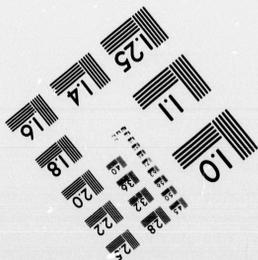
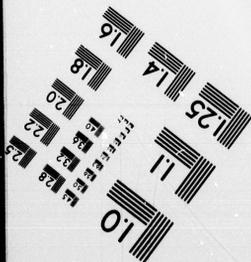
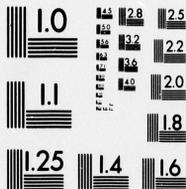


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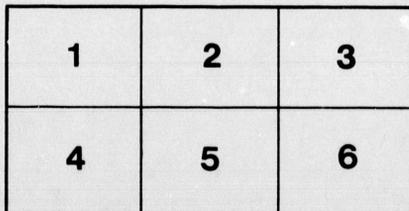
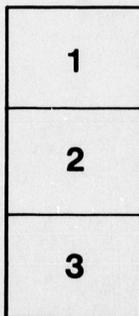
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REPORT

OF

THE IVES MINE,

BOULTON TOWNSHIP, P. Q.

To C. S. GZOWSKI, Esq., &c. &c.,
Toronto.

SIR,—Having received your instructions to make a careful examination of the Ives Mine and Mineral Location, with a view, more especially, to determine the amount of ore ready for stoping, and the average richness of the ore, I have carried out these instructions to the best of my ability, and I now beg to offer the annexed summary of the results of my inspection. The small plan and section which accompany these statements are merely hand sketches, it will be understood, given simply to assist the explanations. My time at the mine was limited to a couple of days, but I passed several hours underground, and made careful measurements of the heaps of ore upon the surface. I extended my observations also to the Huntingdon location, the copper-bearing beds of the latter being evidently a continuation of those of the Ives mine.

1. The Ives mineral location comprises 400 acres of heavily timbered land lying in the 8th and 9th Ranges of Bolton, one of the Eastern Townships of the Province of Quebec. It is

situated at a distance of about 12 miles from the Village of Waterloo, and 10 miles from Frost Village, the present terminus of the Stanstead, Shefford and Chambly Railway, which communicates with Montreal, Portland, Boston, &c., *via* St. Johns. The River Missisquoi, a comparatively narrow stream, flows through a portion of the property, and along the western limit of the location generally. The east bank of this stream rises into a long escarpment or bluff, running, roughly, north and south; and the copper-bearing ground lies on the eastern edge of this bluff, throughout the entire length of the location. The country-rock consists essentially of magnesian slates belonging to Sir William Logan's Lauzun Division of the Quebec Series of strata, and forming an intermediate part of one of the remarkable synclinals which the officers of the Geological Survey have traced out in that section of the Province. The strike, dip, and mineral characters of these magnesian beds are given below.

2. The copper ore, which consists essentially of the ordinary or yellow pyrites, mixed more or less with cubical and magnetic pyrites, does not occur in a vein, but is disseminated through a bed of chloritic slate bounded on its western edge by a bed of slaty talc, locally known as the "soapstone bed."

3. These strata have a general strike in the direction of N. 26° to 30° E., and they dip towards the south-east at an angle of 77° or 78°.

4. They can be traced entirely across the location, a length of about 125 chains, or rather more than a mile-and-a-half; and they evidently form a continuation of the copper-bearing beds of the Huntingdon mine.

5. The copper ore, although disseminated through a thickness of probably 50 feet, or even more, appears to run chiefly in two bands or lodges parallel with the stratification.

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6. One of these bands is in close proximity to the soapstone bed: it averages about 6 feet in thickness. The other band runs parallel with this, at a distance of about 5 fathoms, and exhibits an average width of about 8 feet. It carries, at one part of its course, a solid mass of copper ore, averaging at least 20 per cent. of metal, and varying in width from two to three feet.

7. Bunches and strings of ore occur here and there within the intermediate space, but as these are of more or less partial and irregular occurrence, they have not been taken into consideration in the calculations which follow. Other bands of ore may also be found to the east of the 8-foot band, but the calculations, given below, refer only to the two bands already mentioned.

8. The copper-bearing slates are cut in one place, almost at right angles, by a dyke of trap of about two feet in thickness; but this has caused no practical interruption of the copper bands, as these continue on each side of it; nor has it displaced the beds beyond the extent of an inch or two.

9. The workings at the mine belong to two, at present, distinct areas. The first shaft was put down on the 8th Range, to a depth of about ~~11~~^{eleven} fathoms. This is known as the "Ferrier Shaft." The sinking at this spot was subsequently stopped, and new workings were opened about two-thirds of a mile farther north, on Lot 2 of the 9th Range. Here two shafts have been carried down: one, the "Brydges Shaft," to a depth of ~~27~~²⁷ fathoms, and the other, or "Galt Shaft," (farther north) to a depth of 22 fathoms. These are being united at the 15-fathom level by a drift on the run of the 8-foot band of ore, and cross-cuts have been carried from them in a westerly direction to the 6-foot band on the edge of the soapstone, another drift having been carried along the course of

this over a length of about 50 fathoms. Rails are laid down in these drifts, and solid timbering has been put up where necessary. Other cross-cuts have also been taken across the intervening ground; and one has been carried eastwards, to the distance of a few fathoms, from the Brydges Shaft, in order to test the ground in that direction. The shafts are well housed, and each is provided with a horse-whim,* carrying a drum of 8-feet diameter. The Brydges Shaft is braced off and provided with ladders from the surface; but in the Galt Shaft the ladders commence only at the 15-fathom level. These works have been carried on under the superintendence of Capt. Rogan, who has shewn much skill and judgment in their execution. A blacksmith's shop, powder-house, stables, and good buildings for the accommodation of the superintendent and miners, have also been erected in the vicinity of these shafts.

10. To obtain a thoroughly satisfactory estimate of the actual percentage of metal carried by these bands of ore, it would be necessary to crush and dress several tons of material. To get, however, as close an approximation as possible to the average percentage of copper, I sub-divided the area of these bands within the present workings into six distinct parts, and took samples in fair proportions from each. The samples, united, amounted to just 45lbs. The whole was then carefully crushed, and the particles were thoroughly mixed together. Portions subjected to wet assay (in which the copper was weighed as black oxide) gave the following results:

No. 1. Metallic Copper	.. 5.22 per ct.	} Av. yield=5.24 per ct.
No. 2. " "	.. 5.36 per ct.	
No. 3. " "	.. 5.14 per ct.	

* Captain Rogan, the superintendent of the mine, has made an innovation in the arrangement of these whims, which cannot be too highly recommended. The horse works without shafts. There is thus no strain or drag upon it when stopping, and it can be turned with great ease and rapidity.

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Fig. 2.
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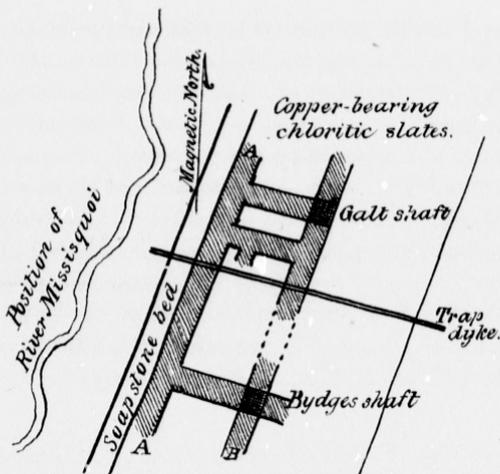


Fig. 1. Sketch-Plan at 15-fathom level. (§ 11)

A. Soapstone Drift.

B. Galt and Bydges Drift.

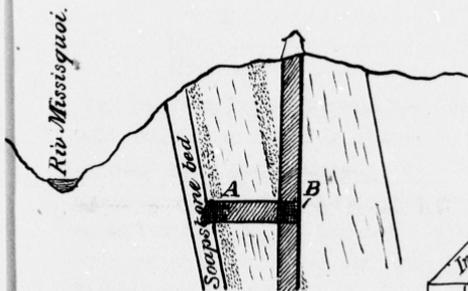


Fig. 2. Sketch-Section at Galt shaft, showing dip of strata, and position of soapstone bed and copper bands. (§§ 2.3. 5.6).

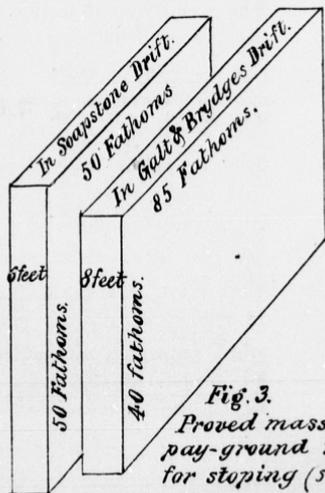


Fig. 3.

Proved masses of pay-ground ready for stoping (see § 12).

J. Chapman.
June 18th, 1869.

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This result, referred to its corresponding dry-assay value, may be taken as equivalent to about 4 per cent. It must be observed, however, that the value thus obtained refers only to the bands of pay-ore within the comparatively limited space now opened out. Richer and also poorer ore may be met with in other parts of the copper-bearing slates. But, comparing this result with the ore taken from the Ferrier Shaft, two thirds of a mile farther south, and with that from the Huntingdon Mine, beyond the limits of the property in the same direction, I think it may be regarded as likely to prove a fair average of the general yield of the Ives ore. The present workings at the Galt Shaft appear to be in a comparatively rich part of the band.

11. In the portion of ore taken for assay No. 2, the other components were also determined. The complete analysis shewed the following results :

Sulphur.....	12.33
Copper.....	5.36
Iron	10.79
Rock matter.....	71.28

12. As these copper deposits are not in the form of a true vein, but are contained in altered and folded beds of sedimentary rock, their extension in a vertical direction is undoubtedly more or less limited. But, confining our calculations to the two bands of ore within the workings now opened out or in progress around the Galt and Brydges shafts, we may legitimately assume that the 6-feet or soapstone band will hold good to a depth of at least 50 fathoms, and the length now exposed for stopping may also be taken at 50 fathoms. Assuming, as above, that the ore in these bands will only average 4 per cent. metal, and taking the specific gravity at 3.10, this 6-feet band will carry within the indicated limits about 46,573 tons, which, at 4 per cent., should yield 1,863 tons of metallic copper.

The Galt-and-Brydges, or 8-foot band, is laid open to a length of about 85 fathoms, and its proved depth may be averaged at 40 fathoms, a lower value being here taken on account of a pointed mass of apparently barren ground which comes up in the form of a so-called "horse" near the bottom of the Brydges shaft. With these dimensions, we obtain 84,452 tons of ore, which at 4 per cent. should yield 3,378 tons of copper. We have, consequently, within this comparatively limited area, now under stoping, 131,025 tons of ore, carrying 5,241 tons of metallic copper. Fig. 3 may serve to convey an idea of the relative positions, &c., of the two rectangular masses of ore referred to in these calculations.

13. The amount of slack ore, *id est*, ore that cannot be profitably hand-dressed for transportation—on the ground at the time of my visit (June 10th, 1869), was approximatively as follows:

540 tons of about 6 per cent. ore ("smalls").

3,570 tons of about 4 per cent. ore, in several heaps.

To these, which are being constantly increased, must be added a small parcel of dressed ore, about $4\frac{1}{2}$ tons of 12 or $12\frac{1}{2}$ per cent., and another of 9 tons of undressed 3 per cent. ore, or thereabouts, lying at the Ferrier shaft. A considerable amount of ore, roughly dressed by hand to about 13 or 14 per cent., has also been boxed for market within the last ten months.

14. Estimating the ore to average, as above, 14 feet of pay-ground, and to contain 4 per cent., copper (with sp. gr.=3.1), a square or running fathom will carry $43\frac{1}{2}$ tons of 2,240 lbs., or about one ton and three-fourths metallic copper. Assuming further, that the ore run only to a depth of 25 fathoms—an assumption certainly much within the true limits, as the Galt shaft has proved the ground to that depth, with increasing

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richness of ore—the entire band of copper-holding slate throughout the property could yield no less than 1,435,000 tons of ore, or 57,400 tons of metallic copper. As no allowance is here made for the anticipated occurrence of pay ore in other parts of the slate band, this amount may be regarded as at least a safe estimate. It is probably much below the truth.

15. If proper dressing floors were put up at the mine, and suitable machinery provided, all the ore might be brought to about 15 per cent. ; but it would not be advisable to carry the dressing beyond this, as much copper would inevitably pass into the slimes if a higher degree of concentration were attempted.

16. The preceding statements are sufficient to shew the value of the Ives location as a mineral property. In order, however, to render the mine a source of profit to its owners, one condition, namely, the reduction of the copper on the ground by some cheap and effectual mode of treatment by which practically the whole of the copper can be got out, appears to be absolutely necessary. The ore is of good quality, as it is entirely free from galena, zinc blende, heavy spar, and other substances, by which its chemical treatment might be more or less impeded or complicated ;* but, at the same time, when viewed generally, it cannot be regarded as a rich ore ; neither can it be dressed, without undue loss, to a great degree of fineness. The duty lately placed on copper and other ores by the United States' Government, virtually closes the American market to this ore ; and, at the present low price of copper, the ore can scarcely be transported to Europe with fair profit

* In some of the heaps of ore at the Huntingdon Mine, I observed here and there a few specks and particles of mispickel, but I have not found, as yet, a trace of that substance in the Ives ore. If present at all, it will probably occur only in traces.

to the owners. By shipment also of the dressed ore, a large amount of good material is necessarily left, as refuse on the mining ground, and is thus permanently lost.

My conclusions, therefore, may be briefly recapitulated as follows:

The mine is well situated as regards drainage, supply of timber, and other conditions.

The ore is of good quality, and evidently present in large quantity; but the successful working of the mine requires the reduction of the copper to be effected on the ground itself.

E. J. CHAPMAN, Ph. D.,

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

TORONTO,

June 18, 1869.

$$\begin{array}{r} 1650 \\ \underline{412.50} \end{array}$$

$$\begin{array}{r} 330 \\ \underline{82.50} \\ 412.50 \end{array}$$

