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REPORT

ON CERTAIN

APATITE LANDS

—IN—

NORTH BURGESS, ONTARIO.

—BY—

S. DANA HAYES,

State Assayer, Mass.: Memb. New York Acad. of Sciences,: Amn. Chemical Socy.: Inst. Mining Engineers, etc.

1877.

W. A. MOREHOUSE, JOB PRINTER,

SHERBROOKE, P. Q.

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E. CLARK, Esquire,
Mayor of the City of Sherbrooke,
Canada.

Dear Sir:

I take pleasure in presenting for your consideration the following report of my observations, made during a recent examination of certain Apatite Lands, belonging to you, in the Province of Ontario. My visit to these properties was made during the present month, and the notes from which this report is written were made then: they refer to the lands in their present remarkably favorable condition for examinations like this.

LOCATION.

There are eight or more lots of land belonging to you, situated in the Township of North Burgess, in Lanark County, Province of Ontario, Canada. They are from five to ten miles south and southwest of Perth, which is on the Brockville and Ottawa Railway, and they are within from one to three miles of the Rideau Canal, called there the Rideau Lake.

I examined Lots 8, 9 and 12, in Concession VI; Lots 12, 19 and 20, in Concession V, and Lot 1, in Concession VIII. The lots are one mile long, from north to south, the northern and southern boundary lines running nearly east and west, dividing the concessions. The lots are about one third of a mile wide, from the eastern to the western boundaries.

THE MINERAL.

The most valuable mineral found on these lands, is Apatite, tribasic phosphate of lime, or calcic phosphate. This "phosphate ore" is now used more extensively than at any time heretofore, as a source of soluble phosphoric acid, in the manufacture of concentrated fertilizers.

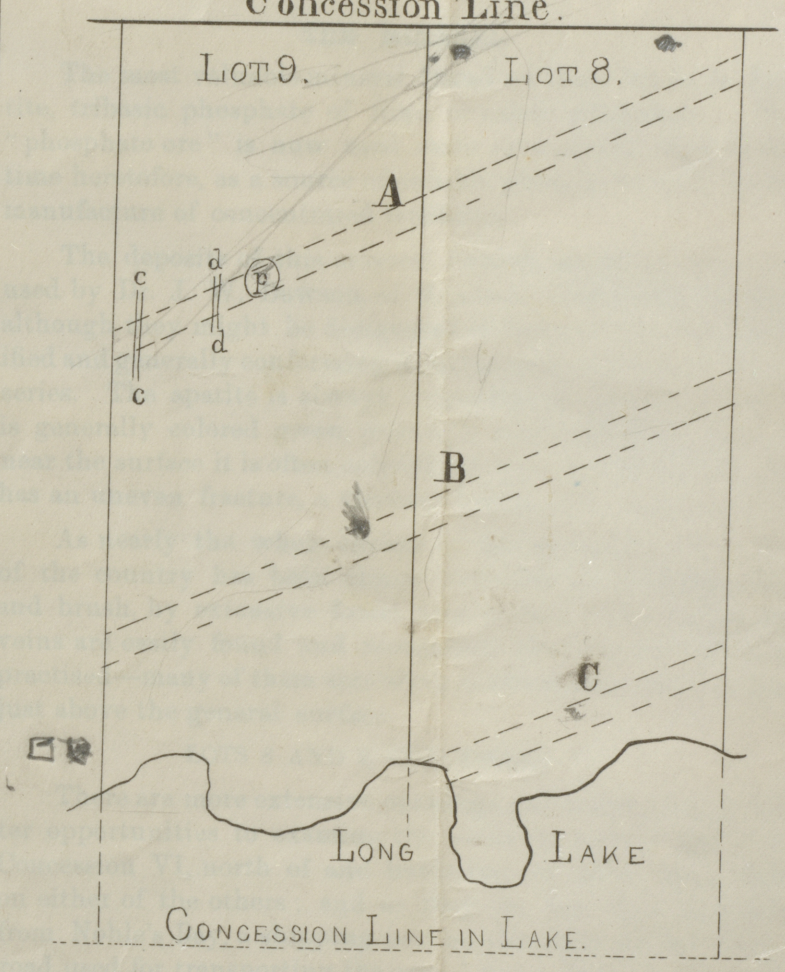
The deposits of this mineral (which, adopting the term used by Dr. J. W. Dawson, of Montreal, I shall call "veins," although they might be designated as beds,) occur interstratified and generally conforming with the rocks of the Laurentian series. The apatite is always crystalline or granular, and it is generally colored green, although when found at or very near the surface it is often colored red and reddish brown. It has an uneven fracture, a vitreous lustre, and is translucent.

As nearly the whole surface of the ground in this part of the country has been almost denuded of growing trees and brush, by extensive forest fires within a few years, the veins are easily found and recognized after the eye becomes practised—many of them appearing at the surface and in ridges just above the general surface.

LOTS 8 AND 9, CONCESSION VI.

There are more extensive openings and consequently better opportunities to examine the veins on Lots 8 and 9, in Concession VI, north of and bordering on Long Lake, than on either of the others; and as they are less than one mile from Noble's Bay, a shipping port on the canal, by the winter road used for transporting the ores, I have deemed them the best to represent in a plan that has been copied and drawn from the Government maps, to accompany this report.

The country is generally quite level on these lots, and having been so effectually cleared by the fires, the courses of three main veins, or groups of veins, can be distinctly traced across the lots as drawn on the plan, where A represents the upper or northern vein, B the middle vein, and C the lower or southern vein. They are nearly parallel and equi-distant,



Plan of Lots 8 and 9. Concession VI.

A. B. C. Main veins of apatite.

cc. Cross cut.

d d. Ditch.

p. Pit.

HELIOTYPE

and they strike N. 30 ° E., with the containing beds of granitic rocks. There are also smaller veins and tracings of the phosphate between these main veins. The accompanying rocks on these lots, are always granite, gneiss, feldspars,quartz, mica, honblende, and pyroxene. These are all insoluble in sulphuric acid, and there is no limestone attached to the apatite on Lots 8 and 9.

About one hundred and twenty feet from the western boundary line of Lot 9, between the letters *c c*, in the vein A, on the plan, a cross-cut has been made by digging a trench through the soil, forty-two feet long, across the vein, which is thus shown to be fifteen feet wide of clear apatite at this point, with small veins near it, both to the north and south. Following this main vein along N. 30 ° E., nearly a thousand feet, at *d d*, on the plan, a ditch shows its continuity ; and at a point, perhaps five hundred feet beyond, at *p*, on the plan, it has been uncovered again. At this place *p*, there is an excavation designated as the pit, from which forty-eight tons of the phosphate have been taken out and stacked in a pile near by, and the vein is now exposed in the pit, showing eleven feet across of clear green apatite. Following this vein further, there are five or six other smaller openings, all showing the mineral vein striking N. 30 ° E. across lots 8 and 9, as drawn on the plan.

This northern vein has been uncovered to a greater extent than either of the others, and certainly a very large body of calcic phosphate is in sight here that may be profitably mined directly from the surface. As an indication of the depth of this deposit, there is, at a point a few hundred feet southwest from the cross-cut *c c*, on this same vein, although not on your land, the so-called Anthony shaft which has been driven between one hundred and twenty-five and one hundred and forty feet, nearly perpendicularly down, showing the vein of phosphate for the whole distance, as I am credibly informed by several intelligent miners who worked in this shaft.

The middle and southern main veins of apatite, B and C, were also traced through numerous excavations and outcroppings across the lots, as shown on the plan. They present all the characters of the upper vein so far as they have been uncovered, but the southern vein C was only found on lot 8. It apparently passes under the water of Long Lake.

Lot 8 (VI) contains one hundred and eighty-five acres of land, and lot 9 (VI) one hundred and fifty acres, as shown by the Government surveys.

LOT 12, CONCESSION VI.

There are abundant and valuable veins traversing your lot 12 in Concession VI, which I examined at fourteen different excavations, although these are not all that have been made for the purpose of showing the deposits of apatite below the soil. This lot is especially rich in its lower or southern half; there are also large quantities of phosphate in sight on other parts of the lot, excepting near its northwest corner. The geological stratification of the country, and the accompanying minerals, are the same here as on lots 8 and 9, and the winter road to Noble's Bay is about one mile and a half long. Lot 12 (VI) contains two hundred acres of land.

LOT 12, CONCESSION V.

You are the owner of about half of lot 12 in Concession V, consisting of two separate quarters, at the northeast and southwest corners of the lot respectively, with a small body of water known as Round Lake encroaching upon the land of the northeast quarter. I visited ten openings on this lot and saw there veins of phosphate crossing it, striking N. 30° E. There are several places exposed here where the apatite can be profitably mined from the surface, as the veins show four and six feet wide of the clear phosphate. The stratification is the same on this lot as on the others; but on the lower or southwest quarter, there is an appearance of more limestone, with the other rocks. It is not intimately associated with

the apatite near the surface, however. Lot 12 (V) is within half a mile of Burgess Bay, another shipping port on the Rideau canal. Your half of this lot contains ninety-five acres of land.

LOTS 19 AND 20, CONCESSION V.

On the mineral beds of these lots, belonging to you, I examined twenty-two openings, uncovering the apatite, and there are apparently as many more. The phosphate lies in three main veins, with intermediate small veins, striking N. 30 ° E. on these lots, as on the others, and there are also good opportunities for profitable mining work here. The apatite is not intimately associated with limestone, and there is very little of the latter in sight; while the stratification and minerals are like those in lots 8, 9, and 12, in Concession VI.

Running through this lot 20, there is a stream, the outlet from Black Lake, with several eligible sites for mill dams. This stream was formerly used for running saw mills, and it will afford an ample source of power, if it should become desirable to erect a mill for pulverizing the phosphate of lime, before sending it away. Lots 19 and 20 (V) are within three miles of Burgess Bay, on the canal, and they contain respectively seventy-five and one hundred and four acres of mineral lands, belonging to you.

LOT 1, CONCESSION VIII.

You own more than half of lot 1, in Concession VIII, bordering on and north of Otty's Lake. I examined the apatite as it appears in six or more excavations on this land, and saw it in abundant quantities for easy, profitable mining. The veins in sight in these places are nearly four, six and seven feet across.

On this lot, the direction of the veins is different from that on any of the others, and it is not with the stratification of the country. The veins of apatite in all the places seen, strike nearly due N.W. here, although they show large bodies of the mineral. From one of the openings, over fifty tons of clear green apatite have been taken out and piled on the

ground, and the vein is now stronger and larger in the bottom of this excavation than it was near the surface. There is some limestone on this lot, and more mica than on either of the others. It is within two miles of the canal, and your portion contains ninety-five acres of land.

QUALITY OF THE APATITE.

In order to fully determine the percentage value of the apatite on these lots, I have made analyses of seven samples taken upon the ground by myself, with the results given below.

Samples Nos. 1, 2, and 3, are all from the large pile of phosphate at the pit (*p*), on lot 9, Concession VI. No. 1 was selected as the poorest bit of "ore" in this pile; No. 2 as an average piece, and No. 3 as representing the best. Upon analysis, these samples yielded:—

No. 1,	Tribasic Phosphate of Lime			.....	76.96 per cent.
No. 2,	do	do	do	.....	88.21 do
No. 3,	do	do	do	.....	92.44 do
Average richness of these three samples				.....	85.87 do

A more complete analysis of sample No. 2 yielded:—

Tribasic Phosphate of Lime,	88.21
Fluoride of Calcium,	8.11
Chloride of Calcium,	Trace
Insoluble Minerals, etc.,	3.68
Total,	100 00
Phosphoric Acid,	40.71 per cent.

The absence of any excess of lime or traces of limestone is noticeable, and I may say here, that it was not present in any appreciable quantity in either of the other six samples analyzed.

Sample No. 4, was an average mining sample from Lot 12 (VI). It contained 88.56 per cent. of calcic phosphate.

Sample No. 5, was an average mining sample from Lot 12 (V). It contained 86.13 per cent. of calcic phosphate.

Sample No. 6, was an average mining sample from Lots 19 and 20 (V). It contained 86.81 per cent. of calcic phosphate.

Sample No. 7, was an average mining sample from Lot 1 (VIII). It contained 85.34 per cent of calcic phosphate.

Apatite like this, as it is mined, is in lumps varying greatly in size. A few of the pieces now awaiting shipment are as large as barrels, and it is generally rather smaller than bituminous coal, at the mouth of a shaft. It is brittle and not a hard mineral, when compared with quartz and metalliferous ores, and it is easily mined. In one case two men have obtained over fifty tons from one opening, with considerably less than one keg of blasting powder. Between eighteen and twenty cubic feet of it, weigh one ton.

When pulverized finely it absorbs sulphuric acid, and an acid phosphate of lime, containing a very large percentage of soluble phosphoric acid is readily obtained from it. At the present time, when it is difficult to procure phosphatic material, free from carbonate of lime, and capable of yielding concentrated fertilizers of the desired richness in soluble phosphate, this apatite becomes particularly valuable for manufacturers.

In this connection, I copy the following table from one of the recent State Reports. It gives very nearly the market values of the phosphatic materials now in common use by manufacturers, in the United States.

MARKET.	NAME OF PHOSPHATE.	Percentage of Calcic Phosphate.	Price per Ton of 2000 lbs.	Cost of 1 pound of Phosphoric Acid.
Charleston.....	South Carolina.*	54.56	$7.50	1.5 cts.
Boston.....	South Carolina.....	54.56	11.50	2.3 "
Boston.....	South Carolina, ground..	54.56	13.50	2.7 "
New York.....	Navassa Island, do.....	65.70	16.00	2.6 "
Boston.....	Bone Black Waste.....	72.75	25.00	3.7 "
Boston.....	Ground Bones.....	53.54	40.00	4.0 "

*Contains six to ten per cent. of carbonate of lime.

If apatite should be rated in this manner, its value would be largely raised.

QUANTITY.

There has been no systematic mining on your lands yet, although there are more than one hundred and twenty-five tons on the ground, as it was taken out in uncovering the veins; but in several places contiguous to your lots, the residents, who are properly small farmers, have by desultory work obtained and prepared for shipping, since last May, at least twelve hundred tons of apatite, as I am informed by the principal shipping merchant at Perth; and from the piles of phosphate seen by myself, I believe that this statement is correct. There is also abundant evidence, that from five to eight thousand tons of apatite, have been taken from the deep Anthony shaft already mentioned, before the disastrous conflagration there.

These quantities of phosphate, so easily obtained and an increasing yield every year, with the appearance of so many workable veins on your lands, lead me to the belief, that this mineral will be found here in practically inexhaustible quantity, for many years. I do not attempt to estimate the quantity that is already in sight, in the veins.

NOTES.

The mica that is generally present with the apatite is

stained and colored when near the surface, but some of the pieces from below were white and pure, indicating that this mineral may prove to be a source of some revenue, in connection with skillful mining of the phosphate of lime.

There are a few houses and buildings on these lots, and much of the soil is of excellent quality for cultivation.

I have been unable to find any memoranda of observations by others, on either of the lots referred to in this report, but the general geological features and the accompanying rocks, correspond with those described by the officers of the Geological Survey of Canada, and by Dr. Dawson and others, when reporting upon some of the surrounding country, and they are now more readily studied than before the last great forest fires.

In conclusion, I will only add that, although I had previously heard much of the veins of apatite in North Burgess, I was surprised at the evident abundance of this valuable mineral upon these properties of yours. These deposits seem to invite immediate and extensive mining operations.

Respectfully submitted.

S. DANA HAYES.

State Assayer and Chemist, Massachusetts.

———o———

Boston, September 29, 1877.

E. CLARK, Esquire.

DEAR SIR:—I obtained such information as I could about cost and prices at North Burgess, by inquiring among

persons there, who should have accurate knowledge upon the subject, and incorporate it here very briefly.

There is no difficulty in getting good working men in this district, and the average price of labor is $24 per month. From this, the estimated cost of one ton of apatite delivered in Montreal would be :

Mining, picking, and carting to canal,.....	$5.00
Freight to Montreal, including loading,.....	2.25
Total cost,.....	$7.25

The cost of freight from Montreal to Liverpool is said to be about $3.50 per ton.

Respectfully,

S. DANA HAYES.

———o———

PERTH, ONT., October 8, 1877.

E. CLARK, ESQUIRE,

DEAR SIR,—

Since Professor Hayes was here, I have visited lot 24, in 6th Concession, North Burgess, not seen by him, three miles distance from the Narrows shipping port, on the Rideau Lake, and discovered six outcrops of apatite free from all impurities, two of which are in the face of a hill of great promise, the other places not being opened, but look well on surface. There is one half of this lot free from limestone, good mineral ground and when explored and opened has every appearance of being of great value, the location being good for minerals.

At the N. W. corner, on an adjoining lot owned by another party, a few rods distance, is a valuable property, from which a large quantity of apatite has been taken.

It will require time to explore this lot and I await your further instructions.

DANIEL FARRY.
Mining Overseer.

RADENHURST & DOUGLAS,

Solicitors for the Merchants Bank of Canada, Perth,

Barristers, Attorneys, Solicitors,

CONVEYANCERS, &c.,

PERTH, - ONT.

WM. H. RADENHURST. JOHN W. DOUGLAS.

OFFICE: Allan's Buildings, near Seeley's Exchange.

Perth, Ont., Sept. 27, 1877.

E. CLARK, ESQUIRE,

DEAR SIR,—

The mineral lots owned by you in North Burgess, in the County of Lanark, Ont., viz:

Rear 104 acres, 20 in 5th

Rear 75 " 19 in 5th

N. E. and S. W. quarters of 12, in 5th, 90 acres.

Allowance for Road between lots 12 and 13, in 5th and 6th Concessions—16 acres.

Lot 24, in 6th, 200 acres.

Lot 12, in 6th, 192 1-2 acres.

150 acres of lot 9, in 6th.

185 acres in lot 8, in 6th.

West half in lot 1, in 8th, 95 acres.

were purchased after I had investigated the title of each of them at different times, and passed them as correct; and the title now in you of the same is, in my opinion, clear and indisputable.

Yours Truly,

W. H. RADENHURST.

REMARKS.

The great drawback in mining generally is expensive freights before reaching a market. This is not the case in reference to my apatite properties.

The following are the prices for freight per ton, from any part of my properties, consisting of 1107 acres :—50 cents from mines to Rideau Lake ; from Lake to Kingston, $1.00 ; from Kingston to Montreal, $1.25, including loading, and every expense.

From Kingston or Montreal apatite can be shipped by water, in bulk, to the United States or Europe at low freights.

E. CLARK.

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REPORT

ON THE

PHOSPHATE LANDS

OF THE

TEMPLETON & NORTH OTTAWA MINING COMPANY.

BY

E. J. CHAPMAN, PH. D., &C.,

Professor of Mineralogy and Geology in University College, Toronto, and Consulting Mining Engineer.

TORONTO:
LOVELL BROTHERS, PRINTERS, 39 & 41 MELINDA STREET.
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—o—

To F. W. HENSHAW, Esq., &c., &c.

MONTREAL.

SIR,—Having received your instructions to examine the PHOSPHATE LANDS of the TEMPLETON AND NORTH OTTAWA MINING COMPANY, and to furnish you with an impartial Report upon the property, I visited the ground, and remained there during an entire week, at the commencement of the present month (June, 1878). In my examination of the ground, I had the valuable guidance of Mr. J. G. MILLER, whose intimate knowledge of the district, and of phosphate deposits generally, rendered his co-operation of the greatest service, and enabled me to save much time in my investigation of the numerous lots belonging to the Company.

On the assumption that my Report is mainly intended for public information, I have confined myself as much as possible, in drawing it up, to the discussion of practical details as distinguished from points of purely scientific or theoretical interest. The Report, thus limited, embodies the following subdivisions:—(1) Site and general description of the Property; (2) Mineral Features; (3) Composition and average quality of the Phosphate; (4) Statistics and general conclusions.

(1) *Site and General Description of the Property*:—The phosphate lands of the Templeton and North Ottawa Mining

Company comprise altogether 4715 acres, situated in the Townships of Templeton and Portland in Ottawa County, Province of Quebec. Of these, 945 acres are possessed in fee simple; 950 acres are worked by mineral and mining rights (embracing the power to cut timber for mining use, the right of roadway, &c.); and 2820 acres are held on lease at the low royalty of 50 cents per ton of mined phosphate. A large sheet of navigable water, MacGregor's Lake—with its northern extensions known as Dam Lake and Grand Lake, and its southern extension, Courville's Bay—lies in the centre of the property, and greatly facilitates the transportation of the phosphate material from the more important lots at present opened. Several smaller bodies of water, as Beaver Lake, Clear Lake, Crooked Lake, &c., also lie within the limits of the Company's property, or impinge upon its boundary. The greater portion of the property is within the area of the so-called "Phosphate-bearing Belt" as determined by the geological survey of Canada; but this belt, as layed down on Mr. Vennor's map, is somewhat too restricted in width, as several fine deposits, and notably the opened portion of the large phosphate-bearing vein of Mr. McLaurin (west margin of lot 18, Range 9), are just beyond its limits.

A substantial wharf has been erected on the east shore of MacGregor's Lake (lot 12, Range 12), and another, equally good, near the dam, on lot 13 of the 9th Range, between which spots—a distance of about three miles—the phosphate is conveyed on a well-built scow belonging to the Company. From the dam wharf, the conveyance is by teaming over a very fair road to Dunning's Wharf on the Ottawa River, a distance of nine or ten miles, from whence the phosphate is shipped directly to Montreal. On lot 12 of the 12th Range, a well-appointed blacksmith's-shop has been put up, together with several dressing sheds and storing houses; and additional sheds for cobbing and storing the mined phosphate have been erected on other parts of the property. Altogether, the tools and plant, at present on the ground, are sufficient for working gangs of at least forty men.

The following is a complete enumeration of the Company's lots.*

A. TOWNSHIP OF TEMPLETON.

Range 2, South part of east half of lot 15, (100 acres). Lies a mile and a half from the river front. Contains at least two phosphate-bearing bands of considerable width, but at present altogether undeveloped. The phosphate is distributed in numerous crystals through bands of limestone. It would be advisable to test these limestone bands by boring, as the phosphate may very probably run into workable bunches at a moderate depth from the surface. The lot, however, lies completely apart from the main mining ground of the Company. It is known as the "Bertrand" lot.

Range 8, East half of lot 15 (100 acres). Two pits, known as the Pioneer Pits, have been opened on this lot, and 162 tons of phosphate have been shipped from their yield. In one, a long lead of phosphate occurs on the pit-floor, and evidently indicates a further extension of the workable mass.

Range 8, continued: East half of lot 19, and west half of lot 20 abutting on Latourneau's Lake, (200 acres). Good indications of phosphate, but the lots, at present, are practically unexplored. The surface-rock for the greater part is entirely concealed by soil, fallen timber, &c. This applies also to many other portions of the Company's property.

Range 9, North half of lot 4 (100 acres), south half of lot 5 (100 acres), east half of lot 8 (100 acres), south part of lot 11 (90 acres). Fair shews on all, but none yet opened out. East half of lot 19 (100 acres). Several promising shews from which a few tons of phosphate have been taken, occur on this lot, but the ground practically is still unopened. Mr. McLaurin's deep pit, from which upwards of 600 tons have been already obtained, lies on the adjacent lot 18; and some fair shews occur also on lot 17.

Range 10, lot 8 (200 acres). Contains fourteen or fifteen good shews, not yet opened. West half of lot 11 (100 acres): shews several exposures, two partially stripped but not yet worked. North half of lot 12 (100 acres): perhaps less promising than some of the other lots in this Range, but containing several shews from the surface of which a ton or two of good phosphate has been extracted. South half of lot 16 (100 acres), the "Brown" lot: very promising shews but at present unworked.

Range 11, lot 12 "Birch Point" (160 acres), lot 13 (130 acres), lot 14 (80 acres). These lots lie on Courville's Bay, a southern extension of MacGregor's Lake. They shew several very promising leads, from trial-pits on which about 24 tons of phosphate have already been taken; but

* The small map, which accompanies this Report, exhibits the position of the more central and important lots of the Company in the north part of Templeton. Other phosphate lands belonging to the Company, in Templeton and Portland, lie beyond the limits of the map, but are referred to in the Report.

the deposits are at present merely opened. Lot 16 (200 acres); slight shews, unworked. Lot 19, north half (100 acres): four good shews; but if worked in summer, a road to this lot is required.

Range 12, lot 11 (200 acres): several fine shews, one opened in the "Carey" Pit, but scarcely worked as yet, although about six tons have been taken from its surface. Lot 12 (200 acres). This lot has yielded the principal portion of the phosphate hitherto taken from the Company's property, and it is still being largely worked. Its southern border abuts on Mud Bay and MacGregor's lake, on which a good wharf has been erected. Twelve or thirteen pits, known collectively as the "Fidelity Mine", have been opened on the lot. These are referred to, more fully, in § 2, below. One pit, the "Trusty", 52 ft. deep, has yielded 320 tons of first-class phosphate; and another, the "Emerald", has yielded 150 tons. Lot 13 (130 acres): contains a number of good shews, on one of which a little sinking has been done (the "Baron" Pit), and about seven tons have been taken out. Over fifty exposures of phosphate in small strings and leads occur on a steep hill-side on another part of this lot. These shews, although small in themselves, are quite as promising as many surface shews, on other lots, which have opened out into good workable bunches at comparatively slight depths. Lots 15 and 16 (100 acres, each): practically unexplored, but shew indications of phosphate in several places. Lot 19 (180 acres): four slight shews, altogether unworked as yet. Lot 21, north half (100 acres): several shews, one exceedingly promising (Bishop Pit) on which work is just being commenced. It extends over a considerable space. A deposit, a short distance to the north-west of this lot (just beyond the Company's limit) known as "Breckon's Mine," has yielded over 400 tons, and is constantly improving. Its surface shew does not appear to have been as promising as that at the Bishop Pit on the Company's ground.

Range 13, lot 11 (200 acres). About the centre of this lot, near the south-west extremity of Clear Lake, a deep pit has been carried down on a large deposit of very pure green phosphate. The pit has already yielded over 60 tons, and is still improving. Another shew, unworked as yet, occurs a short distance west of this opening. Lot 12 (170 acres): contains a very promising surface shew, as yet only picked over. Other smaller shews also occur on the lot. Lot 14 (190 acres): altogether unexplored, but evidently a promising country. Lot 17 (57 acres); consists of two portions separated by the southern extremity of Grand Lake. Good shews occur on both, but have not at present been opened.

B. TOWNSHIP OF PORTLAND.

Range 2, lot 17 (120 acres), lot 18 (130 acres), lot 31 (120 acres), lot 32 (130 acres). Good shews, mostly of red phosphate, but altogether unworked.

Range 3, lot 19 (120 acres). Fair shews, but lot practically unexplored. Ground, heavily timbered.

(2). *Mineral Features* :—The country-rock of the district in which the phosphate property of the Company is situated, consists of Laurentian gneiss, in thick and thin beds, composed essentially of quartz and orthoclase feldspar, with a little mica in some places, and much hornblende in others. The mica, as a rule, is sparingly present—and in this respect the gneissoid rock presents a marked contrast to the phosphate-bearing veins, in most of which a magnesian mica (phlogopite) occurs largely, or forms, even, the predominating portion of the veinstone. Coarse brown garnets, and here and there crystals of black tourmaline are also occasionally present in the gneiss. Over the greater part of the Company's property, the strike of these gneissoid rocks is in a general north and south direction, although subject to local exceptions. Numerous veins, some of great width, traverse the country-rock almost at right-angles, or in a general east and west direction. These veins carry the phosphate deposits. They consist, mostly, of a mixture of coarse crystals of brown magnesian mica (phlogopite), light or dark green pyroxene, and white or pale-reddish calcite; and a banded structure is sometimes observable in them. In some cases—as on the Bertrand Lot: 15 in Range 2 of Templeton—the veinstone consists essentially of crystalline calcite; but in most of the veins within the limits of the property, the chief portion of the gangue consists of either phlogopite or pyroxene, or of an intermixture of these magnesian silicates. In some veins, finely-crystallized scapolites, and quartz and zircon crystals, are also present. The phosphate—fluor-apatite—lies in more or less lenticular masses within the gangue, and throws out small strings or "leads" in various directions. In practically all the veins, the phosphate at the outcrop of the vein shews merely thin strings and patches, with perhaps a few scattered crystals in the surrounding veinstone; but in descending, the strings run more or less together, and at the depth of a few feet a solid bunch or mass of apatite is frequently struck. This, as a rule, expands rapidly; but after widening to from two or three, to over ten or fifteen feet—or in special cases to a

still greater breadth—it gradually contracts again, and finally thins out. The annexed sketches present generalized sections of phosphate masses of this kind: fig. 1 being a section along the run or course of the vein; and fig. 2, a section across the vein. In some cases, a mass of phosphate, after contracting to a very narrow width—or being partially cut off by large fragments or horses of gneissoid rock lying within the vein—has again opened out into workable dimensions.

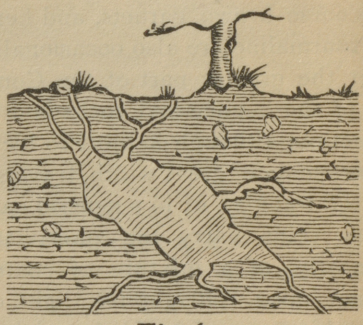


Fig. 1.

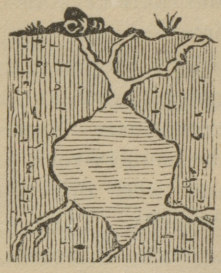


Fig. 2.

The actual width of these phosphate-bearing veins exceeds in some instances twenty or thirty feet, but in most cases it remains still to be ascertained, as the excavations have necessarily been confined to the phosphate masses, the other portions of the vein being left unstripped. At present, also, no definite attempt has been made to continue the workings below the first phosphate masses, the primary object being to get out as much phosphate as possible without incurring the expense of deep sinkings. But it may be legitimately inferred that other masses will be found at greater depths,—not necessarily directly under the others, but in the vicinity of these. It would seem advisable, therefore, to test the veins more thoroughly by a few deep borings carried down upon the vein at different spots. I am convinced that this would lead to the discovery of other workable deposits.

The course of the veins, it has been stated on a preceding page, is mostly in a general east and west direction. In

one or two cases, this cannot, at present, be actually proved, but in the greater number of examples it is sufficiently manifest. Thus, at the "Fidelity Mines," on the more southern portion of lot 12 in the 12th Range of Templeton, three veins, at least, may be clearly traced by the pits already opened upon them. Near the lake margin, in passing from east to west, these pits comprise: the "Surprise," the "Tricky," the "Emerald," (from which 150 tons of phosphate have been taken), the "Feeder" (which has yielded 25 tons), the "Boulder," and the "Tidy." A second vein, running in the same general east and west direction, a chain or two north of the above, outcrops on the shore of Mud Bay, where it shews a long and very promising lead, and is opened farther west at the "Trusty," the "Colossal," and the "Purity" pits. From the Trusty pit, 320 tons of phosphate—representing a profit of nearly $2000—have already been obtained. A third vein, still farther north, has been opened at the "Red," the "Hermit" and the "Carey" pits, which also lie east or west of one another.

Two facts here come prominently to the surface. First, the very important fact that the phosphate lies in irregularly-lenticular masses imbedded in true fissure-veins, the essential or characteristic veinstone being brown magnesian mica in large crystals, pyroxene, or calcite, or a mixture of these minerals,—from which it may be concluded that workable deposits of phosphate will be found at greater depths than those hitherto reached. And secondly, the fact of the veins running (at least, in most instances) in a general easterly and westerly direction, a knowledge of which may facilitate the discovery of workable masses at present concealed.

(3). *Composition and average quality of the Phosphate*:— The mineral substance technically termed "phosphate" in Canada, is known mineralogically as Apatite. Of this mineral, two leading varieties are recognized. In one, the substance may be regarded as essentially a compound of phosphate of lime and fluoride of calcium; and in the

is from $18 to $19, with a marked tendency to rise. At the lower quotation, consequently, it is evident that a good profit should be realized alone from the lots now under exploration.

In concluding this Report, I may again express my thorough conviction that the Company possesses in these lands a most valuable phosphate property. Under judicious management, the property, I feel assured, will yield good returns for the outlay expended upon it.

I have the honor to be, Sir,

Your obedient servant,

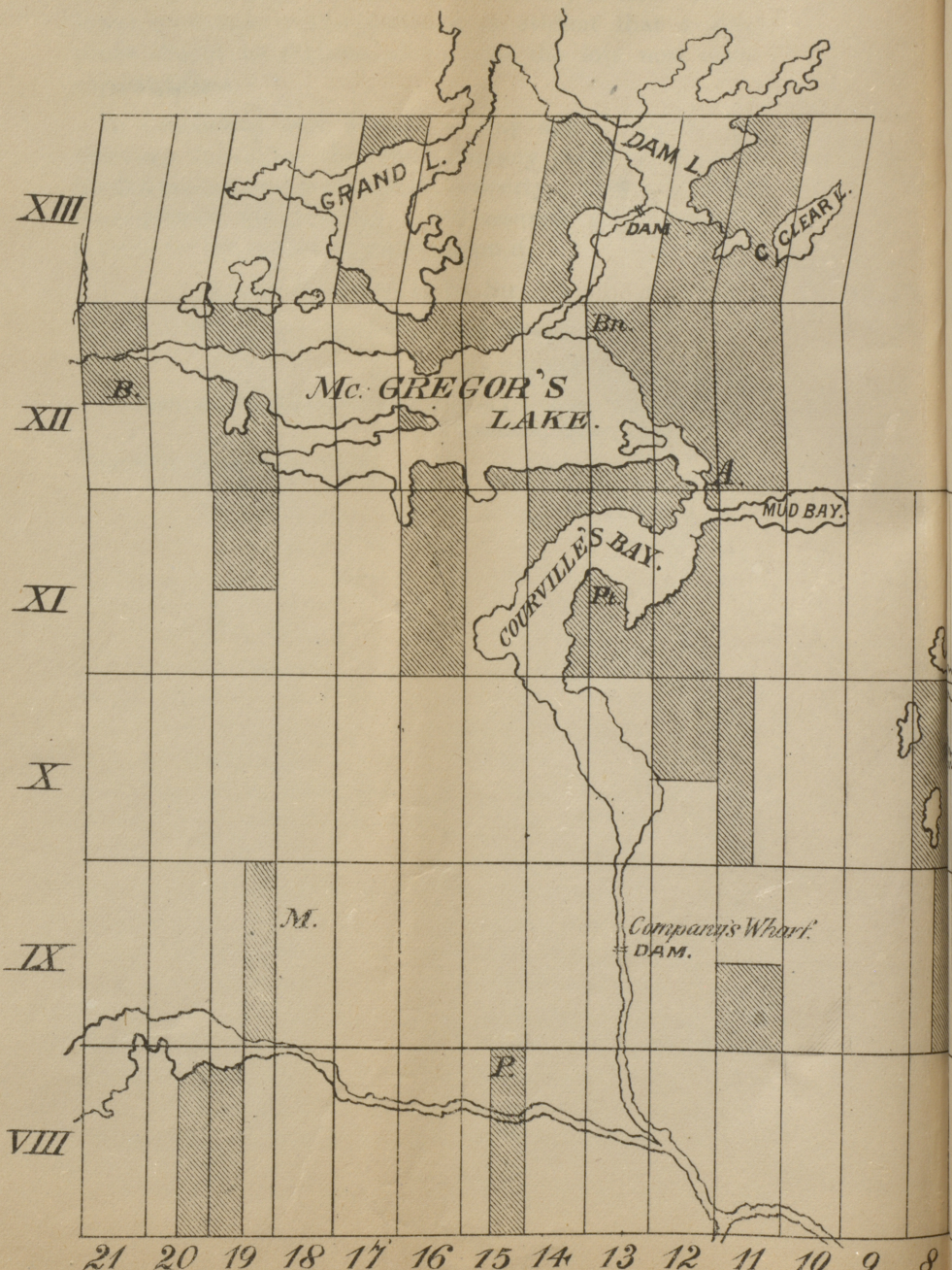
E. J. CHAPMAN, PH. D., &c.,

Professor of Mineralogy and Geology in University College, Toronto, and Consulting Mining Engineer.

TORONTO, June 15th, 1878.

PHOSPHATE LANDS

Of the Templeton and North Ottawa Mining Company,
In the Township of Templeton, Quebec:
Concessions viii to xiii inclusive.



REFERENCES:

The Company's Lots are denoted by oblique shading.

A. Fidelity Group of Mines, with wharf, &c., Lots 11, 12; R. xii (see Report).

B. Bishop Pit; Bn. Baron Pit.

C. Clear Lake Mine (see Report).

Pt. Birch Point.

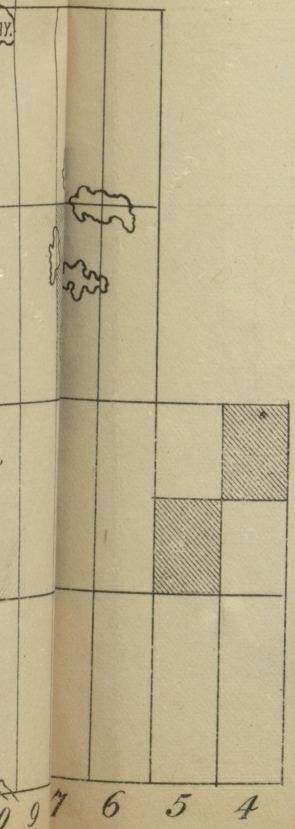
M. Position of the McLaurin Mine.

P. Pioneer Pits.

For other localities, see the Report.

Scale (approximative) 1 inch to the mile.

E. J. C.
June, 1878.



1/4 40

2 3/4

1/4 9 3/4

1/8 18.2 113.7

1/2 1 4

75 - 16.50

80 - 17.68

Ent 4.80 for 90 day Bill