

REPORTS ON THE IVES MINE.

Notes on the Copper Deposit of Bolton. By DR. T. STERRY HUNT, F.R.S.,
Chemist and Mineralogist to the Geological Survey of Canada.

MONTREAL, May 1, 1872.

The Copper deposit of this region, which is now attracting so much attention, is found on lots 2, 3, 4, 5, 6, 7, 8, 9, and 10 of ranges VIII. and IX. of the township of Bolton, in the province of Quebec. According to the description given in the Report of the Geological Survey of Canada for 1866, and to a geological map of the district prepared under the direction of Sir William E. Logan, it occupies a position on the west side of an overturned anticlinal, and belongs to an interstratified portion of the crystalline schists of the region. The strata, which have here a strike of about N. 35 deg. E. magnetic, dip with a very high angle, about 80 deg. to the south-east, and consist of soft more or less chloritic schists, with an included band of STEATITE or SOAPSTONE, sometimes with serpentine. This band (which serves to mark the position of the Ore-bearing belt) bends to the eastward, near the northern limit of lot 2, and, according to the map just mentioned, thence turns southward, running a course parallel with the western outcrop (along which the openings for mining have been made), and from a quarter to a half of a mile to the eastward of it.

Although YELLOW COPPER ORE has been found in such quantities at various points along the western outcrop, throughout the distance of more than three miles, as to show the CONTINUITY of the Ore-belt, the only workings as yet are those at the IVES MINE, on lot 2 of range IX., and the HUNTINGTON MINE, on lot 8 of range VIII.; the south-western course of the Ore-belt taking it obliquely across the ranges, which run north and south. The property known as the IVES MINE comprises the NORTHERN PORTION OF THIS BELT, including lots 2, 3, and 4; while the property of the HUNTINGTON MINING COMPANY includes the lots 5, 6, 7, 8, 9, and 10, lying to the southward of the last. On lot 6 is the opening known as the Canfield Mine.

The workings at the IVES MINE, which commence about a quarter of a mile from the northern extremity of the western outcrop, consist of two shafts, about 50 fathoms apart. Of these the southern or BRYDGES shaft was sunk for fourteen fathoms through good mining ground, and yielded 100 tons of 10 per cent. Ore in the sinking; besides Ore of lower grade, which has never yet been dressed. From this depth it passed downwards eleven fathoms through barren ground, the sudden appearance of which appears to indicate a local disturbance in the stratification. At a depth of fifteen fathoms, a cross-cut was carried a distance of nine fathoms to the westward, until the BED OF SOAPSTONE was met with; a portion of RICH ORE having been met in the cutting. A level, at this depth of fifteen fathoms, was then driven northward, along the eastern limit of the Soapstone band, for FIFTY FATHOMS, THROUGH GROUND WHICH IN SOME PARTS HOLDS SO MUCH ORE AS TO BE FIT FOR STOPING. At the northern extremity of this level a cross-cut was made to the eastward, when GOOD ORE was encountered, until at a distance of eight fathoms from the SOAPSTONE, A BED VERY RICH IN MASSES OF YELLOW ORE WAS MET WITH.

A shaft, known as the GALT shaft, was here sunk a little farther to the east, and, owing to the slope of the surface, reached the horizon of the so-called fifteen-fathom level at a depth of twelve fathoms, without, however, encountering the Ore-stratum; which, owing to its eastward dip, was met with at the bottom of the shaft, eight fathoms below, or twenty fathoms from the top of the Galt shaft. At twelve fathoms a level was driven along the strike of the Ore bed, for a distance of ten fathoms northward and thirty fathoms southward, or within eighteen fathoms of the Brydges shaft, which lies in the strike, and was sunk fourteen fathoms along the same Ore bed. RICH ORE-BEARING GROUND WAS FOUND THROUGHOUT THIS LEVEL OF FORTY-TWO FATHOMS, and considerable work has been done near the Galt shaft, where the ground on both sides has been stoped downwards for six fathoms. The accumulation of water, the only means of removing which is by a bucket, has prevented working at a lower level. (The Ore-bearing ground thus stoped along the twelve-fathom level varies from FIVE TO TWELVE FEET, but has an average width of one and a-half fathoms, and yields to the cubic fathom an average of FOUR TONS OF ORE OF THIRTEEN PER CENT., besides about TWO TONS of stuff, estimated to contain SIX PER CENT. of Copper, which is accumulating at the Mine for want of dressing-machinery. The gangue is a soft chloritic and dioritic rock, calculated to weigh about seventeen tons to the cubic fathom, so that the yield for the rock raised is nearly four per cent. of Copper. The Ore is Pyritous Copper, with a little Iron Pyrites, and has assayed from twelve to fourteen per cent. in Liverpool. About 200 tons of such Ore are now ready for shipment, and it is estimated by Mr. Andrew Whyte, the Superintendent, that, with proper facilities for draining the Mine and for dressing the Ore, THE PRESENT STOPES COULD BE MADE TO YIELD EQUAL TO 150 TONS MONTHLY OF ORE OF ELEVEN PER CENT.

In sinking the BRYDGE'S Shaft, as already said, evidence of some disturbance was found at a depth of fourteen fathoms, and the rich Ore bed was lost. The cross-cut of eight fathoms to the westward showed some good Ore, and thence the fifteen-fathom level (already mentioned as extending fifty fathoms to the northward) was carried twenty-five southward, along the east wall of the Soapstone, portions of Ore being met with all the way, but no considerable quantity. From the bottom of the Brydges Shaft, at the depth of twenty-two fathoms, another level parallel with this last (but of course farther to the eastward) was carried for seventeen fathoms to the southward. This is now filled with water, but is said to have yielded some Ore throughout. It would now appear that the position of the Ore-bed, which, in sinking the Brydges Shaft, was lost at fourteen fathoms, lies between these two levels. In the course of April, 1872, exploration was re-commenced twenty-three fathoms southward from the Brydges Shaft, in the fifteen-fathoms level, where A MASS OF ORE WAS UNCOVERED IN THE BOTTOM OF THE LEVEL. A WINZE NOW SINKING UPON THIS SHOWS, AT THE DEPTH OF TWO FATHOMS, THE ORE-BED, PRECISELY AS THE STOPES SEVENTY-FIVE FATHOMS TO THE NORTH-WESTWARD; having a breadth of NINE FEET, and yielding, according to the Superintendent, FOUR TONS OF TWELVE PER CENT. TO THE CUBIC FATHOM; besides MUCH Ore of lower grade. It is proposed from this winze to communicate with the 25-fathom level at the bottom of the Brydges Shaft; and, from present appearances, ANOTHER EXTENT OF GROUND AS RICH AS THAT NOW WORKED FARTHER NORTHWARD WILL, IN THE COURSE OF THE SUMMER, BE SO FAR OPENED AS TO DOUBLE THE PRESENT PRODUCTION OF THE MINE.

The cost of Ore from twelve to fourteen per cent. from the present workings, all expenses included, is, according to Mr. Whyte, the Superintendent, 12 dols. per ton. To this may be added, for freight to Montreal, and thence to Liverpool, with charges, about 7.50 dols., making the cost of such Ore in Liverpool about £4 sterling per ton.

It is to be remarked that the operations here have, as yet, been limited to such Ores as could readily be raised by hand-picking to the percentage just mentioned, and that no dressing machinery has as yet been erected. At my visit to the Mine last week, I saw, besides 200 tons of 13 per cent. Ore, 2000 tons or more of rejected Ores, holding about 4 per cent.; which, at a very small expense, could be dressed to 6 or 7 per cent., or even higher; the Ore being in a soft Chloritic Gangue, and associated with comparatively little Iron Pyrites.

Should it be desired to erect works on the spot for the extraction of Copper by some WET PROCESS, LARGE QUANTITIES OF ORES suited for this purpose might be extracted and dressed to 6 or 7 per cent., at a small cost, from various points along the ground already opened, both within and outside of the limits of the rich Ore-producing portions already indicated.

In a published report upon the Ives Mine, made by Professor Ed. J. Chapman, of University College, Toronto, in June, 1869, he estimates at not less than fourteen feet the breadth of ground capable of yielding 4 per cent. of Copper, or $1\frac{1}{2}$ tons of Copper to the running fathom. This, however, is not in all parts as concentrated as in the somewhat narrower portion of ground now stoped (which yields, by hand-picking, an Ore of over 13 per cent.), and therefore would require, for the advantageous extraction of its Metal, either proper DRESSING MACHINERY, or, as suggested by Professor Chapman, the employment of a WET PROCESS at the Mine. In his report he has assumed that the Copper-bearing band will be equally productive throughout its whole extent, in which case the productive capacity of the ground becomes enormous. This continued richness of the ground remains to be proved, for the unopened portions, but in the meantime the observations, as far as made, go to confirm it. About a quarter of a mile to the north-east of the GALT Shaft, the outcrop shows a deposit of rich Ore, at a point marked on the Map as the turn of the Copper-bearing belt around the point of the anticlinal. Again, about a half mile south-west of the BRYDGES Shaft, an opening, known as the FERRIER Shaft, was sunk at the

- 22 2 30

commencement of mining operations in this region, and yielded several tons of 10 PER CENT. ORE, besides, it is said, a large quantity of poorer Ore, requiring dressing to fit it for market. Some distance beyond this occurs the Canfield Mine, which has yielded similar results, and about two miles south-west of the Brydges Shaft is the HUNTINGTON Mine, which has been worked for the past seven years, and has yielded large quantities of Copper Ore. It is situated on the outcrop of the same Copper-bearing belt, which here, as well as further northward, is marked by the presence of a band of SOAPSTONE OR STEATITE.

Along the east side of this band, at the HUNTINGTON Mine, a shaft has been sunk to a depth of forty-two fathoms, on what is called the New Lode; which is from twelve to fourteen wide, and has been opened by levels, at intervals of ten fathoms, for a distance of thirty-five fathoms, north-east and south-west. As the Ore in this southern extension of the belt contains LESS EARTHLY GANGUE, and A LARGER PROPORTION OF IRON-PYRITES, *it cannot be picked or dressed to so high a percentage as that farther northward.* The workings at the HUNTINGTON Mine, besides shewing the persistence and richness of the copper-bearing belt at a distance of two miles to the south-westward of the workings at the Ives Mine, have disclosed *another very important fact*; which is, that besides the deposit of Ore on the EASTERN side of the SOAPSTONE belt, there exists another deposit immediately to the WEST of it, separated by a distance of about fifty feet only. UPON THIS WESTERN COPPER BAND, there known as the Old Lode, a shaft has been sunk to the depth of thirty fathoms. It has a breadth of eight or ten feet of workable ground, and, according to Mr. Charles Robb, to whose recent report I am indebted for details as to the present condition of the HUNTINGTON Mine, has proved to be richer in Copper than the New Lode, on the east side of the Soapstone. Several cross-cuts have been made through the Soapstone from the old to the new Lode. From these comparatively limited openings at the HUNTINGTON Mine, there were, it is stated, shipped to Liverpool in 1870, 4500 tons of Ores yielding from six per cent. to twelve per cent. of Copper; while there are now lying at the Mine, it is estimated, over 25,000 tons of Ore, holding from 3.0 to 3.5 per cent. of Copper, which, from the large admixture of Iron Pyrites, cannot be dressed for shipment, but must be treated on the spot. The outcrop of the Copper-bearing belt has been traced to a considerable distance to the south-west of the HUNTINGTON Mine; and at 50 fathoms in that direction, according to Mr. Robb, there is exposed a very rich deposit of Copper Ore.

Without attempting, from the data furnished by the present workings, to form any estimate of the probable quantity of Copper which might be extracted from the whole known extent of the Copper-belt in Bolton, IT IS EVIDENT THAT THE PROSPECTIVE RESOURCES OF THE REGION ARE VERY GREAT INDEED; AND THAT, JUDGING FROM THE FACTS BEFORE US, THERE IS NO REASON TO BELIEVE THAT OPENINGS AT ANY OTHER POINT ALONG THE OUTCROP OF ABOUT THREE MILES, WOULD NOT PROVE AS PRODUCTIVE AS THOSE NOW MINED. Mr. Robb, in a late report on the Ives Mine, has called particular attention to the deposit of Ore on the west side of the SOAPSTONE, which, it may be supposed, is not less continuous than that on the EASTERN side, or than the SOAPSTONE itself, but which has not been sought for except at the HUNTINGTON Mine; the Soapstone band having hitherto been the western limit of the explorations in the Ives Mine. He reasonably remarks: "I fully anticipate that the COPRIFEROUS BAND ON THE OTHER SIDE OF THE SOAPSTONE will prove at least EQUALLY EXTENSIVE AND PRODUCTIVE;" in which case the Copper-producing capacity of the region would be greatly extended. It is also proper to mention that, although no explorations for Copper Ore have as yet been made along what has been represented on the map as the eastern outcrop of the belt, a repetition of the Copper deposits already known, may be looked for throughout its extent, and should be an object of future exploration.

Report on the Ives Mine, Bolton Township, Province of Quebec, by E. J. CHAPMAN, Ph.D., Professor of Mineralogy and Geology in University College, Toronto, and Consulting Mining Engineer.

TORONTO, June 18, 1869.

Having received 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 HUNTINGTON 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 TWELVE miles from the Village of WATERLOO, and TEN miles from FROST Village, the present terminus of the STANSTEAD, SHEFFORD, and CHAMBLEY RAILWAY, which communicates with MONTREAL, PORTLAND, BOSTON, &c., *via* ST. JOHN'S.* 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 Lauzon Division of the Quebec Series of strata. 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 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 Huntington Mine.*

5. The Copper Ore, although disseminated through a thickness of probably FIFTY FEET, or even more, appears to run chiefly in TWO BANDS OR LODES parallel with the stratification.

6. One of these BANDS is in close proximity to the soapstone bed: it averages about SIX feet in thickness. The other BAND runs parallel with this at a distance of about five fathoms, and exhibits an average width of about EIGHT feet. It carries at one part of its course a SOLID MASS OF COPPER ORE, averaging at least TWENTY 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 eight-foot band, *but the calculations, given below, refer only to the 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 seven or eight 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 fifteen fathoms, and the other, or "GALT SHAFT" (farther north), to a depth of twenty-five fathoms. These are being united at the fifteen-fathom level by a drift on the run of the eight-foot band of ore, and cross-cuts have been carried from them in a westerly direction to the six-foot band on the edge of the soapstone, another drift having been carried along the course of this over a length of about fifty 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 eight-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 fifteen-fathom level. These works have been carried out under the superintendence of Captain Rogan, who has

* Since the date of this Report a Railway has been commenced and will speedily be pushed to the Ives and Huntington Mines.— Vide Mr. Robb's Map.—Note by Directors.

† Now 26 fathoms.

‡ 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. (Note by Professor CHAPMAN).

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 subdivided 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 Cent.	} Average yield, 5.24 per Cent.
No. 2. " "	5.36 "	
No. 3. " "	5.14 "	

This result, referred to its corresponding dry-assay value, may be taken as equivalent to about FOUR 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 HUNTINGTON 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 SIX-FEET or SOAPSTONE BAND will hold good to a DEPTH of at least FIFTY FATHOMS, and the LENGTH now exposed for stoping may also be taken at FIFTY FATHOMS. Assuming, as above, that the ore in these bands will only average four per cent. of metal, and taking the specific gravity at 3.10, this SIX-FEET BAND will carry within the indicated limits about 46,572 TONS, which, at FOUR per cent., should yield 1,863 TONS OF METALLIC COPPER.

The GALT-AND-BRYDGES, or EIGHT-FEET band, is laid open to a LENGTH of about EIGHTY-FIVE fathoms, and its PROVED DEPTH may be averaged at FORTY 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 four 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. (Vide Plan by Professor Chapman.)

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 approximately as follows:—

540 tons of about six per cent. ore ("small.")
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 four and a-half tons of twelve or twelve and a-half per cent., and another of nine tons of undressed of three per cent. Ore, or thereabouts, lying at the Ferrier Shaft. A considerable amount of Ore, roughly dressed by hand to about thirteen or fourteen per cent., has also been boxed for market within the last ten months.

14. Estimating the Ore to average, as above, FOURTEEN FEET of pay-ground, and to contain FOUR per cent. copper (with sp. gr. = 3.1), A SQUARE OR RUNNING FATHOM will carry 43½ tons of 2,240 lbs., OR ABOUT ONE TON AND THREE-FOURTHS METALLIC COPPER. Assuming farther, that the Ore run only to a depth of twenty-five fathoms,—an assumption certainly much within the true limits, as the Galt Shaft has proved the ground to that depth, with increasing richness of Ore,—the ENTIRE BAND OF COPPER HOLDING SLATE THROUGHOUT THE PROPERTY WOULD 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 FIFTEEN 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 show 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 Ore 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 (June, 1869), the Ore can scarcely be transported to Europe with fair profit to the owners. By shipment also of the dressed Ores 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.

Extracts from Report on the Property of the Ives Copper Mining Company. By Mr. CHARLES ROBB, Mining Engineer.

146 ST. JAMES STREET,
MONTREAL, 9th February, 1872.

To the HONBLE. JAMES FERRIER, MONTREAL.

Topographical Description.

On the accompanying small map, on which, upon the authority of Sir William Logan, the Provincial Geologist, I have traced the lines of outcrop of the various rock formations, and the leading topographical features I have also indicated by the red tint the boundaries, extent, and position of your Property, and the lines of highway and proposed railways traversing or connecting with it.

The Property, which I understand is held by you in fee-simple, or by direct patent from the Crown, consists of the west half of Lots 2, 3, and 4 in the 9th Range, and part of Lots 3 and 4 in the 8th Range of the Township of Bolton, in the Province of Quebec, comprising about 400 acres. The Missisquoi River, a considerable stream, affording at all seasons abundance of water and sufficient fall for driving the requisite machinery and for washing the Ore, partly traverses and partly forms the western boundary of the Property, which is, for the most part, sufficiently elevated to secure good drainage, and is heavily timbered with pine, spruce, hemlock, cedar, and birch, and more sparingly with beech and maple, affording an ample supply of the requisite material for timbering the mines, and for fuel and lumber. The mines are accessible by good roads, being at present about 10 miles distant from the nearest railway in operation (65 miles from Montreal), communicating with the general railway system of the country, and with points of cheap water conveyance to Montreal, Quebec, New York, &c. It is most important to note, however, that a line of railway connecting with that above referred to has been graded and prepared for the rails to a point about two miles south of your property, where another important

* 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 run only in traces.—(Note by Professor Chapman.)

Copper Mine (the Huntington) has been for many years in successful operation; and that the Vermont Central Railway Company, a powerful corporation which controls all the railways in this district, is under contract not only to lay the rails and work the line to the above-mentioned point during the present season, but also to build and work a branch line to your Mines. These railway routes, as well as the highways, will be found approximately laid down in the accompanying map. Two good boarding-houses, a superintendent's house, stables, blacksmith's shop, powder magazine, and several miners' houses, all of the most substantial description, have already been erected on the premises.

Geological Features.

The rocks of this region consist of various magnesian and chloritic strata lying toward the base of the Lauzon division of the Quebec group. In this geological horizon and in such conditions many important deposits of Copper Ore have been found in this Province; BUT PROBABLY NOWHERE IN SUCH ABUNDANCE AND IN SUCH A STATE OF WORKABLE CONCENTRATION AS AT AND IN THE IMMEDIATE VICINITY OF YOUR PROPERTY.

The Mine I have already referred to (called THE HUNTINGTON COPPER MINE), situated two miles to the south of yours, and on the same band of rocks, has been in successful operation for the last seven years, having produced great quantities of very fine Ore. THE SAME METALLIFEROUS BAND OF ROCKS HAS BEEN TRACED UNMISTAKABLY AND UNINTERRUPTEDLY TO AND THROUGHOUT YOUR PROPERTY, AND IN CONDITIONS HIGHLY FAVOURABLE FOR THEIR ECONOMICAL DEVELOPMENT.

Occurrence of the Ore.

The Copper Ore, which is of the Pyritous variety, or ordinary yellow Sulphuret, occurs in grains and solid patches of greater or less extent, diffused through a very considerable thickness of the Chloritic and Talcose or Micaceous Slates, forming what may be called an embedded vein or veins. The Copper Ore is associated, although in the case of your mine not intimately blended, with the Bisulphuret of Iron, or *Mundic*, and with *Pyrohotine* or Magnetic Pyrites.

Both at the HUNTINGTON and IVES MINES, A BAND OF SERPENTINE and impure STEATITE—constituting a very marked feature in this mineral district—appears to run conformably with the Slate Rocks at or near the lines of greatest concentration of the Ores. The direction of the rocks is N. 35° E. magnetic, dipping to the south-east at an angle of 75° to 80°. The most important Band of Copper-bearing rock on your mine, which has been proved to yield a paying quantity of Ore, occurs about eight fathoms to the east of this so-called SOAPSTONE BED; but the whole intervening body of rock is more or less copperiferous, and will no doubt be found at many points to prove remunerative in working.

The extent of these Metalliferous Bands of rock on your property is UPWARDS OF A MILE IN LENGTH, running parallel with and about twelve chains east from the river. At the HUNTINGTON MINE two parallel Copper-bearing Lodes or Beds have been opened up and extensively developed; one on either side of, and both closely contiguous to the Serpentine and Steatite Bands.* That lying to the west of this Band, and in immediate contact therewith, has proved the richest and most important of the two. At the IVES MINE no explorations, either on the surface or underground, appear to have been made in the relative position corresponding to this last; AND I AM THEREFORE CONFIDENTLY OF OPINION THAT RICHER DEVELOPMENTS THAN ANY YET MADE ON YOUR PROPERTY AWAITS ITS EFFECTUAL EXPLORATION IN THIS DIRECTION.

Productiveness of the Lode.

During my recent visit I availed myself of an opportunity which was afforded me of estimating the actual value of the ground, by accurately measuring a certain portion, of which the production, according to the simple method of dressing in use at the Mines, was known, and thus calculating the percentage of the whole mass. The portion measured was by no means the richest part of the stope exposed; but by the method above explained, which leaves little room for doubt as to the results, it appears that the lode at this part has produced FOUR PER CENT. throughout of Metallic Copper, equal to about FOUR TONS OF TWELVE PER CENT. ORE TO THE FATHOM, besides what is lost in the dressing. When it is considered that some of the most extensive and remunerative Copper Mines on the south shore of LAKE SUPERIOR, and also at the WEST CANADA MINES ON LAKE HURON, with the same width of Lodes and a much harder rock, yield not over one and a half per cent. throughout, and that at the celebrated ACTON MINE the average yield per fathom when at its best was 1.6 tons of twelve per cent. Ore, it must be admitted that the prospects for a successful and remunerative result to your undertaking are sufficiently favourable.

Dressing the Ore.

The total quantity of Rock excavated at your Mines in the underground operations may be roughly estimated at 400 cubic fathoms, or 6400 tons of 21 cwt. per ton; and the Ore obtained and sent to market at 600 smelters' tons of twelve per cent. produce; in addition to which there is now on the dressing floor about 35 tons of the same grade already dressed up, and a pile of rock estimated to yield about 40 tons when dressed. There is also a pile of *smalls* about 300 tons weight, which will probably produce at least five per cent. of Copper: and a large pile of rock, of which, being covered with snow at the time of my visit, I could make no estimate either as to quantity or quality; and another pile which I had no opportunity of examining at the Ferrier Shaft.

The method hitherto in use at your Mine for dressing the Ore to a convenient marketable grade is probably the best which could be adopted under the circumstances. It consists of simply spalling, or separating by hand as far as possible the Ore from the waste rock; and the quality and mode of occurrence of the Ore at your Mine render this simple process peculiarly and advantageously applicable. There must still remain, however, a considerable proportion of Ore in the rock which cannot be made available in this manner; and it may be worthy of your consideration whether, especially in the event of your applying a Steam Engine to drain the Mine, it might not at the same time be advisable to erect a small battery of stamps and cheap system of tyes and buddles to crush and dress the piles of low percentage rock now at grass, as well as much that is mined, but now left on the stulls. Of course, in the event of some humid process of extraction being adopted either at your Mine or at the HUNTINGTON, these recommendations will require modification.

Estimate of Quantity of Ore and Cost of Production.

The Band of Copper-bearing Slates, the economic value of which has been amply established at the HUNTINGTON MINE and your own, extends as already remarked across the entire breadth of your Property, or about 1000 fathoms; and at your northern boundary, from the effects of a twist in the stratification, is sharply contorted or folded over upon itself, returning in a southerly direction and again traversing your property at the distance of about a quarter of a mile to the east, as shewn in the map. It is worthy of remark that in metalliferous beds the greatest concentration of Ore almost invariably occurs at or very near the points where such folds take place; and accordingly I am credibly informed that in costeening at the point referred to, near your northern boundary, a rich show of Copper has been found; and I think that in your future operations this is a point deserving very special attention.

There is no reason to doubt that the eastern out-crop of the Copper-bearing rocks will prove equally important with the western; and accordingly I venture to submit the following rough estimate of the total amount of Ore which may be expected to exist on your property:—

Leaving out of view for the present the metalliferous Band on the WEST side of the SOAPSTONE, which does not appear yet to have been sought for on your Property, and estimating the thickness of the productive part of the Lode or Bed on the EAST side at ONLY EIGHT feet, and supposing it to be worked to a depth of ONLY FIFTY FATHOMS (which one of the Shafts at the HUNTINGTON MINE, already sunk to that depth, proves to be amply within bounds), we have (2000 × 50 × 1.3) 130,000 cubic fathoms; and assuming the average productiveness at 4 TONS OF TEN PER CENT. ORE TO THE FATHOM (130,000 × 4), 520,000 TONS OF THAT GRADE OF ORE. I fully anticipate that the cupriferous band ON THE OTHER SIDE OF the SOAPSTONE will prove at least equally extensive and productive;—consequently the above results may be expected to be doubled.

Of course, these calculations and estimates must be regarded as subject to the various contingencies and uncertainties to which all mining adventures are liable; but so far as experience in this district has shown, they appear to be justifiable.

The COST OF MINING, RAISING, and DRESSING the Ore to TEN or TWELVE per cent. produce ready for shipment at the Mine, will probably not exceed TWELVE DOLLARS PER TON, including all actual working expenses, after the ground has been opened up for stopping. The FREIGHT and CHARGES to England from the Mine will amount to about EIGHT DOLLARS PER TON.

* The importance of this Mine may be judged from the fact that although not over six years since being systematically worked, and although the scale of operations has been very limited—owing chiefly to the disadvantage of distance from railway communication and the low price of Copper—it has already produced very large quantities of Ore for the market. During the year 1870, with an average force of not over 40 men and boys, 4500 tons of Ore, of from six to twelve per cent. produce, have been raised, and for the most part shipped to Swansea. Contracts were made during that year to furnish from the HUNTINGTON MINE 1000 tons of such Ore per month. The lode at some parts has yielded as high as ten tons of twelve per cent. Ore to the cubic fathom.

As both obstacles, above referred to, are now being removed, there is no doubt that this Mine will hereafter be worked vigorously and prosperously.

MEMORANDUM OF ASSOCIATION OF THE
CONSOLIDATED COPPER COMPANY OF CANADA, LIMITED.

- I. The Name of the Company is "THE CONSOLIDATED COPPER COMPANY OF CANADA, LIMITED."
- II. The Registered Office of the Company will be situated in Scotland.
- III. The objects for which this Company is established are—
- (1.) To adopt and carry out a contract dated the first day of July, 1872, between John Watson of Gloucester Road, Kensington, Gentleman, as Agent and Mandatory for the Vendors, of the first part, and John Thomson Duncan, Accountant, Glasgow, as acting for and on behalf of the Company, of the second part, and to acquire the lands, mines, plant, and others therein referred to.
 - (2.) To purchase, lease, or otherwise acquire, any other mines, lands, or mining property, works, buildings, streams, water ways, tenements, and hereditaments, or any estates, interests, easements, rights, powers or privileges in or over the same in Canada.
 - (3.) To work the said mines and obtain the ores and minerals in the said lands, to treat and operate upon the same, and extract metals and other products therefrom, and to dispose of the same with a view to profit.
 - (4.) The purchasing or otherwise acquiring and working and using any patents or patent rights or licences therefor which may be considered desirable for the interests of the Company.
 - (5.) The selling and disposing of any of the lands, mines, works, and property, ores and minerals, belonging to the Company, and of all the products obtained or obtainable therefrom.
 - (6.) The purchasing the goodwill of, or any interest in, any trade or business of a similar nature or kindred character with any trade or business which the Company is authorized to carry on; also, the making and carrying into effect arrangements with respect to the amalgamation or union of interests, in whole or in part, with any other companies, partnerships, or persons.
 - (7.) The taking, by subscription, purchase, or otherwise, and holding shares or stock in any company in which the liability of the Members shall be limited to the amount of their shares or stock, or otherwise, and having objects or purposes of a like nature with those of this Company, or any of them, or calculated to benefit the property or business of the Company.
 - (8.) The entering into and completing all conveyances, leases, transfers, co-partnerships, agreements, licences, charter-parties, and contracts, and writings of every description, and the doing all such other things as shall be considered requisite for, incidental to, or connected with, any of the above objects, or conducive to the attainment thereof.
 - (9.) The purchasing, constructing, hiring, and navigating vessels for the purposes of the Company.
 - (10.) The doing of all other things incidental or conducive to the attainment of the purposes, objects, and things hereinbefore specified.
- IV. The liability of the Members is limited.
- V. The Capital of the Company is Four Hundred Thousand Pounds Sterling, divided into Forty Thousand Shares of £10 each.
- We, the several Persons whose Names and Addresses are subscribed, are desirous of being formed into a Company, in pursuance of this Memorandum of Association; and we respectively agree to take the number of Shares in the Capital of the Company set opposite our respective names.

THE
CONSOLIDATED COPPER
COMPANY OF CANADA,
Limited.

PROSPECTUS.

the Ores of the Ives Mine—assuming that no additional shafts are sunk, but that the Company merely continues to work the existing GALT and BRYDGES SHAFTS alone.

(1st) Cost and Profits of Concentrating richer Ives Ores to 13 per cent.
BY HAND LABOUR, Mr. Robb's Report states, that "the cost of mining, raising, and dressing the Ore to 10 or 12 per cent. produce, ready for shipment at the mine, will probably not exceed 12 dollars (50/) per ton, including all actual working expenses, after the ground has been opened up for stopping. The freight and charges to England from the mine will amount to about 8 dollars per ton (33/)." Professor Chapman likewise states that "the cost of Ore from 12 to 14 per cent. from the present workings, all expenses included, is, according to Mr. Whyte, the Superintendent, 12 dollars per ton. To this may be added for freight to Montreal and thence to Liverpool, with charges, about 7 dols. 50c., making the cost of such Ore in Liverpool about £4 sterling per ton."

Independent Estimates.

The Directors have had INDEPENDENT ESTIMATES prepared by a gentleman well acquainted with Copper Mining in Canada, and with the Bolton Mines, and in no way connected with the present Proprietors of this Mine, which lead to a slightly higher result, viz. :—

Costs of mining, raising, and dressing by hand to 13 per cent., including proportion of expenses for exploring, driving, drawing, and incidentals, per ton,	£3 7 6
Freight and charges to Liverpool, as per actual invoices, per ton,	1 11 3
Total costs and charges per ton,	£4 18 9

The Directors will evidently be safe in assuming the costs and charges to amount to £5 sterling per ton.

Now a ton of Ore containing 13 units of Copper is worth, at the price of £1 2s. 6d. per unit,	£14 12 6
Deduct all costs and charges, as above,	5 0 0

PROFIT PER TON ON HAND-DRESSED ORE, £9 12 6

The TWO EASTERN BANDS are, as it has been already shown, capable, without any considerable expenditure, of producing, from the GALT and BRYDGES SHAFTS ALONE, 300 tons per month of Ore, hand-dressed to 13 per cent., or equal to 3600 TONS OF 13 PER CENT. ORE PER ANNUM, besides a VERY MUCH LARGER QUANTITY OF LOWER GRADE AND WASTE ORES to be treated by the Wet Process.

3600 TONS PER ANNUM OF 13 PER CENT. HAND-DRESSED ORE, AT THE ABOVE PROFIT OF £9 12s. 6d. PER TON, WILL YIELD A PROFIT PER ANNUM OF £34,650 0 0

But it is obvious that if the number of shafts on these lodes were, as already suggested, increased, the profits from the Dressed or Concentrated Ores might be immediately increased by a sum, at present prices, of OVER £17,000 FROM EACH ADDITIONAL SHAFT.

(2d) Cost and Profits of Metallic Copper from lower grade Ores of Ives Mine.

Second.—AS TO THE COST AND PROFIT OF TREATING THE LOWER GRADE AND WASTE ORES BY THE HUMID PROCESS.

The COST of producing Metallic Copper of 90 per cent. by the HUNT and DOUGLAS PROCESS from 5 per cent. Ores is found in North Carolina to be about 4 cents (2d.) per lb. of fine Cement Copper of 90 per cent. obtained, i.e., £18 13s. 6d. per ton, or say £19 per ton. The FUEL used in roasting is Wood, which can be procured in any quantity at 4s. 2d. per cord of 128 cubic feet.

Assuming—and the assumption is far within the mark—that there is partly raised from the existing shafts in addition to the richer ores, and partly accumulated in the waste heaps from the hand-picked richer ores, and treated by the Wet Process (and much more might be so treated with a cheap increase of the Hunt and Douglas apparatus), a quantity of only 1000 TONS PER MONTH, of five or six per cent. Ores, capable of being profitably treated by the Wet Process, this will yield (allowing for waste) FOUR PER CENT. per ton overhead, or 533½ TONS OF METALLIC COPPER OF 90 PER CENT., the value of which at the price of £1 2s. 6d. per unit is £54,000 0 0

N.B.—The waste heaps alone ought to yield far more than the above quality of low grade Ores, and therefore there is no charge for mining them.

Deducting from this the expense of the Humid Process *ut supra* at £19 a ton, £10,133 6 8

And the freight, &c., to England at the above rate of £1 11s. 3d. per ton, 833 6 8

£10,966 13 4

THE TOTAL PROFIT OF TREATING 12,000 TONS OF THE LOWER GRADE AND WASTE ORES BY THE HUMID PROCESS WILL AMOUNT, PER ANNUM, TO £43,033 6 8

The Total Profit, per annum, of the Ores from the Galt & Brydges Shafts (exclusive, however, of management, of wear and tear of machinery, and of interest on capital) will therefore (with an expenditure of £4000 for the Humid Process Apparatus, and the trifling expenditure in sinking the winze from the 15-fathom level of the Brydges Shaft,) amount at present prices to £77,683 6 8

Or say ... £78,000

If the price of Copper were reduced to £1 per unit, this profit would be slightly under £68,250 0 0

If the price of Copper sank to 15s. per unit, the profit would still be £51,188 0 0

And if the price of Copper were no more than 12s. 6d. per unit—the lowest price known for many years—the profit would be ... £42,656 0 0

It will be kept in view that these Estimates refer only to the Profits upon the produce by the existing GALT and BRYDGES SHAFTS from the TWO EASTERN BANDS OF ORE ALONE, and that the amount of Lower Grade and Waste Ores treated by the Wet Process is taken at only 1000 tons per month. Every additional shaft on these bands, while costing, complete, only about £750, would increase the Profits on the Hand-Dressed Ores by ONE-HALF OF THE ABOVE SUM of £34,650, or of any other sum which should be calculated as the profit of the two existing shafts on Hand-Dressed Ores, according to the price of Copper at the time. A much larger quantity of Lower Grade and Waste Ores might, even if no additional shafts were sunk, be treated by the Humid Process, by extending the Hunt and Douglas Apparatus, already projected, to the requisite extent, which would produce a corresponding increase of profit from the Waste and Low Grade Ore. And if the Copper Band WEST of the SOAPSTONE BED be found accompanying the Soapstone in the IVES, as it has been found to do in the HUNTINGTON property, the prospects of the Company as regards Profits will be immensely enhanced.

Of course, these calculations and estimates must be regarded as subject to the various contingencies and uncertainties to which all mining adventures are liable, but experience of Copper Mining in the Bolton District appears to justify them.

NO ESTIMATE HAS BEEN MADE OF PROFIT FROM THE SULPHUR OR THE IRON OF THE IVES MINE. THE SULPHUR IS ENTIRELY FREE FROM ARSENIC, and may be utilized in several ways to the profit of the Company.

The BUILDINGS include the SUPERINTENDENT'S HOUSE, and two BOARDING HOUSES for Miners, STABLES, BLACKSMITHS' SHOPS, POWDER MAGAZINE, and SEVERAL MINERS' HOUSES—all of the most substantial character. The lands are HEAVILY WOODED, and capable of supplying, for a long period, the TIMBER required for FUEL, MINING PURPOSES, and LUMBER. **Buildings, &c., at Ives Mine.**

The MISSISSQUOI RIVER, which partly traverses and partly bounds the property, supplies a NEVER-FAILING WATER POWER within a few hundred yards of the present workings, estimated equal, in the driest season, to that of 50 horses, and capable of driving all the requisite machinery, and affording an abundant supply of water for washing the ores. **Water Power.**

The mines are accessible by good roads from the village of WATELROO (12 miles distant), and from Frost village (10 miles distant), the present terminus of the Stanstead, Shefford, and Chambly Railway, which communicates with MONTREAL (65 miles distant), and with the general railway system of the country, as well as with ST. JOHN'S and other points of cheap water conveyance to MONTREAL, QUEBEC, NEW YORK, &c. A LINE OF RAILWAY between FROST VILLAGE and the IVES and HUNTINGTON MINES has been graded and prepared for the railway, and a copy of a CONTRACT by the VERMONT CENTRAL RAILWAY COMPANY—a powerful corporation—to complete the branch into the IVES MINE during this season, can be seen at the offices of the Company. When this branch railway is completed, the development of the Mine on an extensive scale will be easy. **Railway Communication with Ives Mine.**

There is lying at the works a large quantity of lower grade and waste Ores of about 5 or 6 per cent., ready for dressing by the Humid process, and there are large quantities left in the stopes. **Low Grade Ores.**

RESULTS OF ESTIMATES AS TO BOTH MINES.

Summing up the results of the above Estimates, which it will be seen have been prepared with the utmost care, the following profits may confidently be expected to accrue from the existing Works, without any extensions which would, to any considerable degree, involve expenditure of either time or money.

The Estimated Profits from both Mines amount, at the present price of Copper, £1 2s. 6d. per unit, to - - - - -	£244,417	0	0	per annum, or 81 per cent.
	ON THE SHARE CAPITAL ISSUED.			
At £1 per unit the Profits would amount to - - - - -	213,942	0	0	per annum, or 71 per cent.
At 15s. per unit, to - - - - -	160,458	0	0	do. 53 do.
And at 12s. 6d. per unit—the lowest price known for many years—to - - - - -	133,713	0	0	do. 44 do.

The Sum required for the contemplated developments at both Mines will not exceed £30,000.

The Purchase Money to be paid for both Mines, with Land, Plant, &c., is £245,000, viz.:—£150,000 for Harveyhill and £95,000 for IVES.

The only Contract entered into on behalf of the Company is an agreement, dated the 1st July, 1872, between JOHN WATSON, of Gloucester Road, Kensington, as Agent and Mandatory for the Vendors, of the first part; and JOHN THOMSON DUNCAN, Accountant, Glasgow, as acting for and on behalf of the Company, of the second part.

The Company will have the benefit of the counsel and experience, as Directors in Canada, of Sir ALEXANDER GALT and the Hon. JAMES FERRIER, who have been connected with the IVES MINE from its commencement; and also of Professor T. STERRY HUNT, LL.D., F.R.S., and Professor JAMES DOUGLAS, the Co-Patentees of the HUNT AND DOUGLAS COPPER-EXTRACTING PROCESS, and the latter of whom has been connected with the HARVEYHILL MINE from its commencement. Arrangements are in progress whereby, subject to the approval of the Directors, the VERY BEST PRACTICAL MANAGEMENT will be secured.

No Promotion Money whatever will be paid. The whole of the Preliminary Expenses, up to the date of allotment of Shares, will be defrayed by the Vendors.

The MEMORANDUM and ARTICLES OF ASSOCIATION, with COPY of AGREEMENT, PLANS and SECTIONS of the MINES, and SPECIMENS of the NATIVE and CONCENTRATED ORES, may be seen at the Offices of the Company. **Plans, Specifications, &c.**

In the event of no allotment being made, the amount deposited will be returned without deduction.

Should a smaller number of Shares be allotted than those applied for, the balance of the sum deposited will be appropriated towards the payment of the amount payable on allotment.

Estimated Results of 100 Miners at Harveyhill.

Assuming that *in the meantime* there are only 100 miners, with their assistants, put on the workings—60 on the BEDS and 40 on the LODES—the 60 men on the BEDS, breaking, as they easily do, each of them four fathoms per month of BED, will break 2880 fathoms in a year of a material yielding per fathom a ton of 45 per cent.; and as, on each ton brought to market from the Beds, it has been shown by the Estimate No. 1 *supra* that there is a profit of £33 8s. 6d., the profit on the 2880 tons extracted from the BEDS would be £96,264 per annum. The 40 men on the LODES, breaking each of them three fathoms per month, will break in a year 1440 fathoms of a material yielding $1\frac{1}{4}$ tons per fathom of concentrated Ore, or 1800 tons of 45 per cent. in all, which, at the above profit of £39 3s. 0d. per ton, will yield on the LODES a profit of £70,470 per annum.

Profits from Harveyhill at Present Prices.

PROFIT ON BEDS, - - - - -	£96,264
PROFIT ON LODES, - - - - -	70,470

TOTAL PROFIT PER ANNUM FROM HARVEYHILL, AT PRESENT PRICES, - £166,734

The present price of copper is about 22s. 6d. per unit, and there is every prospect of its rising higher, and continuing so for a lengthened period. But even if Copper fell to 20s. per unit, the profit of Harveyhill would be, £145,692

If it fell to 15s. per unit, the profit would be, 109,270

And if it fell to 12s. 6d. (the lowest price known for many years), the profit of Harveyhill would still be, 91,057.

Whilst the existence of copper-bearing deposits throughout the entire property appears to admit of the indefinite increase of its production.

Unprecedented as this estimate of results may appear, it will be seen by any one practically acquainted with copper mining, that it is based upon solid facts as to the extent and character of the deposits, and a most liberal scale of charges; but, on the other hand, the estimated results are necessarily subject to the contingencies to which all mining adventures are liable. The Directors have consulted the highest and best-informed authorities; and they submit these estimates, confident at least of this, that whether experience shall show their estimates too high or too low, there is ample reason for expecting, in any probable event, a most liberal return from the Harveyhill Mines.

Land Freehold.

It will be noted that, the land being almost entirely freehold, there are NO ROYALTIES to pay, as in the case of many other mines.

Specimens, Photographs, &c.

SPECIMENS of the beds and lodes, selected by Mr. WILLIAMS, as fairly representing their general character at the time of his Report, and specimens from the more recent workings, illustrating their increase of richness as they descend, may be seen at the offices of the Company; and on the premises of Messrs. LEWIS & SONS, at Liverpool, may be seen tons of the material as sold in England; and PHOTOGRAPHS of the buildings, machinery, PLANS of the workings, and SECTIONS of the beds and lodes, together with copies of Mr. WILLIAMS', Mr. DOUGLAS', Mr. BENNETT'S, and Messrs. LEWIS & SON'S REPORTS and CERTIFICATES, as also of Dr. STERRY HUNT'S and Mr. COBLEY'S LETTERS, may be seen at the Offices of the Company, where also may be inspected CERTIFICATE AS TO TITLE OF HARVEYHILL, by the Hon. GEORGE IRVINE, M.P., Solicitor-General of Canada.

II. THE IVES MINE.

Situation, &c., of Ives Mine.

THE IVES COPPER MINE is situated about 65 miles S.E. of Montreal, and adjoins the well-known and successful HUNTINGTON MINE. The IVES MINING PROPERTY comprises 375 Acres of Land, held in FEE SIMPLE DIRECT FROM THE CROWN, and FREE FROM ALL ROYALTIES.

Reference to the accompanying

MAPS, PLANS, and REPORT on the IVES MINE, by Mr. CHARLES ROBB, M.E., who also reported on the Huntington Mine;

NOTES on the COPPER DEPOSIT of BOLTON, with MAP and PLAN of the IVES MINE, by Dr. T. STERRY HUNT, LL.D., F.R.S., Chemist and Mineralogist of the Geological Survey of Canada; and

REPORT on the IVES MINE, with PLANS, by Dr. E. J. CHAPMAN, Professor of Mineralogy in the University of Toronto, and Consulting Mineral Engineer,

Reports by the Highest Mining Authorities on Ives Mine.

will show that the IVES and HUNTINGTON MINES are both situated—within less than two miles of each other—on the same Cupriferous Belts, the continuity and richness of which, throughout both properties, have been ascertained beyond dispute, by actual workings at points along the whole Belt, from the Ives Field at their Northern to the Huntington at their Southern extremity.

The IVES MINE is situated within a geological horizon, which has produced many important deposits of Copper Ore of this class, but, to use the words of Mr. ROBB, “probably nowhere in such abundance, and in such a state of workable concentration, as at, and in the immediate vicinity of, this property.”

The Ives Deposit of Copper Ore.

The deposit of Copper Ore on which both the IVES and the HUNTINGTON Shafts have been put down, consists (irrespective of irregular deposits of Cupriferous Ore, containing grains and solid patches, bunches and strings, of very considerable wealth, disseminated, according to Professor CHAPMAN, through a thickness of about 50 feet,) chiefly of two BELTS or BANDS of Copper Ore, lying at a distance of fifty feet apart, parallel with the stratification, with each other, and with a great SOAPSTONE BED which traverses both Estates—one of which Bands averages SIX FEET, and the other EIGHT FEET in *width*—the former being proved by the workings, so far as they have gone, to possess a *depth* of at all events 50, and the latter to possess a *depth* of at all events 40 fathoms, and each of which, there is no reason to doubt, extends over the IVES property to a distance of A MILE AND A QUARTER IN LENGTH, the former having been *actually opened up* for 50, and the latter for 85 fathoms in *length*, and their persistence and richness being proved by openings all along the outcrop at intervals, till both are traced “unmistakably and uninterruptedly” into the workings of the HUNTINGTON COMPANY'S MINES, and in conditions in the IVES Property, highly favourable for their economical development. (*Vide* MR. ROBB'S REPORT and Dr. STERRY HUNT'S NOTES.)

Two great Belts of Ore East of Soapstone.

These two bands are, as Mr. Robb points out, in reality a continuation of the Ives Ore, which, after traversing in a northerly direction the HUNTINGTON and IVES field, is, at the northern boundary of the Ives Property, sharply contorted or folded over upon itself, returning in a southerly direction, and again traversing both properties a distance of about a quarter of a mile to the east, as shown on the MAP. “It is worthy of remark,” continues Mr. Robb, “that in metalliferous beds the greatest concentration of ore almost invariably occurs at or very near the points where such folds take place, and accordingly I am credibly informed that in costeening at the point referred to, near your northern boundary, a rich show of Copper has been found.”

Ore of Ives Mine, as compared with adjoining Huntington Mine.

The only difference in the character of the Ore in the Ives Mine, as compared with that of the HUNTINGTON Mine, appears to lie in the fact pointed out by Dr. STERRY HUNT, in his NOTES on both Mines, that, as the southern extension of the Copper-bearing belt on which the HUNTINGTON is sunk, contains less earthy gangue and a larger proportion of Iron Pyrites, it cannot be picked or dressed to so high a per centage as that further northwards, upon which the IVES SHAFTS are sunk.

Third Belt of Ore West of Soapstone.

But in addition to these TWO BANDS already wrought in the IVES Property, Mr. ROBB and Dr. STERRY HUNT have drawn attention to another very important fact, which is, that besides these two Bands, which exist in both properties on the *Eastern* side of the great Belt of SOAPSTONE pervading both properties, recent workings at the Huntington Mine have disclosed the existence immediately to the *West* of the SOAPSTONE of a THIRD BELT OF COPPER ORE, richer in Copper than the Belts to the East, and both of the eminent authorities just named agree in confidently anticipating that this WESTERN BELT will be found not less continuous throughout the IVES Property than the EASTERN BELTS or the SOAPSTONE ITSELF.

The Ore is of the Pyritous variety or the ordinary YELLOW SULPHURET of COPPER—"associated," as Dr. Sterry Hunt says, "with comparatively little Iron Pyrites," and as Mr. Robb reports, "associated but not intimately blended with the Bisulphuret of Iron or *Mundic*, and with Pyrrhotine or Magnetic Pyrites." The analysis of the yellow Sulphuret made by Professor Chapman shows—Sulphur, 12.33; Copper, 5.36; Iron, 10.79; and Rock Matter, 71.28. And he states the Ore to be of good quality, as entirely free from Galena, Zinc Blende, Heavy Spar, and other substances by which its treatment might be more or less impeded or complicated. A mean of two analyses by PROFESSOR THORPE, of ANDERSON'S UNIVERSITY, GLASGOW, shows—Copper, 6.71; Sulphur, 15.80. Two other analyses, by DR. STEVENSON MACADAM, of the School of Mines, EDINBURGH, of other portions of the Ore, show respectively—Copper, 15.33; Sulphur, 28; Iron, 29.86; and Copper, 13.92; Sulphur, 28.87; and Iron, 29.62. The Gangue or bed in which this Copper Ore is found is a soft Chloritic Schist or Slate—easily crushed—weighing about 16 tons to the cubic fathom. The proportion of Metallic Copper which the Gangue contains varies. In some parts of its course it carries, according to Professor CHAPMAN, "A SOLID MASS OF COPPER ORE AVERAGING AT LEAST TWENTY PER CENT. OF METAL;" in other parts, FIFTEEN and TEN per cent.; while other portions are not so rich. By subdividing the area of the Copper-bearing bands of higher and lower grade Ores in the present workings into six distinct parts, and taking samples in fair proportions from each, Professor CHAPMAN found THE AVERAGE YIELD OVER THE WHOLE WORKINGS TO BE 5.25 PER CENT., which, after allowing all deductions, is equal to FOUR PER CENT. OF OBTAINABLE METALLIC COPPER in the Gangue of the great bands of Pay Ore already mentioned;—a result which, comparing it with the production from the IVES field at workings two-thirds of a mile further south, and also with that of the neighbouring HUNTINGTON Mine, Professor CHAPMAN regards as a reliable average of the yield throughout the entire extent of the Copper-bearing belts at present wrought.

Character of the Ives Ore.

Analyses of Ives Ore.

Professor CHAPMAN has estimated (on data which take account only of the present workings, and which, even in reference to them, he states to be "much within the true limits") that the TWO EASTERN BANDS of Copper-bearing Schist throughout the IVES Property will yield no less than 1,435,000 tons of Ore, or 57,400 TONS OF METALLIC COPPER—a quantity of Metal which, if extracted from the beds, would, at present prices, be of the value of over £6,000,000 Sterling in the Liverpool Market. This estimate makes no allowance for the anticipated occurrence of Pay Ore in other parts of the Slate band, and, large as it may appear, Professor CHAPMAN says that it is "PROBABLY MUCH BELOW THE TRUTH."

Reserves of Ore in Ives Mine.

It will be noted that this estimate refers only to the EASTERN BANDS, and takes no account of the deposits west of the SOAPSTONE BED, or of the bunches and strings and other less regular deposits disseminated through the adjacent strata.

The EXTENT OF THE MINING OPERATIONS hitherto carried on at the Ives Mine will be thoroughly understood from the accompanying Plans and Sections prepared by DR. STERRY HUNT, F.R.S., PROFESSOR CHAPMAN, F.R.S., and MR. C. ROBB, M.E., to illustrate their Reports. Three shafts—the GALT, the BRYDGES, and the FERRIER Shafts—have been sunk on the outcrop of the EASTMOST of the TWO EASTERN BANDS OF ORE to depths of 20 to 25 fathoms, from which LEVELS have been driven for a length of 80 fathoms, and CROSS-CUTS made into the OTHER of these two Bands. The rich ground commanded by the GALT SHAFT is being stoped out, and there can (as is obvious from DR. STERRY HUNT'S SECTION) be placed at present on these stopes a force of 14 pairs of miners, and, by sinking further and driving another level beneath, the force can be doubled. In the same way the stoping will go on in the ground commanded by the BRYDGES SHAFT, where a WINZE is being sunk from the fifteen fathom level, in order to stope out the rich ground below that level. The GALT Stopes at present yield, monthly, an amount of Orey Material, which, when hand-picked, gives 150 tons of 12 to 14 per cent. The BRYDGES SHAFT will yield the same output. Dr. STERRY HUNT intimates that, judging from the facts, there is every reason to believe that openings at any other point along the outcrop of about three miles (including, *i.e.*, the whole extent of the Bands in both the IVES and HUNTINGTON Properties) would prove as productive as those now mined. It would therefore be easy to open FIVE or even TEN SHAFTS along the outcrop, and to increase the production from the EASTERN BANDS alone, to such an amount of Ore, as will yield, by hand-picking, 1000 or 1800 tons per month, of 12 to 14 per cent. of Copper.

Extent of Mining Operations at Ives Mine.

A shaft may also probably require to be sunk on the Copper Band on the WEST of the SOAPSTONE bed, unless this deposit, when explored, can be conveniently worked by means of cross-cuts, such as have also been made at the HUNTINGTON Mine, through the Soapstone, from the more eastern workings.

The cost of sinking a 16 feet shaft is 100 dollars or £20 stg. a fathom, including timbering and everything else; and the hoisting gear, whims, &c., will cost £250 for each shaft. Taking the average depth of shafts to be 25 fathoms, the cost of FIVE ADDITIONAL SHAFTS along the outcrop of the EASTERN BAND would be only £3750—which the Ore taken out in the sinking would itself go far to pay.

Cost of further Developments.

The RICHER ORE STUFF is at present dressed by the simple process of spalling or hand-picking up to from 12 to 14 per cent., the late consignments sold through Messrs. KENNETH DOWIE & Co., Canadian Merchants, Liverpool, assaying 13½ of Copper. This process, however, involves a very considerable loss of the Orey material treated, a valuable proportion of Copper being left behind in the waste heaps, and there is also a large quantity of lower grade material left in the stopes or accumulating on the surface, which, though it would not repay hand dressing, could very profitably be dressed, either by a small battery of stamps and cheap system of ties and buddies, by which ALL the Ore, according to Professor Chapman, might be brought to about 15 per cent., or—more profitably still—by the application of a HUMID PROCESS OF EXTRACTING THE COPPER in the form of METALLIC-COPPER of 90 PER CENT.

Sales of Ives Ore by Messrs. Kenneth Dowie & Co. in Liverpool.

The sources of the Company's profit from the Copper of the Ives Mine (without taking into account the Sulphur) will be (1) in treating by HAND LABOUR the RICHER ORES so as to raise them to, say 13 PER CENT., and (2) in treating by the HUMID PROCESS the LOWER GRADE ORES (whether native Ores raised from the mine, or waste Ores left partially exhausted by hand-picking), so as to produce Metallic Copper of 90 per cent., and (3) in exporting the concentrated Ores and the Metallic Copper to Liverpool.

Sources of Profit from Ives Mine.

With the object of adopting the WET PROCESS in view, the Company has secured, on favourable terms, the right of pre-emption of the HUNT and DOUGLAS PATENT PROCESS, now in successful operation in the United States, and adopted also at several of the great Chilian Copper Mines. This method—beautiful from its simplicity and economy—consists in oxidizing the ore by a slight preliminary roasting, and then precipitating the copper on scrap iron from a bath of protochloride of iron, which has the great merit of constantly regenerating itself as the copper precipitates. Much less metallic iron is required than by any other wet process, and there is little or no expenditure for chemicals—the cost of which—particularly the price of common Salt, so largely consumed in other processes—is in America a very serious item.

Wet Process—Hunt & Douglas' Patent.

It is proposed, although there is very little water in the Mine, to erect an Engine to drain it. This is done at present by buckets.

Freedom from Water.

The cost of the several additions to the mining operations of the Ives Mineral Field, above suggested, as well as the costs of treating the Ores by the several processes mentioned, and the estimate of profits derivable from the Ores so treated, have been very carefully considered.

Cost of Production at Ives Mine.

The TOTAL EXPENDITURE required to render the TWO EASTERN Copper Bands of the IVES Mine adequate to the output from seven shafts (five in addition to the existing Galt and Brydges Shafts), of such an amount of native Ore as would yield, when hand-spalled, 1050 tons per month, or 12,600 tons per year, of from 12 to 14 per cent. stuff; and to afford the means of working up into Metallic-Copper of 90 per cent. a very much larger number of tons per month of lower grade Ores, raised and to be raised from the same workings, will certainly not exceed £10,000. FIVE additional shafts will cost less than £4000; the Steam-Engine, Furnaces, and apparatus, capable of treating 12,000 tons of waste Ore yearly by the HUNT and DOUGLAS PROCESS at the Ives Mine, would cost only £4000, while a comparatively small additional expense would extend the apparatus to any production that might afterwards be considered necessary; and if the valuable WATER POWER on the property were applied instead of STEAM to crush the Ore, the original cost would be considerably less. A similar sum is more than would be required to develop, to the fullest extent, the wealth of the belt west of the SOAPSTONE Bed.

Total Expenditure required at Ives Mine.

The following is AN ESTIMATE of the COSTS and PROFITS of the several methods of treatment proposed to be applied to

Estimated Profits from Ives Mine.

Prospectus of the Consolidated Copper Company of Canada, Limited.

The Cupreous Pyritic Ores or Mundics of Sulphur, Iron, and Copper, now largely wrought in Spain and in parts of Lower Canada, (notably and successfully by the THARSIS and HUNTINGDON Companies,) contribute comparatively little to supply the demand for Copper, these Ores being valuable principally on account of the large proportion of Sulphur they contain, the Copper not amounting in the Spanish Ores to more than 2½ or 3 per cent. of the material wrought, nor in the Huntingdon Mine to more than an average of 5 per cent., while the production of some of the best American Mines—as the PEWABIC and the FRANKLIN Mines on Lake Superior—is only from 1¼ to 2 per cent. of Metallic Copper on the material wrought, and that distributed through veins narrower than those of this Company's deposit. But even this small yield of Copper enables the prosperous Companies just named to make a large profit on the Copper of their Ores, irrespective of any Sulphur or Iron contained in them.

I. THE HARVEYHILL MINE.

The mineral field of Harveyhill comprises 4,000 acres, of which the Vendors hold 3,700 acres in fee simple, and the mineral and mining rights over the remaining 300.

Dr. T. STERRY HUNT, LL.D., F.R.S., Mineralogist of the GOVERNMENT GEOLOGICAL SURVEY OF CANADA, and the highest authority on the subject, after stating that he has been well acquainted with the HARVEYHILL MINE from the commencement of operations there many years since, adds, "And I AM CONVINCED THAT IT IS A DEPOSIT OF GREAT EXTENT AND RICHNESS UNEQUALLED, IN MY OPINION, BY ANY KNOWN IN THE DISTRICT OF QUEBEC."

Character of Harveyhill Ores.

The Copper Ore which it contains is of a character altogether different from the Mundic Ores of Spain and Canada. It is a SUBSULPHIDE OF COPPER—one of the richest and most important of the Copper Ores, and free from the difficulty of dressing presented by Ores containing large per centages of Iron and Sulphur, with a small per centage of Copper. Near the surface this Ore (meaning the Sub-sulphuret itself, apart from the gangue in which it is imbedded) is the YELLOW SUBSULPHURET OF COPPER, which contains in itself 33 per cent. of Metallic Copper, and only from 10 to 15 per cent. of Sulphur. It is, however, even at the surface, strongly mixed and variegated with the richer and more friable Vitreous HORSEFLESH, PEACOCK, or PURPLE SUBSULPHURET, which contains from 60 to 68 per cent. of Metallic Copper, and the proportion of which, to the Yellow Ore, rapidly increases as the lodes descend, till at the 30 fathom level the Yellow Sulphuret disappears, and the mineral of the lode is changed completely into the PURE PURPLE SUBSULPHURET, and contains a proportionately less quantity of Sulphur. This Purple Ore is, from the 30 fathom level downward, charged with a continuously increasing admixture of the GREY SUBSULPHURET, the richest of all known Copper Sulphurets, containing from 75 to 80 per cent. of Metallic Copper, and a proportion of Sulphur which is quite inconsiderable. The Iron and Silica in all these forms of the Ore are very small indeed. SAMPLES, characteristic of these various forms of the Harveyhill Ore, from both beds and veins, selected by Mr. WILLIAMS to illustrate his REPORT aftermentioned, may be seen at the Offices of the Company.

Yellow and Variegated Ores. Purple Ore.

Grey Ore.

Attention is called to the Certificate and Report of HERRALD DOUGLAS, Esq., Practical Assayer, Quebec, a gentleman well known in Glasgow, who has assayed every batch of Ore brought to grass at Harveyhill during the last four years; the Report by FRANCIS BENNETT, Esq., Mining Engineer, formerly Superintendent of the HARVEYHILL Mine, and now of the Huntingdon Copper Company's Mines; Report by BENJAMIN WILLIAMS, Esq., the well-known Mining Engineer of MARAZION, CORNWALL; Letter on Harveyhill Mine, by Dr. T. STERRY HUNT, LL.D., F.R.S.; Letter on Harveyhill Ores, by TH. COBLEY, Esq., Patentee of Copper Processes, SAN MARCEL, PIEDMONT, and Manager of the great VAL D'AOSTA COPPER MINES; and Certificate as to Quality and Prices of Harveyhill Ores, by Messrs. LEWIS and SON, Copper Brokers, LIVERPOOL—all of which may be seen at the Company's Offices.

Harveyhill Beds of Copper Ore.

In the Harveyhill Mine—situated in that division of the QUEBEC DISTRICT OR GROUP OF FORMATIONS which the Reports of the GOVERNMENT GEOLOGICAL SURVEY OF CANADA state to be the richest in Copper—this rich and valuable Copper Ore occurs in two positions (the first of which is believed to be peculiar):—(1) Interlaminating the leaves of talcoid nacreous schists, of which there have been opened up, by shafts and an adit level, THREE GREAT PARALLEL BEDS, the uppermost of which has been proved, by actual workings and by borings, to exist over an area of 400 acres, at a most favourable angle for mining operations, each of the two upper beds being of the average thickness of SIX feet—in some places TEN; and the third, though not opened up to the same extent, presenting indications of equal thickness and wealth—and the schistose materials of which—very friable and easy to crush and dress—contain, as a minimum, from FOUR to FIVE PER CENT. of their weight of Metallic Copper; and (2) in numerous VEINS or LODES of richer quality striking across the beds, of which lodes, irrespective of several less important veins, there are THREE principal ones, within a few fathoms of each other, now accessible from the workings—proved by actual workings to the extent respectively of 100, 50, and 35 fathoms in length—of regular character—and of an average thickness of about THREE FEET each—the Ore materials of which contain, near the surface, from TWELVE to FIFTEEN PER CENT. of their weight of Metallic Copper, and are found to increase in richness as the lodes are followed down. One of these lodes, and at present (as it is the deepest wrought) the richest of them—the "Fanny Eliza" lode—has been dialled and traced outcropping on the surface—and of the same thickness and richness—beyond the actual workings for a distance of three quarters of a mile in the Harveyhill property.

Harveyhill Lodes of Copper Ore.

Estimated Copper contents of the Harveyhill Beds alone, within area opened up.

The three great Beds of Cupriforous Schist alone, irrespective of the Lodes, supposing the lowest to be of the same extent and wealth as the two upper beds are computed to contain, in merely the 400 acres proven by actual workings, 18,000,000 tons of Ore material, equal to between 7 and 800,000 tons of pure metallic Copper, and as the beds undoubtedly extend over a much larger area, the Reserves of Copper Ore in their entire extent is enormous. The distinguished Cornish Mineral Engineer, Mr. Benjamin Williams, who has reported on the mines, considers that the Lodes, on account of their congenial character, the rich bunches of Copper Ore associated with them, and their increasing value as they descend, are hardly inferior in value to the beds.

Copper Indications over whole Estate.

Only a very small area—in comparison with the great extent of valuable mineral lands belonging to this property—has been opened, and Captain Bennet is of opinion that equally good if not better Mining locations than the present workings probably exist in the unexplored areas, all of which were carefully selected for purchase on account of the rich indications of mineral out-cropping on the surface, or laid open in places where natural or artificial excavations have exposed the Copper-bearing strata.

Reports of Government Geological Survey on Harveyhill.

It is to be observed that these calculations apply only to the area of the Beds which is at present laid open to sight in actual workings. The Lodes are not included in it. The 4,000 acres of mineral field of which the Harveyhill Estate consists present evidences, in Carbonates of Copper everywhere exuding from fissures, and in Copper-bearing Spar lodes cropping to the surface, of the existence of Copper in abundance over their entire extent.

The "CONTINUOUSLY RICH DEPOSITS" of Copper Ore in the beds of the Harveyhill mineral field have attracted the special notice of the eminent geologists who conducted the GOVERNMENT GEOLOGICAL SURVEY OF CANADA, and the Directors beg to refer to the accompanying EXTRACTS of those portions of their REPORTS which bear particular reference to the Harveyhill Mine.

These Reports consist of (1) An elaborate description of the Harveyhill Mine, illustrated by SURFACE PLANS OF THE LODES and SECTIONS OF THE BEDS and WORKINGS contained in the "REPORT OF PROGRESS OF THE GEOLOGICAL SURVEY OF CANADA FROM ITS COMMENCEMENT TO 1863" (Published by Authority, Montreal, 1863); and (2) additional observations on Harveyhill, contained in the "REPORT OF PROGRESS FROM 1863 TO 1866," (printed by order of His Excellency the Governor General, Ottawa, 1866). These Reports accompany this Prospectus.

Railway Communication and Shipping Ports.

The Harveyhill Property is about 45 miles south from the CITY and SEAPORT OF QUEBEC. The main line of the GRAND TRUNK RAILWAY from QUEBEC passes within 21 miles of the Mine, which is connected at present by a road with a point on the Railway called Methot's Mill Station. A BRANCH RAILWAY from this Station to Leeds, now in course of construction, will pass within six miles of the Mine. A TRAMROAD may then, if it is thought necessary, be made from the Mine to the Branch Railway. The produce of the Mine can be shipped from either QUEBEC or PORTLAND, both of which ports are commanded by the Harveyhill Field.

Previous History of Harveyhill.

Mining operations were commenced at Harveyhill about twelve years ago by a Syndicate or Union of the various Proprietors of the lots of lands within which the Mine is situated, under the name of the ENGLISH AND CANADIAN MINING COMPANY; and upwards of £50,000 have been spent in developing the minerals. In 1866 a fire destroyed upwards of £20,000 worth of their property and plant, and suspended their operations till about 1870. Several of the Proprietors being without the means to reinstate the works, one of them, Dr. James Douglas, of Quebec, took over the property, and has continued to work the Mine since with marked success, but on a comparatively limited scale. He restored and increased the buildings and plant injured by the fire, made tramways, and has made some progress in extending the mining operations in accordance with the recommendations of Mr. Benjamin Williams, of Marazion, who was brought over from Cornwall to inspect the Mine, and reported on its condition and prospects, and the best mode of developing it. The results have been such as completely to justify the large anticipations of Mr. Williams, and to prove the great wealth of the Mine. The extent of the operations, however, has so far exceeded the financial resources of the present holders, that while desirous of retaining a large interest in the Mine, they find it necessary to seek the co-operation of Capitalists to prosecute the undertaking on an adequate scale. Copies of Mr. Williams' REPORT,—which was not made for the purposes

of this Prospectus, but for the guidance of the Vendors in developing the field, and which bears date, November, 1871,—can be seen at the offices of the Company.

Independent of numerous surface explorations in the shape of costeaning Pits and Shafts, sunk for the most part on the many out-cropping veins and deposits for the purpose of testing the wealth of the field, there exist on the property no fewer than SEVEN WORKING SHAFTS varying in depth from 12 to 45 fathoms, and an ADIT LEVEL has been driven into the Hill a distance of 284 fathoms, intersecting all the three Cupriferous beds, and affording facilities of the greatest importance for working these beds, as well as the numerous Copper lodes which traverse its course. From these workings, the main object of which was the exploration of the field, many thousands of tons of Orey material have been extracted; the produce of which, concentrated since the introduction of the new machinery at the works TO AN AVERAGE OF ABOUT 40 PER CENT. OF METALLIC COPPER (occasionally as high as 56 per cent.), has been sent to the Liverpool Market, where it has always, on account of its fine qualities, commanded at the public auctions the highest Swansea prices obtained for the finest Chilian Ores. *Vide* CERTIFICATE by Messrs. LEWIS & SON, Copper Brokers, Liverpool, to whom the Ore was consigned.

As will be seen from Mr. Williams' Report, the SURFACE PLANT at HARVEYHILL for raising, crushing, and concentrating the Ore is of a very extensive and efficient character—chiefly of English manufacture and modern. The Directors do not hesitate to say that the Harveyhill Mine is the most extensively proved and best fitted Copper Mine in Canada. PLANS and PHOTOGRAPHS may be seen at the Offices of the Company. The BUILDINGS are of a very substantial character. The CRUSHING and CONCENTRATING WORKS occupy a large building of three storeys, and are capable of treating 80 tons per day. The building and engine-power are sufficient to admit of the present crushing apparatus being doubled at a comparatively small cost. The WORKMEN'S HOUSES are capable of accommodating over 100 Miners. There are OFFICES and STORE; SCHOOL-HOUSE and Teacher's Residence; POWDER HOUSE; SAW-MILL on the river; JIGGING, DRYING, and other DRESSING HOUSES; STABLING for twenty-three Head; BARN capable of holding 500 tons of hay; BLACKSMITH'S and CARPENTER'S SHOPS; and a tresselled TRAMWAY of massive construction connects the Works with the several Shafts. There are also two large FURNACES, with all the necessary Vats and Apparatus for concentrating the lower grade ores on the "HUNT and DOUGLAS PATENT HUMID PROCESS," which has been adopted with success at several of the great Mines of Chili and in Carolina and Virginia, although it ought to be noted that, from the great purity of the Harveyhill Ores, stuff of very low per centage may be dressed without the wet process, while low grade ores of the same or even higher per centage from other mines (such as the Ives) cannot be profitably treated except by this method.

The UNDERGROUND WORKS AND TRAMWAYS are in perfect order, and have a full complement of WAGGONS, WHIMS, BRAKES, &c. The RIVER PALMER, to which this property has two miles of frontage on either side, can, from the configuration of the country, be utilised at a moderate cost so as to substitute WATER for STEAM POWER through the entire works.

There are 800 acres of the land CLEARED and under cultivation, and the remainder is covered by primeval FOREST, affording an inexhaustible supply of FUEL and of TIMBER for mining purposes. For agricultural purposes the lands are reckoned amongst the most fertile lands of the Eastern Townships.

With the view of enabling a force of about 100 miners to be put to work in the meantime on the beds and lodes—60 in the former and 40 in the latter—it is proposed, in accordance with the plan of operations laid down by Mr. Williams for the guidance of the present proprietors, to extend the existing 30-fathoms level, (*vide Plans and Sections of Harveyhill*)—so as to intersect the two most easterly of the three principal lodes at the same depth at which the Fanny Eliza lode is being now worked; to sink winzes all along the course of the three lodes, and thoroughly ventilate them; to sink a new shaft of 60 fathoms in depth on the course of the central lode, at a point nearer the base of the hill, from which cross-cuts will be driven east and west to intercept all the three lodes, so as to permit of their being worked both upwards and downwards at the same time, and to make this shaft the working shaft for these lodes exclusively, leaving the present working shaft and the adit level to work the beds; to build additional reservoirs; and enlarge the dressing floors and machinery on a scale adequate to the increased output. When these operations are completed (and they can be completed in SIX MONTHS), it is computed, on the basis of Mr. Williams' *minimum per centages* of 4 per cent. in the Ore of the Beds, and 12 per cent. in the Lodes, that the Mine will be then in a position to send to market Ores equivalent to 2000 TONS PER ANNUM OF PURE METALLIC COPPER, which represents a value, at the present price of £1 2s. 6d. per unit, of £225,000 PER ANNUM. It is, however, competent for the Company, even at the present time, to commence operations on the Beds, which are easily now accessible from the adit level, ON A VERY MUCH MORE EXTENSIVE SCALE, and for a sum not exceeding £20,000; and there are still more important operations which Sir W. E. LOGAN, F.R.S.E., Director of the GEOLOGICAL SURVEY OF CANADA, has recommended, to develop the wealth of the Lodes, and which the Company may—with a view to still larger results—undertake. But the Directors are exceedingly desirous of placing before intending subscribers a computation of results almost immediately obtainable, such as they believe the evidence in their possession justifies them in doing with absolute confidence.

The Directors have gone very carefully into the following ESTIMATES OF PROFIT, from Harveyhill, which are the results of several separate calculations, some proceeding on data obtained from the cost sheets of the Mine, and others on independent materials furnished by Mr. Williams' Report, and by information personally supplied by Mr. Herrald Douglas. The Directors have also had these estimates examined and revised by Mr. Th. Cobby, manager of Val D'Aosta Copper Mines, and patentee of Copper Processes, San Marcel, Piedmont, a gentleman who has had large experience in working Copper Ore of the same peculiar character, and in a formation the same as that of the Harveyhill deposits. (*Vide* Letter by Mr. Cobby.)

I.—*Estimate of the Cost and Profit of Working the Ore of the Schist Beds of Harveyhill—Per fathom.*

Each fathom of the Bed stuff yields 12 tons of material, containing from 3½ to 5 per cent.—say 4 per cent.—of Metallic Copper;—that is, a unitage equal to 48 per cent. of Metallic Copper—but say 45 per cent., which will allow 3 units for loss in dressing—and which, at the present selling prices of this ore is worth, in Liverpool, 22/6 per unit, or	£50 12 6	Cost and Profit of Working Harveyhill Beds.
Actual Cost of Mining per fathom, including stoping, driving, timbering, &c., £4 8s., but say	£5 0 0	
Raising and delivering at Works 12 tons of material, - - - - -	0 12 0	
Crushing and Concentrating 12 tons to one ton of 45 per cent., - - - - -	2 4 0	
Boxing the Ores for Shipment, - - - - -	0 7 0	
Present actual expenses of Cartage, 21 miles, to Railway, 4 dols. 50c.; Railway Dues to Quebec and Lighterage, 3 dols.—7 dols. 50c., - - - - -	1 10 0	
(This will be reduced, when the Leeds Branch Railroad is opened, to below £1.)		
Present Freight, per contract with Allan's Steamers, to Liverpool, £1 5s. per ton (by Timber Ships, which take the ore as ballast, 12s. to 15s. per ton)—but say - - - - -	1 5 0	
Estimated Staff Expenses, Management, &c., say - - - - -	5 0 0	
Brokerage on Sale, and Costs in Liverpool, including Insurance, say 3 per cent. on price, - - -	1 8 0	
Total Expenses per ton of Concentrated Ore of 45 per cent. produced from one fathom of 12 tons of Crude Bed Ore, - - - - -	17 4 0	
Present prices (exclusive of wear and tear of Plant and Machinery and Interest on Capital Expended), - - - - -	£33 8 6	

II.—*Estimate of the Cost and Profit of Working the three principal Lodes of Harveyhill—Per fathom.*

Each fathom of the lodes yields 5 tons of material, containing from 12 to 15 per cent. of Metallic Copper—say 12 per cent.—that is, a unitage of 60 per cent. of Metallic Copper; but say 57 per cent., which allows 3 units for loss in dressing. This, at present selling prices of this ore, is worth in Liverpool, - - - - -	£64 2 6	Cost and Profit of Working Harveyhill Lodes.
Estimate cost of Mining, per fathom, including timbering, watering, track laying, and delivering at works 5 tons of 12 per cent. Ore, - - - - -	£10 12 0	
Crushing and concentrating to 1¼ tons of 45 per cent. stuff = 1 ton of 57 per cent. - - - - -	2 10 0	
Expenses of Boxing, Cartage, and Railway Dues to Quebec; Freight to Liverpool; Staff Expenses, Brokerage and Cost in Liverpool, all at same rates as taken in the above estimate of Bed Ore, but increased by a fourth, as the fathom of Lode Stuff yields ¼ of a ton of 45 per cent. Ore more than the Beds, - - - - -	11 17 6	
Total Expenses per 1¼ tons of concentrated Ore of 45 per cent., produced from a fathom of Lode Stuff, - - - - -	24 19 6	
Profit per fathom of Lode Ore wrought at present prices (exclusive of wear and tear of Plant and Machinery, and Interest on Capital expended), - - - - -	£39 3 0	

Seven Shafts, Adit Level, &c.

Sales of Harveyhill Copper Ore in Liverpool by Messrs. Lewis & Son.

Plant, Buildings, &c., at Harveyhill.

Underground Works and Tramways.

Water Power, Timber, &c.

Proposed Operations at Harveyhill, and Cost thereof.

Estimates of Profits from Harveyhill Mine.

THE CONSOLIDATED COPPER COMPANY OF CANADA, LIMITED.

(Province of Quebec, Dominion of Canada.)

CAPITAL £400,000, IN 40,000 SHARES OF £10 EACH,
(OF WHICH ONLY £300,000 WILL BE ISSUED AT PRESENT.)

PAYMENT—£1 PER SHARE ON APPLICATION; £1 ON ALLOTMENT.
£2 ON 15th AUG., 1872; £2 ON 3rd SEPT., 1872; £2 ON 1st OCT., 1872; AND £2 ON 1st NOV., 1872.

Directors.

MAJOR-GENERAL SIR J. E. ALEXANDER, K.C.L.S., K.C.S.I., OF WESTERTON, STIRLINGSHIRE.
 HUGH BROWN CRUM, Esq., MERCHANT, GLASGOW.
 ARTHUR HORNBY LEWIS, Esq., OF MESSRS. LEWIS & SON, MERCHANTS AND COPPER BROKERS, LIVERPOOL.
 JOHN MILLER, Esq., C.E., LEINSTER TERRACE, HYDE PARK, LONDON, AND UNIVERSITY CLUB, EDINBURGH.
 ROBERT HANNAN, Esq., MERCHANT, GLASGOW.
 THOMAS DICKSON, Esq., GROSVENOR CRESCENT, EDINBURGH.
 D. P. MACKENZIE, Esq., REGENT TERRACE, EDINBURGH.
 ROBERT SHAW STEWART, Esq., WEMYSS BAY.
 SIR ALEXANDER TILLOCH GALT, K.C.M.G., LATE MINISTER OF FINANCE, CANADA.
 THE HON. GEORGE IRVINE, Q.C., M.P., SOLICITOR-GENERAL OF THE PROVINCE OF QUEBEC.
 T. STERRY HUNT, Esq., LL.D., F.R.S., PROF. OF CHEMISTRY AND MINERALOGY, LATE MINERALOGIST
 OF THE GOVERNMENT GEOLOGICAL SURVEY OF CANADA, AND ONE OF THE CO-PATENTEES OF THE
 HUNT AND DOUGLAS COPPER-EXTRACTING PROCESS. } *Executive*
 JAMES DOUGLAS, Esq., PROF. OF CHEMISTRY, MORRIN COLLEGE, QUEBEC, ONE OF THE CO-PATENTEES } *Committee*
 OF THE HUNT AND DOUGLAS COPPER-EXTRACTING PROCESS. } *in*
 THE HON. JAMES FERRIER, SENATOR, MONTREAL, DIRECTOR OF THE BANK OF BRITISH NORTH AMERICA. } *Canada*
 JOHN RANKIN, Esq., MERCHANT, MONTREAL.
 THE HON. DAVID PRICE, SENATOR, QUEBEC.
 THE HON. THOMAS M'GREEVY, SENATOR, DIRECTOR OF THE UNION BANK OF CANADA, QUEBEC.

Bankers.

THE BANK OF SCOTLAND, GLASGOW, EDINBURGH,
AND (43, LOTHBURY) LONDON.
 THE MOLSONS' BANK, MONTREAL.
 THE UNION BANK OF CANADA, QUEBEC.

Solicitor.

J. A. DIXON, Esq., 156, West George Street, Glasgow.

Auditor.

JOHN GRAHAM, Esq., C.A., 71, West Nile Street, Glasgow.

Broker in London.

EDWARD FOX, Esq.,
3, AUSTIN FRIARS, LONDON. E.C.

Brokers in Scotland.

MESSRS. M'OWAN & HOUSTON,
87, ST. VINCENT STREET, GLASGOW.
 MESSRS. A. H. & J. GRAHAME & SPENS,
128, ST. VINCENT STREET, GLASGOW.
 MESSRS. MITCHELL, WATSON, & WINK,
4, NATIONAL BANK BUILDINGS, GLASGOW.

Broker in Dublin.

H. C. FOX, Esq.,
51, DAME STREET, DUBLIN.

Secretary.

J. THOMSON DUNCAN, Esq.

Offices of the Company (pro tem.) 146, Buchanan Street, Glasgow, and 31, Lombard Street, London. E. C.

Synopsis of Profits as set forth in Detail in the Prospectus.

The Estimated Profits will amount—

At present price of Copper, 22/6 per unit,* to	-	-	£244,417 per Annum, or 81 per Cent.
			<small>ON SHARE CAPITAL ISSUED.</small>
At £1 per unit, to	-	-	£213,942 per Annum, or 71 per Cent.
At 15/ per unit, to	-	-	£160,458 per Annum, or 53 per Cent.
At 12/6 per unit, the lowest price known for many years, to	-	-	£133,713 per Annum, or 44 per Cent.

PROSPECTUS.

**The Bank of Scotland, Glasgow, Edinburgh, and London, and Messrs. Taylor, Cameron, & Co.,
31, Lombard Street, London, are authorized to receive Subscriptions for 30,000 Shares
of £10 each in the Consolidated Copper Company of Canada, Limited.**

THIS Company has been formed for the purpose of acquiring and working (1) the COPPER MINE of HARVEYHILL and the adjoining Lands containing the same lodes and deposits, situated in the Township of LEEDS, County of MEGANTIC and Province of QUEBEC; and (2) The IVES COPPER MINE, situated in Lots 2, 3, and 4 of the 8th and 9th Ranges of the Township of BOLTON and Province of Quebec.

It is well known that the demand for Copper—which has for some years steadily increased—now greatly exceeds the supply. The great mines of Chili—the Monthly Reports of which may be said to regulate the price of Copper all over the world—are annually decreasing in their production, and the yield of Copper from the English Mines continues to sink lower and lower; while the activity of trades requiring the metal has become greater every year, and the price of Copper has risen in proportion.

* NOTE.—The highest of the above Estimates is based upon recent prices, which fluctuate somewhat from day to day, and whilst it is generally believed that the price of Copper is likely to be much higher, the calculations of results given above on a scale of prices descending to the lowest known for many years will obviate any difficulty which may arise from this cause.

REPORTS ON THE HARVEYHILL MINE.

Extract from "REPORT OF THE GEOLOGICAL SURVEY OF CANADA, from its
Commencement to 1863, by Sir WILLIAM E. LOGAN, LL.D., F.R.S., F.G.S.
Published by authority of the Governor-General. Montreal, 1863." Pp. 724
to 730.

IN Leeds the copper-bearing rocks are exposed in a great number of places, and have been more carefully examined than in any other locality along this synclinal. The explorations at the HARVEYHILL MINE, on the seventeenth lot of the fifteenth range, now the property of the English and Canadian Mining Company, are the MOST EXTENSIVE which have as yet been made in the Eastern Townships. The shafts, and the long adit which has been opened, afford an opportunity not elsewhere presented for studying the structure of this mining region, and it is proposed therefore to give a detailed description of this mine. The accompanying Plan and Sections are reduced from drawings furnished to the Survey, on a scale of one inch to a chain, by Mr. HERBERT WILLIAMS, the skilful director of the Harveyhill Mine, who has also kindly given many details to complete the description. The Copper Ores at this locality occur both in courses or VEINS and in BEDS. The strata are here, for the most part, finely micaceous slates, which, from their unctuousity, are often called talcose, but are generally not magnesian. A bed of steatite is, however, met with, and dark bands, approaching to argillite, occur in some parts, while others are whitish or light grey in colour, and contain a large amount of chloritoid disseminated. The dip of the strata appears to be from 25° to 80° W. of N., with an average inclination of from fifteen to thirty degrees. The courses are really irregular and interrupted veins, which do not coincide with the strata either in dip or strike. The bearings of eight of them are from north to N. 20° E., while others run nearly eastward. Their underlie is generally to the westward, at from fifty to nearly ninety degrees. These veins, which appear to have filled up fissures in the slates, are more or less lenticular in shape. Some of them have been traced for as much as 100 FATHOMS ON THE SURFACE, and are occasionally SIX OR SEVEN FEET WIDE in the thickest part, thinning out, however, both horizontally and vertically.

These veins have a gangue of quartz, occasionally mixed with calc-spar, pearl-spar, and chlorite, and contain rich Ores of Copper; some of them yielding the variegated and vitreous species, and others, copper pyrites. These are sometimes so abundant that AS MUCH AS TWO TONS OF TWENTY PER CENT. ORE HAVE BEEN OBTAINED FROM A FATHOM. Within an area of about THIRTY ACRES, open cuttings have been made upon as many as FIFTEEN DISTINCT COURSES, and SHAFTS have been sunk on two others. Notwithstanding the richness of portions of these veins, the Ore is disseminated in them in such an irregular and uncertain manner, that they are considered secondary in importance to the INTERSTRATIFIED BEDS, in which the Sulphurets of Copper are disseminated in the slate rock. The FIRST of these BEDS has a thickness of from two to six feet. Twenty fathoms below it occurs a bed of three inches, followed, in descending, by fifteen feet of barren slate. This separates it from another ore-bearing bed of six inches, which rests upon a stratum of soapstone or steatite, six feet in thickness. In the plans and descriptions here given, the stratum of steatite, with the two layers of copper-bearing rock, and the intervening fifteen feet, will be represented as a single band, and designated as the SECOND. This band, characterised by the bed of steatite, can be traced for a distance of two miles along the outcrop, but is lost sight of to the eastward of Fremont's shaft. An adit has been carried horizontally into the side of the hill for a distance of 248 fathoms, intersecting in its course the upper bed. The second bed, however, was not seen in the adit, and is perhaps displaced by some fault in the strata. Near the place where it might have been looked for, a quartz course occurs. Several of these courses were met in the adit, but they appear to have no connection with those on the surface, and, according to Mr. Williams, thin out both vertically and horizontally. At about twenty fathoms from the extremity of the adit, after traversing about twelve fathoms of soft, dark bluish slate, a light grey band was met with, holding chloritoid and a little copper pyrites. A rock similar to the last also occurs at the end of the adit, and contains, besides a little disseminated Ore, some quartz courses holding copper pyrites. This band of greyish chloritoid slate is marked C in the plans. The strata in this part of the adit appear much disturbed; and the dip varies, being in some places from 10° to 14° , and in others from 35° to 40° .

The interstratified beds contain THE YELLOW AND VARIEGATED ORES, the LATTER GENERALLY PREDOMINATING. These sulphurets are disseminated through the slate in small masses, of a lenticular form, running with the bedding. They are generally thin and small, but sometimes attain from one-half to three-fourths of an inch in thickness, and occasionally present in section a length of six or even twelve inches. Besides plates and lenticular masses, which interlock and overlap one another, numerous small grains of Ore are scattered through the BEDS, and the average amount of Copper in the layer may be stated at from THREE AND A HALF TO FIVE PER CENT. The Copper-bearing beds are sometimes light grey and quartzose, and have at other times a chloritic aspect.

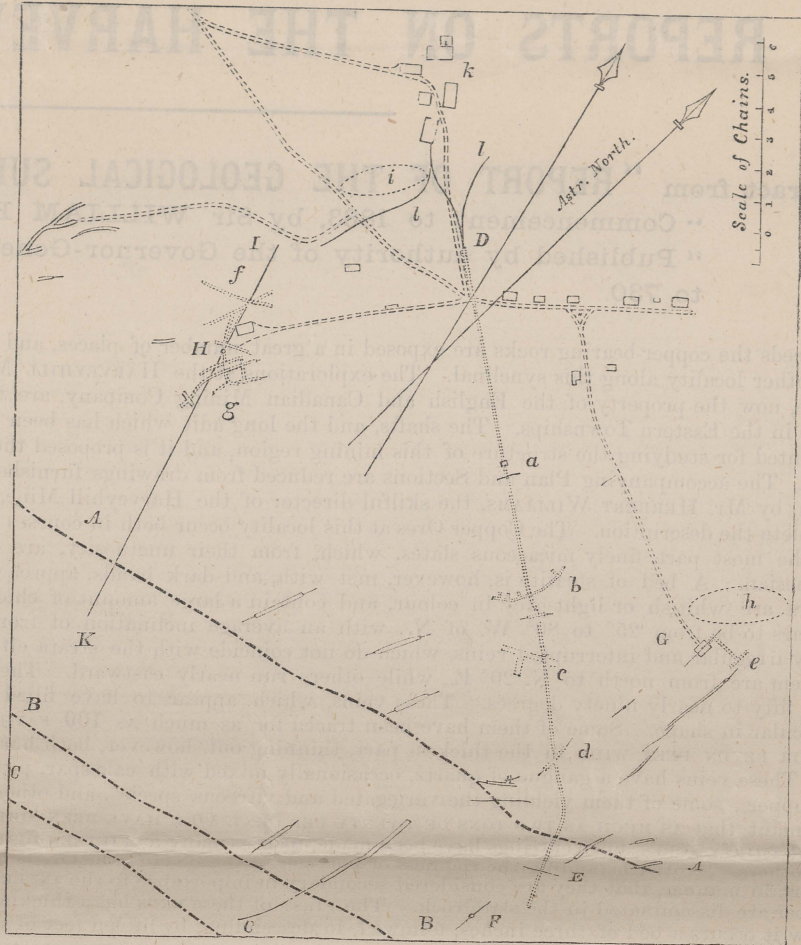
In the second shaft of Morrison's adit, the upper COPPER-BEARING BED was met with at a depth of fifteen fathoms. Immediately beneath it was found a quartz course, which contained some VERY RICH COPPER ORE; while the bed itself at this point held scarcely a trace of copper, and could only be distinguished from the adjacent slate by its lighter colour and quartzose nature. In sinking Kent's shaft, which is about 170 fathoms to the westward, the same bed is met with at a depth of about twenty fathoms. It has also been intersected by two levels or cross-cuts from the shaft, the lower at thirty fathoms, and followed upwards for a distance of over twenty fathoms on the incline. The working of the bed is now being continued up toward the shaft, as well as east and west from the thirty-fathom level, where it has been wrought for about twenty-five fathoms on its strike, and for ten fathoms on the level above. In the early part of 1862, ten superficial fathoms of the rock from this upper level were broken, weighed, and sampled, and were found to average 258 HUNDREDWEIGHTS OF ORE, YIELDING THREE AND A HALF PER CENT. OF COPPER (EQUAL TO 1000 POUNDS OF METAL) TO THE FATHOM OF GROUND. The ore now removed from the working at thirty fathoms averages about FIVE PER CENT. OF COPPER. In driving the lower cross-cut, a lenticular quartz course was met with, from which there were taken over FIFTY TONS OF RICH ORE, yielding FORTY-THREE PER CENT. It thinned out as it approached the interstratified bed; and on working this on the incline, it was found to be greatly impoverished for some distance on either side of its contact with the quartz course. In driving east on the bed, from the thirty-fathom level, another lenticular quartz course is met with, running nearly with the dip of the bed, which last is almost destitute of copper on both sides. The course, however, which is being followed, and has a breadth of from eighteen to twenty-four inches, yields about A TON AND A HALF OF FORTY PER CENT. ORE TO THE FATHOM. This, with the other two instances already mentioned, seems to show that these veins or courses have been filled with ore derived from the bed. In working this bed, masses of quartz are occasionally met with imbedded in it. These, which are probably in some cases courses running with the strata, and in others small lenticular beds, vary from a few inches to six or seven feet in length, and from a quarter of an inch to a foot or two in thickness. They contain, on an average, from SEVEN TO EIGHT PER CENT. OF COPPER; while the adjacent slate, for a thickness of five or six feet, does not contain more than FIVE PER CENT. The various workings in Kent's shaft may be said to have tested the bed over an area of over 600 square fathoms; while the extension of this same bed to the adit, a distance of 170 fathoms, and the fact that it has been traced along its outcrop for more than 500 fathoms, SHOW THAT MUCH MAY BE EXPECTED FROM WORKING THIS COPPER-BEARING BED.

In some courses in this working a considerable quantity of sulphuret of molybdenum is found, with a little Copper Ore, in a gangue of quartz and bitter spar. Not unfrequently these courses hold LARGE MASSES OF THE COPPER ORES, which are

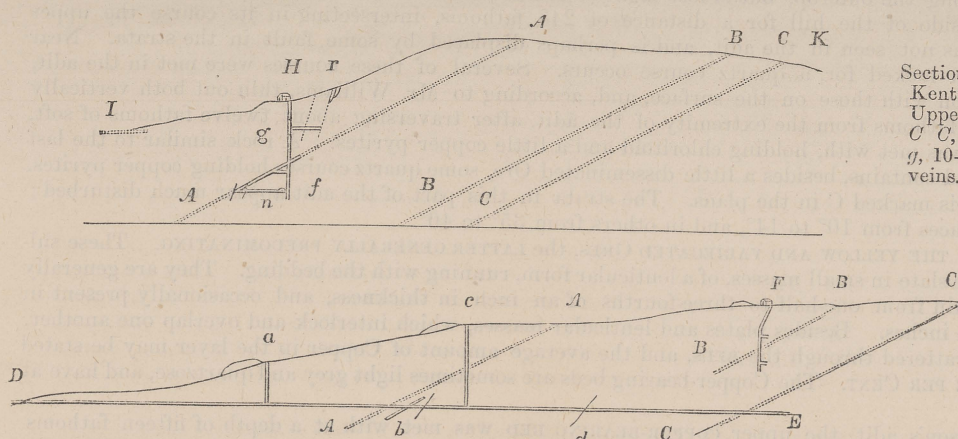
sometimes PERFECTLY PURE AND HOMOGENEOUS, and at other times enclose cleaveable masses of bitter-spar, or of limpid transparent quartz, giving to the Ore a porphyritic aspect. This quartz, on examination, is found to be in regular prismatic crystals, which, however, have their angles rounded. In one case, a mass of compact variegated Copper Ore was penetrated by several terminated prisms of quartz, from one-fourth to one-half an inch in diameter. All the angles of these were much rounded, and the planes of the crystals, which were in close contact with the Ore, were concave, and had lost their polish; retaining only a somewhat greasy lustre, precisely like crystals which have been exposed to the action of a solvent liquid. A thin shining green layer, apparently of a Silicate of Copper, covers the surfaces of the Ore in contact with the crystals. Similar specimens of quartz have been found in the vitreous Copper Ore of this locality, and also at the Ham Mine.

PLAN OF HARVEY-HILL COPPER MINE, LEEDS.

- Outcrop of copper beds.
- Ditto of quartz courses.
- Open cuttings on ditto.
- ⋯⋯ Underground workings.
- == Roads.
- A A, Upper copper bed.
- B B, Second copper bed.
- C C, Lowest copper bed.
- D E, Morrison's adit; line of section No. 2.
- a, 1st shaft in adit, with quartz course.
- b, Sewell's level, on a lode.
- c, 2nd shaft in adit, with bed A.
- d, Level on a quartz course.
- f, Fremont's shaft.
- G, Harveyhill shaft.
- e, 10-fathom cross-cut, and level.
- H, Kent's shaft, with level on bed A.
- f, 30-fathom levels on bed A.
- g, 10-fathom levels.
- I K, Line of section No. 1.
- h, i, Reservoirs. k, Dressing floors.
- ll, Lines of tramways.



SECTIONS AT THE HARVEY-HILL MINE.



Section 1.—I, Level of Morrison's adit.—H, Kent's shaft, with three cross-cuts.—A A, Upper copper bed.—B B, Second copper bed.—C C, Lowest bed.—f, 30-fathom cross-cut.—g, 10-fathom cross-cut.—n r, Quartz courses or veins.

Section 2.—D, Entrance to the adit.—a, First shaft.—c, Second shaft.—A A, Upper copper bed.—b, Sewell's lode, a quartz course.—d, Another quartz course.—f, Fremont's shaft.—B B, Second copper bed.—C C, Lowest bed.—E, Extremity of adit.

FREMONT'S shaft was sunk upon a quartz vein, which had an underlie of 75° to the eastward. After following this for forty-five feet, the underlie changed to the westward, still with the same angle; but the shaft being continued vertically for seventy-five feet more, the SECOND COPPER BED, with its underlying stratum of steatite, was met. The layer in contact with the steatite was excavated for five fathoms on the incline, in the course of which the vein from the surface was again met with. At the bottom of the incline, a level was driven in the bed for about five fathoms; AND THE COPPER ORE BEING CONTINUOUS THROUGHOUT THESE DISTANCES, ITS PRESENCE MAY BE SAID TO BE SHOWN OVER ABOUT TWENTY-FIVE SQUARE FATHOMS OF THE BED. In some parts of this working, the Copper Ore is found in the steatite; a layer of which, several inches in thickness, sometimes becomes a highly crystalline green talc, holding bitter spar, AND RICH IN DISSEMINATED SULPHURETS OF COPPER. The shaft at G was sunk upon a quartz course, which ABUNDED IN VITREOUS ORE. In a cross-cut from this shaft, at a depth of ten fathoms, a SECOND QUARTZ COURSE was met with.

The following quantities of Ore, averaging about thirty-five per cent., have within the last five years been shipped from this Mine to England. The fractions of tons are here disregarded. In 1658, 10 tons; in 1859, 43 tons; in 1860, 104 tons; in 1861, 70 tons; and in 1862, 95 tons; equalling in all 322 tons of Ore. In addition to this, there was at the surface, at the close of 1862, about 1000 tons of poor material, supposed to contain about TWO AND A HALF PER CENT. OF COPPER; besides 500 tons of material raised from the upper Copper bed, and containing from FOUR TO FIVE PER CENT. OF COPPER.

Besides the COPPER-BEARING BEDS whose course has just been described, quartz courses holding the VARIOUS SULPHURETS OF COPPER have been observed on a GREAT NUMBER OF LOTS from the eighth to the eighteenth of the ranges from ten to fifteen inclusive. In the western part of the township, Copper pyrites occur in dolomite on the fourth lot of the fourth range. On the fifteenth lot of the fourteenth range, a shaft was sunk by the predecessors of the present Mining Company, on the land of Mr. Nutbrown, ON A REMARKABLE VEIN, which cuts a band of steatite, and contains VITREOUS COPPER, specular IRON, and native GOLD.

Letter on Harveyhill Deposits and Mines, by Dr. T. STERRY HUNT, F.R.S., Chemist and Mineralogist, of the Government Geological Survey of Canada.

QUEBEC, 8th June, 1872.

MY DEAR SIR,

IN reply to your note of this morning, I beg leave to say that I have been well acquainted with the HARVEYHILL MINE from the commencement of operations there many years since, AND AM CONVINCED THAT IT IS A DEPOSIT OF GREAT EXTENT AND RICHNESS, UNEQUALLED IN MY OPINION BY ANY KNOWN IN THE DISTRICT OF QUEBEC. I am, therefore, much pleased to know that there is a probability of its being actively worked by your friends in England.

As regards Mr. BENNETT, I have known him for several years, and have full confidence both in his capacity as a Mining Engineer and his integrity.

I regret that I was unable to meet you sooner, owing to my absence in New York, else I would have been happy to have laid before you the Specimens and Plans in the Offices of the Geological Survey. With kindly aid,

I remain,

DEAR MR. DE CHAIR,

Very sincerely yours,

T. STERRY HUNT.

DUDLEY DE CHAIR, Esq.

Letter on Harveyhill Ores, by T. COBLEY, Esq., Manager of the Val D'Aosta Copper Mines.

LONDON, June, 1872.

I have examined the samples of Canadian Copper Ore from the HARVEYHILL District, and I am extremely pleased with their appearance, BEING THE RICHEST FORM OF SULPHURET. Judging from the character of the same, and particularly the Schistose quality, I should certainly endorse the opinion that they are taken from rich Cupriferous ore-bearing strata, and it is to this class of ore I attach the greatest importance.

This opinion is borne out by an examination of the Plans and Sections of that part of the property already opened up.

As far as I can learn from the price of labour and materials, &c., &c., the estimates have been fairly made, and I think, on the whole, that this undertaking presents unusually favourable chances of success.

I may add that in Italy the largest profits have been derived from this class of ore.

(Signed) TH. COBLEY, Patentee of Copper Process,
San Marcel, Piedmont.

Certificate from Messrs. J. LEWIS & SON, Copper Brokers, Liverpool, as to the Ores of Harveyhill.

THE above Ore is of UNUSUALLY HIGH PERCENTAGE, and is also of very good quality. It commands the HIGHEST PRICE RULING IN THE MARKET, BEING PREFERRED BY THE SMELTERS TO CHILI REGULUS, and is to-day worth 21/6 per unit.

We are,

DEAR SIR,

Yours truly,

(Signed) JAMES LEWIS & SON.

LIVERPOOL, 3rd June, 1872.

Extracts from "THE GEOLOGICAL SURVEY OF CANADA—SIR W. E. LOGAN, DIRECTOR. REPORT OF PROGRESS FROM 1863 TO 1866. Printed by order of his Excellency the Governor-General, Ottawa. Printed by George E. Desbarats. 1866."

IN the Report of Mr. JAMES RICHARDSON, on the QUEBEC GROUP, page 33, after explaining the division of the Lauzon division of this group into three synclinals, he says:—"In the second synclinal the lower part of the Lauzon division is still composed of Dolomites, &c., with the occurrence in some parts of Slates. In the last township (of Leeds), at the Harveyhill Mine, there occurs in this belt, on the south side of the second synclinal, a small patch of Serpentine and another of Soapstone. . . . So far as I am able to judge, although the largest bunch of Copper Ore was met with in the first synclinal, at Acton, the most continuously rich deposits seem to exist in the second and third, and the place of these appears to be in or near the DOLOMITE, the SERPENTINE, or the NACREOUS SLATE. The HARVEYHILL MINE, in Leeds, which has been described in the General Report (Geol. Can., pp. 724, 727), presents an instance of the occurrence of Copper Ore at the base of the Lauzon division, on the south-east side of the second synclinal. In this mine the ore occurs in THREE DISTINCT BEDS, of which the uppermost is the most important.* In it the Ore is associated with a fine NACREOUS or MICACEOUS SLATE, while the second or middle Bed, which is twenty† fathoms lower in the stratification, rests upon, and is mingled with a six-foot layer of SOAPSTONE, in the strike of which SERPENTINE occurs at a distance of about a mile and a half to the south-west. In 1862 the upper Bed had been worked over an area of about ten square fathoms; it has now (1866) been excavated to the extent of 300 square fathoms, and in one part the thickness has gradually increased from THREE up to between NINE and TEN feet; while the average produce of the Ore-bearing Rock, as it lies IN THE BED, is said to be ABOUT FIVE PER CENT. IN METALLIC COPPER."

Increase of Beds in Thickness.

To Mr Richardson's Report there is an "APPENDIX: LIST OF LOCALITIES in which Ores of Copper have been met with in Rocks of the Quebec Group in Eastern Canada," from which (pages 319, 20) the following Excerpt is made relating to specified ranges and lots in the Township of Leeds—being the ranges and lots in which the HARVEYHILL MINERAL FIELD is situated—and showing that the valuable YELLOW, VARIEGATED, AND VITREOUS SULPHURETS mentioned in the Prospectus PERVADE THE WHOLE EXTENT OF THE HARVEYHILL ESTATE:—

"LEEDS.

Range.	Lot.	Description.
" 13	16	Yellow, variegated, and vitreous Sulphurets in nacreous Slate.—English and Canadian Mining Company.
"	17	Yellow, variegated, and vitreous Sulphurets in nacreous Slate.—English and Canadian Mining Company.
" 14	13	Yellow, variegated, and vitreous Sulphurets.
"	14	The same.
"	15	The same.
"	15	Yellow, variegated, and vitreous Sulphurets, and green Carbonate in a vein with Quartz, Bitter-Spar, Chlorite, Steatite, Specular Iron, and a little Native Gold. (Geol. Can., p. 730.)—The minerals belong to the English and Canadian Mining Company, the land to Nutbrown.
" 15	16	Yellow, variegated, and vitreous Sulphurets in nacreous Slate.—English and Canadian Mining Company.
"	17	Yellow, variegated, and vitreous Sulphurets in NINE Quartz Courses and THREE BEDS in nacreous Slates. Here is the Harveyhill Mine, in which many shafts have been sunk, and one of the Beds has been worked to a considerable extent. (See p. 34, and Geol. Can., pp. 724-729.)—English and Canadian Mining Company.
"	17	Yellow, variegated, and vitreous Sulphurets.—English and Canadian Mining Company."

* In 1866, the uppermost bed alone had been wrought.

† Should be 30.

Report of BENJAMIN WILLIAMS, Esq., to the PROPRIETORS of the HARVEYHILL COPPER MINES, in reference to the development of the Ores.

GOLDSITHMEY, MAROZION, CORNWALL, November, 1871.

District, Feature of the Mines, Quantity and Quality of Ore in Sight, Character of Lodes, their Probable Extent, &c., &c.

Situation, Acreage, Wooding, &c.	The Harveyhill Mining and other properties embraced in the object of my visit to Canada are situated in the 13th, 14th, 15th, and 16th Ranges of the township of Leeds, in the county of Megantic, Lower Canada, and about 45 miles south from the city and seaport of Quebec. They consist of 3700 acres of land in fee simple, besides the mining and mineral rights on 300 acres more. By far the greater part thereof is heavily wooded with spruce, pine, maple, and other useful timber for mining purposes, whilst about 800 acres are already cleared and mostly let to neighbouring farmers as grazing land.
Superficial Explorations. Yellow and Grey Ores.	It will be seen, on reference to Plan and Section, that the Harveyhill Mine is situated on the 15th Range, and on the top of a mountain which rises 400 feet from the valley below, and 2000 feet above the sea level. The Mining operations consist of a large number of surface explorations in the shape of costeaning pits and shafts, sunk for the most part on out-cropping copper indications and on small spar or quartz courses that are numerous found traversing the clay slate which is the geological formation of the Hill, and I am told a great many tons of RICH YELLOW and GREY COPPER ORE resulted from these surface trials.
The Three Copper-bearing Beds.	The principal feature in connection with the Harveyhill Mine is the existence of THREE CUPRIFEROUS BEDS (see section), in which COPPER ORE is found to be interstratified with the clay slate—that is, layers of the ore and slate alternate. Operations, however, have been chiefly confined to what I shall designate “the No. 1, or uppermost bed,” which has been opened on at several points on surface, and is there traceable for a considerable distance, whilst extensive deep explorations also thereon conducted prove this. No. 1 Bed covers a very large space of ground. It is found traversing the hill in an east and west direction, with an underlie of about 33° north, and varies in thickness from 4 to 8 feet. Specimens No. 4, 5, and 6, are from this bed.
Increasing Thickness of Beds as Opened up.	I will now enter into a description of the principal Mining operations which have been commenced and carried on, taking them in detail and commencing from surface.
Seven Shafts.	Independent of the several openings, as before mentioned, to test the many outcropping veins and deposits found here, no less than SEVEN SHAFTS have been sunk on the property, varying in depth from 12 to 40 fathoms. “FREMONT'S SHAFT” which was commenced on the summit of the “Harvey Hill” and on the course of one of the quartz outcrops, before alluded to, is sunk to a depth of 26 fathoms from surface. It has cut into the No. 1 or UPPERMOST BED after a distance of 4 fathoms, and some GOOD COPPER ORE was got out of this shaft. It also passed through what is called No. 2 BED (see section), at about 22 fathoms from surface, and this bed is BETWEEN 5 AND 6 FEET IN THICKNESS and CONTAINS COPPER IN PAYING QUANTITIES.
Thickness of Bed No. 2.	The next, called No. 2 SHAFT, which is sunk 18 fathoms from surface, at which point it communicated with Adit level (hereafter to be noticed.) The position of No. 2 Shaft is about 10° east of north from Fremont's Shaft, and at a distance of 90 fathoms further down the hillside, and it is passed through the No. 1 uppermost bed after a depth of 16 fathoms had been reached from grass. Here also THE CUPRIFEROUS SCHIST was found to contain some GOOD INTERSTRATIFIED LAYERS OF COPPER ORE.
Lodes.	At a distance of 55 fathoms north, 30° east from No. 2 Shaft, stands what is called “THE OLD HARVEYHILL SHAFT” which has been sunk a depth of 14 fathoms from the surface, but the No. 1 or uppermost bed has not been intersected at this point. The shaft, I presume, was commenced for testing one of the many outcropping veins of spar met with on Harveyhill.
Thickness of Bed No. 1. Rich Purple Ore.	“DOUGLAS SHAFT” comes next, which is situated at a distance of 77 fathoms in a north-westerly direction from No. 2 Adit Shaft, and is still further down the hillside. It was sunk for the purpose of intersecting the No. 1 bed, but after a depth of 14 fathoms had been attained, operations were suspended, leaving about 2 fathoms more to sink. I am told however, that a borer hole was put down from the bottom of the shaft, and, as was anticipated, it cut into the said No. 1 bed, after the hole had been bored 12 feet, and was found to contain Copper Ore of good quality.
Other Rich Lodes.	“KENT'S SHAFT” is next, and is the most important shaft in connection with the underground workings. Its position is 76 fathoms in a north-westerly direction from “Douglas' Shaft,” still nearer the valley. It is sunk to the 30, but after a depth of 10 fathoms vertically from surface had been attained, a cross cut was driven south in order to intersect the “No. 1 uppermost bed” which was accomplished after driving 26 fathoms; but, with the exception of a winze sunk on its course, no work of much importance is done at this depth (10 fathoms). In driving the above-mentioned cross cut, two QUARTZ BRANCHES are seen crossing the level nearly at right angles, and about 4 to 5 FATHOMS APART FROM EACH OTHER, running east and west. In both instances, these spar courses contain GOOD COPPER ORE IN FAIR QUANTITY.
“Fanny Eliza” Lode. Yellow and Purple Ore.	At a depth of 20 fathoms from grass, Kent's Shaft struck and passed through the No. 1 or uppermost bed, which at this point was found to be FROM 5 TO 6 FEET THICK, and holding RICH PURPLE COPPER ORE IN PRODUCTIVE QUANTITIES. From the 20 a level was carried off east and west on its course; eastward, 20 fathoms were driven; and westward, 25 fathoms. For the whole of these distances THE BED proved very ore, and upward sloping operations were then carried on, extending to within 6 fathoms of the surface. The BED STUFF from these slopes yields, as broken down, FROM 4 PER CENT. TO 5 PER CENT. OF COPPER.
Continuity of Lodes.	In driving this 20 fathoms level east from Kent's Shaft two OTHER SPAR COURSES were met with, one at a distance of seven fathoms, &c., and the other 18 fathoms from shaft. The former is there FROM 15 TO 18 INCHES WIDE, the latter from TWO FEET TO TWO-AND-A-HALF FEET IN WIDTH, with STRONG PURPLE AND YELLOW COPPER ORE disseminated throughout both. Upward on the latter a stope is carried, wherein the spar course has widened to FULLY THREE FEET, being REGULAR and WELL-DEFINED, with a slight underlie to the west and north, from about THREE TO FOUR TONS OF NINE PER CENT. TO TWELVE PER CENT. ORE PER FATHOM. Specimens 1, 1, 1, are from this stope.
Increase of “Fanny Eliza” Lode.	At a distance of six or seven fathoms west of Kent's Shaft is found what is called the “FANNY ELIZA” LODE. This, too, is a quartz branch, and there averages TWENTY INCHES IN WIDTH, with an underlie to the west of about two feet in the fathom, and is STONGLY CHARGED WITH RICH YELLOW AND PURPLE ORE. From there downwards this branch is observed to keep its regular course north twenty per cent. east, and presents every indication of being a REGULAR METALLIFEROUS VEIN.
Do. Do.	From the 20 (as from the 10), and just opposite the shaft, another “WINZE” is sunk on the course of the “No. 1 bed” to the 30; but when the winze head attained a depth of about five fathoms, a level called the “25 fathom level” was commenced and driven east on the copper-bearing bed 11 fathoms, and west 20 fathoms. Very extensive stoping operations were carried on here, and the whole of the bed for the above distance, both east and west of the shaft, has been taken away to the 20 fathom.
Purple and Grey Ore.	At this depth (25 fathom level) one only of the two branches of quartz seen in the eastern portion of the level, five fathoms above, has been intersected, WHERE IT PRESENTS SIMILAR APPEARANCES AS IT HAS IN THE MORE SHALLOW LEVEL, and is seen running into the slate formation.
	The “Fanny Eliza” lode—the western branch—is also seen here at the 25 fathoms, where it assumes a more lode-like appearance, and IS EVIDENTLY GETTING LARGER IN DEPTH.
	As before stated, Kent's Shaft is worked vertically from surface a depth of 30 fathoms.
	From the 30 another cross cut was begun and driven north 20 fathoms, where it again intersects “No. 1 uppermost bed,” and a level is carried off, both east and west, on its course. Eastwards 9 fathoms were explored, and west a distance of 40 fathoms were driven. Large stoping operations were also conducted on the bed at this point, and, with the exception of an occasional arch left standing for the purpose of supporting the superincumbent ground, the stopers have followed the angle up and taken away the bed stuff for a length (in some places about the 20 and 25) of 40 fathoms, and for at least 50 fathoms high.
	Mr Douglas, one of the present proprietors of the Mine states, in his notes to the Literary and Historical Society of Quebec, that 8000 tons of bed stuff were broken and sent to grass from these stopes.
	From the 30 another WINZE has been sunk on the course of the western branch, or the “Fanny Eliza” lode, but still keeping the angle of “the number 1 bed.” This winze is commenced about five fathoms west of Kent's Shaft, and at the time of my visit had attained a depth of 50 fathoms, whilst this “FANNY ELIZA” LODE IS DISTINCTLY SEEN, BOTH UNDER AND OVER, FOR THE WHOLE OF THAT DISTANCE, and varying in size FROM TWO-AND-A-HALF TO THREE-AND-A-HALF FEET, and has EVERY APPEARANCE OF BEING A WELL-DEFINED MINERAL VEIN. In sinking the winze several VERY RICH BUNCHES OF PURPLE AND GREY ORE were passed through, some of these bunches yielding, as broken from the lode, AS MUCH AS THREE

AND FIVE TONS OF 12 PER CENT. AND 15 PER CENT. ORE TO THE FATHOM, whilst in a stope where four men were engaged in the back of the winze THE LODE WAS THREE FEET WIDE, and would produce THREE TO FOUR TONS OF FROM 10 PER CENT. TO 12 PER CENT. COPPER ORE PER FATHOM. Specimens Nos. 2, 2, 2, 2, are taken from this stope.

In addition to the above Mining operations an ADIT has been taken up and driven into the hillside, A DISTANCE OF 248 FATHOMS. This adit is commenced at a point which would afford a tack over at "Fremont's Shaft" of about 25 fathoms, and in its course intersected the No. 1, No. 2, and No. 3 Cupriferous beds.

Adit Level Intersects, all Three Beds.

Mode of Operations, Machinery, &c.

It will be readily seen by the foregoing remarks that, with but few exceptions, the underground operations were confined almost entirely to exploring the No. 1 uppermost bed, and from it SOME THOUSANDS OF TONS OF OREY STUFF have been taken out and sent to grass, which contained, as broken down, FROM FOUR PER CENT. TO FIVE PER CENT. OF COPPER. It will be seen, moreover, that all the above cupriferous stuff was found within a space of about an average length of 34 fathoms and about 50 fathoms downwards on the angle of the bed. In this distance SEVERAL BRANCHES OF QUARTZ were met with, which sometimes were found traversing the clay slate formation almost horizontally, and at others they assumed a more vertical and lode-like appearance. When this occurred the Cupriferous Schist became to a certain degree impoverished, the Copper Pyrites apparently leaving the bed, and the metal ore concentrating, as it were, in the Quartz veins. Indeed, I have frequently had occasion in making the above remarks to allude to these QUARTZ VEINS, and there are THREE of these which command especial attention—two referred to in the 20 east level, and one, THE "FANNY ELIZA" LODE, a few fathoms west of Kent's Shaft. On the latter, as before mentioned, a winze has been sunk from the 30 fathom level at Kent's Shaft, a distance of 50 fathoms on the incline of the No. 1 Bed Feus. "FANNY ELIZA" LODE, in sinking here, was found very regular, its direction being about 50° to 20° east of north (a north and south lode), with a straight underlie to the west, and will average from top to bottom of said winze THREE FEET in width, and for the whole of that distance (50 fathoms) Copper Ore is found strongly disseminated through the vein, and several VERY RICH BUNCHES of Ore were cut into and worked away, some yielding as much as THREE TONS OF 40 PER CENT. PER FATHOM. It is here, too, where GREY COPPER ORE is first seen, and where the yellow Copper Pyrites found associated with these Quartz courses, in the more shallow levels, gives place to the richer and more friable variegated BLUE AND PURPLE SULPHURETS, as will be seen by specimens Nos. 2, 2, 2, 2, which are taken from the "Fanny Eliza" lode at some fathoms below the 30 in the winze.

Excavations and Per centage of No. 1 Bed.

Copper Lodes.

Three Principal Lodes.

"Fanny Eliza" Lode.

Grey Copper Ore.

Blue and Purple Ores superseding the Yellow Ore.

During my stay at the Harveyhill Mine, in compliance with my request, a pair of miners were placed to work vertically on the "Fanny Eliza" lode. From the bottom of the winze, and up to the day before my departure, they had sunk a depth of about 10 feet, and I am much pleased to state that the Lode appeared to keep its regular, well-defined course downwards, and I was able to break some FINE STONES OF RICH COPPER ORE from this sink. Specimens 3, 3, 3, are taken from this pit.

It should also be here remarked that there are VERY LARGE PORTIONS OF THE NO. 1 OR UPPERMOST BED, as well as the "FANNY ELIZA" LODE, and the OTHER TWO LODES already mentioned in the 20 East Level, which, as soon as an advance takes place in the price of Copper, could be worked away at a good profit. I must also mention that there are now on grass between 1500 AND 2000 TONS OF OREY STUFF only waiting the erection of stamp machinery to be turned to good account.

What I should recommend to further prove the Harveyhill Mine is, in the first place, the extension eastward of the 30 fathom level from Kent's Shaft, for the purpose of intersecting the two quartz courses above alluded to, as seen in the 20 fathom level (see pages 5 and 6), and from which some rich copper ore has been raised. The first of these quartz branches according to its position and bearing, as seen in the 20, ought to be cut after the end had been advanced about 11 fathoms from the shaft, and the other at a distance of 22 fathoms from Kent's Shaft, when in the event of these quartz branches proving productive (and there is very great reason to believe they will), it will be easily understood that the future prospects of this enterprise would be considerably enhanced, as there would then be three lodes known to exist on the property, and all within a few fathoms of each other. Of course after these lodes are intersected at the thirty other trials should be commenced, such as driving both north and south on their course, sinking winzes, &c., &c.

Recommendations for further working of Lodes.

On the "Fanny Eliza," which is the most western lode, I should deepen 10 or 15 fathoms more the winze I wished to be commenced, from the bottom of the incline, as first above referred to. This would be found, in consequence of its inconvenient position, rather an expensive and troublesome operation; nevertheless it is a most important one, as in sinking this winze the character of the lode will be partially tested, and will assist in a very great measure in forming a pretty correct idea as to the future prospects of the whole concern in depth. If the lode should be found to improve in depth as the winze goes down, get more ore, and present such indications as would warrant other and more extensive operations, I should resume the sinking of Kent's Shaft (which is admirably situated to command, by means of short cross cuts, all the three lodes), whilst, from the fact of these veins having an underlie to the west, the eastern lodes would be getting nearer every fathom the shaft is sunk, and eventually the shaft could be continued in the very course of the middle lode, whence the other two lodes, viz., the Fanny Eliza to the west, and the eastern vein, could readily be reached by cross cutting.

To thoroughly ventilate, and to properly explore the different lodes, a second shaft would be required; and, according to my opinion, ought to be commenced as early as possible. This shaft should be sunk further down the hillside, at a distance of say 70 or 80 fathoms north, and a little east from Kent's Shaft, and should be so placed as to intersect the Fanny Eliza lode at a depth of 70 fathoms from the surface. This should eventually be the Sump or Engine Shaft. From it, at intervals of about ten fathoms, cross cuts might be taken up. I should also recommend winzes being sunk on the course of the lodes from level to level, at distances from each other not exceeding 30 fathoms. These winzes would not only thoroughly ventilate all the operations, but would prove the intermediate ground, and by these means the mine could be explored to almost any depth, or as long as the mineral veins continued remunerative.

In consequence of the closeness of the ground, the water is as yet very little, and up to date has been drawn out by means of barrels, but a greater quantity may be anticipated as the Mine is there deepened.

Very Little Water in Mine. Steam Engines.

To contend against this difficulty there is ample machinery on the property, for there are no less than FOUR STEAM ENGINES on the Mine. One, a 24-inch cylinder, is erected about 60 fathoms north from Kent's Shaft, and can, with some little alterations, be made available for draining the Mine, as well as for driving dressing machinery if necessary. At Kent's Shaft a 14-inch high-pressure horizontal engine is erected for driving purposes, and a good double "skip road" is fixed from surface to bottom of shaft 30 fathom level. There are two other small steam engines used in the dressing floors for driving hutches, &c.

Reduction Works, Water Supply, &c.

The copper ores found at Harveyhill are concentrated by the means usually employed elsewhere. There is a good deal of MODERN AND USEFUL MACHINERY on the works for reducing purposes, which, when required, can easily be brought into working order, consisting of two JIGGING HUTCHES, round BUDDLER, a CRUSHER with two sets of rollers, two GERMAN PERCUSSION TABLES, a PETHERICK'S PATENT HUTCH, two RAFT WHEELS or belts, and a BLAKE'S STONE-BREAKER.

Crushing and Concentrating Machinery.

The ore, which is now being dressed at the Mine, contains, when drawn from under ground, FROM 10 TO 12 PER CENT. OF COPPER, and is then concentrated up to 30 and even as high as 40 PER CENT.—the lowest percentage now sent to England being 30 per cent. It will be seen by the sales effected in September last, that several tons sent were 38½ produce, and "the seconds" assayed 34¾ per cent.

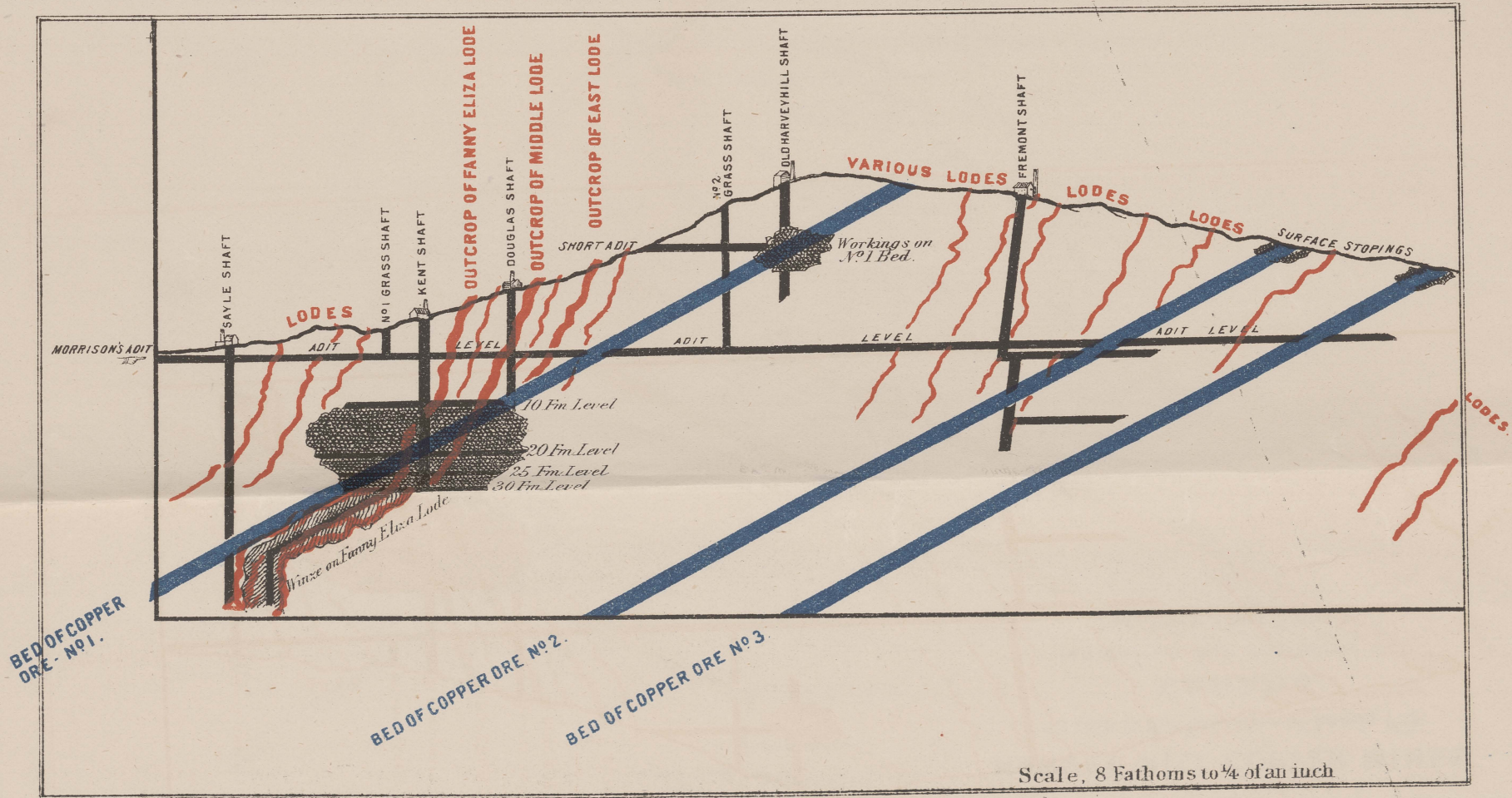
Per Centage to which Ore capable of Concentration.

Water in the immediate vicinity of the Mine is scarce, and hitherto has been chiefly obtained by collecting in a reservoir the mountain streams after heavy rains. This at best seems to me a precarious source of water supply, though those who are well acquainted with Canadian rains and the result of snow-melting there assert that thus sufficient water supply could be calculated on for more extensive dressing operations than have ever yet been conducted at the Harveyhill. Still, if this be the case, a much larger RESERVOIR than the present one would be certainly required; and though the making of this would be greatly facilitated by the favourable slope of the hillside, I am of opinion a more desirable site for the permanent dressing floors is to be found on the banks of the PALMER RIVER, about a mile and a quarter down the valley from the mine. This river, I am told, would yield ample water supply all the year round, and the rights of the river belong to the Harveyhill proprietors. Here then, when required, I should recommend the laying of DRESSING FLOORS ON A LARGE SCALE, connecting the same with the mine by means of a tramway for the easy transmission of the ores from the works, and for this the position of the Palmer River is admirably adapted, there being a slight incline from the mine all the way; and I may add the road intended for the tramway has been already surveyed and cleared. Sheds should cover the whole floors, in order to protect those engaged thereon from the excessive heat in summer, and more especially from the severe cold during the winter months, when, without such protection, it would be impossible to continue the reduction of, or

Reservoirs.

Palmer River.

SECTION OF HARVEYHILL MINE, SO FAR AS OPENED UP, SHEWING THE BEDS, LODES, AND WORKINGS.



Steam and Water
Power

dressing the mineral for market. These sheds would have to be warmed in the same way that all the dwelling houses are in Canada, and thus there would be, I am told, no difficulty in keeping the dressing department going all the year through. It is on the Palmer River where the proprietors have erected a SAWMILL.

The logs from the forests on the Harveyhill Estate are felled and floated down the river during spring, and the breaking up of the ice, thus making their transport easy and cheap. As before stated, there is AMPLE STEAM MACHINERY already on the Mine, which might be easily removed to the river for crushing purposes, &c., during winter. I think, however, that for at least six months out of the twelve, there is water enough to drive a CRUSHER, or what, perhaps, would answer better still, a series of STAMPS might be so arranged as to perform ALL THE NECESSARY CRUSHING, without the aid of steam power.

Labour Cost.

Native labour is pretty expensive, and at present rather scarce about the locality of the Mine, but I am told there would be no difficulty in getting hands, in large numbers, as soon as it became known that continuous employment could be obtained at the works.

The miners there usually work on the Cornish system of "tut-work" (contract work), and may earn from £8 10s. to £9 10s. per month, but when engaged on day work, are paid from 6s. to 7s. a-day.

Underground labourers, such as strikers, kibble fillers, framers, &c., earn from £4 10s. to £6 per month. Men engaged on surface get from 2s. 6d. to 3s. per day, whilst boys of from 12 to 15 years of age, working on the dressing floors, are paid from 1s. 6d. to 2s. per diem.

I may here add that the labouring population are industrious, civil, manageable, and tolerably efficient.

Roads, Inland Carriage, Sea Freight, &c.

The GRAND TRUNK RAILWAY from Quebec passes within twenty-one miles of the Harveyhill Mine, and is connected, by means of a cart road, with a point on the above railway called Methot's Mill. At the time of my visit (in October), the roads were at their worst, and certainly were in a wretched condition. This is only the case, however, for a short period during the autumn, as in summer they are kept in good repair. During winter, when they are covered with several feet of snow, is the time selected for transporting all heavy materials, in the shape of machinery, &c., as this is comparatively easily done on sledges.

Cartage of the ore from the Mine to the railway is done by the farmers in the neighbourhood. After careful enquiry regarding the details of freight, I find the total cost of transport from the Mine to Liverpool, per steamer, in spring, summer, and autumn is £3 8s. 10d. per ton, but in winter, or when river navigation to Quebec is closed, £4 8s. 4d. per ton, with additional fees, in the latter case, to the United States Government on each gross cargo of £1 11s. 11d.

For shipping to Bristol on board timber carrying vessels from Quebec during open navigation, the total cost from mine to Bristol would be from £3 to £3 3s. per ton. A BRANCH RAILWAY from METHOT'S MILL STATION on the GRAND TRUNK MAIN LINE to LEEDS is now in course of construction, and when carried out will pass within a few miles of Harveyhill property. This, as a matter of course, would very materially reduce freight charges to and from the mine.

Surface Plant.

Buildings, &c.

In addition to the Machinery spoken of in this report, there are several other buildings on the property, chiefly of wood, consisting of 13 Dwelling Houses, Office and Store, School House, with two rooms for teachers; Powder House, Saw Mill on the Palmer River, Jigging and other Dressing Houses, Stabling for 13 horses and 10 stalls for cows, Barn, Blacksmith's and Carpenter's Shops, and one large house, three storeys high, containing the large engine, the crusher, and Blake's Stone Breaker. This house (where a portion of the Ore's concentration is carried on) is connected with Kent's Shaft by means of an inclined TRAMWAY for the transmission of Ore, &c. Several horses, too, are kept on the mine for whin drawing, &c., &c.

Staff Required.

I should recommend the Company's engaging the services of a thoroughly practical Mining Engineer, who could take the supervision of the entire operation. There should be another to act as second underground agent, and also an accountant. These would be all the officers required. I should also advise the sending out of a good respectable person as Ore-dresser. He should be a man who thoroughly understands his business, and is capable of laying out large dressing floors with the most modern appliances.

Certificate and Report on the present Condition of, and Operations at the Mining Properties of
the ENGLISH and CANADIAN MINING COMPANY at HARVEYHILL. By HERRALD
DOUGLAS, Esq., Practical Assayist and General Superintendent of the Harveyhill Mine,
Quebec.

THE Property of the ENGLISH AND CANADIAN MINING COMPANY is situated in the Township of Leeds, and County of Megantic, about 45 miles south of the city and seaport of Quebec, and 21 miles from Methots Station, on the Grand Trunk Railway of Canada, and consists of 3,700 acres of land in fee simple, and the mining rights over 300 acres more.

I have been Assayist and General Superintendent at Harveyhill since the beginning of 1869. I have assayed every batch of material extracted from the mine during the last four years; and what I am about to state is the result of hundreds of assays made by me, and of constant supervision during that time. I state nothing which is not matter of intimate personal knowledge, and of which I am able to pledge my character and reputation.

From the rich outcrops of Copper Ore, and other indications of mineral wealth which have been found throughout the entire estate, it is the opinion of eminent geologists that the whole property would justify thorough exploration and working; but operations have been necessarily confined hitherto to comparatively a very small portion of it—about 400 acres out of the whole 4000.

When at a depth of about 20 fathoms from the surface, three remarkable LODES of rich Copper Ore have been struck, one of which has been opened out to a total *depth* of 60 fathoms, and about 100 fathoms in *length*. These lodes—of an average thickness of three feet each—so far as hitherto worked, are yielding a large quantity of very rich ore from 12 to 15 per cent., and of increasing richness and quantity, which, by the ordinary process of dressing is at present raised to an *average* of 40 per cent. of Metallic Copper, but sometimes the process has been carried much higher—as high as 56 per cent.; nor is there any difficulty or any material increase of expense in doing so, while the saving of freight, &c., is very considerable.

These Lodes are found in connection with, or striking across and through THREE DISTINCT BEDS of interstratified Copper Ore, the entire materials of which yield on an average from four per cent. to five per cent. of Metallic Copper. These beds have been traced by workings over an area of from 300 to 400 superficial acres, and no doubt exist over a very much larger area of the estate. They vary in thickness from four to ten feet. The second bed is 30 fathoms under the first, the lowest ten fathoms under the second. From the great thickness of these beds—averaging, so far as explored, six feet each—it is obvious that they contain an unlimited reserve of Copper Ore; and from the character of the bed—chiefly soft talcose schist—any practical man will understand that the Ore is easily mined, raised, and dressed. The profit of the enterprise is therefore based on two distinct sources of supply, namely, the LODES, and the three interstratified BEDS. The Ore itself, in chemical or mineralogical character, is, in both beds and lodes, DISULPHIDE OR SUBSULPHURET OF COPPER. Near the surface the Yellow Sulphuret, containing 33 per cent. of Metallic Copper, prevails, and continues to be seen down to the 30 fathom level, but every fathom more and more richly variegated with the VITREOUS PURPLE SULPHURET, containing from 60 to 68 per cent. of Copper, which indeed predominates before the 30 fathom level is reached. From this level downwards the Yellow Sulphuret entirely disappears, and the Ore is the PURE PURPLE OR PEACOCK SULPHURET, which itself, as you descend, becomes more and more

richly variegated with the GREY SULPHURET, containing from 75 to 80 per cent. of Copper. The yellow Sulphuret, which contains most sulphur, does not hold more than 10 to 15 per cent. of it. Iron is hardly present at all, nor are there any of the ores of Antimony, or other metallic impurities, which in other localities interfere to deteriorate the quality of the same kind of ore.

The following figures are based on actual working results:—

In part of the year 1866, 265 fathoms of ground were broken FROM THE BED, which was dressed with the crude hand machinery then in use to 25 per cent., and brought in Liverpool \$35,420, or \$132 per fathom. The average price then paid was 15s per unit, the price of Copper being very low. Since then, and up to a very recent date, work was suspended on the beds in consequence of a disastrous fire that broke out and destroyed the entire reducing works, and other property, to the value of £20,000. During the rebuilding of the crushing and dressing houses, machinery, &c., &c., more attention was given to the development of the three rich Copper LODES before mentioned, and this undertaking met with marked success, as the Lodes continued to prove both richer and larger as the workings increased in depth. There are numerous other Lodes cropping out on the surface, and cut across in the formation of the Adit Level, of the same class of Ore, but which the limited resources of the Proprietary have not enabled them as yet to open out. I refer to the Surface Plan of the Lodes for the position of some of these Lodes. It is, however, an undoubted fact that, irrespective of the Lodes, enormous wealth is to be found in the THREE INTERSTRATIFIED BEDS OF HARVEYHILL, as the following figures will show. The Beds are of friable stuff; the Lodes, though richer in Copper, are somewhat more difficult to work; and though the Lodes pay a larger profit per fathom wrought, yet much more Copper can, in an equal period, be got out of the Beds than out of the Lodes. The richer the Lodes become, they also become more friable. A miner will readily break four fathoms per month of the Beds and three of the Lodes. A fathom of Bed contains 12 tons of ore stuff; a fathom of Lode, 5 tons of ore stuff. The former will go into 1 ton of 45 per cent. dressed Ore; the latter into 1½ tons, same strength.

Supposing the BED only to yield 40 units per fathom (actual assays show it to stand on an average 12 tons per fathom, of from 4 to 5 per cent., or from 48 to 60 units), and the dressed Ore to stand only 30 per cent. (instead of 40 per cent. or 45 per cent.), the following is the cost of mining, raising, and dressing the Bed Ore, with the present improved appliances:—

Mining a fathom, yielding 12 tons of Ore,	- - - - -	\$22 0
Raising and delivering at Works,	- - - - -	3 0
Dressing 1½ tons to 30 per cent.,	- - - - -	11 25
Boxing, Cartage, and Freight to Liverpool,	- - - - -	16 75
		\$53 00
	Total Expenses,	\$53 00

Copper in England is now worth, say \$5 per unit, the value therefore of the 40 units is \$200, leaving a profit of \$147 per fathom.

The result of work upon the LODES during the past year is even more satisfactory. The fathom of ground broken on the lodes yields on an average five tons of 12 per cent. to 15 per cent., which therefore yields from 60 to 75 units of Copper Ore, which is dressed from 35 per cent. to 50 per cent., by hutches, &c. The cost is as follows:—

Mining, Raising, Watering, Timbering, Tracklaying, &c., &c.,	- - - - -	\$53 00
Dressing,	- - - - -	10 00
Boxing, Cartage, Freight, &c.,	- - - - -	20 00
		\$83 00

Value of say 60 units, at \$5 per unit, \$300; leaving a profit of \$217 per fathom.

The item for mining in the actual work from which the last estimate is taken is unusually high, as more than the average amount of drivage has been done. The cost for watering is always very small.

The concentration and dressing of the Ore is performed by the ordinary mechanical means of crushing and washing. No chemical process or smelting is required to bring the Ores up to 45 per cent., or even higher.

The Mine is equipped for very extensive working. The driving shaft is well timbered and provided with hoisting apparatus of the best description, worked by a 15 horse-power engine. A strong and substantial tramway connects the shaft with top storey of the dressing house, in which a Blake's crusher, two sets of rolls, a battery of stamps, sizing sieves, Petherick's and four automatic hutches, are so connected by elevating apparatus that the process of concentrating the Ore is effected with very little manual labour. In the slime department there are four Rettinger sizing boxes, attached to as many percussion tables, and dressing floors, independent of the large dressing house, with ties, drags, and concave buddles.

The machinery in the dressing house is driven by a 120 horse-power high-pressure engine, with four boilers, which also supply steam to a small engine, which runs the slime apparatus.

For treating waste Ores or low-grade Ores there is a complete apparatus for applying the wet Copper-extracting process, patented by Professor Sterry Hunt and Professor James Douglas, if in any case this be considered desirable. There are also a saw-mill, carpenter's and blacksmith's shops, engineer's shop, with lathe, tools, &c. &c.; 14 dwelling-houses, office, store, powder-house, stables for 24 head, a large barn, drying-houses, and sheds.

Of the land about 800 acres are under cultivation, supplying the establishment with hay, and the remainder is thickly wooded, and will supply the Mine with firewood and timber for mining purposes for a very lengthened period, at a small cost.

As already stated, the distance from the Railway Station is 21 miles over a good country road, but a Railroad has already been surveyed and planned, and is in course of construction, that will pass within a short distance of the Mine. This, when finished, will enable the Ore to be delivered at the port of shipment for \$2 per ton.

It will thus be seen that the Mine is making a large return upon the working expenses; and, under more skilful management than the present Company can command, it would at once pay large dividends.

The three Beds are now all accessible from the Adit Level, which passes through them all, and a large force of miners could be put on them at once. When Mr. Williams' recommendations as to the development of the three principal Lodes are completely carried out—which will take six months, or, at most, eight months—they might be worked by 40 miners. There would be some increase of machinery and workmen's houses required, but these would not cost much. We have never had more than 20 at any time on Beds and Lodes together.

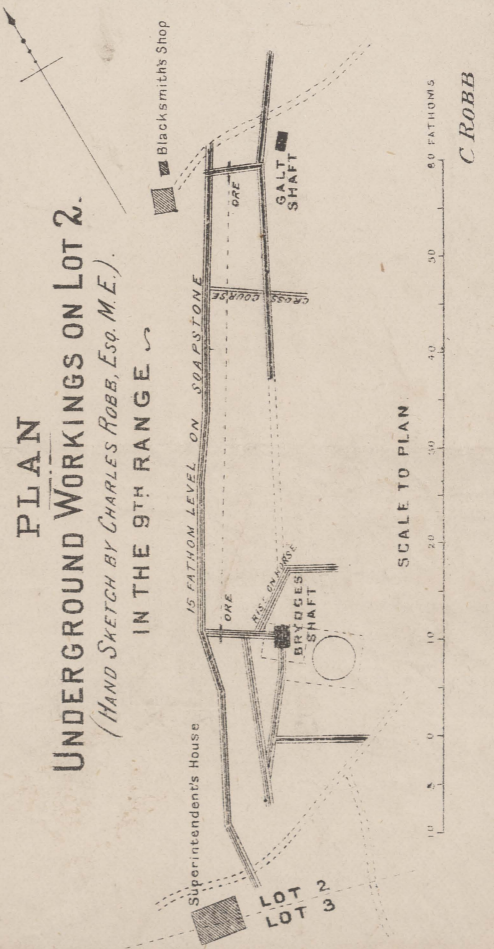
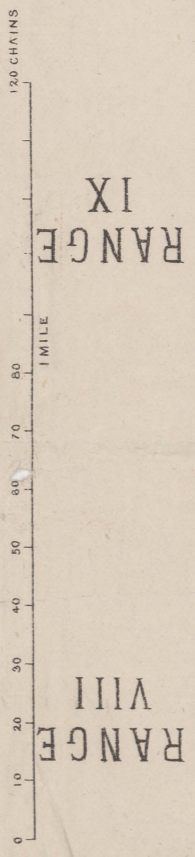
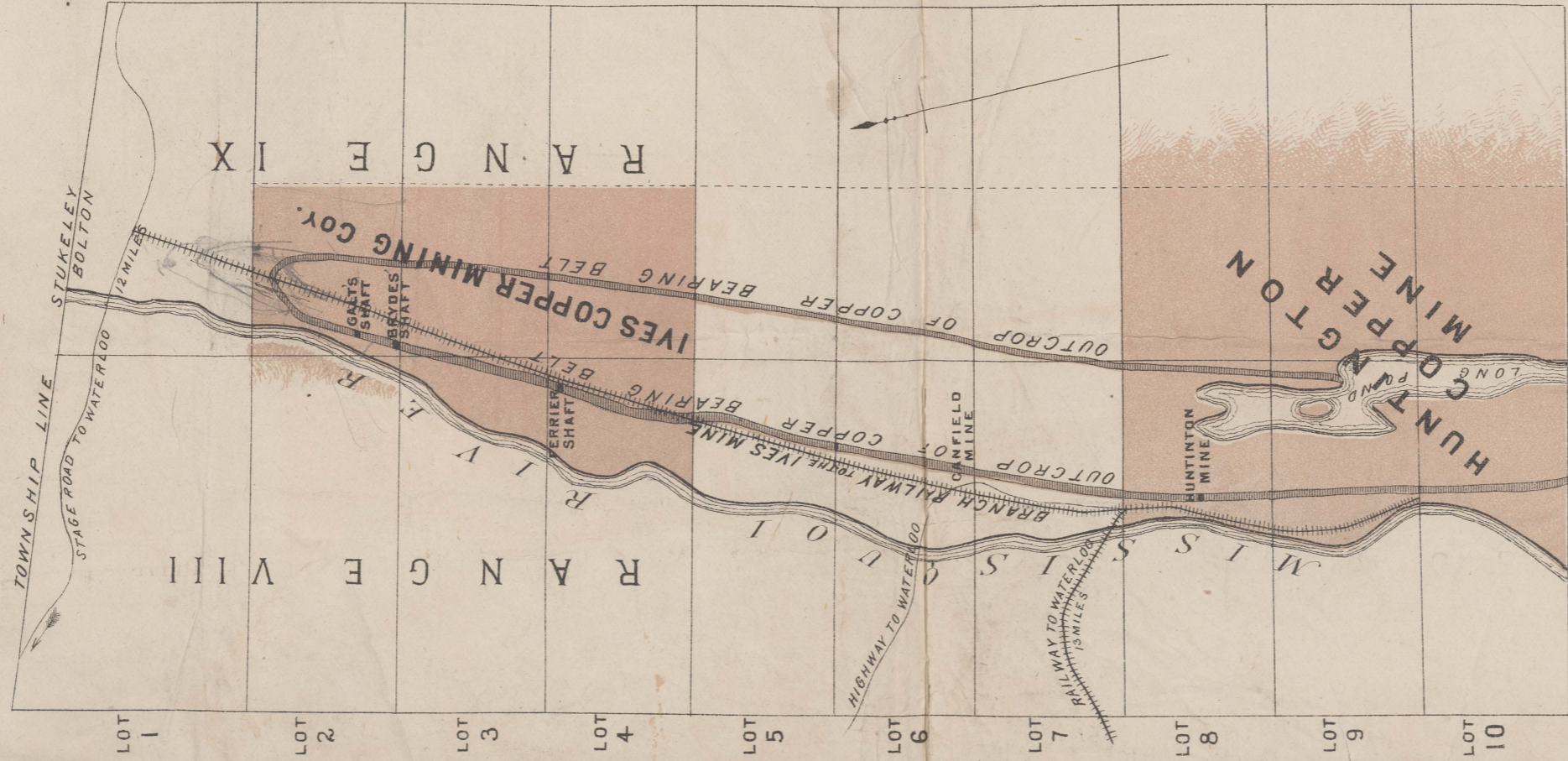
I have been informed that Sir W. E. Logan, the late Director of the Geological Survey of Canada, recommended the Proprietors, in order to develop at once what he expected will prove the richest and most prolific portion of the deposits, to sink a 100-fathoms shaft at the base of the Hill.

(Signed) HERRALD DOUGLAS.

CANADIAN IVES COPPER & SULPHUR MINING PROPERTY & WORKINGS.

MAP
 SHEWING THE
 COPPER DISTRICT OF THE TOWNSHIP OF
 BOLTON. P.Q.

From a Tracing by M^r C. Robb, M.E. taken
 from a Map by the Geological Survey of Canada.



SKETCH PLANS prepared to accompany Report on
 the IVES MINE, by E. J. Chapman, Professor of Mineralogy
 and Geology, University College, Toronto, and Consulting Mining
 Engineer.

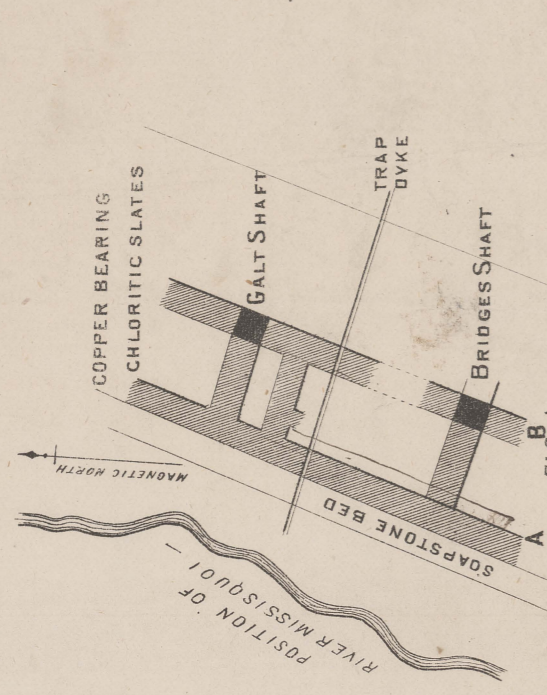


FIG. 1.
 SKETCH PLAN AT 15 FATHOM LEVEL (S II)
 A SOAPSTONE DRIFT.
 B. GALT & BRIDGES DRIFT.

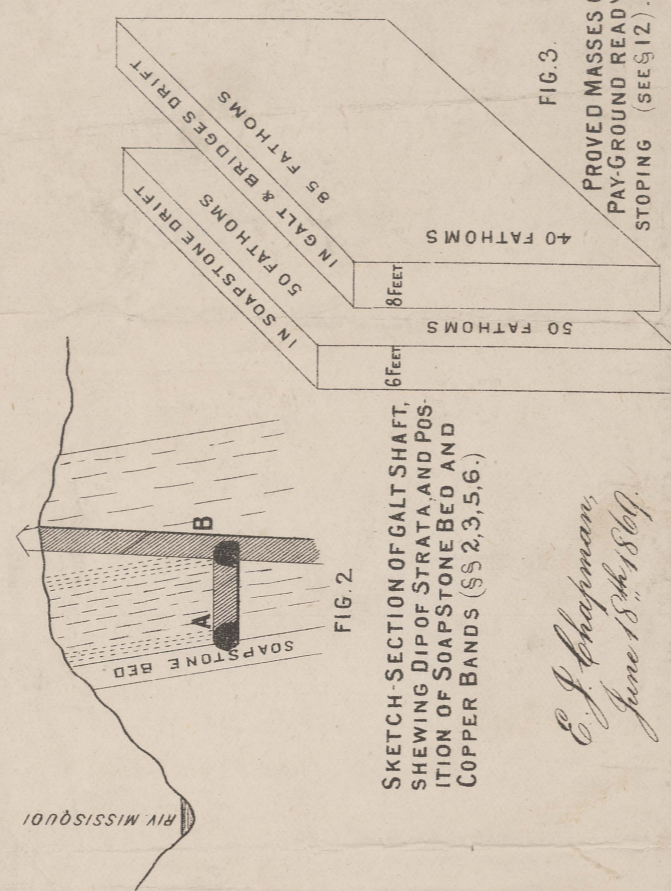
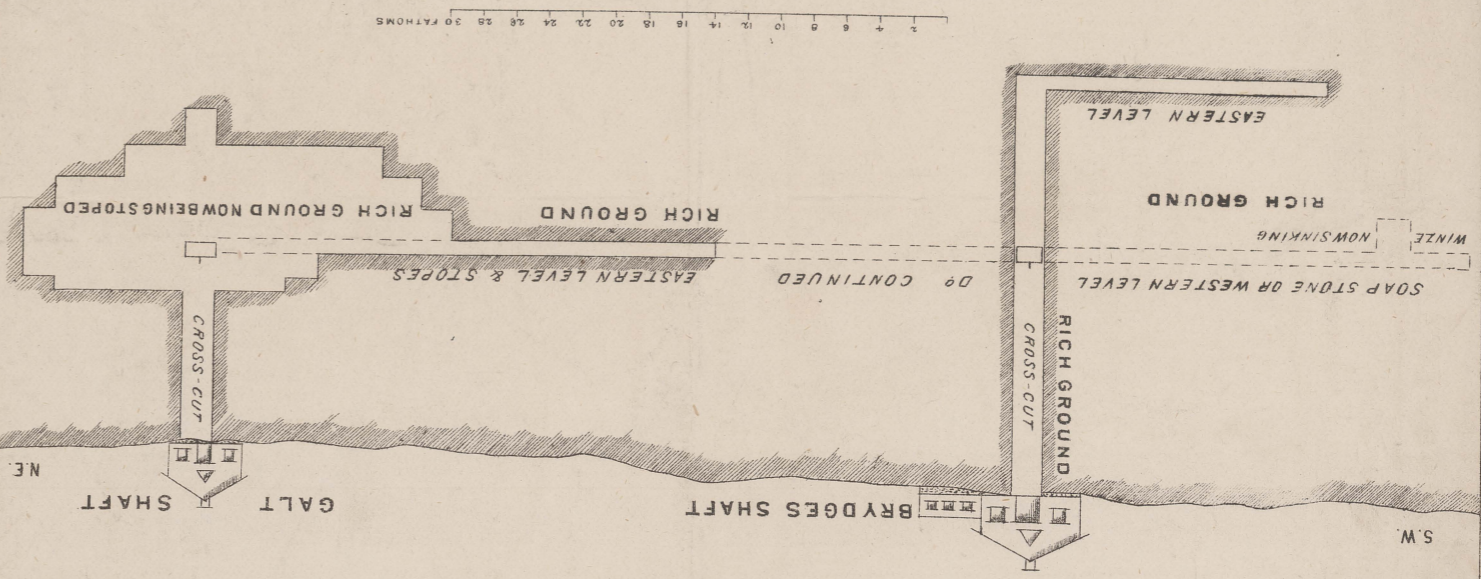


FIG. 2.
 SKETCH SECTION OF GALT SHAFT,
 SHEWING DIP OF STRATA AND POS-
 ITION OF SOAPSTONE BED AND
 COPPER BANDS (S S 2, 3, 5, 6.)

FIG. 3.
 PROVED MASSES OF
 PAY-GROUND READY FOR
 STOPPING (SEE S 12.)

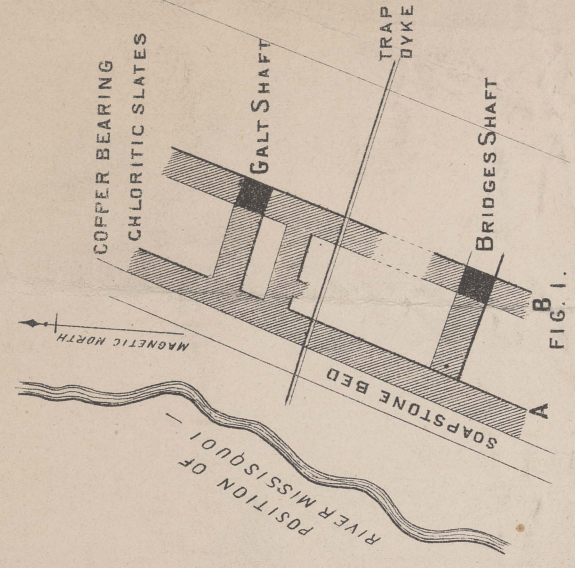
E. J. Chapman,
 June 18th 1872.

PLAN OF WORKINGS
 at the IVES MINE, Bolton, April 25th 1872.
 Prepared by T. Sterry Hunt, L.L.D. F.R.S. Chemist and
 Mineralogist to the Geological Survey of Canada.

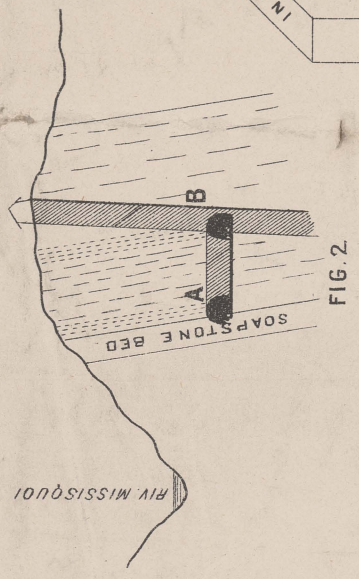


CANADIAN IVES COPPER & SULPHUR MINING PROPERTY & WORKINGS.

SKETCH PLANS prepared to accompany Report on the IVES MINE, by E. J. Chapman, Professor of Mineralogy and Geology, University College, Toronto, and Consulting Mining Engineer.



SKETCH-PLAN AT 15 FATHOM LEVEL (S II)
A. SOAPSTONE DRIFT.
B. GALT & BRIDGES DRIFT.



SKETCH-SECTION OF GALT SHAFT, SHEWING DIP OF STRATA, AND POSITION OF SOAPSTONE BED AND COPPER BANDS (S S 2, 3, 5, 6).

E. J. Chapman,
June 18th 1879.

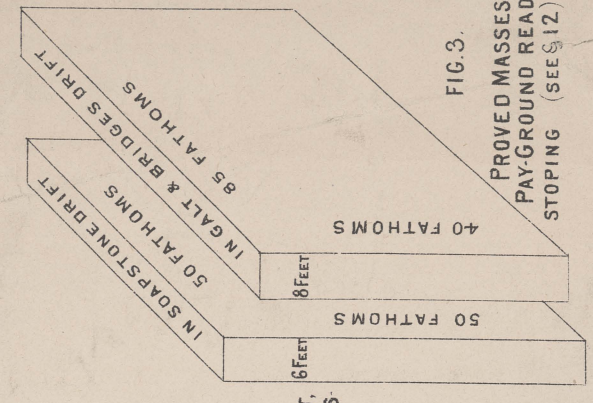
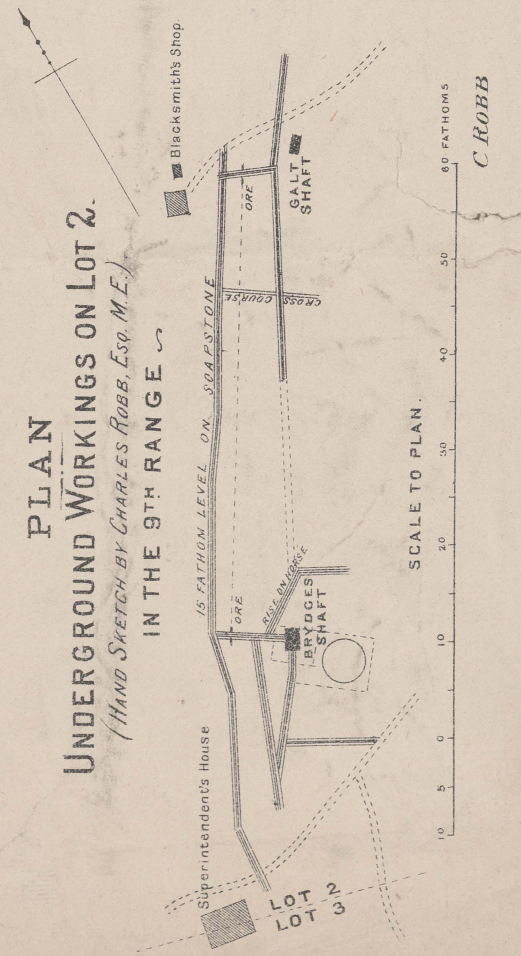
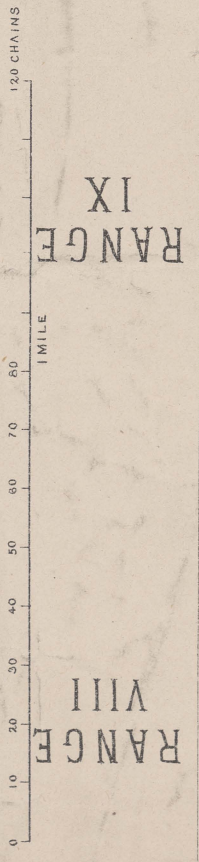
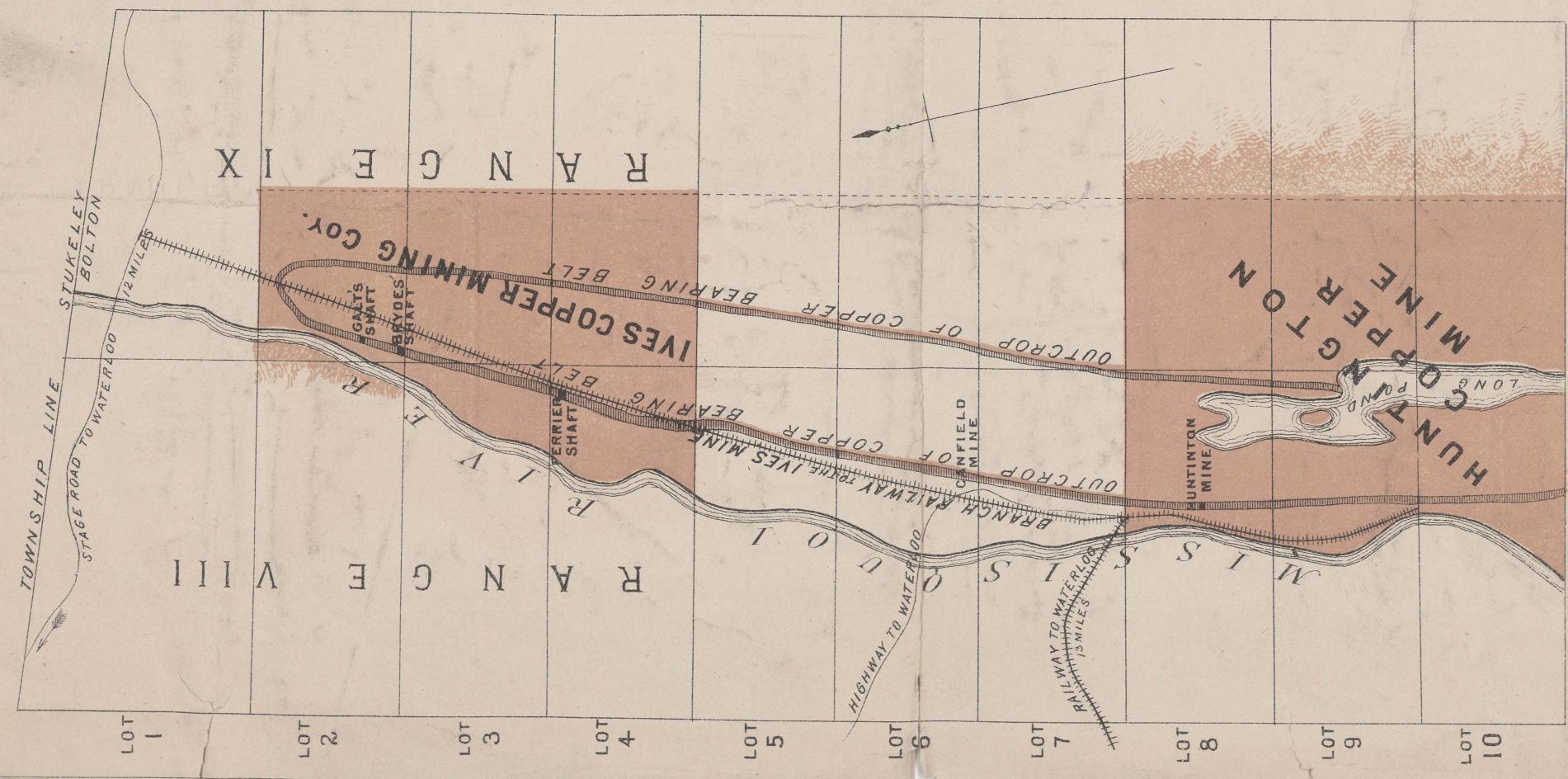


FIG. 3.

PROVED MASSES OF PAY-GROUND READY FOR STOPPING (SEE S 12).

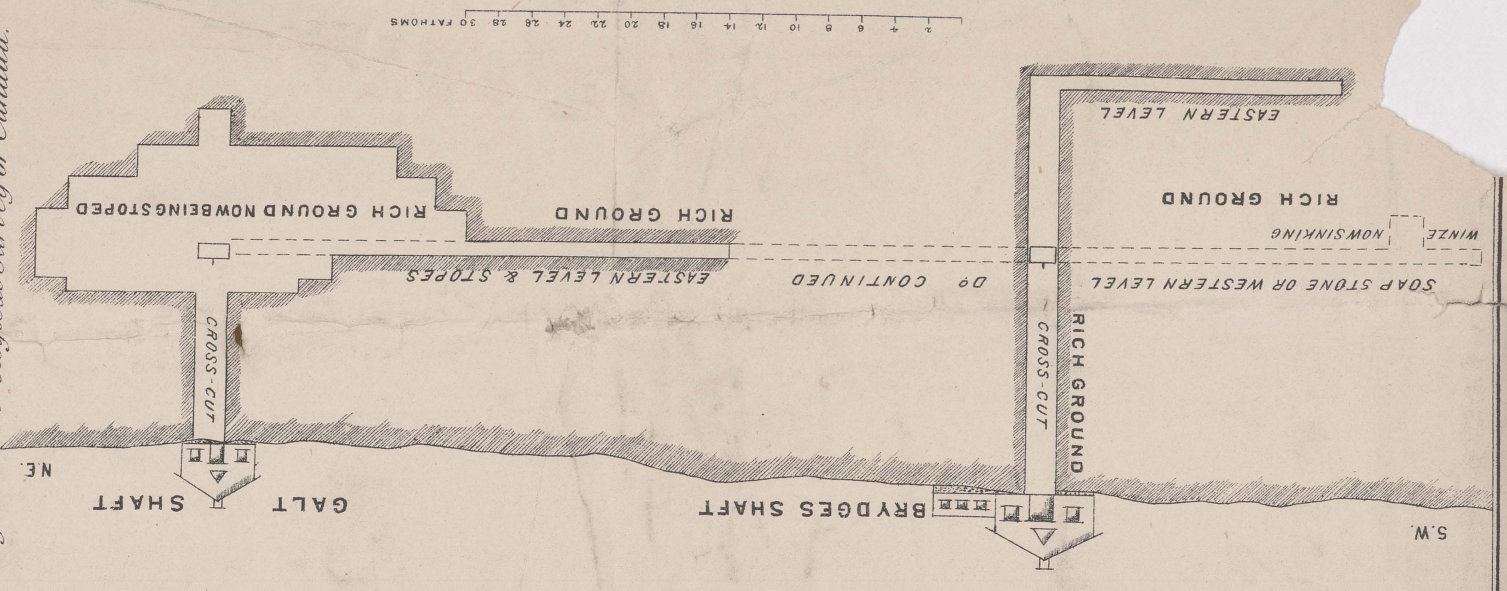
MAP SHEWING THE COPPER DISTRICT OF THE TOWNSHIP OF BOLTON. P.Q.

From a Tracing by M. C. Robb, M.E. taken from a Map by the Geological Survey of Canada.

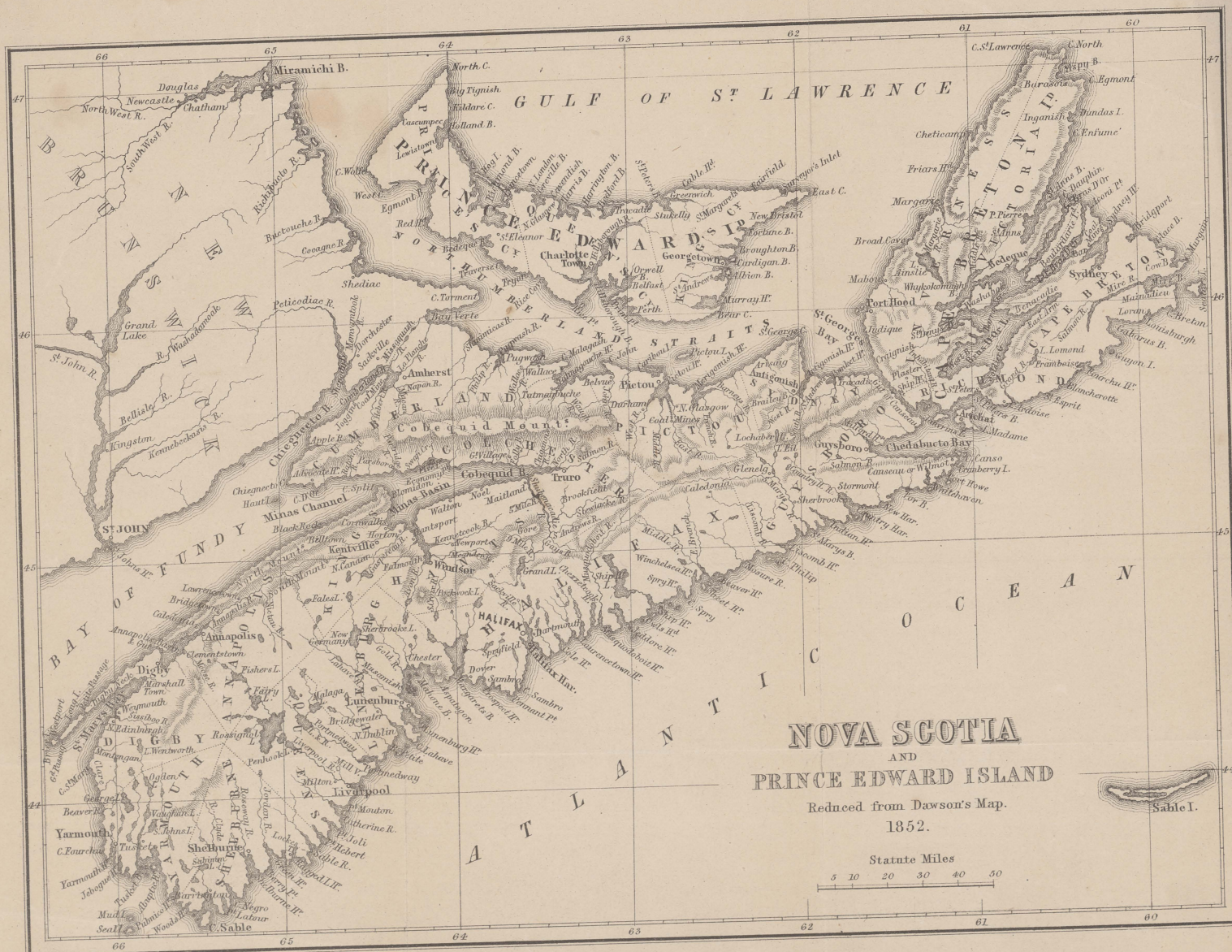


SCALE TO PLAN.
60 FATHOMS
C. ROBB

PLAN OF WORKINGS at the IVES MINE, Bolton, April 25th 1879. Prepared by T. Sterry Hunt, L.L.D. F.R.S. Chemist and Mineralogist to the Geological Survey of Canada.

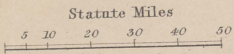


S.W.



NOVA SCOTIA
AND
PRINCE EDWARD ISLAND

Reduced from Dawson's Map.
1852.



Drawn by J.W. Dawson.

Published by J. Dawson & Son.