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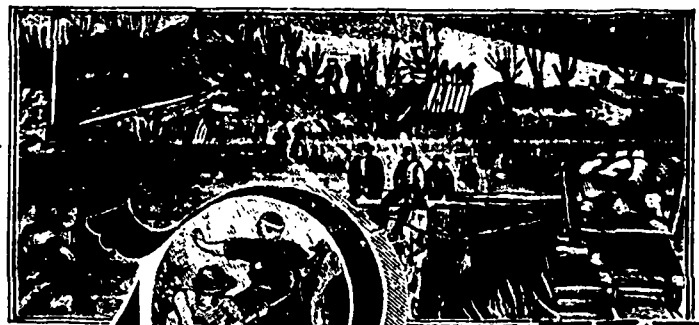
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REVIEW

Established 1882.

Vol. VI.—No. 4.

1888.—OTTAWA, APRIL—1888.

Vol. VI.—No. 4.

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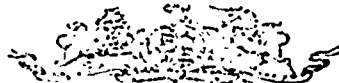
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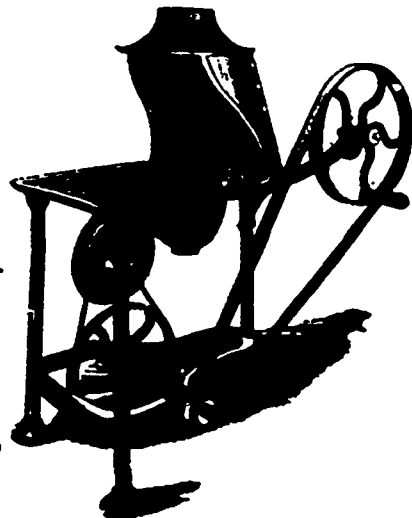
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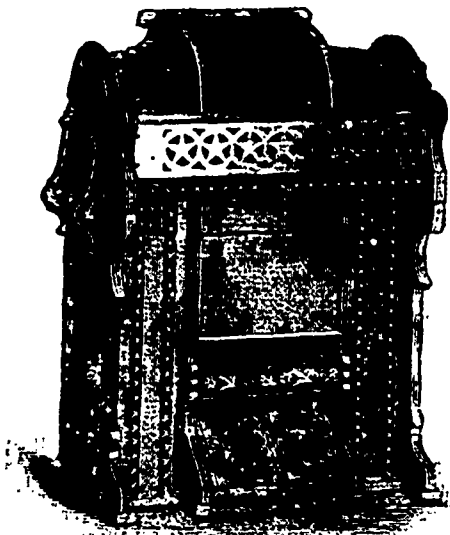
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readily understand the difficulty of obtaining accurate returns from far distant mining towns early in the year, but enough information can be gathered respecting the minerals most in demand to approximately approach a fair result. As our mining industries are annually more and more developed and fresh products find their way into the markets, so the list will continue to increase, a fact remarkably apparent in this new issue of the summary already. Mr. Coste is doing a good work in acquainting the public with facts, and the thanks not only of the mining community but of commercial men generally are due to him for the labor evinced and the evident pains taken to tabulate in so summarized a form such a mass of information. Only those who undertake such work realise the labor in condensing copious information into a table occupying only a page. The figures presented are the pith of weeks of labor, and the more condensed such statements are the more valuable they become. The following is Mr. Coste's summary slightly abbreviated:—

| NAME OF PRODUCT. | 1887. | |
|--|--------------|--------------|
| | Quantity (a) | Value (b) |
| Antimony ore..... tons | 434 | \$18,960 |
| Arsenic..... " | 30 | 1,200 |
| Asbestos..... " | 4,573 | 227,716 |
| Paryta..... " | 400 | 2,000 |
| Brick..... thousands | 139,185 | 725,694 |
| Building stone..... cu yds | 223,835 | 450,934 |
| Cement..... bbls | 69,843 | 81,909 |
| Charcoal..... bush | 1,610,900 | 88,323 |
| Chromic iron ore..... tons | 38 | 570 |
| Coal..... " | 2,368,041 | 5,208,429 |
| Coke..... " | 32,198 | 86,214 |
| Copper (c)..... lbs | 3,260,424 | 342,345 |
| Flagstone..... sq ft | 110,925 | 10,811 |
| Gold (d)..... ozs | 62,289 | 1,111,877 |
| Granite..... tons | 15,123 | 98,995 |
| Graphite..... " | 300 | 2,400 |
| Grindstone..... " | 2,772 | 35,368 |
| Gypsum..... " | 154,008 | 157,277 |
| Iron (c)..... " | 31,527 | 1,087,728 |
| Iron ore..... " | 76,330 | 146,197 |
| Lead (fine, contained in ore)..... lbs | 204,800 | 9,216 |
| Lime..... bush | 2,303,667 | 389,369 |
| Limestone for iron flux tons | 17,171 | 17,500 |
| Manganese ore (f)..... " | 1,630 | 39,672 |
| Marble and serpentine..... " | 242 | 7,845 |
| Mica..... lbs | 22,083 | 29,816 |
| Miscel. clay products..... | ..... | 78,670 |
| Ochre..... tons | 100 | 1,500 |
| Petroleum (g) (brls of 35 imp gals) | 594,411 | 463,641 |
| Phosphate (h)..... tons | 23,690 | 319,815 |
| Pig iron..... " | 24,827 | 366,192 |
| Platinum..... ozs | 1,400 | 5,600 |
| Pyrites..... tons | 38,043 | 171,194 |
| Salt (i)..... " | 66,173 | 166,394 |
| Sand & gravel (exports)..... | 180,860 | 30,307 |
| Silver (j)..... | ..... | 322,602 |
| Slate..... tons | 7,357 | 89,000 |
| Soapstone..... " | 100 | 800 |
| Steel (k)..... " | 7,326 | 331,199 |
| Sulphuric acid..... lbs | 5,477,950 | 70,609 |
| Superphosphate..... tons | 498 | 25,943 |
| Tiles..... thousands | 8,555 | 136,112 |
| Whiting..... brls | 500 | 600 |
| Total..... | | \$12,959,073 |

(d) Nova Scotia gold is estimated at \$19.50 an ounce and British Columbia gold at \$17 an ounce.
 (e) This includes 6 rolling mills, 1 forge and also the Londonderry Iron Works. The returns from the 4 Montreal rolling mills and from another mill at St. John, N.B., have not been received, and, unfortunately, render this statement incomplete.
 (f) The value of the Nova Scotia ore is estimated at only 25.00 per ton, as the returned quantity is thought to include a certain amount of low grade ore used in making paint.
 (g) Crude equivalent of the quantity (7,905,666 imp. gallons) of refined oils inspected, calculated at 100 galls. crude for 38 galls. refined. The direct returns received from 13 refineries give the quantity of illuminating oils and benzine and naphtha manufactured during the year as:—10,732,395 imp. gallons, worth \$1,022,739 and the actual corresponding consumption of crude returned as:—763,933 barrels.
 (h) Direct returns; the value is taken at an average of \$13.50 a ton at the mines. The production is divided as follows:—
 From Ottawa County mines..... 18,955 tons
 From Ontario mines..... 4,735 "
 Total..... 23,690 "
 which agrees very nearly with the Customs Department figure of export which is for the calendar year 1887:—23,152 tons with a declared value of \$433,217.
 (i) In barrels of 280 lbs. it would be 429,807 brls. The value is that of the salt alone, exclusive of packages.
 (j) Export returns plus \$126,318 estimated silver contained in the copper pyrites of the Capelton mines—together the total production is probably from six different mines.
 (k) Return probably not quite complete.

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**LETTERS TO
THE EDITOR.**
*
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*

We invite Correspondence upon matters consistent with the character of the REVIEW.
 Be as brief as possible. The writers name in all cases required as a proof of good faith.
 One dozen copies of the issue containing his communication will be mailed free to any correspondent on request.
 We do not hold ourselves in any way responsible for the opinions expressed in this section of the REVIEW.

Some Ontario Iron Deposits.
—
TORONTO, 12th April, 1888.

The Editor
 THE CANADIAN MINING REVIEW:
 SIR,—The Snowdon Iron District, Township of Snowdon, County of Haliburton, contains several valuable deposits of iron ore. About 7 miles east of Kinmount, the Monck Road crosses an ore bed on lot 20, 1st con., where the first discovery was made; the ore is magnetic, yielding by analysis over 60 per cent. metallic iron with small amounts of impurities. There appear to be considerable quantities of ore here, and the railway passing through the lot gives good facilities for mining.
 Ore from this district can be shipped very cheaply, either to Pennsylvania furnaces by all rail route, via Buffalo, or to Midland, on the Georgian Bay, by rail, and thence by boat to Chicago, cheap freights being obtainable in returning grain vessels.
 Chicago is an immense consumer of iron ore, the North Chicago Rolling Mills alone using 1,700 tons a day, so that if a trade were once opened up in that direction, it would be likely to swell to large proportions.
 Lot 27, in the 4th concession, shows on the north-east corner an exposure of magnetic iron ore 16 x 2½ feet, and a magnetic attraction 25 x 40 feet. On the west side is a vein where the attraction is over a space 40 feet wide by 600 feet in length, with 7 or 8 exposures of ore, and 100 feet further south a strong attraction 30 x 30 feet, with an exposure of iron sand and ore. The outcrops are on a hill 200 feet above the track of the Irondale, Bancroft and Ottawa Railway, which is about 1,000 feet distant. The ore may be mined by drifting tunnels into the hillside, and the ore loaded on the railway cars by tram-cars, which could be run down by gravity. The Burnt River runs directly in front of this ore range and affords good drainage.

The ore is of Bessemer quality, very free from impurities, as shewn by the following analysis by the chemists of two Pittsburg steel works:

| | | |
|--------------------|-------|-------------|
| Metallic iron..... | 62.57 | 63.00 |
| Titanium..... | None. | None. |
| Sulphur..... | None. | 0.025 |
| Silica..... | ..... | 3.1 |
| Phosphorus..... | 0.025 | Trace only. |

An exposure of limestone occurs on this lot, and there is plenty of timber for mining purposes. On lot 25 are several good shows of magnetic ore, an analysis of which is as follows:

| | |
|--------------------|--------|
| Metallic iron..... | 62.00 |
| Titanium..... | None. |
| Sulphur..... | 0.025 |
| Silica..... | 1.7 |
| Phosphorus..... | Trace. |

Between these two properties, on lot 26, in the 4th concession, is the Howland Mine, operated by Mr. C. J. Pusey. A shaft has been sunk here 80 feet, and is said to be in good ore, of which the following is an analysis:

| | |
|--------------------|-------|
| Metallic iron..... | 61.48 |
| Phosphorus..... | 0.01 |
| Titanium..... | None. |

Other shows of ore occur on lot 26. This ore range extends for about three-quarters of a mile across these lots, and, being so favourably situated on high ground close to the railway, possesses peculiar advantages. In close proximity to this magnetic iron range on lot 24, in the 3rd concession, Snowdon, are deposits of limonite or brown hematite. This ore, although not Bessemer quality, would be useful for a local furnace and for ordinary castings.

Close at hand is excellent water power on a creek which flows into the Burnt River, and on which there is a suitable site for a blast furnace; the position also being favourable for obtaining an abundant supply of cheap charcoal.

Belmont Mine.—The following are extracts from a report made by Prof. Thos. Heys, of Toronto, of a large bed of magnetic iron ore on lot 19, in 1st con., Belmont, Co. of Peterboro':

"This lot is about four miles nearly due north from the Village of Blairton, and there is a fairly good wagon road to the mine. There is a clearance of about 20 acres, the remainder being covered more or less with timber.

The ore deposit is situated near the east side of the west half, about midway between north and south on the lot, and has been cleared and underbrushed. On this is an exposure of magnetic iron ore, with the soil stripped to a depth of 4 to 5 feet. The excavation shows what appears to be a solid bed of ore, with a westerly dip of 20 degrees.

The ore is strongly magnetic, considerable portions showing a compact ore almost free from rock matter, and very free from sulphur.

Two other excavations were examined, one about 60 feet to the south and the other about 120 feet to the east; the ore in these was overlaid with surface soil to a depth of 2 or 3 feet. The character of the ore in these appeared to be the same as in the other exposure, some hematite of fair quality showing on the easterly side.

The extent of the ore-bed, as shown by the dip-needle, is more than two acres, measuring about 250 feet from east to west, by 390 feet from north to south. It is covered by surface soil to a depth of 4 to 5 feet (in some places, perhaps, more), which can be easily removed.

The ore-bed can be easily drained, as it lies close to a creek which would carry off the water.

The location is convenient for the shipment of ore, being about six miles from the Blairton station of the Canadian Pacific Railway, on two miles of which the rails are already laid, being a portion of "The Cobourg, Peterboro' and Marmora Railway," thus leaving only four miles to

(a) Quantity marketed except when otherwise specified. The tons are of 2000 lbs.
 (b) Market value less charges of transport from point of production.
 Nova Scotia and British Columbia values have not been received but are estimated as above, except for grindstones.
 (c) Quantity of fine copper manufactured from the ore of Capelton plus fine copper contents calculated from assay value in the other returns.

be constructed, the line for which is most favourable, over a level route with no engineering difficulties. "The Central Ontario Railway" runs about six miles east of the mine, in which direction there is also a most favourable route for a branch railway.

The facilities for obtaining hardwood and charcoal from the surrounding country are especially favourable from the close proximity of Belmont Lake and its tributary waters, including Crow River, which flows through lots 14 and 15 of the same range, within a mile and a-half of the mine.

A fine site for a blast furnace is found on Crow River, close to the branch railway line, on there is also a powerful and never failing water power.

Abundance of limestone for flux is found on these waters.

Judging from the ore exposures, the dip of the ore and the magnetic attraction in connection therewith, I consider the deposit to be very extensive, and there is no doubt it contains a large quantity of first-class ore, with no trace of titanium and practically no phosphorus or sulphur, while the rock matter "would be to a considerable extent self-fluxing."

Prof. Heys computes that this ore-bed contains at least one million tons of ore within 100 feet of the surface, and there should be no difficulty in producing 300 or 400 tons of ore a day.

A report made of the same property by Mr. F. D. Taylor, M.E., who has had large mining experience, contains the following:

"From the action of the dip-needle and from the three cross-cuts which had been cleared out showing an unbroken body of magnetic ore of an unusual width, I feel assured upon development it will prove one of the finest and largest iron mines on this continent. Although very high in metallic iron, it is by no means a refractory ore, and will be found in its working in the blast furnace that it will reduce very easily and not require above the average charges of coke to the ton.

"In the opening and working of this mine, it can be made to yield profits from the commencement (as the stripping is so light), and should be mined by the use of compressed air drills at a cost of 50 cents per ton, as little or no culling will have to be resorted to.

"This is one of the very few mines that can be taken hold of and put on a paying basis at a small amount for dead work. The expenses required will be simply for equipment and general buildings."

An analysis of surface ore made by Prof. E. J. Chapman, of "The Toronto School of Science," gave metallic iron, 64.26; sulphur, 0.04; phosphorus, faint trace; titanium, none. The Professor remarking "This is an exceedingly good ore; not too dense in texture and rich in metal. It is well adapted for the Bessemer process."

An analysis of ore taken from about six feet below the surface, made by Mr. W. F. Brugman, Chemist of "The Scranton Steel Co.," showed metallic iron, 65.36; phosphorus, 0.002; sulphur, slight trace; silica, 4.5; the chemist remarking on the exceptional purity of the ore.

Since these analysis were made more of the ore-bed has been uncovered, and two pits sunk in different parts of the deposit. In November, 1887, samples of ore were taken from all over the deposit and an average analysis made by the Chemist of "The Juliet Steel Co.," which gave iron, 66.29; phosphorus, 0.024; silica, 3.19; manganese, .42; titanio acid, none.

An analysis made by Prof. Davenport Fisher, of Milwaukee, of ore taken about ten feet below the surface, gave iron, 68.88; silica, 3.18; phosphorus, 0.006; titanium, none.

These analysis show that the ore improves as it goes down, and that it is almost as perfect Bessemer ore as can be conceived.

On the construction of the branch railway into the mine, ore can be shipped conveniently to United States furnaces, either by all rail route in returning coal cars or by "The Central Ontario Railway" to the ore docks on Weller's Bay, and thence by boat to port, either on the south shore of Lake Erie or Lake Ontario.

If we had Unrestricted Reciprocity with the United States, Toronto would be an excellent point for a blast furnace, at which ore from this mine could be delivered for \$2 per ton, which would include mining and freight; or, if there was no duty, it could be delivered in Buffalo for \$3 per ton in returning coal cars, or in Pittsburg, Pa., for about \$4.50 per ton, and would probably be the cheapest Bessemer ore that could be obtained there.

I am, etc.,
T. D. LEDYARD.

Mineral Statistics.

OTTAWA, April 16th, 1888.

The Editor

THE CANADIAN MINING REVIEW:

DEAR SIR,—I was very surprised to see in your last number, page 31, a table by Mr. W. Hamilton Merritt pretending to represent the

mineral output of Canada in 1887. As this is not the first time that such tables have been published and circulated not only in Canada but in the United States and England, and as their complete incorrectness may have a very detrimental effect on certain mining industries and certain mining districts, I think it my duty to point out how unreliable these statistics are. In the following table of Mr. Hamilton Merritt, which you published in your last number, I have introduced the correct figures (according to official statements) on the second line for each product, so that a glance at the table might show at once that almost every figure in Mr. Merritt's table is wrong and that they are grossly so in several cases. To take only, for example, the case of the copper: it is certainly very injurious to the mines of the eastern townships to have it published, not only in Canada, but in the United States and in England, that they only produced in 1887 1,385 tons, when their real output was 38,772 tons. The same may be said of the phosphate mines of Ontario which have produced 4,735 tons instead of 733, as shown by Mr. Merritt; also of the mica mines, antimony mines, &c.

I am, Sir, yours truly,

E. COSTE,

Mining Engineer to the Geological Survey, in charge Mining Statistics.

| | Nova Scotia. | New Brunswick | Quebec. | Ontario. | Manitoba. | N. W. T. | British Columbia | Total. |
|---------------------------------|--------------|---------------|-----------|-----------|-----------|----------|------------------|--------------------|
| Coal.....tons (a)..... | 1,524,000 | 700 | ..... | ..... | 0 | 69,000 | 413,370 | 1,998,000 tons. |
| ..... | 1,87,339 | 8,360 | ..... | ..... | 470 | 73,751 | 4,3860 | 2,367,200 |
| Gold.....\$..... | \$500,000 | ..... | 0 | ..... | ..... | 0 | \$793,709 | 1,293,709 dollars. |
| ..... | \$413,614 | ..... | \$1,604 | ..... | ..... | 2,160 | \$691,559 | 1,111,877 |
| Gypsum.....tons..... | 124,600 | 24,525 | ..... | 5,450 | ..... | ..... | ..... | 163,975 tons. |
| ..... | 116,314 | 29,102 | ..... | 8,560 | ..... | ..... | ..... | 154,008 |
| Iron Ore.....tons..... | 50,000 | ..... | 0 | 18,907 | ..... | ..... | 4,410 | 73,317 |
| ..... | 43,532 | ..... | 13,404 | 16,598 | ..... | ..... | 2,796 | 76,331 |
| Manganese Ore..... | 529 | 1,066 | ..... | ..... | ..... | ..... | ..... | 1,595 |
| ..... | 306 | 939 | ..... | ..... | ..... | ..... | ..... | 1,245 |
| Copper..... | 6 | 2 | 1,335 | 3,874 | ..... | ..... | ..... | 5,207 |
| ..... | 0 | 0 | 38,772 | 1,581(b) | ..... | ..... | ..... | 41,334 |
| Silver.....\$..... | ..... | ..... | 0 | \$215,035 | \$8,170 | \$,152 | 0 | 214,937 do'ars. |
| ..... | ..... | ..... | \$110,768 | \$184,503 | 0 | 0 | 17,331 | 322,612 |
| Salt.....tons..... | ..... | 13 | 65,890 | 60,16 | ..... | ..... | ..... | 65,890 tons. |
| Petroleum (crude).....bbls..... | ..... | ..... | ..... | 768,333 | ..... | ..... | ..... | 768,333 bbls. |
| ..... | ..... | ..... | ..... | 594,411 | ..... | ..... | ..... | 694,411 |
| Phosphate.....tons..... | ..... | ..... | 21,000 | 733 | ..... | ..... | ..... | 21,733 tons. |
| ..... | ..... | ..... | 18,955 | 4,735 | ..... | ..... | ..... | 13,690 |
| Asbestos..... | ..... | ..... | 3,590 | 1,000 | ..... | ..... | ..... | 4,590 |
| ..... | ..... | ..... | 4,173 | 400 | ..... | ..... | ..... | 4,573 |
| Mica (c).....lbs..... | ..... | ..... | 3,000 | ..... | ..... | ..... | ..... | 30,000 lbs. |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 22,033 |
| Antimony Ore.....tons..... | 174 | 0 | ..... | ..... | ..... | ..... | ..... | 174 tons. |
| ..... | 550 | 31 | ..... | ..... | ..... | ..... | ..... | 581 |
| Pyrites..... | ..... | ..... | 35,000 | ..... | ..... | ..... | ..... | 35,000 |
| ..... | ..... | ..... | 38,743 | ..... | ..... | ..... | ..... | 38,013 |
| Plumbago.....cwt..... | ..... | 7,189 | ..... | ..... | ..... | ..... | ..... | 7,180 cwt. |
| ..... | ..... | 6,000 | ..... | ..... | ..... | ..... | ..... | 6,000 |
| Barytes.....tons..... | 0 | ..... | ..... | 3,000 | ..... | ..... | ..... | 3,000 tons. |
| ..... | 400 | ..... | ..... | 0 | ..... | ..... | ..... | 400 |

(a) On the second line for each product the tons are tons of 2,000 lbs.

(b) Export figure.

(c) We are only at liberty to give the total but can say that there was much more produced in Ontario than in Quebec, and consequently that Mr. Merritt's figure is altogether wrong.

The Rock Formations of the Ottawa Valley and Natural Gas.

By Henry M. Ami, M.A., F.G.S.

In geology, as well as in other branches of physical research, it is often advisable and necessary to look back for a moment and consider the sum of evidence and facts which naturally accumulate in the work of investigation carried on in any particular district.

Much has already been published respecting the leading geological features of the Ottawa Valley. As far back as 1853 we find that Messrs. Richardson and Murray and other geologists, with Sir William Logan, carried on geological explorations in this district. The

results obtained by those pioneer geologists in Canada were embodied in the report entitled "Geology of Canada, 1863," and incorporated in the "Geological Map of Canada for 1866." This map gave the geographical distribution of the various geological formations in the Ottawa district, and the details of boundaries were laid down with such accuracy of detail as the facts at their disposal then allowed.

The eminent researches of Mr. E. Billings in strata about Ottawa are classic to every geologist and of incalculable value, especially with reference to the paleontology or fossil evidence which they contain.

In the "Canadian Naturalist and Geologist," as well as in the "Decades of the Canadian Survey," Mr. Billings published many papers and described a series of crinoids and cystideans, which have been admired all the world over.

Investigations in the fossil *Eelmiodermata* of our rocks have been followed up successfully by his nephew, Mr. W. R. Billings, of our Club, and each year sees new and interesting results added to these researches.

Since the organization of the Ottawa Field Naturalist's Club, in 1879, renewed energy has been manifest in the completion of the geological history of this district, and a number of active workers have contributed not a little towards ascertaining the extent, distribution and other details respecting the various formations occurring about Ottawa.

In 1881, Dr. A. R. C. Selwyn, C.M.G., F.R.S., &c., the able Director of the Geological Survey of Canada, delivered a very timely and interesting address "On the Geology of the Ottawa Palaeozoic Basin." (See Trans. C. F. N. C., Vol. III., p. 31, *et seq.*) There is there given a graphic, as well as instructive account of the various formations existing in the basin in question, which were deposited under such favourable circumstances in those old palaeozoic seas.

During the past nine years, the writer has had many opportunities, both as member and leader in the geological section of the Club's work, to examine the geological formations of the district and enter into numerous details of structure, more interesting and instructive perhaps, than remunerative, nevertheless of considerable value in working out the geological history of Ottawa. With a view of giving in a concise and practical manner the result already obtained, it has been thought that a table or schedule might better illustrate the same than a detailed description.

The question of natural gas occurring or not occurring in the strata of the Ottawa district has been and is still being freely discussed—a

question of considerable import from an economic standpoint and one which has given rise to this paper, written with a view to giving those interested in the matter a general idea of the succession of the rock formations as they are known in this vicinity. There are many problems involved in discussing the likelihood of gas occurring in a certain district. The characters of the strata, its thickness, composition, mode of occurrence and its distribution have everything to do with the occurrence of gas. The result of experiments made in other parts of the world, and especially in the United States, show that gas occurs in rock of almost any age in the history of the earth, and in comparing the rocks of the Ottawa district with those of similar age and origin in the States which are known to afford natural gas, even there do we find questions of detail and structure coming in which prevent any one from making the rash statement that it does or does not occur here. For example, whilst it is well known that the Trenton formation in several places yields natural gas—nevertheless, it does so when the limestones of that rock-formation are dolomitic (Prof. Orton), which character we know does not apply to the Trenton as it is developed about Ottawa. It is also a remarkable fact that, besides the three great faults or dislocations indicated by Sir Wm. Logan ("Geology of Canada, 1863") to affect the geological structure of the rocks here, there are large numbers of smaller ones which constitute a more or less parallel series of breaks of great importance in working out the geological structure of the country, and which act as so many chimneys or openings whence natural gas may have been escaping for ages past, had the strata ever been impregnated with this substance. Whilst the

writer would be pleased to see natural gas occurring in large quantity and easy of access for manufacturing and other purposes, and whilst there are many points occurring in the geology of Ottawa which make it desirable that borings be made to ascertain if gas really does occur in paying quantities; nevertheless, the result of his researches lead him to conclude that there are undeniable evidences which point to the likelihood of gas not occurring in quantity about Ottawa. A bore sunk through the Hudson River, Utica and Trenton formations would soon reveal the fact of its occurrence, yes or no.

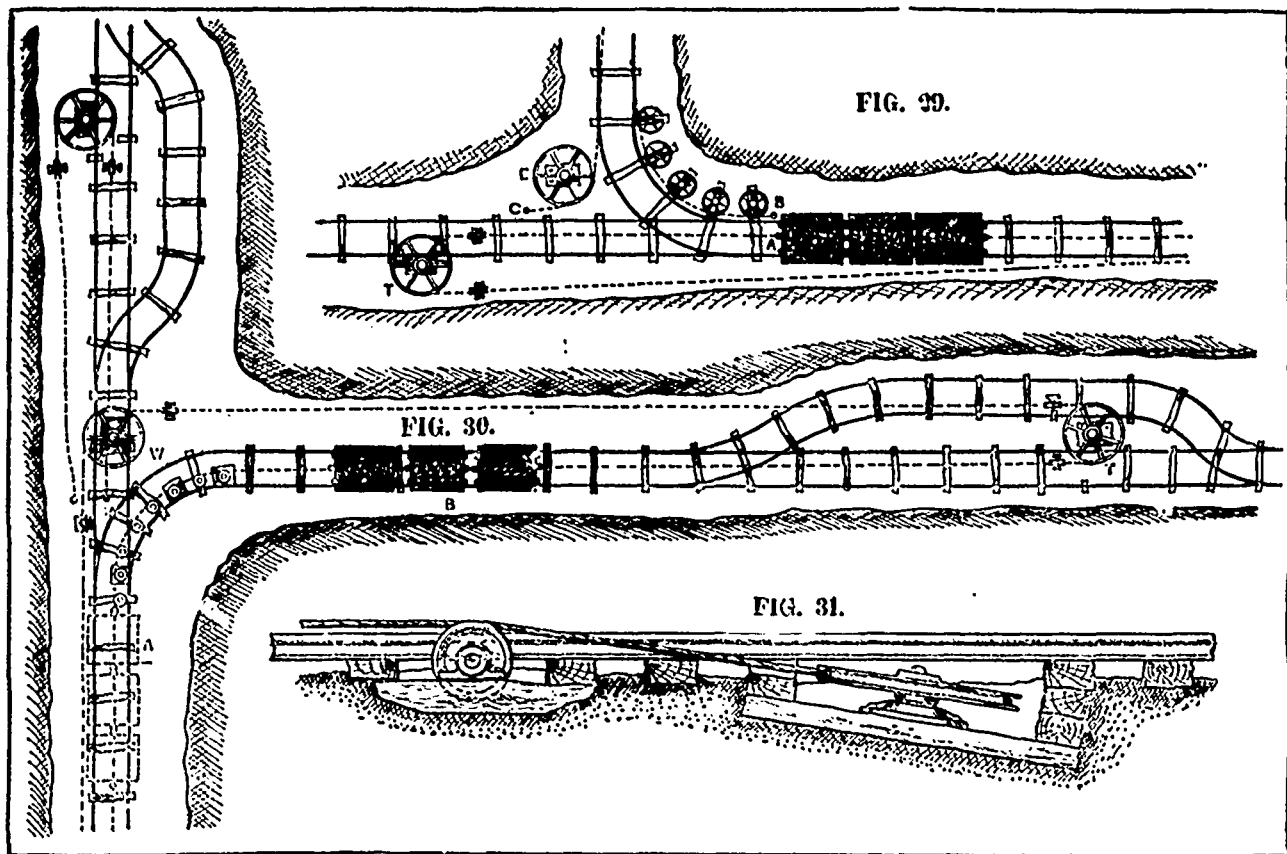
The following table has been prepared with a view of giving at a glance and in chronological order the different rock-formations met with. It does not by any means profess to be exactly accurate, but it has been drawn up from the evidence obtained in the field at the excursions and sub-excursions of this Club. These rock-formations divide themselves into three naturally grand divisions as they may be seen in the field, belonging to three different ages or epochs of the earth's history:

- I. Laurentian or Archæan.
- II. Cambro-Silurian or Ordovician.
- III. Post-Tertiary or Post-Pliocene.

The local development of the second division, viz., Cambro-Silurian formations, include a series of formations which succeed in perfect unbroken sequence from the Hudson River formation above to the Potsdam sandstone below. For reasons, palæontological and stratigraphical, which it is not within the province of this paper here to discuss, the writer has placed the Potsdam and Calciferous formations along with the other overlying series into the Cambro-Silurian System, rather than class them in the Cambrian System.

TABLE showing the Rock-Formations about Ottawa City, in their Natural Order.

| SYSTEM. | FORMATION. | CHARACTER OF STRATA. | FOSSILS. | THICKNESS. |
|--------------------------------|--|---|---|---|
| POST-TERTIARY | Alluvium, shell-marl, fresh water sands, lake and river gravels. | River and lake alluvium. sands and clays, shell-marl (white clays), ancient low beaches, stratified gravels. | Recent fresh water shells, plants and other organic forms. Pre-historic remains of Aborigines, along with <i>Castor fiber</i> , <i>Ariæcus Virginianus</i> , <i>Limnæa galbana</i> . | Vary from 0 to 50 feet in different places. |
| | Saxicava Sand (maine) | Marine sands | <i>Saxicava rugosa</i> , <i>L. Natica affinis</i> , Gmel, &c. | Vary from 0 to 6 feet and more. |
| | Leda clay (marine) | Chiefly stiff, blue clay, with occasional nodules, boulders and sandy portions. | <i>Leda</i> (Portlandia) <i>arctica</i> , Gray. <i>Phoca groenlandica</i> and <i>Mollotus villosus</i> , insects, star fishes, &c | Varies from 0 to 120 feet and more. |
| | Boulder clay | 'Till,' 'moraine profonde,' glacial deposits. | No fossils yet discovered | 0 to 30 feet. |
| CAMBRO-SILURIAN or ORDOVICIAN. | Hudson River | Buff weathering calcareo-arenaceous shales and limestones. | <i>Zygospira fecunda</i> , B. <i>Ambonychia radiata</i> , H. <i>Crytolites ornatus</i> , Con. <i>Modiolopsis pholadiformis</i> . | About 20 feet (known), probably thicker. |
| | Utica | Black or dark bituminous shales and limestones. | <i>Leptograptus flaccidus</i> , H. Orthogr. quadimucronatus. <i>Triarthrus spinosus</i> , B. <i>Asaphus canadensis</i> , C., &c. | From 60 to 75 feet. |
| | Trenton | Nodular and evenly bedded for the most part light coloured limestones, with occasional shaly measures, in part bituminous. | <i>Prasopora Selwyni</i> , N. <i>Glyptocrinus ramulosus</i> , B. <i>Pleurocystites squamosus</i> , B. <i>Anazyga recurvirostra</i> , H. <i>Murchisonia bellicincta</i> , H. <i>Asaphus platycephalus</i> , S., &c., &c. | Between 400 and 500 feet. |
| | Bird's Eye and Black River. | Hard, compact, impure fossiliferous limestones (cement-rock). | <i>Tetradium libiatum</i> , S. <i>Columnaria Halli</i> , N. <i>Maclurea Logani</i> , Salter. <i>Gonioceras anceps</i> , H. <i>Bathyurus extans</i> , H., &c., &c. | About 200 feet. |
| | Chazy | Limestones Shales Sandstones and sandy shales | <i>Lingula Belli</i> , B. <i>Orthis imperator</i> , B. <i>Asaphus canalis</i> , B., &c., &c., &c. | 20 } 30 } 200 feet. 150 } |
| | Calciferous | Magnesian limestones, quartziferous, passing downwards into arenaceous rock. | <i>Ophileta compacta</i> , S. <i>Murchisonia Anna</i> , B. <i>Lituites Apollo</i> , B. <i>Orthoceras Lamarcki</i> , B. | 250 to 400 feet. |
| | Potsdam | Sandstones and sandstone conglomerates | <i>Ophileta compacta</i> , S. <i>Orthoceras</i> sp. <i>Scolithus Canadensis</i> , B. <i>Clinactinulites</i> , &c., &c. | About 260 feet. |
| LAURENTIAN or ARCHÆAN. | Laurentian (Lower) of Logan | Granitoid gneisses, pegmatite, diorites, crystalline limestones (newer), &c., with apatite, graphite, iron ores, garnet, jasper, galena, barytes, gold, &c. | <i>Fozoon. Canadense.</i> (Dawson.) (In limestones.) | 16,500 feet, according to Logan. |



Wire Rope Haulage and its Application to Mining.

By Frank C. Roberts, C.E., Philadelphia, Pa.

Continued from March Issue.

II. c. AERIAL PLANES. (1) -- It frequently occurs that the character of the route renders the construction of surface planes a matter of great difficulty and expense. To such cases the application of aerial planes has peculiar advantages. These planes consist of wire ropes extending between the points of desired communication. Upon these cables the carrying vehicles or carriages travel, the ropes serving as tracks. This system, as in the case of surface inclines, admits of single or double planes and may be operated by engine power or gravity, according to the conditions and requirements of the case.

Aerial inclines find frequent application in mountainous regions and in the hoisting of material from large open-cut mines or quarries. Fig. 24 shows a serviceable application of the single rope system. This system is especially adapted to quarry work where the loading point is continually shifting. As shown, the incline consists of a single wire rope, one end of which is made fast at the bottom of the quarry, while the other end passes through the head of a derrick or mast to an anchorage on the bank beyond. The hauling rope being fastened to one side of the carriage, passes downwards around the hoisting blocks and up again to the carriage, from whence it continues on to the hoisting engine. Attached to the main wire rope and immediately over the loading point in the quarry is located the stop block. (2) This block arrests the descent of the carriage beyond its position, but the hauling rope continuing to be paid out, the hoisting blocks are lowered into the quarry. Inclines of this character will readily hoist 150 to 200 tons per day.

Where the grades are excessively steep and large output is required, the double-rope system will be found very serviceable. The governing principles are similar to those of surface-inclines,

the two ropes serving instead of the surface track. Figs. 25 and 26 show this system as applied to the diamond mines of South Africa.

III. WIRE-ROPE HAULAGE.

Experience has clearly demonstrated that, where the output of a mine is sufficient to warrant the use of mules in hauling the product to the hoisting slope or shaft, the most economical method of underground transportation is obtained by the use of wire rope. So generally has this conclusion been accepted that, since its introduction a few years ago, the system has been extensively applied both at home and abroad. These remarks are especially true of the bituminous coal regions of Pennsylvania, where there are but few mines of large output where one or another of the wire-rope systems is not in use.

Wire-rope haulage may be divided into three systems, viz: the tail-rope, the counter-rope, and the endless-rope systems.

III. a. THE TAIL-ROPE SYSTEM.—In this system the hauling-engine is located at a convenient point, generally the adit, and the *main* and *tail* ropes are attached to two rope-drums, seated on the engine shaft. The end of the main rope leading from the drum is attached to the forward end of a train of cars, while the tail-rope, running along the side of the entry to the end of the line of tracks, passes around a sheave or wheel, so located that the rope is brought midway between the rails. The rope continuing between the rails is fastened to the rear of the train. In connection with each drum there is a friction clutch, by means of which one drum may be driven by the engine, while the other runs freely on the shaft. Thus, when a number of cars are drawn to the adit the *main* rope is wound on its drum while the *tail* rope is paid out. To take the empties back into the mine, the ropes are attached to each end of the train as above, the engine is reversed, and the tail-rope, now acting as the hauling rope, draws the cars back into the workings.

In application, this system naturally divides into two sub-systems: 1st, that in which the

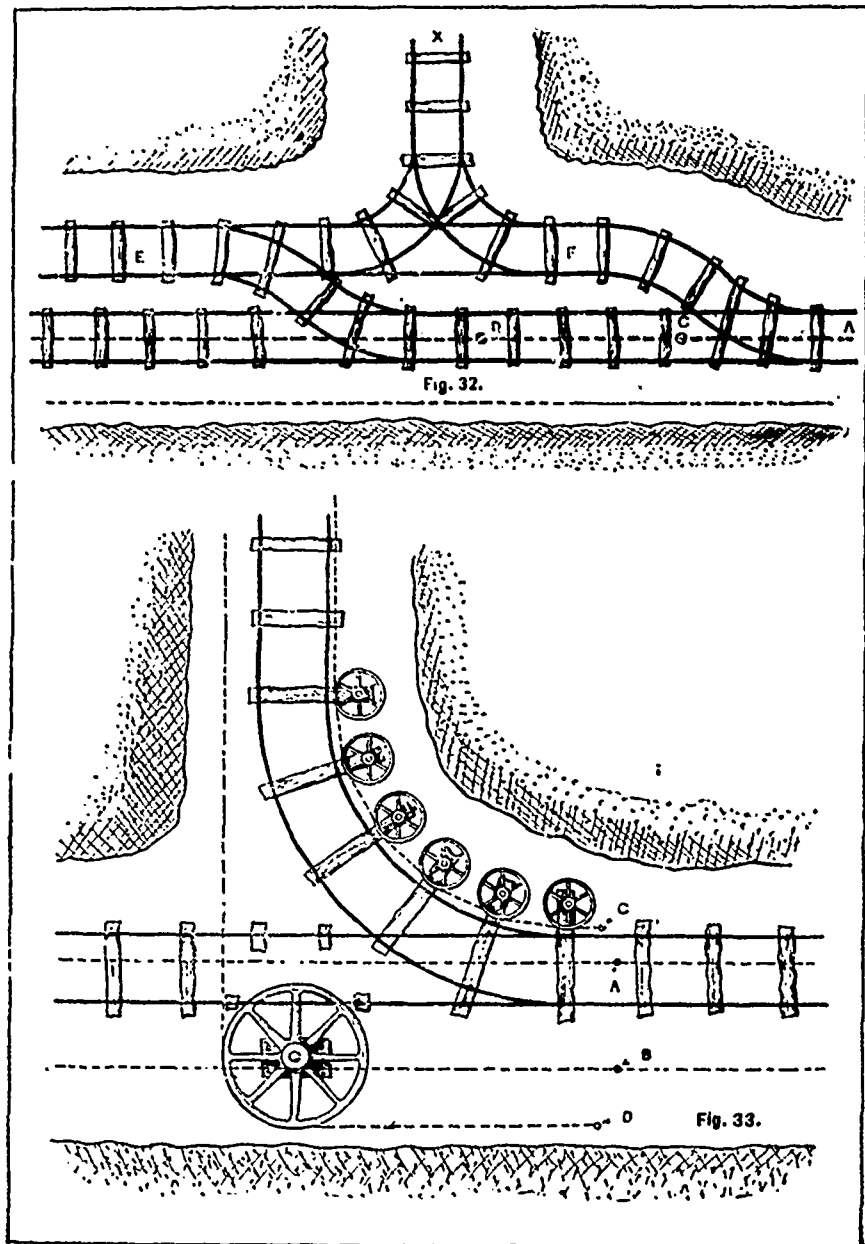
main entry only is operated by wire rope, the mining product being transported from the side-workings or entries to the haulage track by mules or gravity; and, 2d, that in which the side-entries also are operated by wire rope, the haulage-system in this case extending to all parts of the mine. One of the best systems of the former class is illustrated in Fig. 27, and is in use in one of the coal mines on the Monongahela River. The circumstances of location are such that it is necessary to place the engine and drums at a point intermediate between the two terminals, and not, as is usual, at one or the other end. This makes it necessary to employ two tail-sheaves, one at the parting A, and another at the parting B. The main rope is fastened to the drum M, and passing off is led around the tail-sheave at B, and attached to the forward end of the train at C. The tail-rope, on the other hand, is fastened to the drum T, and is led thence around the tail-sheave A and attached to the rear of the train. The main rope is supported between the rails by 6-inch rollers, about eighteen feet apart; and the tail rope is supported overhead along the sidewalls by rollers supported from the hanging-wall or roof of the pit. The rope is guided around curves by 12-inch wooden sheaves, arranged as shown in Fig. 18. At the sharp bends, guide-sheaves 4 feet in diameter are placed, and guard-rails are introduced at the sides of the track to prevent the derailing of the cars due to the angular pull of the rope at this point. The engine is double-acting, with 10-inch by 12-inch cylinders, and 4-foot diameter drums, geared 1 to 5½. The road is approximately 3,300 feet long, and its daily capacity is about 750 to 900 tons. The wire rope employed is steel, 7 wires to the strand; the main rope being ¾ of an inch in diameter, and the tail-rope ½ of an inch. In this instance the coal is hauled by mules from the side-entries and branches to the general parting. When a sufficient number of cars have accumulated, the main rope is attached to the forward end of the train and the tail-rope to the rear end, and the train is hauled to the tippie. This is the simplest form

of the tail-rope system, and were that system thus limited to the operation of one line, much less might be said in favor of it. To transport the mining product to the main entry with mules, and then transfer it to the rope system, is less economical in every way than to extend the operation of the rope-haulage system to the various workings. The additional first cost of a complete system is very slight, but the advantages gained in economy and convenience are multiplied. Each entry is here provided with its own separate rope passing around a tail-sheave at the end of the working, and supported in the usual manner by rollers. The rope is of such length that the two ends reach to the main entry, and, when not in use, rest on the ground. Again, the rope in the main entry is divided into as many sections as there are entries or branches, the connections being arranged at such distances that when the train is at the tippie one set of these connections is opposite each side-entry or branch. In this manner, when it is necessary to haul a set of cars into any particular one of the side entries, the connections of the rope in the main entry opposite the side-workings to be operated are detached, and the engine end of the main rope is attached to the extremities of the side rope which, as before mentioned, extends into the side working. When the connections have thus been made, we have what corresponds to the original continuous rope; but, in this case, the tail-sheave for the rope is located in the side-entry.

Figs. 29, 30 and 33 illustrate the usual methods of arranging the side-entry ropes. Fig. 33 shows the arrangements permitting the changing of the rope when the cars are at the adit. In this case, when it is desired to haul a set of cars into the side entry the main rope is detached at A and B, while the entry rope ends C and D are connected to A and B, thus forming a continuous rope passing into the entry. Figs. 29 and 30 illustrate other arrangements, both of which are based upon changing the rope connection when the cars are near the side-entry, and not, as in the former case, at the terminus of the system. In Fig. 30, the guide-wheel W is placed under the main track, to permit the free passage of the rope, and the connections being severed, as before, one end of the entry-rope is attached to the train and the other to the main rope; and in this manner the side entry is operated as shown. The dotted lines at A show the position of the cars while the disconnection is made, B showing the train after passing into the entry. Fig. 29 shows an arrangement whereby but one disconnection is made in the main entry-rope, namely at A, the head of train. The end B of the entry-rope is here attached to the car and the end A of the main rope, being free, is drawn a little farther by the engine and attached to the end C of the entry-rope. In both of these latter arrangements, where the road is not level, the disconnection is, of necessity, made while the rope is under a severe stress, thus rendering disconnection a difficult matter. This is not true of the method illustrated in Fig. 33, as the ropes are here disconnected while the cars are at the end of the system and the rope is consequently free from stress.

When operating a side-entry by either of the arrangements illustrated in Figs. 29 or 30 it is customary to facilitate disconnection by employing what are known as "knock-off" links. Figs. 31, 35 and 36 illustrate three devices that have given great satisfaction. Fig. 38 shows a shackle-joint, which is frequently used in making the connections between the sections of rope.

The usual method of locating the tail-sheave is illustrated in Fig. 31.



When it is found necessary to locate intermediate loading points in the main or side-entry between two terminals, the arrangement illustrated in Fig. 32 will be found convenient. Suppose a branch to a side entry at X and it is found necessary to have a switch station for loaded and empty cars at X. The empty cars coming from the direction A, the rope ends C and D are knocked off at these points, and the empties run on siding E. The rope extremities are now about opposite the front and rear cars of the loaded train at F, and can be attached at the forward and rear ends and hauled to the adit. Other dispositions of tracks and switches are sometimes employed, but none that have proved themselves so efficient.

The rope is taken around curves by either of the two methods illustrated in Figs. 17 and 19. The main rope is supported as usual by rollers, placed between the rails and the tail-rope by rollers along the side of the entry, such as are shown in Figs. 15 and 16.

Figs. 40 and 40a show the improved types of tail-rope hauling-engines manufactured by the Ottumwa Iron Works, Ottumwa, Iowa. That

illustrated in Fig. 40 is known as a *single two-drum engine*. It consists of two engines with cranks at right angles, coupled to a common shaft carrying two pinions meshing in turn with two spur-wheels keyed to the drum-shaft. There are two drums, one for the main and the other for the tail-rope. This type of engine is adapted for location at either end of a haulage-plant.

It is sometimes very desirable, owing to the relative position of the workings, to place the hauling engines in the center of the mine and to operate the rope system in opposite direction from that point. To such conditions the engine illustrated in Fig. 40a is admirably adapted. Four rope-drums are provided, enabling the operation of two separate and distinct tail-rope systems.

The motion of the drum in both the foregoing engines is controlled by an improved cone friction device, the operation of which is simple and effective. These engines are also provided with automatic indicators, the purpose of which is to enable the operator to determine the position of the train at any moment, and consequently to govern all stoppages, and provide for variations

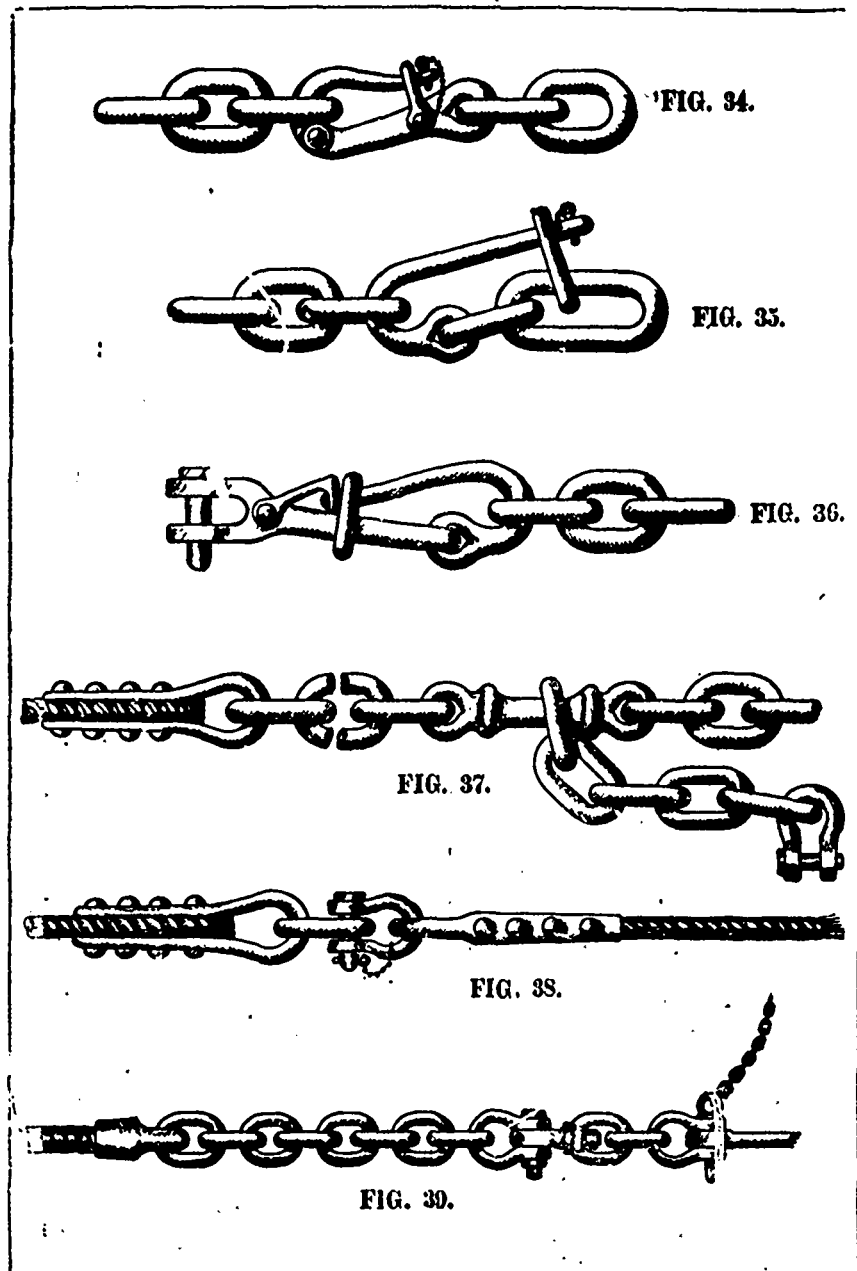
in grade. I append a table of the tractive power of these engines.

| Cylinders. | | Pipes. | | Drum Specifications. | | | | | Load in tons of 2000 lbs., on a grade of | | |
|---------------------|-------------------|---------------------------|-----------------------------|----------------------|-------------------|-----------------------------------|-----------------------------|------------------------|--|-------------|-------------|
| Diameter in inches. | Stroke in inches. | Diameter of steam inches. | Diameter of exhaust inches. | Diameter in inches. | Length in inches. | Capacity of each in feet of rope. | Diameter of rope in inches. | Diameter of full rope. | 10 per 100. | 20 per 100. | 30 per 100. |
| 12 | 16 | 3 1/2 | 4 1/2 | 48 | 36 | 2500 | 36 | 36 | 30 | 15 | 7 1/2 |
| 12 | 16 | 3 1/2 | 4 1/2 | 48 | 36 | 3100 | 42 | 36 | 19 | 9 1/2 | 4 3/4 |
| 12 | 16 | 3 1/2 | 4 1/2 | 48 | 36 | 4000 | 44 | 36 | 25 | 12 1/2 | 6 1/4 |
| 12 | 16 | 3 1/2 | 4 1/2 | 48 | 36 | 5000 | 48 | 36 | 35 | 17 | 8 1/2 |
| 12 | 16 | 3 1/2 | 4 1/2 | 48 | 36 | 5000 | 48 | 36 | 35 | 17 | 8 1/2 |
| 12 | 16 | 3 1/2 | 4 1/2 | 48 | 36 | 5000 | 48 | 36 | 35 | 17 | 8 1/2 |

III. b. THE COUNTER-ROPE SYSTEM.—This is closely allied to the tail rope system, the chief distinction being that in this case the tail rope is replaced by a main rope operated by a separate engine. Briefly, the counter-rope system consists of two stationary engines, one in the mine and one outside, alternately pulling a train of cars in and out by means of two ropes, the one attached to the forward and the other to the rear end of the train. One rope is thus wound over the hauling-drum while the other runs freely of its drum, which, for the time being, is disconnected from the engine. The details of this system being almost identical with those of the tail-rope system, I content myself with describing in brief a counter-rope plant in actual practice.

Fig. 28 illustrates the general plan of a mine in the Monongahela region. The main hauling-drum and engine are located outside the mine near the adit, while the other engine and drum are located about 500 feet from the parting at the end of the entry. The rope is guided around the curve by six iron sheaves 18 inches in diameter, placed outside the track (see Fig. 18) about 10 apart. Guardrails are, as usual, placed at this point to prevent the cars from leaving the track. The ropes in this plant are connected end to end by means of a chain, as shown in Fig. 37. The number of these connections varies according to the length of the train. The maximum number of cars hauled by this plant is 40, representing about 80 tons; in this case four connections are made. The length of the line is about 6,600 feet, and the rise about 1 in 30. A crucible steel rope, 3/4 of an inch in diameter, is employed, and lasts about one year. The rope is supported every 20 feet by 6-inch rollers. The tail-sheave is 48 inches in diameter. The main drum is 60 inches in diameter, and is operated by a 16-inch by 24-inch engine geared 1 to 2 1/2. The fly-wheel weighs 5 tons.

This system has been extensively applied in Europe, the conclusion of European engineers



being that the counter-rope system forms the cheapest method of underground transportation where the output exceeds 800 tons per day. This is undoubtedly true where only the main entries are operated, but if we include the working of side-entries the above conclusion is probably at fault.

III. c. THE ENDLESS-ROPE SYSTEM.—Endless-rope haulage may be divided into two systems: 1. That in which the motion of the rope is continuous in one direction; and 2. That in which the rope is driven alternately in opposite directions.

The first system is that known as the "double-track." In this case one track is used for ingoing and the other for outgoing trains. The rope is led from the engine-drum to the centre of one track and continued to the terminal, where it passes around a tail-sheave placed at the end of the engine. In the latter, or "single-track" system, the hauling side of the rope passes from the drums midway between the two rails to the terminal, where it is led around a similar sheave, and continued back to the engine along the side of the entry. The latter is practically the tail-rope system, used in connection with an endless wire rope. The chief advantage of the endless system is that it permits stopping or starting the train at will without interrupting the motion of the engine, and

in this manner does away with the system of signals necessary to a tail-rope plant. A familiar application of this system is that of cable-railways for passenger traffic, which in fact is a complete and extensive endless-rope haulage-system.

In this system, as in the tail-rope, curves are passed most advantageously by the use of small iron wheels 12 inches to 24 inches in diameter, placed as shown in Figs. 17 and 19, their distance apart being governed by the radius of the curve.

The operation of the side-entries and branches in the single-track system is similar to one of the tail-rope methods (see Fig. 29), except that in this case the rope is continuous. Fig. 41 represents the method of operating a side-entry in connection with the double-track system. Let us suppose a train of empties at X. Should it be desired to run them into the entry B, the switches are set at the branch D, and the grip being attached to the moving rope, the cars are taken to F, where they are loaded and switched to the other track by E. Here the rope is gripped and the cars are taken to the junction with the main entry at K, where the rope is detached from the train, the latter being allowed to continue by its own momentum to the return track X. The rope is again taken hold of, and the cars are carried to the adit. Should it be

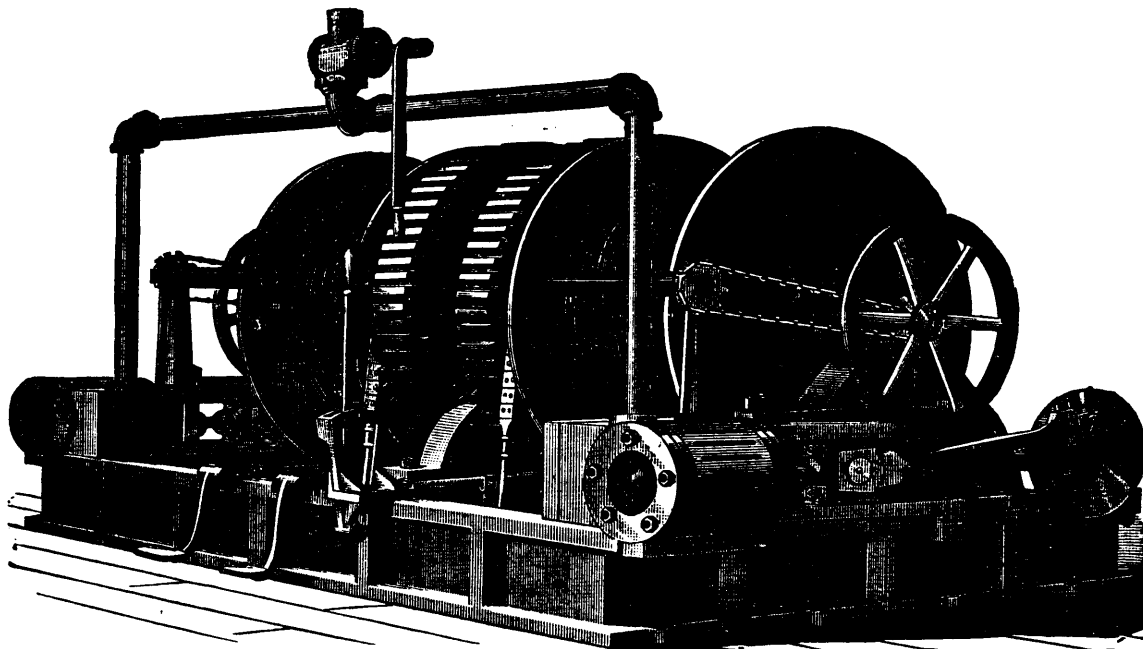


FIG. 40.—Two-drum Reversible Hauling Engine.

desired to run the cars direct to A the cars are detached from the rope just before reaching the entry B, and pass this point by their momentum; the rope is again gripped and the cars are drawn to switch E.

(To be Continued.)

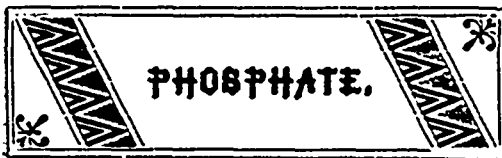
Estimating Mine Values.—It may not be impossible to establish some basis upon which the valuation of mines should rest. At any rate it is a subject which should be more generally understood, because it is in the direction of placing mining upon fair and just grounds, and seeks to prevent the expenditure of more money upon mines than they are reasonably worth. As a rule there is little danger of a mine being over-estimated. It is probable, however, that any such a basis would not be satisfactory to those who expect to realise enormous profits from dealing in mining stocks, instead of being satisfied with the actual yearly profits obtained from a mine. Eventually, no matter how they are twisted and turned, all the factors in the mining problem are resolved into these three: cost, production and risk. It is not impossible to state the two first mentioned with something like mathematical exactness; the latter must necessarily depend upon a variety of circumstances, peculiar to each case, though a few general rules applicable to all cases, might be formulated. It is this factor of risk which causes the English investors to place so great a value upon the record of a mine. They correctly argue that a fairly well developed mine—if a fissure vein—is well nigh uniform in its characteristics, and that its future production can be judged from its past. Consequently the record of a developed mine is considered nearly if not quite erasing the factor of risk, leaving it a problem which involves only cost and production, in which the future of both can be stated with a reasonable degree of certainty. That our English friends have not always been correct we know from the fact that they have purchased mines, because they had a record, but which were almost exhausted. Some of them have also learned that the question of management is intimately connected with the risk factor. Whatever may be said to the contrary the record of a mine should be given a prominent place in estimating values, though it should never be forgotten that every ton of ore extracted to make that record, by just that amount reduces

the aggregate of the contents of the mine; and when all those contents are gone the mine is worthless. It is this question of risk which is the stumbling block in establishing a basis for values. But the cost and production factors are too often largely neglected. Cost includes not only the first cost of the mine, but interest on the money, the cost of development, if any be necessary, and the cost of extracting and marketing the ore. Production should not only pay all of these expenses, but provide a sinking fund to pay back the original investment before the exhaustion of the mine, and should pay a profit in addition to offset the question of uncertainty; and that profit should be, more or less, just in proportion to the extent of the risk. An illustration of how cost, production and values were in one case correctly estimated, came to the notice of the editor very lately. Seven years ago a report was made upon a mine which at that time had a shaft nearly 200 feet in depth and drifts both ways from the shaft at 50, 100 and 150 feet from the surface. These drifts aggregated 750 feet in length and opened up a vertical block of ground, which measured 150 x 250 feet. The thickness of the ore was 2 feet, and the measurements of the shoots indicated that about one-half of it was pay ore, having an average assay value of \$32 per ton. This ground, then, would yield 3,750 tons of ore having a total assay value of \$120,000. The cost of stoping and hoisting was placed at \$3 per ton, and the cost of shipping to market and treatment was placed at \$15 per ton, while the discount on the assay value of 10 per cent. was \$3.20 per ton. This, then, made the cost of obtaining each ton \$21.20, or \$79,500 as the total cost of obtaining \$120,000, leaving a profit of \$59,500. As one year was required for the extraction of the ore, the interest on the investment, amounting to \$6,000 per annum, was deducted, leaving the total net profit of \$53,500. The mine then was worth at least that much, as could be determined with a reasonable degree of certainty. But now comes in the calculation of the value of the chance to find more ore in the mine than that shown in the reserves. It was the factor of risk. The ore shoots presented every appearance of permanency, or continuity from one drift to the other. As the vein was covered with "slide," nothing could be told from surface indications regarding the probabilities of finding ore in the lode beyond the drifts. Assuming

that the ore should continue in value and quantity at depth as it was shown in the drifts, and allowing for increased cost of working as depth was gained, each ton of ore below the lower workings would give a net return of \$6, and the yearly product could be made to reach 5,000 tons, giving a yearly return of \$30,000 net. Of course, the ore might, in the unseen portions of the mine, decrease in quantity or quality, or both, and it might, on the other hand, improve in one or both ways. The assumption, however, considered all that could be hoped for, and ordinary prudence dictated that the estimates should be cut in two, making the yearly income of the mine \$9,000, after deducting for interest on investment. Out of this \$9,000 had to come whatever amount was desired to set aside for the sinking fund, and the profit to pay for the risk. The life of the mine was placed at ten years, during which time the sinking fund would have to amount to \$50,000, or \$5,000 per year, leaving \$4,000 yearly profit to offset the risk. Seven years have elapsed, and the purchasers have just given the information that the mine has paid for itself, besides interest on the money invested, and gives as good promise of future profits as it ever did. The incident is noted to show one method of arriving at mine values; incidentally, it shows two other opportunities of profit in mining; one is for the man who takes a good prospect and intelligently develops it into a mine, and the other is the chance which exists for the investment of money in legitimate and profitable mining.

Ventilation with Mine-Gas.—The Cincinnati Colliery, near Pittsburgh, is ventilated by mine-gas—that is to say, the fire which gives the upward current in the upcast shaft is a mine-gas flame. Formerly coal was used; but it having been found that a clay seam in the mine gave out a considerable quantity of gas, it was decided to use the gas for ventilating purposes, thus compelling fire-damp to do useful work. Pipes are sunk in the clay, and the gas rising in them is collected and conducted in pipes to the bottom of the upcast shaft, where it is burnt.

E. GAUJOT,
MINING ENGINEER.
BELLEVILLE, ONT.



In General.

The question of using ground phosphate in the raw state still continues to attract considerable attention, and Professor Saunders is now making preparations for an elaborate series of tests on the Government Experimental Farm during the coming season, the results of which will be made public. The manure question is one of the most important connected with agriculture, and whatever will tend to an increased production of crops must necessarily demand the attention of the agricultural community. Phosphate rock has now, to a great extent, been substituted in place of bones in the manufacture of superphosphate and commercial fertilizers, by treatment with sulphuric acid, for the purpose of rendering it soluble. Phosphoric acid, as contained in crude phosphate, has been considered insoluble in water, but water containing carbonic acid, ammonia, or common salt, has the power slowly of liberating the phosphoric acid from its basic lime, and rendering it soluble for plant food. But the slower operations of water to render the phosphoric acid available for crops, can be largely increased by mixing the pulverized material with fermented manure, or peat. This system has for several years been carried on in the United States, in connection with cotton and tobacco plants, both of which being very exhaustive to the soil, require very stimulating fertilizers to restore the growing properties essential for plant life of the land. It is to be hoped that our farming community will see the necessity of adopting some measures for keeping the land required for the growth of cereals, up to its standard, by using fertilizers, and it does seem anomalous that this rich natural product at our very door, should be shipped away to the United States and Great Britain without its value being recognized by our own farming community.

Mr. John Dyke, Canadian Government agent at Liverpool, in his annual report to the Minister of Agriculture, makes special reference to last year's British market. He says: "The total export from Montreal during 1887 has been 20,349 tons against 19,298 tons in 1886. Prices have rather gone back somewhat, owing to trade depression, and a large supply of low grade phosphates; 80 per cent. strengthened as the year advanced, and closed firm. The average price for the year is about 1 per cent. per unit, ex-ship, United Kingdom. A good proportion has gone to Germany and also to Ireland at proportionately higher prices, but has not compensated for the additional freight that had to be paid. Lower grades have been selling at 9½d. for 75 per cent., and 8d. for 70 per cent. The future outlook for Canadian phosphates is favorable, one shilling to 1s. 1½d. could now be obtained for 80. per cent. for this next season. There are slight signs of prices strengthening. South Carolina phosphate (which is used largely by manufacturers here) has slightly varied in price. The average for the year is about 7½d. per unit, ex-ship, United Kingdom. Belgian phosphates have been sold at lower prices than hitherto, 40 to 45 per cent. ranging from 5d. to 6d., and 50 to 60 per cent. from 6½d. to 7½d. per unit, ex-ship here. Of a newly discovered phosphate (Somme) only

moderate quantities have as yet been offered, but sales have been made at 10½d. for 70 to 75 per cent., ex-ship here. The new source of phosphoric acid from basic slag has attracted considerable attention. This material contains somewhere about 17 per cent. of phosphoric acid, equal to 35 per cent. tribasic phosphate. It is found when reduced to fine powder to be easy of assimilation by plants, especially where the soil is of a peaty nature, and can supply the necessary carbonic acid to assist in the solution of the phosphate. In Germany the use of this has been rather large where there are big tracts of land, and it can be used to advantage. To a limited extent it is being introduced into Ireland and other parts of the United Kingdom at comparatively cheap prices."

The Government topographical survey of the phosphate region of the Ottawa Valley, begun last summer by Messrs. E. D. Ingall and J. White, will be resumed in a few weeks. It will be remembered that this important work was somewhat abruptly terminated last season by the severe accident to one of these gentlemen at the Little Rapids Mine.

A prominent shipper who has just returned from Great Britain states that the present outlook of the fertilizer industry there is much brighter than it has been for years. Manufacturers, however, feel the loss of the American superphosphate trade which has fallen off in two years from 40,000 to nil. It seemed absurd to send the rock to England and bring it back manufactured.

Market.

Markets seem strong for 80 per cent. and over, but lower grades are difficult of sale owing to the competition of the French phosphates. The Curacao, which is the principal opponent of our high grade, is not being produced this season. This strengthens our market materially. The demand for our ground phosphate, 60 to 65 per cent., is increasing in the United States and quite a quantity can be placed there.

Du Lievre.

Owing to the almost impassable state of the roads and the consequent cessation of traffic both up and down the river, our notes from this district are necessarily fewer than usual.

The management of the High Rock Mining Co. purpose utilizing the electric light to illuminate their workings next fall.

The Dominion Mining Co. intend pushing their operations strongly this season. They will engage a larger number of men than they had expected to, having struck some rich phosphate seams.

Negotiations are going on just now for the sale of some phosphate lands in this district, which, if successful, will result in a large amount of capital being brought into operation.

Mr. W. H. Dickson will do some phosphate mining shortly on his lots in the 5th and 6th ranges.

Templeton District.

We are informed that the Templeton and Blanche River Company, of Montreal, will shortly increase their capital stock. A little over 150 tons of good ore at present awaits shipment from their property.

It is rumoured that the celebrated Goldering property has been sold to American capitalists, and that mining will shortly be resumed on these lots.

As soon as the snow leaves the ground the Anglo-Canadian Company will further explore their lots in the Gore of Templeton and Wakefield.

Perth District.

At the Otty Lake Mines, the Anglo-Canadian Company is changing its operations to contract work instead of day labor.

Kingston District.

Captain W. J. Moore, of Hurley, Wisconsin, who, sometime ago purchased 2650 acres of mining lands in this district, has had a number of men under the direction of Mr. J. Sloan, prospecting, taking out timber, and making other preparations for the commencement of active operations at an early date. All the necessary buildings to accommodate a large force will be immediately erected, and the latest and most approved machinery will be put in before the 1st of June. The surface indications are rich and abundant, and a number of pits and shafts have been opened. Mica and magnetic iron is also found on the property.

Work on the Foxton property has been carried on during the winter with satisfactory results, about 200 tons of ore having been mined and hauled to Kingston. The vein continues to improve as depth is attained.



We shall be greatly obliged to mine owners and superintendents for such authentic reports of their operations as may concern shareholders and the public.

Nova Scotia.

Operations at the various collieries are still much retarded by the inability of the Inter-Colonial Railway to furnish adequate rolling stock, and mainly on this account managers have not been looking up new business. When spring opens, and the English through traffic begins to slacken off, more coal will be moved.

At the Drummond Colliery great preparations are being made for an active season. The company has secured a large portion of the Grand Trunk contract at an advance over last year's prices. Freight rates are somewhat higher, however, which will counterbalance the advance in coal. The shipments from this mine are expected to figure close upon 1000 tons per day.

At the Vale Colliery both pits are working full time, banking when cars are not to be had. This company has also secured considerable trade this season with the upper provinces. Although heretofore most of their coal has gone to the I. C. R. and to local consumers, it is much sought after by iron workers for smelting, and gas producers for working iron and steel. The company are sinking a new lift, 600 or 700 feet, to the deep on the McBean seam, and have unwatered the six foot seam which was allowed to fill up at the time of the strike. About 60 pairs of men are working on this seam, mostly Belgians. About 100 of these men have been imported to work these mines, and it is said that they are doing well.

At the Acadia Mines, work is dull, owing to scarcity of places—so it is said. Some alterations are being made in the hoisting gear, new boilers are being put in, and in a few weeks the company will be in a position to do a large output.

The parties, who have acquired the Black Diamond Mines, from the N. S. Coal Co., have relaid the travelling slope, and utilized one of the old locomotives as a hoisting engine. The present output is in the neighborhood of 50 tons per day.

Since the explosion in January, everything is very dull at the old Albion Mine. The "Tom" pit is working, but owing to lack of places and scarcity of men, very little coal is coming up. A large number of miners have left for the North-West, and others are going in a few days. The recent accident, and the condition of the adjacent mines, surrounded as they are by fire and water, has made the men timorous and unsettled, and it will be some time before a large quantity of coal will be got. Nothing has been done on the 3rd seam, since the explosion, beyond idling down the roof of the air way connecting No. 1 and 2 slope, this, it is hoped, will enable them to shut off the slope in which the fire is located, and perhaps save the other, if the fire has not penetrated too far into it. Investigations will shortly be made to find out the condition of this slope. The work of unwatering the Ford Pit continues, but owing to continued heavy rains, very little progress has been made.

Work at the Springhill Mines is reported to be very dull. It is rumored that the company has lost some of their large contracts. The "syndicate" pit is closed down and the others working short time. All sorts of reports are current as to the cause, but nothing definite is known beyond the fact that the company has not sold as much coal as usual.

One of our correspondents writes: "All the talk in mining circles here is about the Commission appointed to investigate the recent explosion at the Albion Mines. Most people think it is only a dodge of Mr. McCall, M.P.P., to carry favor with the miners, and secure their vote. There are no experts on the committee, which is composed of members of Parliament, who have called two or three witnesses who know as little about the matter as they do themselves. A good many think the whole affair a farce."

A charcoal furnace is being built on one of the iron properties up the East River by an Englishman who has done considerable prospecting. It is said the ore is of a very superior quality. Considerable ore has been shipped to the N. S. Steel Co. at New Glasgow and proved of excellent quality.

The total yield of gold for the past month has been 218 ounces. Some of the mines are doing very well. Edgerton and Rawdon are working full time. Edgerton will turn out 80 ounces, the product of 20 men.

A good deal of prospecting will be done at Fifteen Mile Stream this season, as that locality is looking up.

A force of prospectors will be sent in as soon as spring opens, and a crusher will be built on the Twelve Mile Brook.

Large areas have been taken up on the Twelve Mile Brook, and at Sheet Harbour, and valuable discoveries are reported at the old "Board Camp Mines."

Probably the first manganese mine in Canada was opened at Tenny Cape in Hant's County nearly 30 years ago, and was for a number of years the first mine in America, but it has gradually failed; has changed hands a number of times, and has never been a very valuable property to any of its owners; the output now is small and of inferior quality compared with the ore raised in New Brunswick.

Manganese ore in small quantities has been raised about Walton in Hant's County, but never in quantities to warrant vigorous operations being carried on.

There is also a mine in operation near Truro which is producing a small quantity of fair quality ore. This mine has recently changed hands and may now be operated more successfully. It has not, heretofore, been a bonanza.

The Crow's Nest Gold Mining Company (limited) has been organized in London with a capital stock of £100,000, shares £1 each, to purchase the mining property and estate known as the Crow's Nest Mines, or otherwise to acquire and work the property.

The total amount received by the mines department last year, from coal royalties, was close on \$120,000. Spring Hill takes the place of honor with \$70,000, followed by Sydney Mines with \$18,084; Acadia, \$12,600; Gowrie, \$11,776; Intercolonial, \$11,500; International (B. Port) \$7,296; Victoria, \$6,635; Caledonia, \$6,230; Glace Bay, \$4,976; Reserve, \$4,833; Block House, \$2,651; Chignecto, \$854; Halifax Coal & Iron Company (C. B.) \$573; Grant & Co., \$102, and Ontario \$60.

New Brunswick.

We are indebted to our correspondent for the following brief sketch of the Markham Manganese Mines: "These mines were opened by the late Wm. Davidson of St. John, about 26 years ago, worked by him a year or two, then sold to a Boston syndicate, who operated the mines up to about 1873, when they were sold to the present proprietors. Major Markham has had the management of them since 15th April, 1886—22 years. About 30,000 tons of Manganese has been shipped—about $\frac{2}{3}$ to Europe and $\frac{1}{3}$ to United States. I understand these to be the only Manganese Mines on this continent that have been in steady operation for more than a few years. The mines are situated south-east of Sussex Station on the I. C. R. and are reached by a good turnpike road."

In Albert County, ore of excellent quality is found, but it has not yet been discovered in paying quantities.

A manganese mine has been in operation in the parish of Waterford, King's Co., and a small quantity of ore has been raised; but the mine has not been profitable and is now closed.

Ore has also been discovered in parish of Stulholm, Kings Co., about eight miles north of Sussex Station, said to be in large quantities; it is also said that the property has been bonded to American Capitalists for a large amount but we are told no sale has yet been made.

The Montreal Manganese Company of St. John are chiefly engaged at present in prospecting their property, and we are informed that they have an extensive deposit of rich ore, particularly at their East Mountain Mines, Onslow. Last season two jigs for cleaning the ore were worked, and these will again be worked this season by steam power.

Quebec.

Mr. Parker C. Choate, of the Bartlett Smelting Works, Portland, and Mr. Brigham, representing New York and Boston capitalists, have, during the past few weeks, paid two visits to the South Ham Antimony Mine. Mr. Choate has had a quantity of the ore smelted, which he pronounces very pure, being free from tin, arsenic, copper, zinc or lead. He is of opinion that large quantities of the ore can be taken out and profitably crushed, concentrated and smelted on the spot. If successful in their negotiations with Dr. Reed, the owner, works will be at once put up for the manufacture of metallic antimony.

It is reported that Mr. Charles Lionais has sold the Hervey Hill Copper Mine, in the Township of Leeds, to a Glasgow syndicate, and that extensive preparations are being made to work the property on a large scale. The car loads of the ore taken out last fall have been pronounced first class, averaging 40 per cent. metallic copper.

There are numerous enquiries in this section of the country for the purchase of copper locations, and many of the old mines will again be opened up if the present market price continues.

The price of chromic iron with other substances, having increased in value, we are informed that the deposits of Leeds, Thetford and South Ham are to be worked extensively during the summer. Part of the ore will be sent to Birmingham, Alabama, where the mineral is extensively used in the manufacture of steel.

We understand that during the past three months the average quantity of marketable mica taken out of the Villeneuve mines has been close upon six hundred pounds per month, and from latest accounts the production promises to exceed that amount during the present month. Mr. Neil Cochrane has all hands working on the outside slopes, work in the tunnels having been abandoned for the present. Large crystals of a very superior quality continue to be taken from the very surface. About thirty men are at present employed at these mines.

The new cobbing factory and other works being erected at considerable outlay by the Scottish Canadian Asbestos Co., are rapidly nearing completion. When in operation the new system will, it is thought, result in the saving of many thousand dollars in the manipulating and manufacturing of the mineral.

The weather has been very backward of late in the Asbestos Mining District and not much has yet been done. Things are being got in shape for active operations, which will be prosecuted vigorously after 1st May, but not very much can be done before that date as there is still considerable snow in the vicinity. There is a good and steadily increasing demand for asbestos. Prices keeping firm, with an upward tendency at this season.

Mr. Alexander Ward will shortly open up the property owned by Mr. H. W. Johns of New York, on lot 26, range A., Coleraine.

Captain Williams of the Rockland Slate Quarry will also develop an asbestos property on lot 32, Range B, owned by Mr. Arthur Murphy.

Our correspondent also states, "that parties are here from Paris and Germany enquiring for asbestos and asbestos mines. They speak in the highest praise of the quality of the Canadian mineral."

The following estimate of the asbestos output for 1887 may be taken as correct:—

| | Tons. |
|------------------------------|-------|
| Asbestos Packing Co..... | 850 |
| Johnson & Co..... | 520 |
| Argyle Can: Asbestos Co..... | 340 |
| Scottish "..... | 210 |
| Frchette Mining Co..... | 220 |
| King Bros..... | 120 |
| Irwin, Hopper & Co..... | 90 |
| Coleraine Mining Co..... | 59 |
| A. H. Murphy..... | 10 |

An exchange writes. "There are two inherent evils in asbestos mining in Canada which prevent this industry being as profitable to the miner as it would at first sight appear. The exorbitant price charged for mining locations by their proprietors, or by the promoters of the companies destined to work them, causes an amount of outlay of capital that seriously cripples the resources of the company and renders the dividend payable often infinitesimal, even if the mine turns out a paying one; and secondly, a doubt always exists as to whether (in view of the uncertain nature of the veins of chrysotile) underground mining will pay expenses after the surface deposits are exhausted and quarrying is no longer possible. With these two drawbacks in view there is always an element of uncertainty present in asbestos mining, and as a consequence it is difficult to divert Canadian capital in this direction."

Capitalists on the look out for an investment in mineral lands in the Eastern Townships cannot do better than read carefully the masterly report on the geology of the counties of Compton, Stanstead, Beauce, Richmond and Wolfe, written by Dr. R. W. Ellis, and recently published by the Geological Survey. Great progress has been made in the development of this section of the Province, evidenced by the construction of the several lines of railway which centre in the Town of Sherbrooke, as well as by the opening up of hundreds of miles of settlement roads, by which large areas, formerly inaccessible, have now become comparatively open to investigation. The report comes from so eminent an authority and contains so much important information bearing on the mineral resources that it cannot fail to be of immense practical value to the district.

Ontario.

Our Red Rock correspondent writes: "The Town of Nipigon is located on the line of the C. P. R., and situated within a few yards of the river of the same name. Plenty of minerals are found in this vicinity. The river banks and lake shores have been explored to a considerable extent and several locations are taken up. Iron in large quantities has been discovered, silver is known to exist, and gold bearing quartz has been found."

Our Belleville correspondent writes: "A couple of days ago I had an opportunity of examining the Richardson Mine, and I would ask your readers to accept with caution very much of what has been said lately about the recent finds at this property. About sixty feet, south by east of the old shaft, a new one has been started on what appears to be the beginning of a vein having a leader under a granite hanging wall, dipping north at an angle of about 75°, and another leader on an apparently foot wall dipping at an angle of about 70°. There is a false horse between the two leaders, the footwall being felsite rock. This shaft is 26 feet deep, and at the bottom the two leaders are coming together very rapidly. This may form a vein or run out altogether, as the whole Richardson Hill is a big upheaval or dyke, and has no regular formation. The matrix of the two leaders, or would be veins, is a hornblende rock, having the appearance of gneiss; this same formation is visible in the old shaft, near the place where the old celebrated pocket was first struck, and here the rock shows considerable free gold. This rock as well as the ore coming out of the new shaft is being taken to the stamp mill at Bannockburn.

At the Robertsville Mines, Wm. Roach is still prospecting with a diamond drill. The results are said to be satisfactory.

A correspondent to the *Emigrant* thus describes the Vermillion Gold Mines recently discovered in the Sudbury district, and patented Messrs. R. J. Tough and Jas. Stobie:—

"This discovery was made in the township of Denison (lot 6 in the 11th. concession), about 23 miles south of Sudbury Junction, within 2 miles of the Sault Ste. Marie branch, on the west side of that line. It consists, at date of my visit (March 10, '88), of one strongly defined gold-bearing quartz vein, in the green slate, apparently close upon the junction of the granite, which prevails to the east. This particular lode is distinguished from another lode or outcrop as "No. 2." The "No. 2" vein has been traced for a distance of 80 chains, or the entire width of two lots. Its magnetic direction is north, 52 E., dipping south-east 73 degrees. The average width of this vein is 22 to 36 inches. The gangue is fine grey and white quartz, rich in native gold. A shaft is being sunk, and it has now attained a depth of 30 feet. From this, an intermediate distance, splendid nuggets of gold have been extracted, and average samples of quartz give results ranging from \$200 to \$1,000 to the ton of 2,000 lbs. Nor is this free gold confined to the vein: on the contrary the country rock on either side appears impregnated with it for a distance, in places of over 6 feet. Excavation work here at date of inspection was as follows: depth, 15 feet; length, 120 feet. A sample of pyrites from this lode, or deposit, assayed \$17 in silver, and also a percentage of nickel; while the gold ranges from \$36 to \$1,500, to the ton 2,000 lbs. Beyond the work already described nothing has been done on this location. A log shanty for the accommodation of the miners stands on the production of No. 2 vein, at a distance of 700 feet from the shaft. Owing to the great depth of snow (nearly 5 feet) it is difficult to closely examine the topography or geology of the country. The surrounding country generally is, however, high and rolling—with frequent exposures of granite and green slate. Most of the township has been overrun by fire, but a large percentage of the burned pine-tract is yet sound. The soil is clay loam and clay subsoil. Denison township is in Algona District. It is traversed by the Vermillion River and by the "Sault" branch of the C. P. R. A stock company has been formed to work this mine. The principal Canadian owners are the original investors with several Chicago men, including a Mr. Foster and Hill. Their organization is not yet complete."

Port Arthur District.

The usual break up of the roads in spring has temporarily interrupted communication with the mines. The Beaver, Badger, Silver Mountain, Caribou and Crown Point mines are working steadily with nothing remarkable to

note, and so soon as travelling is good a strong force will be at work at the Peerless, Little Pig and Palisades mines.

The Government bridge over the Kaministiquia River on the road to the mines has now been thoroughly renovated and strengthened at a cost of several thousand dollars, and a gang will soon be at work completing the road substantially as far as Whitelish Lake to enable those who have prospects further to the southwest a chance to go on with development.

The surveys performed for the Government last winter extended as far as the famous Hunters Island iron region, which is undoubtedly a continuation of the famous Vermillion iron range, and has been taken up in large tracts by our enterprising American cousins.

There is a steady demand both from England and the States for both mining and other lands in the vicinity of Port Arthur.

General McArthur has returned from Chicago and has gone down to Nipigon Bay to inspect his sandstone quarries, where he has a force of thirty men at work getting out this handsome stone, which is now in good demand in Chicago and elsewhere.

Application has been made for a monopoly of the supply of natural gas to the town of Port Arthur.

The very interesting article on the Rocks of Lake Superior, by Peter McKellar, read before the Royal Society of Canada, is a most valuable addition to our mining knowledge, and coupled with the writings of Messrs. Ingall, Coste and Lawson, of the Geological Survey, afford a good insight into the Thunder Bay mining region and its resources.

Manitoba and North-West Territories.

Mr. W. Case, experienced in locating oil wells in Pennsylvania, has found oil in considerable quantities, at a depth of 50 feet, in the Riding Mountain district. The party examined a district three or four miles square, at a point about eighteen miles from Lake Dauphin and about fifty miles from Strathelair Station. From the appearance of the rock strata and various surface indications, this gentleman is convinced that this is an oil district.

Mr. James Coffman has a gang of miners working on one of the claims recently sold at Tunnel Mountain. The claim is across the Kicking Horse, north of the track. Mr. De Wolf is at present negotiating with him for the construction of a 50-foot tunnel to be put in the Monarch Mine, and as it is almost sure the contract will be let a lively time is expected in that vicinity this year. Joe Buchard has gone to work with a gang of men on his claim, which is a continuation of the Coffman lead. The same gentleman will begin work at the Ottertail about the 10th of the month.

The miners are very anxious to see a smelter erected for the reduction of the ore, and would be glad to see it built in Calgary, which is their natural base for supplies.

British Columbia.

Advices from Victoria report that 2,727 acres of coal lands in the Nanaimo and Cedar districts have been bonded in London. This tract of land is said to be amongst the finest coal

and mineral deposits on Vancouver Island, and as they are contiguous to the Vancouver and Wellington mines, being the same quality, need no further reference to their value.

In conversation with a number of Yukon miners we learned that nearly all of them held the opinion that the wash gold found on Forty Mile creek and the Tananah on the northeast, and Copper river on the southwest. They believed that if the prospectors going up the coast would ascend to the headwaters of the latter stream, they would find as good, if not better, diggings than those on Forty Mile. The Rocky Mountain range cuts through the Coast range above Copper river, and it was near that point they should look for the fountain head, as it is a well established fact that the richest mines in America are found in the main Rocky Mountain range.—*Alaska Free Press.*

The following letter, under date of 6th April, from Dr. A. R. C. Selwyn, Director of the Geological Survey, has been received by Dr. G. W. Orton, Winnipeg, and explains itself:—

"I am in receipt of your letter of 3rd inst., asking me to give you in a general way my opinion of the prospects of mineral development in British Columbia. In reply I may say that I have always considered the region from the Fraser River eastward to the Kootenay & Columbia valleys one of exceedingly great promise for the discovery of rich mineral bearing veins. The chief, though not the only reason I have for this opinion is that the geological structure and conditions there correspond with those to the States of Idaho and Eastern Montana, two of the largest gold and silver producing States of the Union, having produced respectively in 1886, according to the Mineral Statistics of the United States, as under: Idaho—gold, \$1,800,000; Silver, \$3,000,000; Montana—gold, \$1,125,000; silver, \$15,225,000. There seems no reason why corresponding results should not be attained in British territory over corresponding areas. I have myself traversed the region in several directions and last summer I spent some days examining some of the mines opened near Invermere on the line of the C. P. R. and all I saw tended strongly to confirm the opinion above expressed, as also do the assays of numerous specimens from the region made in the Survey Laboratory by Mr. Hoffman. A list of some of these is appended for your information."

A Genuine Smoke Consumer.—There is now in operation at the works of the C.P.R., Canadian Rubber Company, waterworks, etc., Montreal, an excellent device for the consumption of smoke, indeed it is pronounced by the first authorities in the country to be the best for the purpose that science has produced. As exhibited at the C.P.R. and waterworks no smoke issues from the stack except at the moment of firing or "pushing back," when a thin stream of colored vapor issues, and ceases when the fire doors are shut. The apparatus is very simple—consisting of iron deadplate damper and air chambers—which are placed at back of the bridge any night after day's work and in a few hours a certain regulated quantity of air from the ashpit is taken by the adjusted damper into the air chamber and passing out therefrom in finely divided streams mixes with the gases at the point where they are most highly heated, igniting them and consuming what would otherwise pass into the stack, in the form of black smoke. It is difficult to conceive of any objection to such a device. It is simple, inexpensive, cannot get out of repair, needs no attention when once set, augment and equalizes the heat, improves the draft and must save a large percentage of coal. If Cape Breton coal gives off 16 per cent of smoke and this is utilized as fuel instead of escaping into the atmosphere the saving is clear. Again, the deposit of soot is done away with, which presses the heating power of the boiler plate. Evaporation tests

with Scotch coal shew 11 oz. water per 1 lb. coal. In the externally fired boilers so much in use its action is such as to reduce the issue of black smoke from seven minutes at firing to about one minute's emission of a brownish vapor. The fire chambers of this type are so varied in construction and size that the effect of the consumer is not so pronounced as in the flued type where it is as near perfection as is possible. With first class testimony as to its thorough efficiency we see nothing to retard manufacturers from adopting it; no time is lost in attaching it; the furnace proper is unobscured; no holes are made in the plate; no steam jet is used; by moving adjusting rod and closing damper the flue is as before application of the consumer and the dense smoke issues. By opening it the discharge ceases. It will be readily seen that if one stack smokes at firing and another does not a considerable percentage of heat goes into the atmosphere in the former case, and in the latter it is used, representing coal saving. The inventors and patentees are Messrs. Dobson & Brodie of Montreal, engineers, who also undertake the planning and setting of new boilers in such a manner as to cause the heat to travel five times in flued and four times in tubular before going into the stack. We understand that this firm are exclusive agents for Smalley's patent piston which is causing so much stir in shipping circles in Europe, a description of which we will give in an early issue.

Strange Things About Steam.—When water once begins to boil, it is impossible to raise its temperature any higher; all excess of heat is absorbed by the escaping as so called latent heat, and is given out again when it condenses. We often speak of seeing the steam escaping from the spout of a kettle, but this is incorrect; steam is an invisible vapor, and we can no more see it than we can air. What we do see are the minute drops of water in which the steam condenses on coming into the cool air. If we boil water in a glass flask, we shall notice that nothing can be seen in the interior; and by observing the steam escaping from a kettle, we shall notice that there is quite a distance between the end of the spout and the point where the cloud becomes visible. This cloud of steam is of exactly the same nature as the clouds which float in the sky, and which are formed by the condensation in the cool upper regions of the steam or aqueous vapor present in the air.

Electric Light in Coal Mines.—More than 2,000 electric lamps are now in use in the coal mines of England. There is a disadvantage attending the use of incandescent lamps in mines, inasmuch as they offer no indications of the presence of fire damp.

First Discovery of Coal. The interesting statement has been made by the United States Geological Survey that the first definite discovery of coal in North America can be credited to Col. Wm. Boyd, who made a report May 19, 1701, to the Colonial Council of Virginia, in which he relates the discovery of coal in the Richmond basin. The coal, however, was not worked for general sale to the public, until between 1770 and 1780.

Ontario to the Front!

A Matter of Vital Importance.

The following unsolicited opinions from your friends and neighbors, men and women, whom you know and respect, ought to carry conviction

to any doubting mind. The words of gratitude are from those who have been afflicted but are now well, and the persons giving them are naturally solicitous that others, troubled as were they, may know the means of cure. There is no reason why you should be longer ill from kidney, liver or stomach troubles. You can be cured as well as others. Do not longer delay treatment, but to-day obtain that which will restore you to permanent health and strength:

296 McNab St. North, HAMILTON, Can., Nov. 2, 1886.—I had been suffering for over twenty years from a pain in the back and one side of the head and indigestion. I could eat scarcely anything, and everything I ate disagreed with me. I was attended by physicians who examined me and stated that I had enlargement of the liver, and that it was impossible to cure me. They also stated that I was suffering from heart disease, inflammation of the bladder, kidney disease, bronchitis and catarrh, and that it was impossible for me to live. They attended me for three weeks without making any improvement in my condition. I commenced taking "Warner's Safe Cure" and "Warner's Safe Pills," acting strictly up to directions as to diet, and took thirty-six bottles, and have had the best of health ever since. My regular weight used to be 180 lbs. When I commenced "Warner's Safe Cure" I only weighed 140 lbs. I now weigh 210 lbs.

Mos. H. H. H. H.

St. CATHERINES, Ont., Jan. 24th, 1887.—About six years ago I was a great sufferer from kidney disease, and was in misery all the while. I hardly had strength enough to walk straight and was ashamed to go on the street. The pains across my back were almost unbearable, and I was unable to find relief, even temporarily. I began the use of "Warner's Safe Cure," and inside of one week I found relief, and after taking eight bottles, I was completely cured.

W. E. H. H.

Manager for American Express Co.

TORONTO, (18 Division Street,) Sept. 17, 1887.—Three years ago last August my daughter was taken ill with Bright's disease of the kidneys. The best medical skill in the city was tasked to the utmost, but to no purpose. She was racked with convulsions for forty-eight hours. Our doctor did his best and went away saying the case was hopeless. After she came out of the convulsions she was very weak and all her hair fell out. The doctor had left us about a month when I concluded to try "Warner's Safe Cure," and after having taken six bottles, along with several bottles of "Warner's Safe Pills," I saw a decided change for the better in her condition. After taking twenty-five bottles there was a complete cure. My daughter has now a splendid head of hair and weighs more than she ever did before.

Wm. J. H. H.

CHATHAM, Ont., March 6, 1888.—In 1884 I was completely run down. I suffered most severe pains in my back and kidneys, so severe that at times I would almost be prostrated. A loss of ambition, a great desire to urinate, without the ability of so doing, coming from me as

it were in drops. The urine was of a peculiar color and contained considerable foreign matter. I became satisfied that my kidneys were in a congested state and that I was running down rapidly. Finally I concluded to try "Warner's Safe Cure," and in forty-eight hours after I had taken the remedy I voided urine that was as black as ink, containing quantities of mucus, pus and gravel. I continued, and it was not many hours before my urine was of a natural straw color, although it contained considerable sediment. The pains in my kidneys subsided as I continued the use of the remedy, and it was but a short time before I was completely relieved. My urine was normal and I can truthfully say that I was cured.

Wood

GALT, Ont., Jan. 27, 1857.—For about five years previous to two years ago last October, I was troubled with kidney and liver trouble, and finally I was confined to my bed and suffered the most excruciating pain, and for two weeks' time I did not know whether I was dead or alive. My physicians said I had enlargement of the liver, though they only gave me temporary relief. Hearing of the wonderful cures of "Warner's Safe Cure" I began its use, and after I had taken two bottles I noticed a change for the better. The pains disappeared and my system seemed to feel the benefit of the remedy. I have continued taking "Warner's Safe Cure" and no other medicine since. I consider the remedy a great boon, and if I ever feel out of sorts "Warner's Safe Cure" fixes me all right.

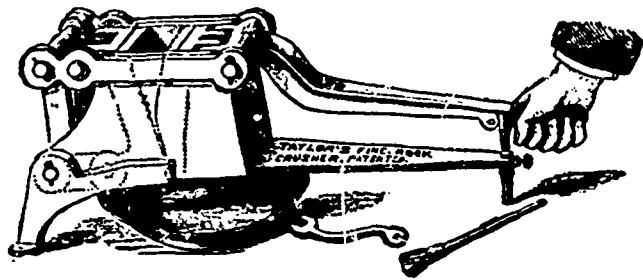
I weigh twenty pounds heavier now than ever before.

John Jones

Inventor of the Maple Leaf Lance-tooth Cross-cut saw.

(1) I understand that Mr. E. Gybbon Spilsbury will present an exhaustive paper at the next meeting of the Institute upon the subject of wire-rope tramways. For this reason I will not particularize the details of this system of declines, but simply mention some of the more important features. Mr. Spilsbury has also kindly examined the copy of this paper, and I am especially indebted to him for information in connection with aerial inclines.

(2) The loading-point may be changed by varying the position of the stop-block.



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Our Patent FELT LAPLANDER is the best FELT BOOT made, as it is WATERPROOF as well as WARM.

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AND OTHER
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IN THE TOWNSHIP OF BUCK-
INGHAM, COUNTY OF
OTTAWA.

1st.—Lot 28, in the 6th range, containing 100 acres, in addition to the salina of the lake.

2nd.—North half of lot 23, in the 5th range, containing 100 acres.

3rd.—Nine acres of lot No. 28, in the 5th range, with water privileges thereto appertaining, being site of mill dam, etc., etc.

The property formerly belonged to the Montreal Plumbago Mining Company, and was worked successfully for several years, until the company's mill was destroyed by fire, but the mill dam remains almost uninjured, and there are on the property several houses, sheds, etc., built for various purposes when mining operations were carried out.

The Plumbago Deposits

upon the property are regarded as amongst the richest and most extensive in the Dominion. As to the quality of the Plumbago, it has been extensively used in the manufacture of crucibles, lubricating leads, stove polish, etc., etc., and given unbounded satisfaction. This is established by the experience of consumers, and by a certificate from the celebrated Battersea Crucible Works, London, England, a copy of which is open for inspection.

MICA

has also been discovered in quantities.

The lands are in the Phosphato region, and recent prospecting has disclosed a rich and extensive deposit of this mineral. There are unrivalled facilities for transporting the ore to and from the mines by the Ottawa River and C. P. Railway. Distance from mines to Railway Station 6 miles. Good road.

All that is required to make these valuable mines handsomely remunerative is a little capital and enterprise.

The Title is Indisputable.

For information apply to

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160 Waller St., Ottawa.

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Russell House, Ottawa.

OR TO THE OFFICE OF

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OTTAWA.

**FOR SALE.
VALUABLE
Copper Mining Properties
— IN THE —
Eastern Townships**

TOWNSHIP OF ASCOT.

- 1st. Clark Mine, Lot 11, R. 7 Ascot 187 acres
- 2nd. Sherbrooke Mine, part Lots 12 and 13,
R. 7 Township of Ascot..... 329 "
- 3rd. Belvidere Mine, part Lots 9 and 10, R.
9 and 10, R. 8 Ascot 292 "
- 4th. Mining Rights in same vicinity on..... 250 "

All of the above properties lie within 1½ miles of the Village of Lennoxville, at the junction of the Grand Trunk, Canadian Pacific and Passumpsic Railways, and have been developed to a considerable extent, and veins opened 6 to 20 feet in width, yielding 3 to 5 per cent. of copper, also silver, and 35 to 40 per cent. of sulphur. These mines are only 2½ to 3 miles distant from the City of Sherbrooke, and evidently are of the same class of ores found at Copelton, only four miles distant, owned and worked by the Orford Copper and Sulphur Company, and by Messrs. G. H. Nichols & Co., of New York, which have proved so remunerative.

TOWNSHIP OF ORFORD.

5th. Carhuncle Hill Mine, Lots 2 and 3 R. 14, and 2, 3, 4 R. 15, 718 acres. Same class of ore as is found in the Ascot properties above described, but yielding a higher percentage of copper.

TOWNSHIP OF CLEVELAND.

6th. St. Francis Mine, ¼ Lot 25 R. 12, 50 acres, with dwelling houses, smith's shop, ore sheds and office, large winding and pumping steam engine, with boiler, winding and pumping gear, and about forty fathoms Cornish lifting pumps complete, railway tracks, ladders, etc., situated three miles from Grand Trunk Railway. A considerable amount of mining work has been done at this mine. A well defined vein richly charged with vitreous purple and yellow sulphurets of copper traverse the entire length of the property, five feet in thickness, yielding 3 to 40 per cent. metallic copper.

TOWNSHIP OF GARTHBY.

7th. Fifty-six lots of land, 2,938 acres. This property for the most part is unexplored, but copper is found on the greater part of the property. On one of the lots a vein about twenty feet in width has been found. Samples of the ore have yielded as much as 22 per cent. of copper, being also rich in sulphur. Other samples of pyrites from the same property, free from copper, have yielded as high as 48 per cent. of sulphur. The only drawback to this property is in its distance from the railway, it being about four miles from Garthby Station, Quebec Central Railway. A new line is chartered, however, which, when built, will run directly through the property.

TOWNSHIP OF ACTON.

8th. The Acton Mine, 100 acres, with engine, boiler, pumps and appliances. Within three years after this mine was first opened it produced nearly \$500,000 worth of copper. It is situated about half a mile distant from the stations of the Grand Trunk and South Eastern Railways.

9th. Brome Mine, part Lots 2 and 3 R. 4, 50 acres.
10th. Bolton Mine, two miles from Eastman Station, Waterloo & Magog Railway, 400 acres.

The above properties formerly belonged to the Canadian Copper and Sulphur Company, and were acquired by the present owner at sheriff's sale, giving an indisputable title thereto.

The whole or any portion of the property will be sold at reasonable prices.

For further information apply to

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Information regarding mines cheerfully given. Correspondence solicited. Crown Land business attended to.

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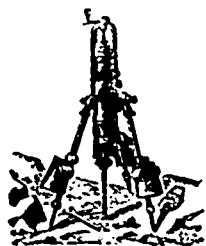
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Department of Inland Revenue.

An Act Respecting Agricultural Fertilizers.

The public is hereby notified that the provisions of the Act respecting Agricultural Fertilizers came into force on the 1st of January 1886 and that all Fertilizers sold thereafter require to be sold subject to the conditions and restrictions therein contained—the main features of which are as follows:

The expression "fertilizer" means and includes all fertilizers which are sold at more than TEN DOLLARS per ton, and which contains ammonia, or its equivalent of nitrogen, or phosphoric acid.

Every manufacturer or importer of fertilizers for sale, shall, in the course of the month of January in each year, and before offering the same fertilizer for sale, transmit to the Minister of Inland Revenue, carriage paid, a sealed glass jar, containing at least two pounds of the fertilizer manufactured or imported by him, with the certificate of analysis of the same, together with an affidavit setting forth that such jar contains a fair average sample of the fertilizer manufactured or imported by him; and such sample shall be preserved by the Minister of Inland Revenue for the purpose of comparison with any sample of fertilizer which is obtained in the course of the twelve months then next ensuing from such manufacturer or importer, or collected under the provisions of the Adulteration Act, or is transmitted to the chief analyst for analysis.

If the fertilizer is put up in packages, every such package intended for sale or distribution within Canada shall have the manufacturer's certificate of analysis placed upon or securely attached to each package by the manufacturer; if the fertilizer is in bags, it shall be distinctly stamped or printed upon each bag; if it is in barrels, it shall be either branded, stamped or printed upon the head of each barrel or distinctly printed upon good paper and securely pasted upon the

head of each barrel, or upon a tag securely attached to the head of each barrel; if it is in bulk, the manufacturer's certificate shall be produced and a copy given to each purchaser.

No fertilizer shall be sold or offered or exposed for sale unless a certificate of analysis and sample of the same shall have been transmitted to the Minister of Inland Revenue and the provisions of the foregoing sub-section have been complied with.

Every person who sells or offers or exposes for sale any fertilizer, in respect of which the provisions of this Act have not been complied with—or who permits a certificate of analysis to be attached to any package, bag or barrel of such fertilizer, or to be produced to the inspectors to accompany the bill of inspection of such inspector stating that the fertilizer contains a larger percentage of the constituents mentioned in sub-section No. 11 of the Act than is contained therein—or who sells, offers or exposes for sale any fertilizer purporting to have been inspected, and which does not contain the percentage of constituents mentioned in the next preceding section—or who sells or offers or exposes for sale any fertilizer which does not contain the percentage of constituents mentioned in the manufacturer's certificate accompanying the same, shall be liable in each case to a penalty not exceeding fifty dollars for the first offence, and for each subsequent offence to a penalty not exceeding one hundred dollars. Provided always that deficiency of one per centum of the ammonia, or its equivalent of nitrogen, or of the phosphoric acid, claimed to be contained, shall not be considered as evidence of fraudulent intent.

The Act passed in the forty-seventh year of Her Majesty's reign, chaptered thirty-seven and entitled, "An Act to prevent fraud in the manufacture and sale of agricultural fertilizers," is by this Act repealed, except in regard to any offence committed against it or any prosecution or other act commenced and not concluded or completed, and any payment of money due in respect of any provision thereof.

A copy of the Act may be obtained upon application to the Department of Inland Revenue, as well as a copy of a Bulletin which it is proposed to issue in April, 1886, concerning the fertilizers

E. MIALL,
Commissioner.

18th Dec., 1887.



TO THE CANADIAN VOYAGEURS

—OF THE—

NILE EXPEDITION, 1884-1885.

NOTICE is hereby given that a decoration known as "The Khedive's Bronze Star," granted by His Highness the Khedive of Egypt to those who served with the Nile Expedition of 1884-85, will be distributed to members of the Canadian Voyageur Contingent by the persons, and at the places, as under:—

To Members of the
Caughnawaga Detachment,
By E. de Lorimer, Esq., Caughnawaga, P. Q.
Manitowaning Detachment,
By T. R. Burpee, Esq., Land Com'n Office,
Winnipeg.
Three Rivers,
By the Postmaster, Three Rivers.
Peterboro', by the Postmaster, Peterboro'.
Sherbrooke, by the Postmaster, Sherbrooke.
OTTAWA, by CAPT. COSTIN,
Dept. Railways and Canals.

In every case applicants must be accompanied by some person to testify to their identity—and sign as a witness to the applicant's receipt of the decoration.

HENRY STREATFIELD, Capt.,
Military Secy to the Gov.-Gen l.
Governor-General's Office,
Ottawa, April 4th, 1885.



TENDERS.

SEALED TENDERS, marked "For Mounted Police Provisions and Light Supplies," and addressed to the Honorable the President of the Privy Council, Ottawa, will be received up to noon on Tuesday, 15th May, 1888.

Printed forms of tenders, containing full information as to the articles and approximate quantities required, may be had on application at any of the Mounted Police Posts in the North-West or at the office of the undersigned.

No tender will be received unless made on such printed forms.
The lowest or any tender not necessarily accepted.

Each tender must be accompanied by an accepted Canadian bank cheque for an amount equal to ten per cent. of the total value of the articles tendered for, which will be forfeited if the party declines to enter into a contract when called upon to do so, or if he fails to complete the service contracted for. If the tender be not accepted the cheque will be returned.

No payment will be made to newspapers inserting this advertisement without authority having been first obtained.

FRED WHITE,
Comptroller N. W. M. Police.
Ottawa, March 20th, 1888.

SUBSCRIBE NOW FOR
THE
Canadian Mining Review
1888.



INDIAN LANDS

LANDS IN THE UNDERMENTIONED localities are offered for sale to actual settlers through the following Indian Agents: On the Great Manitoulin Island, Lake Huron, Ontario; Mr. J. C. Phipps, of Manitowaning, is the Agent for the sale of lands in the following Townships on this Island: Assiginack, Bidwell, Howland, Shequandah, Billings, Campbell, Carnarvon, Allan, Telikumnah and Sandfield, and in the Townships of Shequandah, Manitowaning and Shaftsbury (commonly called Little Current). Mr. H. W. Ross of Cockburn Island, is the Agent for the sale of lands on that Island and in the Townships of Gordon, Mills, Burpee and Barrie Island, and in the Township of Gore Bay as well as for those in the Townships of Robinson and Dawson, on Manitoulin Island. Leading roads have been constructed throughout the Great Manitoulin Island.

On the Sauguen Peninsula, Ontario, the lands in the Townships Anabel, Alenmar, Keppel, Eastnor, Lindsay and St. Edmunds, as well as several Townships in the Peninsula, are offered for sale through Mr. William Simpson, Indian Lands Agent at Warton, County of Bruce, Ontario.

On the Garden River Reserve, Ontario, Mr. William Van Abbott, of Sault Ste. Marie, is the Agent for the sale of lands within this tract, and which are situated in the Townships of Macdonald, Laird and Meredith; also for lands within the tract commonly known as the Hatchewana Bay Indian Reserve, and comprised in the Townships of Aweres, Fenwick, Kars, Pennefather, Dennis, Herrick, Fisher, Tilley, VanKoughnet, Tupper and Archibald. There is a leading road through these lands which affords ready communication with other parts of the country to intending settlers.

The condition of sale in respect to the lands within the Townships above described can be ascertained on application to the respective Agents.

(Signed) L. VANKOUGHNET
Deputy Supt. General of
Indian Affairs.

Department of Indian Affairs,
Ottawa, February, 1887.



SEALED TENDERS addressed to the undersigned and endorsed "Tender for Post Office, &c., Aylmer, Que.," will be received at this office until Monday, 14th May, 1888, for the several works required in the erection of Post Office at Aylmer, Que.

Specifications and drawings can be seen at the Department of Public Works, Ottawa, and at Ritchie's Hotel, Aylmer, on and after Tuesday, 24th April, and tenders will not be considered unless made on the form supplied and signed with actual signatures of tenderers.

An accepted bank cheque, payable to the order of the Minister of Public Works, equal to five per cent. of amount of tender, must accompany each tender. This cheque will be forfeited if the party declines the contract, or fail to complete the work contracted for, and will be returned in case of non-acceptance of tender.

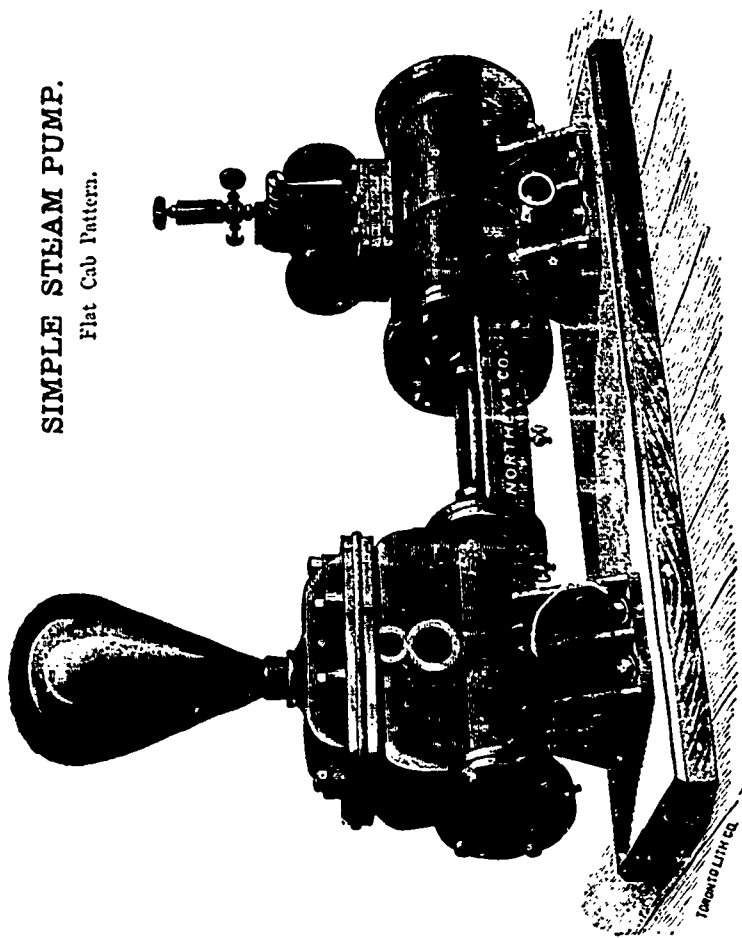
The Department does not bind itself to accept the lowest or any tender.

By order,
A. GOBEIL,
Secretary.

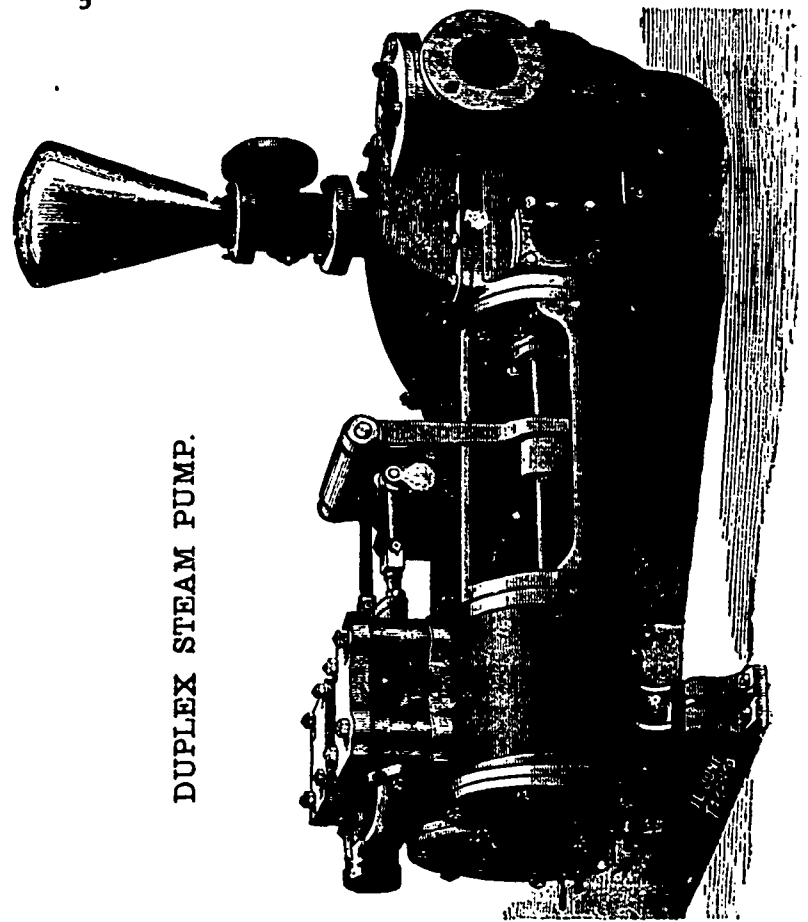
Department of Public Works,
Ottawa, 20th April 1888.

Northey & Co's Steam Pump Works, TORONTO, ONT.

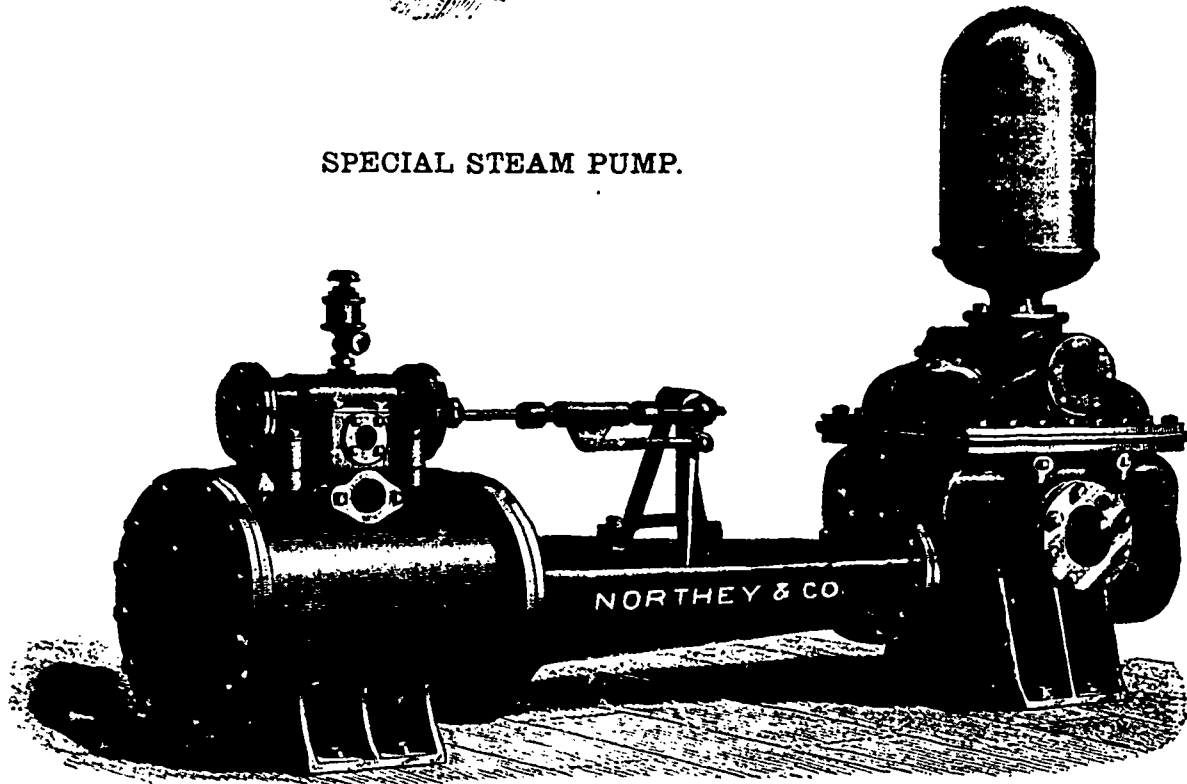
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Mining Regulations

TO GOVERN THE DISPOSAL OF Mineral Lands other than Coal Lands, 1886.

THESE REGULATIONS shall be applicable to all Dominion Lands containing gold, silver, cinnabar, lead, tin, copper, petroleum, iron or other mineral deposits of economic value, with the exception of coal.

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

QUARTZ MINING.

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

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

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

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

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

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

IRON.

The Minister of the Interior may grant a location for the mining of iron, not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal its length. Provided that should any person making an application purporting to be for the purpose of

mining iron thus obtain, whether in good faith or fraudulently, possession of a valuable mineral deposit other than iron, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The regulations also provide for the manner in which land may be acquired for milling purposes, reduction works or other works incidental to mining operations.

Locations taken up prior to this date may, until the 1st of August, 1886, be re-marked and re-entered in conformity with the Regulations without payment of new fees in cases where no existing interests would thereby be prejudicially affected.

PLACER MINING.

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

The nature and size of placer mining claims are provided for in the Regulations, including bar, dry, bench creek or hill diggings, and the rights and duties of miners are fully set forth.

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

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

THE SCHEDULE OF MINING REGULATIONS

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

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

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

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

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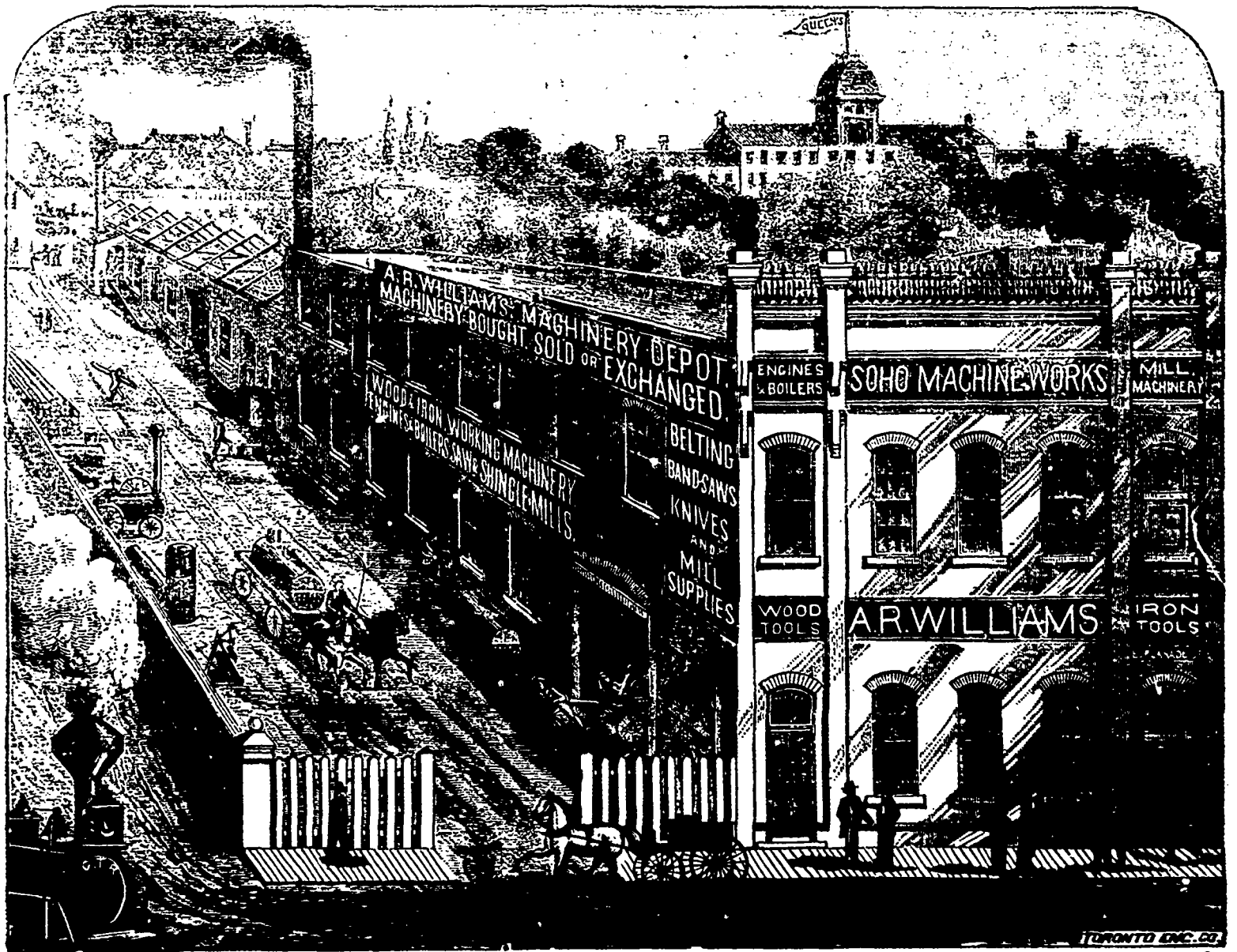
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