incorporation under the Companies Act of British Columbia to carry on the business of manufacturing, and trading in dynamite, nitro-glycerine, blasting powder, and all other explosives of every description. Head office, Vancouver, B.C. Capital stock, \$100,000 in 1,000 shares of one hundred dollars each. Applicants, Johann Wullfssohn, Donald McGillivray and Edward Arthur Morris.

The Kootenay and Columbia Prospecting and Mining Company (Limited).—Application for incorporation will be made under the Companies' Act of the Dominion, to carry on a general mining business, to buy, work and sell mines, quarries, mining lands and minerals of all kinds, in the Dominion of Canada. Head Office, Ottawa. Capital stock, \$40,000, in 400 shares of \$100 each. The applicants are, George Patrick Brophy, civil engineer; William Anderson Allan, contractor; Hector McRae, merchant; and Edward Watts, miner, all of the city of Ottawa; and William McNally, merchant, of Montreal, P.Q.

Lanark Consolidated Mining and Smelting Company.—At a meeting of this company held recently, Thos. Earle, M.P., was elected President and Messrs. F. S. Barnard, W. J. Goepel, N. P. Snowdon, and the Rev. Canon Beauland, the Board of Trustees; G. A. Sargison, 48 Langley Street, Victoria, B.C., Secretary. The company's mines include the Lanark, Red Fox, Isabella and Doherty, in one group, and the Sutton and Sprague a short distance away. Development work at the Lanark is now well under way.

Slough Creek Mining Company.—This company has been incorporated under the laws of the State of Wash-

ington to work placer ground on Williams Creek, in the Cariboo district, Province of British Columbia. Capital \$500,000. Directors, W. H. Fife, Hon. Henry Drum, Hon. John Grant, J. D. Caughran, E. N. Ouimette, Chas. Ramos. Head Office, Hon. Henry Drum, Secretary, Fife Block, corner 9th Street and Pacific Avenue, Tacoma, Wash.

Duluth and St. Paul Mining Company.—This company has been formed to work the Fourth and other claims near Coffee Creek. The capital stock is \$200,000 in \$100 shares, and the incorporators are John Graham, Minneapolis; James McNaught, of New York; E. C. Long, N. C. Thrall and F. Wilsey, of St. Paul; G. C. Howe and John H. Upman, of Duluth.

The Rosedale Pressed Brick and Terra Cotta Company, (Ltd.)—Give notice that application will be made for incorporation under the Ontario Act, to make and sell bricks and other products of clay and shale. Head office, Toronto. Capital stock, \$30,000, in 300 shares of \$100 each. The applicants are: W. T. Jennings, C.E.; Humphrey Lloyd Himé, estate agent; Donald Campbell Ridout, engineer; Thomas Parker, brick manufacturer; and James David Edgar, solicitor; all of the city of Toronto.

Cumberland Railway and Coal Company.—The annual general meeting of this company was held during the month at the offices in Montreal. By reason of his illness, Mr. John McDougall, president of the company, was unable to attend, and Mr. Robert Cowans, vice-president, occupied the chair. The annual report and the financial statement were presented. Both were found to be very satisfactory and unanimously adopted.

The Sudbury Customs Smelting Company, (Ltd.)—Give notice that application will be made for incorporation under the Ontario Act, to erect and operate a Customs smelter or smelters at or near Sudbury; to mine and smelt nickel and copper ores, etc. Head office, Sudbury, Ont. Capital stock, \$75,000, in 7,500 shares of \$10 each. The names and addresses of the applicants are: James Conmee, M.P.P., Port Arthur; James Stobie, prospector, Stobie, Ont.; Rinaldo McConnell, lumberman, Mattawa; Stephen Fournier, merchant, Sudbury; Frank Cochrane, merchant, Sudbury; James McCormack, merchant, Sudbury; Robert Bruce Struthers, M.D., Sudbury; Mathew Wm. James McCormack, merchant, Sudbury; Charles Kettle, merchant, Sudbury; Daniel O'Connor, hotel keeper, Sudbury; James Flannery, hotel keeper, Sudbury; Alex. Hoffman Smith, manufacturer's agent, Sudbury; Charles Jessop, prospector, Sudbury; Wm. John Skynner, prospector, Sudbury; James Boyle Hammond, chemist, Sudbury; James Andrew Orr, editor, Sudbury; Charles Gordon Richardson, professor Ontario Veterinary College, Toronto; James Robertson Gordon, C.E., Toronto; William McVittie, prospector, Whitefish; Alex. Murray, analytical chemist, Sudbury; Angus James Macdonnell, manager of Ontario Bank, Sudbury.

The Cross Lake Silver Mining Company, (Ltd.)—Give notice that application will be made for incorporation under the Ontario Act, to explore for, buy, sell and work mines and mineral lands in Ontario; to buy, sell, smelt and refine ores of nickel and silver, etc. Head office, Toronto. Capital stock, \$50,000, in 500 shares of \$100 each. Applicants are: Jeremiah Daniel Cockburn, merchant, Sturgeon Falls; Walter Cockburn, merchant, Sturgeon Falls; Adam James Cockburn, prospector, Toronto; Frederick Reesor James, broker, Toronto; Thomas Urquhart, barrister-at-law, Toronto.

The Drury Nickel Company (Ltd.)—This company has been incorporated under the Ontario Act, on the 6th January 1892, to acquire and work mines and mineral lands and to smelt, refine and treat nickel and other ores. Capital stock \$500,000 of which \$250,000 is to be first preference stock, divided into 10,000 shares of \$50 each. Richard Peter Travers, mining capitalist, Chicago; Henry Roger Durkee, real estate dealer, Chicago; Auguste Francke Mason, capitalist, Boston, Mass.; Thomas Lothrop Nelson, capitalist, Boston, Mass.; Henry Richard Valprey, manufacturer, Boston, Mass.; Francis

Austin Whitney, manufacturer, Leominster, Mass.; and Thomas Travers, mining superintendent, Township of Drury, District of Algoma, Ontario.

The Oneida Quarry Company (Ltd.) give notice that application will be made for incorporation under the Ontario Act, to manufacture and sell stone, marble, glass and lime. Head office, Township of Oneida, County Haldimand. Capital stock \$50,000 in 500 shares of \$100 each. The applicants are:—Charles Sidney Hotchkiss, manufacturer, Brantford; Cortland De Cew, lumberman, Aylmer, Ont.; Wm. Edward Winskel, M.D., Brantford; George Henry Wilkes, banker, Brantford; Frank Wilson, agent, Brantford; and Harman Stenebaugh, merchant, Brantford, Ont.

The United Asbestos Company (Ltd.) recommend a dividend for the past year of 10 per cent. on the preference and 5 per cent. on the ordinary shares, carrying a substantial balance forward.

The New Toronto Oil and Natural Gas Company (Ltd.) give notice that application will be made for incorporation under the Ontario Act, to bore and work wells of oil and natural gas and construct pipe lines, etc., for light, heat or power in the county of York, Ont. Head office, Toronto. Capital stock \$150,000 in 15,000 shares of \$10 each. Applicants are:—Lewis Gibson Harris, broker, Toronto; Joseph Barrett, broker, Toronto; Achd. John Thompson, cattle dealer, Toronto; Thomas McDonald, manufacturer, Toronto; Wm. Parsons, broker, Toronto; James Wright, electrical engineer, Montreal; Lawrence Fawler Faught, oil producer, Pittsburg, Pa., and William Sharp, oil producer, Pittsburg, Pa.

The R. J. Doyle Manufacturing Company of Ontario (Ltd.)—This Company has been incorporated under the Ontario Act, on the 14th January, 1892, to quarry and manufacture stone, lime and clay for making whiting, putty, brick, tile pottery, artificial stone and other cements. Capital stock, \$100,000 divided in 2000 shares of \$50 each. Richard Judsin Doyle, Sr., Insurance manager, Township Sarawak; Richard Judsin Doyle, Jr., farmer, Township Sarawak; Robert Alexander Starke, saw miller, Township Derby; John Thomson, merchant, Township Sydenham; Archibald Duncan, hotelkeeper, Owen Sound.

The Lindsay Stone and Lime Company (Ltd.)—The lands of this company which are as follows:—

Part of S.W.  $\frac{1}{4}$  of lot 13 in 6th Con. of the Tp. of Somerville,  
" S.  $\frac{1}{2}$  " 13 in 6th " " "  
" N.  $\frac{1}{2}$  " 14 in 5th " " "

being the stone quarries of the company, will be sold by sheriff's sale at Lindsay on 15th April, 1892.

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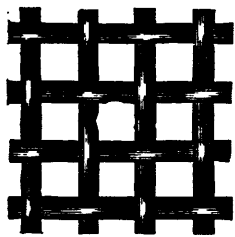
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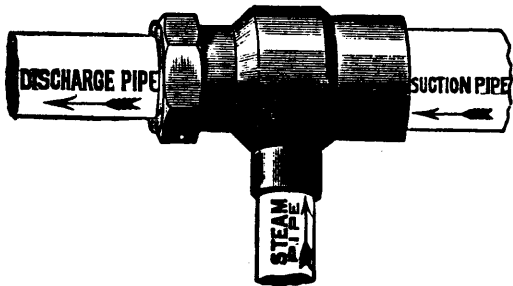
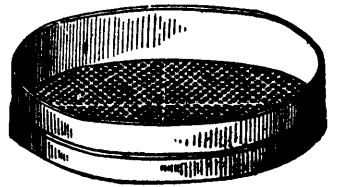
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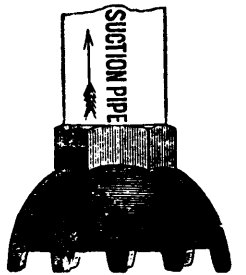
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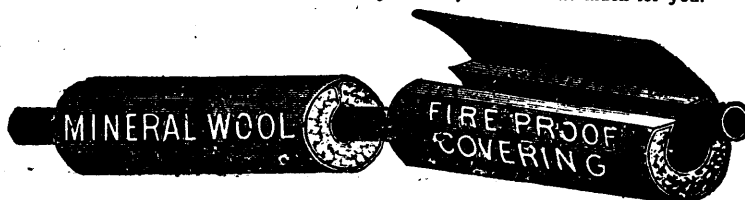
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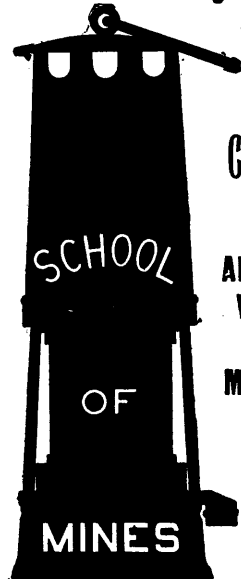
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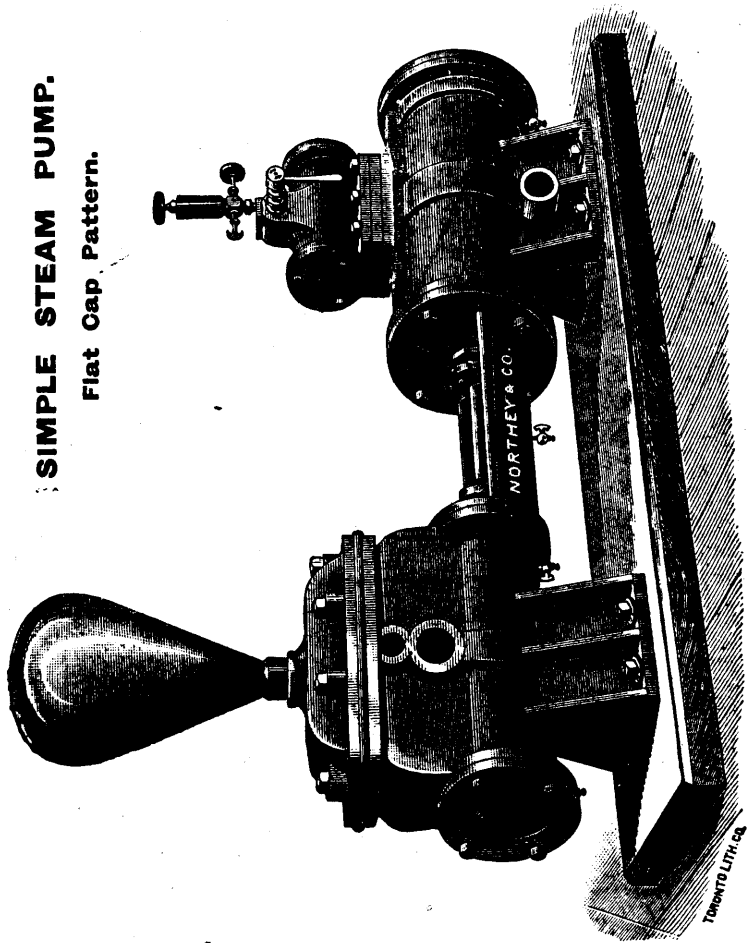
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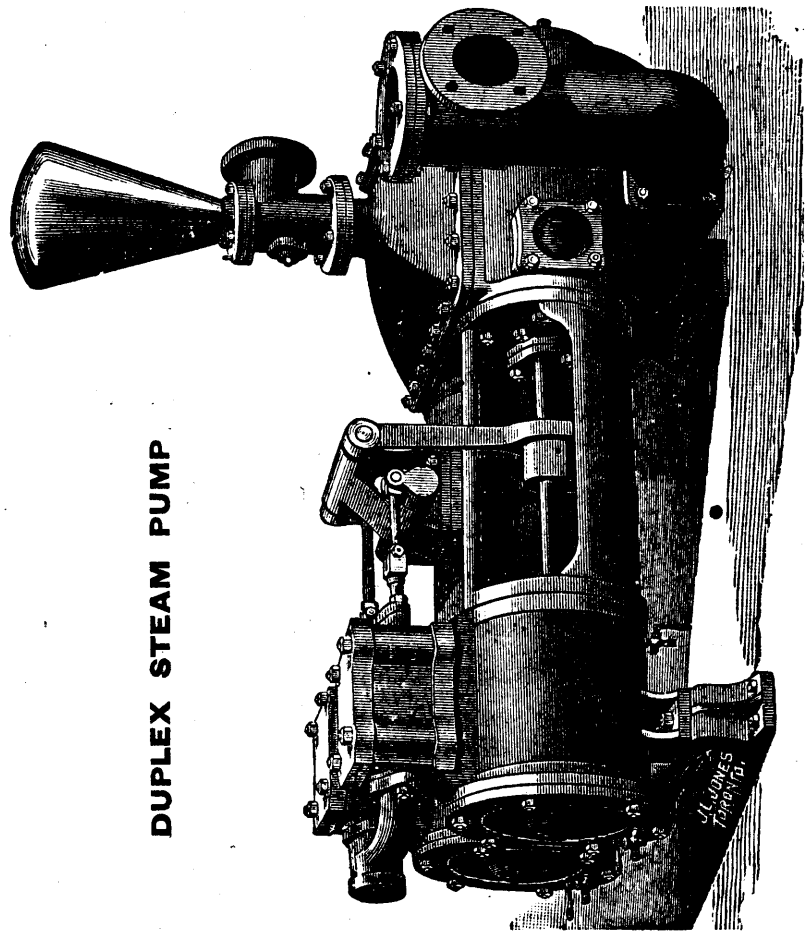
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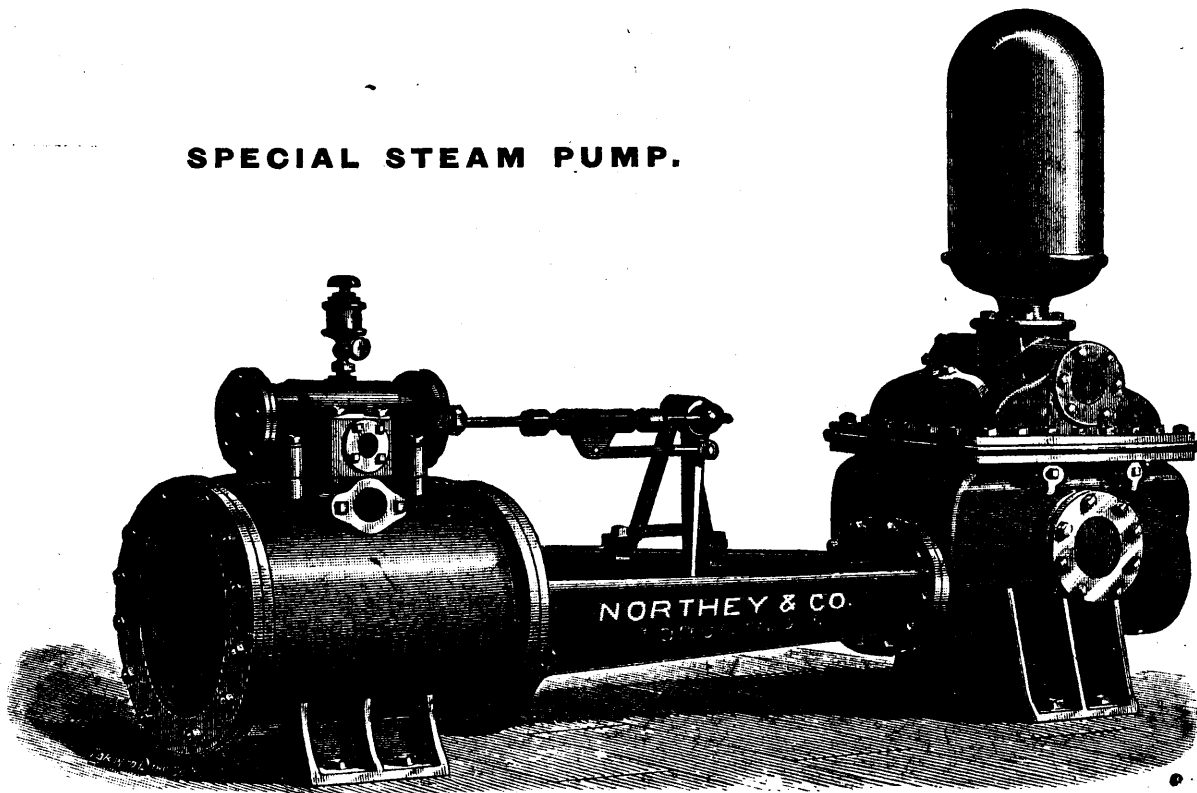
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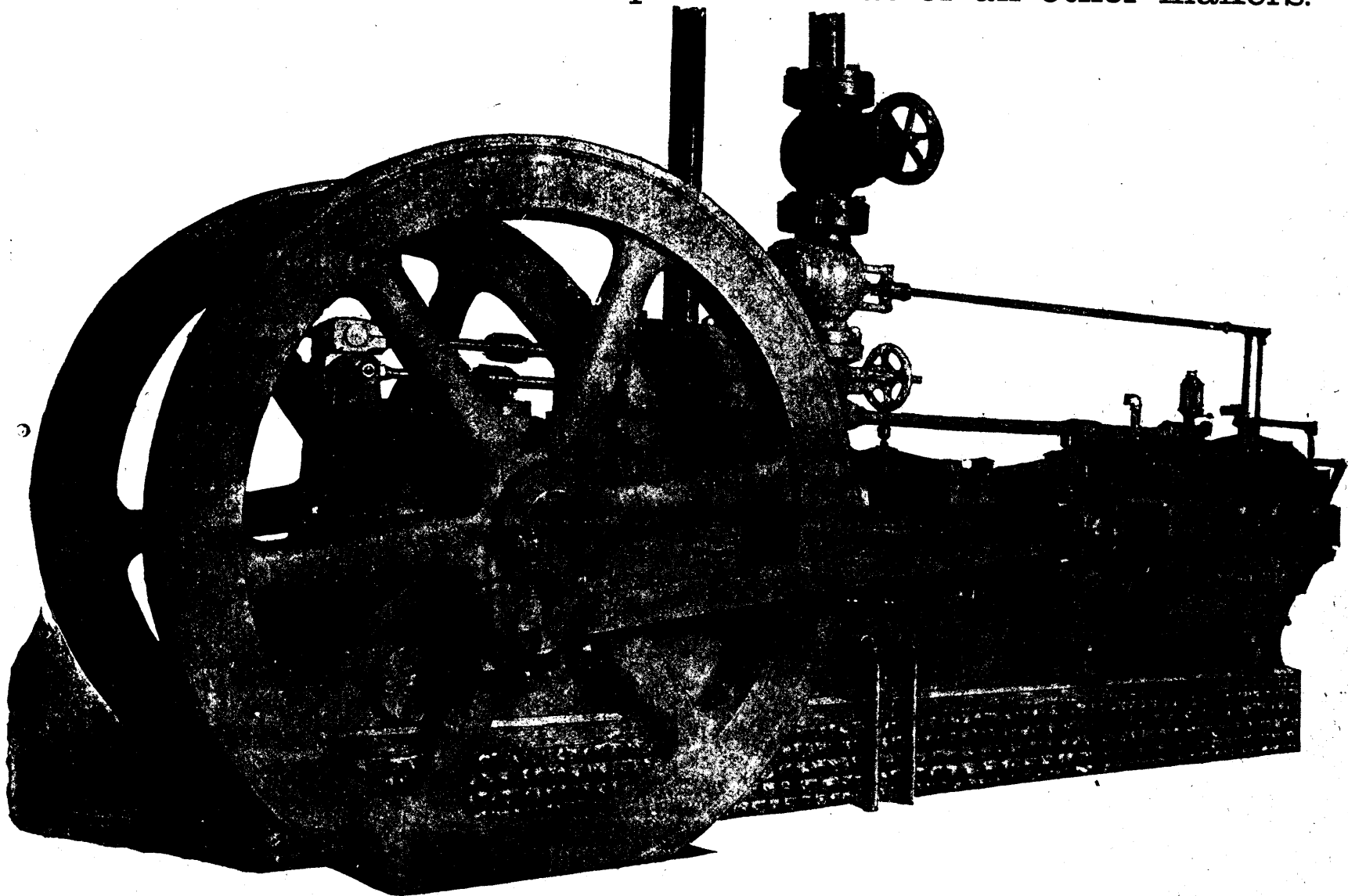
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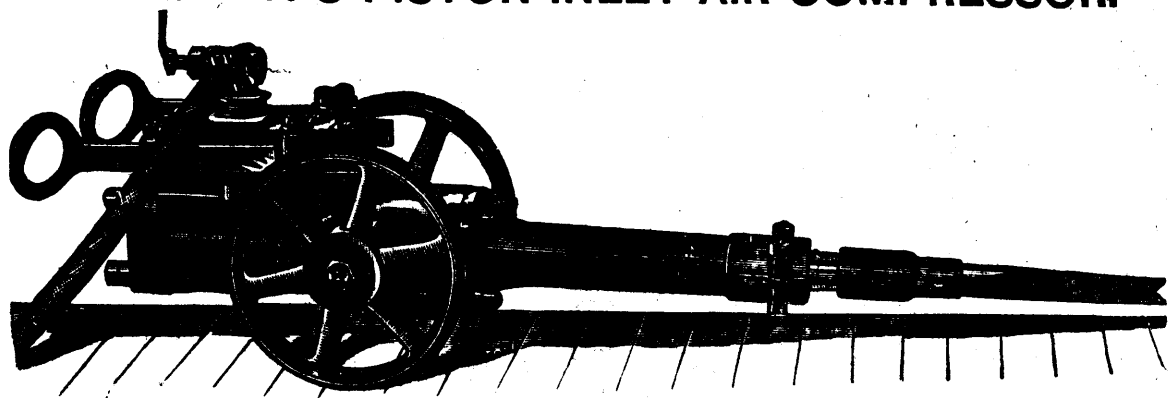


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