STATE OF MICHIGAN.

MINERAL RESOURCES

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BY AUTHORITY

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GOLD.

THE ROPES GOLD MINE.

A great deal has been said from time to time and innumerable conjectures made respecting the existence of gold among the mineral deposits of the Lake Superior region. The discovery of veins of quartz fabulously rich in this precious metal has been so often reported, investigated and disproved that something more than the mere claims of interested parties are now necessary to establish public confidence or even to awaken any general interest in the reported "finds" of rich deposits of gold. And yet the faith that gold really does exist in our rocks in paying quantity, and the expectation that rich deposits of it would ultimately be found, has never ceased to prevail. Gold bearing quartz veins are of not infrequent occurrence. Specimens of quartz have been occasionally shown in which the native gold was plainly discernable to the naked eye. The early geologists are said to have made favorable verbal reports respecting their belief in the existence of gold, and the companies that were first formed to operate in this country were organized to explore and to mine for gold and silver. At later periods similar corporations have been formed and some exploring work done in different localities, but nothing was accomplished that proved of any permanent value except what has been learned in the matter of experience.

The first and only Michigan gold mining company to engage in systematic mining work and to actually produce gold bullion is the Ropes. It is a legitimate pioneer enterprise, undertaken by men of limited means who have faith in the enterprise, and believe they could carry it to a successful conclusion. The mine is in the S. ½ of the N. W. ¼ of S. 29, T. 48, R. 27, being about six miles northwest from the city of Ishpeming. The proprietor, Mr. Julius Ropes, had examined the property considerably during several years preceding his discovery of gold, and had collected and polished many beautiful specimens of serpentine and marble from the massive outcrop of these minerals which prevail in this locality. Great ridges of serpentine and marble may be traced for miles, and these minerals, as they are found here, it would seem are possessed of excellent quality in a sufficient degree to render this formation of economic value.

The whole formation has nearly an east and west trend, and is made up of bare, sharp ridges of serpentine, marble, magnesian schists, greenstones and quartzite, all correlated under the general term, serpentine formation.

The discovery of gold was made in 1881, at a point near the east line, 500 feet south from the northeast corner. To the west is the greenstone, and .south of it the massive serpentine, followed by magnesian schists, in which latter are found various quartz veins, including the one in which the discovery of gold was made, and in which it is supposed the mine is opened. The mine itself is 600 feet west from the point where the original exploring was done, across a valley in the high ground opposite.

The bluff in which the mine is situated slopes to the north and east to a narrow valley of low, wet land, in which the ledge is deeply covered with drift, and so wet that exploring work would be difficult to pursue; so that whether the mine is in the same vein that was first explored is only a matter of conjecture.

Regular mining was begun in October, 1882, and during the winter following a shaft was sunk 80 feet. In the succeeding summer a “five-stamp" mill was erected, Fraser's concentrator, which was run about two months on rock taken mainly from the shaft and east and west in the first level. About 200 tons were stamped, which afforded a yield, including concentrates, of $10 per ton—an encouraging outlook. Work was resumed in the following April, a new arrangement having been made whereby stock was sold to the amount of $40,000. With this money machinery was purchased from Fraser & Chalmers, Chicago, and the work has been continuously

prosecuted since. A 25-stamp mill was completed and put in operation in November, 1884.

The mine has two shafts—one to first level, 100 feet deep, which is not now used. The other is the main working shaft, the Curry, which is now 260 feet deep—to below the fifth level. The hoisting is with bucket, worked from the engine house. The first level is only 30 feet below surface, and affords some of the best rock that has been found in the mine; much of the ground is standing. The mill is not capable of working up all the rock that could be mined. The vein is split in two parts in the upper levels which have the appearance of coming together further down. At 120 ft. east of the shaft the vein is cut off, but a small drift in south seems to strike it again, but not enough has been done to determine the matter.

It is possible that the regular vein lies northeast from the shaft, possibly a diamond drill would be the thing to use here east of the shaft. In the first and in the third level, 75 feet west of the shaft, the best rock was found, though now they are obtaining some equally good from the bottom level just opened. The dip of the vein is 80° south to the fourth level, when it changes and the dip is north, the foot becoming the hanging wall thence down to the fifth level. There seems to be some uncertainty regarding whether the levels are in the same vein. It is doubtful if the first level and the third west are in the same vein. On the fourth level they are in 60 feet east, and have carried the drift five to six feet in width, the vein being three feet to twelve feet wide; 80 or 90% of the rock broken goes to the mill, first through the Blake crusher, thence under the stamps, and finally to the concentrators and retorts, mercury being put in constantly to amalgamate the gold. From two-thirds to three-fourths of the gold and silver is held in the amalgam and is freed from the mercury by subsequent retorting. The concentrates are sent to Aurora, Ill., and thence to the U. S. mint. The bullion holds 39% gold, the remainder is silver.

The work has been largely experimental, mistakes have been made, due to the inexperience or incompetency of those in charge, which has run up the cost to a larger figure than was estimated. They have also had much trouble with the machinery, frequent breakages have occurred, requiring stoppage for repairs, resulting always in an increase of cost, since the stopping of the mill means also idleness to the mine. Recent alterations and repairs have put the mine in good shape now, capable of working off eighteen tons of rock per day, but greatly increased stamping facilities are required if the company is to make any money.

In July last a rich pocket was found in the first level west; 17 pounds of this rock gave $103 of gold. There were about 100 pounds of rock in the pocket that showed free gold. The October work was considered favorable. The mine yielded $2,500 in gold and silver; $2,300 of this sum was gold; 475 tons of rock were treated. In July, 1884, 60 tons of rock were stamped, etc., which brought $15 per ton. This was the last run of the old mill. The results show that there are rich pockets in the lode. Possibly, as Mr. Hopes thinks, if the mine were largely opened up there would be a sufficiently frequent occurrence of those rich pockets or shoots of mineral bearing quartz to pay. It is true of the copper mines that the ground is not uniformly rich. The copper is in "shoots," as they are termed, separated frequently by long stretches of barren ground, and I think the same is true of mineral bearing quartz veins. The rich mineral will not be found generally disseminated, but in limited portions of the vein. At the Ropes they have found small, isolated portions of the vein that would pay handsomely if they were large enough. As, for instance, the work of last month, when $2,500 were produced, and the total expenses are given as being $1,600; $3.37 per ton for expenses, against a yield of upwards of $5.26 per ton of rock stamped.

The company employs about 35 men. There are on the location 8 or 10 houses.

The following statement is furnished to me by the President as a general statement, taken from the company's books, of the year's work to Dec. 31, 1885:

No. of tons of rock treated	5,413
Total expenditures	$62,123 54
Total gold obtained	23,552 21
Total silver obtained	2,878 55
Total cost of machinery	15,507 71
Total construction cost	6,460 66
Total mining cost	40,154 17

The President states that they are doing better now than the average of the above figures indicates. During the first six months of the year want of a knowledge of the ground caused considerable unnecessary dead work in drifting and cross-cutting, and also a good deal of rock was run through the mill than later and larger experience would cause them to reject.

They understand the situation of the vein now better than heretofore and also have acquired skill in operating the mill, so that they feel confident of better results in future. The fifth level, Mr. Ropes states, is opening better than any ground they have had since having had the rich pocket in the first level. He states that an assay just made by himself, of rock from the fifth level, gave in gold $360 per ton; in silver, $14 per ton.

Of course this was a selected specimen, but it illustrates the fact that such do exist.

With the fifth level opened up, they estimate the stoping ground will suffice for 9 to 12 months, assuming that the fifth gives the same length as, the others.

The management state that the mine is now paying expenses and something more, and they are hopeful of better results the coming year.

The capital stock of the company is divided into 80,000 shares at $25 per share; assessments made, 69 cents per share.

Julius Ropes, President; E. B. Howard, Treasurer; S. S. Curry, Superintendent, Ishpeming, Mich.

THE LAKE SUPERIOR GOLD

"find" created considerable excitement last summer through the rich specimens that were shown and the assays of the rock that were made, it being reported that the rock yielded $1,000 per ton. The location is three miles west from the Ropes, in the N. W. ¼, S. 35, T. 48, R. 28; the land belongs to the L. S. I. Mining Co., and some parties have an option for it. The rock is a light colored quartz, and while some rich specimens were found, an assay made of an average of the vein did not bear up the boom. A few assays of average specimens took the wind out of the sails and the excitement subsided.

THE PHILLIPS GOLD MINE

is just west of the Ropes over the line. At the time I visited it they were drifting from the bottom of a shaft 60 feet deep, in black serpentine. No quartz vein was found, and the work was subsequently abandoned.

There are many so-called gold mines, but usually there has been very little work done, the parties having merely made some tests of a quartz vein.

One of these in the N. E. ¼, S. 36, T. 48, R. 27, owned by the Canal Co., some exploration was done and excellent results at first obtained, but they did not continue.

Also in Sec. 18—48—27, Mr. A. B. Miner obtained some good specimens, and, apparently, a well defined vein, but it has not been tested much.

On Sec. 35, N. E. ¼ of the N. W. ¼, T. 49—26, is

THE COON MINE,

where some gold has been obtained, in pyrites, etc. They have sunk 35 feet in the ledge, and cross-cutted. Copper ore is found; zinc blende and galena also. It is a vein 5 or 6 feet wide and carries good copper ore.

The Coon is a corporation organized under the general mining laws of the State, with the title of the COON GOLD MINING CO., 80,000 shares, $25 each.

At 15 feet below the surface a rich streak was encountered which assayed $27 to the ton of rock. They claim a vein 12 feet wide, and give as a reason for not working that there is too much water to operate without machinery.

In the north part of the city of Marquette, in grading a street, a large quartz vein was encountered, many specimens of which were assayed and yielded gold.

At other points in the vicinity of the city gold bearing quartz veins have been found, talked about and slightly tested.

Tradition seems to locate the Eldorado of the peninsula in the Huron Mountains. It is in this region that those mysterious "finds," so rich and promising, of the early days, are said to have been made. There may be untold riches, veins fabulously rich in gold and silver, within the limits of this wild and secluded portion of nature's domain; but if so the genii that guard them seem possessed with the power to veil them effectually from the eyes of the eager searcher.

SLATE.

The slate formation of Baraga county comprises a wide belt, and extends, from the Huron mountains west for many miles through Baraga county. At Huron Bay, and in the vicinity of l'Anse, where the deposits of this mineral have been more especially investigated, an excellent quality of merchantable slate is found in abundance, which has been examined and; tested by experienced slate men, quarry men, architects and builders, etc., who universally pronounce it to be fully equal to any slate produced for nearly all purposes for which this rock is used.

Companies organized to manufacture roofing slate, etc., were formed as early as 1872, and work was begun at Huron Bay and continued for a year or two on a scale of some magnitude, but the company met with financial disaster, and the business, which was at a stand still, was again revived and work resumed at the former location under the auspices of a new company. But there is not, and never has been, enough done to sustain or to build up a prosperous business. I have examined all the places where work has been done, and there is not the least manner of doubt in my mind but that slate suitable for commercial purposes exists in practically unexhaustible quantities in the vicinity of l'Anse. Either way, east and west, for many miles, quarries could be opened and worked. Certainly Baraga county has in its slate deposits the basis of a great industry. There is no question regarding the quality of the material; the slate is generally of a jet black color, or a very dark blue black, but there are also lighter shades. It is fine grained, with smooth surface, free from pyrites or other deleterious minerals, and has the most perfect cleavage. The quarries would be within a short distance of Lake Superior, thus giving cheap transportation to the markets east or west; a large number of skilled laborers would find permanent employment, and the pleasant village of l'Anse would grow to be a large and prosperous town.

The manufacture of roofing slate is an industry that cannot well be carried on on a small scale, or perhaps it were better to say that it is an industry that can be more advantageously conducted by a number of companies all manufacturing and acting in concert. There are various reasons for this, but the most important one is that the slate is necessarily made of several sizes. The workman shapes the fragment to such size as it will make to the best advantage; and so a company will have ranked up in its yard slates of different sizes, running like window panes—6"x8", 8"x10" and so on. It cannot well do otherwise without great waste of material. It would be

practically impossible to make any one size exclusively. They can simply manufacture right along, working up the material into such sizes as it will make to advantage, and so in time accumulate a quantity of each.

If it is required to fill an order, it is usually for some particular size of slate, it may be for a size that the company does not have, and one which it cannot in the course of its working manufacture, to the required amount, for a long time to come. Under such circumstances the order could not probably be filled, unless there were several companies who were working with an understanding in such contingences; that is they can, in a measure, pool their orders or sales. What one company does not have another may, and by drawing from one another in this way, they may be able to accommodate all customers. Also the making of slate is a handicraft by itself; the laborers must be trained to the business. Like weavers at the loom, the maker must know how to do it. Thus it is important to have plenty of skilled laborers on the ground to be got when required. If the business was extensively carried on at L'Anse, this class of workmen would congregate there; they would be on the ground, or be available when wanted, and the business could be pushed at any time if desired. Also the slate would be in the market; it could have a reputation that all would know and recognize. It would be known by builders and architects everywhere that the slate could be got of the quality, size and form desired, so that there would be no hesitation in using it in their bills of specifications, etc.

Of course the slate is not limited to roofing purposes alone. There are many other uses to which it can be applied, and to which it is admirably adapted, such as billiard and other tables, sideboard and bureau tops, mantels, window stools and lintels, etc. The material can be gotten out in blocks and slabs of almost any dimensions; it is hard and firm and like iron when struck with the hammer. When exposed to the action of the elements it weathers without serious disintegration. It takes a fine polish, is very tough and elastic; thin plates of it will resist breaking with remarkable force.

Pilasters, mouldings, tracery, images, monuments, etc., have been carved from some of the softer varieties to illustrate the adaptability of the rock for these uses, and the result is such as to leave no question of its practical utility for all such purposes.

The slate formation is made up of beds of slate rock, which at some points are found to be beds of workable slate. The planes of stratification and the cleavage planes are usually at opposite angles, but sometimes they are in the same direction and may even very nearly conform.

The corporation now holding the quarries at Huron Bay is known as

THE MICHIGAN SLATE COMPANY.

The lands of this company comprise those formerly owned by the Huron Bay and by the Clinton Slate and Iron Companies. The quarries are at Arvon, about twelve miles from l'Anse and five miles from Huron Bay, at an elevation above the lake of 500 feet. The company owns and operates a narrow gauge railroad between the mines and the bay, where it has also a dock for shipping, etc.

The quarry has now been working for four years, and during 1885 has made, of all sizes, 5,000 squares of slate, which is estimated as being the 1-100 of the total product of all the quarries in the United States. Prices have been low, but the company has been able to sell its product at a margin, so the superintendent states. They hope for better prices in the future.

The number of splitters and dressers employed is	10
The number of quarrymen and other laborers	33
Diamond drill men	2
Total force	45

Capt. Hooper considers the company's facilities for handling the rock as excellent. The rock is loosened by powder blasts placed in what are called the "ribbons" in the formation and then is separated and worked out in huge blocks with wedges and picks, when it slides down into the bottom of the pit, from where it is elevated to the platform above and run to the dressing house or to the dump pile, according as it is slate or waste rock. There seems to be a great deal of waste, and immense heaps of waste rock have accumulated, derived mainly from the beds that it is found necessary to remove in order to quarry in those which are suitable for slate.

There are two trimmers, the men who finally trim the edges of the sheets and shape the slates; each trimmer requires two splitters—the men who split the blocks into sheets ready for the trimmer—and each splitter requires one dresser. The latter split the blocks across the joints into suitable size and shape to be rendered into sheets. The trimmers receive $2.25 per day. One trimmer will make 10 squares per day and clean up his own refuse.

The machinery comprises engine, which operates four drums for hoisting, etc. Some of the buildings are very good. The miners' boarding house is the best of the kind to be found anywhere in the mining region.

The officers are James M. Turner, President and Treasurer, Lansing; Thomas Hooper, Superintendent, L'Anse, Mich.

THE SILVER RIVER SLATE

is the name given to the property and explorations of Hon. A. C. Davis and others, on the Silver River, four or five miles east from L'Anse. These genItemen hold a continuous strip of land through the middle of Sections 6 and 7, T. 50, R. 32, being two miles in length and a half mile in width. The river cuts through the formation in a succession of rapids, cascades and narrow gorges,

affording a fine opportunity for studying the rock formation along its channel.

Mr. Daivs made some explorations at two points, three-fourths of a mile apart, one in each section, and near the river on the west bank. Both are opened in beds of veritable slate, though, probably, the strata are not the same, as the material differs very much in color and in texture. The upper pit is in a bed of hard black slate, which will split into sheets of great size and of almost any degree of thinness, perfectly uniform in surface, texture and color. The sheets have a clear, metallic ring when struck with the hammer, together with great toughness and elasticity.

The lower pit is in softer, blue-black slate, differing from that in the upper opening mainly in the degree of hardness. Some of this slate has been carved into various forms to show that it may be used for such purposes. The bedding planes dip at an angle of about 40° to the north, while the cleavage is south at about the same angle.

There has been just enough work done to demonstrate the excellence of the slate, and Mr. Davis is desirous of enlisting capital in the enterprise to carry on the business of slate making.

The river affords ample water-power that can be readily and cheaply directed to turning all the machinery that would ever be required for a large business, and the grade to l'Anse for a railroad, etc., is easy and inexpensive,

THE ST. PAUL SLATE CO.

has explored on Section 15, T. 50, R. 33, near L'Anse, on the line of the railroad and on the bank of Fall River, which empties into the extreme end of Keewenaw Bay.

This property has been thoroughly explored by Mr. R. R. Williams, an experienced and practical slate maker. The river runs through the section and the outcrop of the slate is found along its bottom and margins the entire distance. The banks of the river are generally low and the land is level, but near the north line of the company's property, near the northwest corner of the section there is an abrupt fall in the river of 50 ft., affording every facility for using it as water power. Below the falls the river runs in a deep gorge between its high, rocky wooded banks, making a wild, romantic scene of much interest and beauty.

One of Mr. Williams's best openings is just west of the M. H., & O. R. R. on the east and west quarter line of the section, half way between the center of the section and the east side. Thence west to the river, 80 rods, is a series of test pits, or openings, from which the slate rock has been quarried out in sufficient amount to show its quality, etc.

The trend of the formation is slightly northwest and southeast, and the dip, at the opening near the railroad, is slightly to the south, while the cleavage is also to the south at an angle of 45°.

The surface of the ledge, where uncovered, has been worn smooth by the ice and shows the scratches and grooves of the glacial action very clearly. The line of the marks is at right angles to the trend of the formation. There are also to be seen in the bedding planes and planes of stratification, lime spots, spread out thin, in appearance like insect fossil remains. They are shapeless, nearly like the hardened residue of a soft body, between smooth planes, subjected to great pressure.

No slate could be better than is here found, and I can readily agree with Mr. Williams, who has worked in the quarries in Wales and Vermont, when he declares it to be the best in the world.

It is the same blue black, beautiful color that much of the slate possesses that is found in this country. The surface is smooth, with just enough of plumbago in its composition to give it a pleasant and a beautiful appearance, especially when wet. The plumbago, contained, has a further advantage of rendering the slate more durable by resisting the absorption of moisture and thus escaping much of the destructive action of frost.

The pits to the west from the railroad are in wettish land; the slate, when exposed, shows the same glacial action previously mentioned and the slate in trenches and pits is of equally good quality.

Near the river a trench has been made exposing 70 feet across the formation. To illustrate its quality, blocks were taken out and split into sheets, showing perfect cleavage—beautiful black slate. At one point a trench, 40 feet long, was on a beautiful green slate, precisely similar to the black except in color. It splits into thin sheets of fine green slate.

The land is level. The slate has a very slight dip. The falls at the river afford a fine water-power for working the machinery. The main line of the railroad crosses the property; it is but a short distance to the harbor at L'Anse. The slate is of the best, has been thoroughly explored and shown to exist in inexhaustible quantity. There is nothing wanting but capital to make of this location a successful enterprise.

There are other points in the Upper Peninsula where slate is found, but none that I have seen is at all comparable in excellence to that of Baraga county; these certainly are of superior value, and the best grades are probably not excelled in quality by any, native or imported. Slate making in the region about L'Anse ought to become, as it doubtless must, a great and prosperous industry.

COAL MINES.

The coal mining business in Michigan does not make much of a showing. Some of the larger producing mines at Jackson have been worked out and abandoned within the last two years and there has been but little inducement to push the matter of opening new mines. The price of coal has been too low of late.

It is impossible for the Michigan coal mines, working a thin seam of coal, 2 feet to 3½ feet thick, and contending against a great influx of water, to compete with the Ohio coal mines, which are worked in veins that are 6 to 8 feet thick, and are also comparatively dry.

The Ohio coal is sold in Detroit at $1.80 per ton, a price which it is difficult for a Michigan mine to meet successfully.

The Michigan coal deposits seem to lie in shallow basins, sometimes so near the surface as to be directly beneath the drift, and thus to be so situated as to preclude the possibility of working, from the fact that there is no roof, no overlying rock, sufficient to support the soil, etc., above. Veins of coal situated in this manner have been opened in several places, and have been abandoned for this reason.

The most important of the coal mines at Jackson, the Slope mine, Eureka mine, and the Michigan mine, which I have previously described in the Commissioner's report for the year 1881, have been wholly idle during the past two years; it is supposed that the coal has all been taken out, especially is this the case at the Slope.

The Eureka was very wet and the company experienced much difficulty in working the mine. It is probable that the trouble with the water had much to do with the abandonment of the work.

The Michigan mine will be worked again when the company thinks it will pay.

There are now four companies engaged in coal mining at Jackson.

R. H. Emerson & Co.,—Jackson Coal Co.,—are the largest producers. The company is working a new shaft, near the city limits, that was opened three years ago and has been operated since the abandonment of the Slope mine. The company is working but a small force, having only mined in the past year 15,553 gross tons, enough to supply the limited demand which it has been enabled to create.

The chief trouble in working the Jackson mines arises from the water. If it could be drained to the shaft there would be no trouble in getting rid of it. If the shaft were in the lowest place this of course could be done, but it seldom or never so happens. The shaft is just as likely to be sunk in a high part of the coal vein as in a low one. The coal deposit lies in long waves, the inclinations are not abrupt but are sufficient to disturb the flow of the water. Besides this there are frequent faults, usually slight, but it may prevent the drainage in the direction of the shaft. If the water could be run into a swump near the shaft and there elevated with a plunger, the problem of drainage of the mines would be a simple one. As it is the water has to be carried forward towards the shaft by a succession of steam pumps.

The mines are so near the surface,—40 feet to 80 feet below,—that they catch all the surface drainage and are soon flooded if any accident happens to the pumps.

Each mine has one hoisting shaft and further ventilation is secured by air shafts. They are sometimes troubled with a lack of ventilation, and an accumulation of "black damp." No explosive gases arise.

THE PORTER COAL COMPANY

now operates the old Woodville mine, one of the oldest and one of the largest coal mines that has ever been opened in the vicinity of Jackson. It is situated four miles west of the city and was first worked in 1837, but for eight years immediately prior to 1882 the mine had been closed down.

The mine is described, as are all the other coal mines in the vicinity of Jackson and elsewhere in the State, in the Commissioner's report for 1881; at that time, and in the following year I went through all the mines and made a complete examination of each.

The mine is in good shape now. The workings extend about 40 rods each way from the shaft and the coal seam averages about three feet thick. Mr. Jesse Hurd, the manager, states that the mine could produce as much coal as ever it did if the product could be sold at a fair price.

The Jackson companies pay 20 cents per car for mining the coal and reckon three cars to the ton, making the mining cost 60 cents per ton. The cars are hauled to the shaft by mules. These are used in all the mines.

Product of the Porter Coal Company's mine at Woodville:

Year.	Tons.	Year.	Tons.
1882	6,138	1884	15,000
1883	4,000	1885	13,000
Total tons			48,138

THE STAR COAL COMPANY

is a new organization working a shaft near the Jackson city line. The officers; are, Ed. Elliott, President; 'N. Woodworth, Vice President; W. R. Kline, Secretary; John Cary, Treasurer.

The Company mined 5,125 tons in 1885.

THE STANDARD COAL MINE

at Jackson is a new undertaking that has not yet been fully equipped. It is on the line of the M. C. R. R., east of the city, and they are now laying a side track to the shaft. The shaft is 40 feet deep and the coal some 3 feet thick. Overlying the coal is a bed of indurated clay of a blue, slaty color, but not laminated or otherwise resembling slate. The bed is 8 feet thick. The material seems to be wholly free of grit.

As well as I could judge, without analysis or other practical test, it is a good article of fire-clay.

They are working 15 or 20 men at the mine and have mined 1,500 tons in the last year—1885.

The Superintendent is Robert Gage.

THE WILLIAMSTON MINE,

formerly operated by the Jackson Coal Co., has been abandoned. The last mining done was in 1883, during which year 883 tons were mined.

THE CORUNNA COAL CO.

continues to work its mine at Corunna, Shiawassee county, but complains very much of the condition of the business. It seems to cost the Corunna Co. more to mine its coal than it does at Jackson. The coal is harder and cannot be worked out with pick until it is blasted. The company has much difficulty in selling its coal. It supplies the freight engines on the Detroit & Milwaukee R. R., and there is a small local consumption. The mining is regulated according to the demand, that is, the company mines what it can sell and no more. Probably 150 tons per day could be taken from the shaft if there were sale for so much.

For a time previous to September, 1884, they supplied the coal for all the locomotives on the west division of the railroad, but they were underbid by Ohio coal men and lost the trade. Since then they have been gradually working up a small business with the railroad company (Detroit & Milwaukee), which is limited to supplying the freight engines.

The present bank was opened in 1882 and has been worked since. It lies west of the old mine and, it is claimed, has not proved as good. The coal seam runs from 2½ to 3½ feet in thickness. They have not worked much west of the shaft but mainly east, also north and south. Four mules are used in the mine for hauling the cars to the shaft. They do not work continuously, but off and on as they can sell the coal. The shaft is 67 feet deep and the workings extend about 40 rods east from the shaft and to a somewhat less distance to the north and south. They pay the miners 90 cents per ton for breaking the coal; the company trams it to the shaft; the men pay for their own supplies. The company has to make all its openings. The men get 90 cents per ton for breaking the ore after everything is in readiness for them.

About 8,000 tons were mined the past year. The mine has been more fully described in previous reports.

The coal burns rapidly, makes a quick heat, and thus, while it is not so lasting, It possesses advantages in the way of getting up steam that commends it to this use.

The only additional fact of any importance beyond what has been previously reported in the Corunna coal district, is a diamond drill boring that was made north of the mine just one year ago. This boring was begun Nov. 28, and completed January 1, 1885, and extended vertically down 907 feet. It is the only instance of a diamond drill boring in the lower peninsula that has come to my knowledge. I have seen the core and find it to be argillaceous and arenaceous rock, mostly a very fine grained sand rock of a bluish grey color and rather soft. Very little of it possesses any appreciable amount of grit. It is all fine grained sand rock and slate. The drill for the work was obtained from Lake Superior, and the man who operated it was one experienced in such work. The core was preserved and Mr. Kincaid was very careful to preserve an accurate account of the boring. The following is the record which I copied from the books of the company at the office:

Soil, sand, gravel, etc.	26.0
Quicksand	1.6
Light slate	2.0
Dark slate	3.0
Fine dry slate	7.0
Sand rock	8.0
Black slate	7.0
Sand rock	8.0
Black slate	8.0
Blue slate	1.00
Sand rock	3.6
Blue slate	4.6
Sand rock	9.0
Blue slate	19.0
Fine grey slate	20.0
Blue slate	31.0
Sand rock	7.0
Blue sand rock	17.0
White sand rock	5.0
Yellow sand rock	6.0
Blue sand rock	3.0
White sand rock	69.0
Varied sand rock	7.0
Sand rock	13.0
Black grey sand rock	34.0
White sand rock	34.0
Dark sand rock	1.0
White sand rock	8.0
Blue sand rock	51.0
Common sand rock	20.0
Blue sand rock, uniform in color and texture	80.0
Blue—very hard—sand rock	12.0
Common sand rock	6.0
Alternate layers of blue slate and sand rock	39.0
Slate and sand rock	18.0

Blue slate	32.0
Sandstone—coarse grained sand rock	5.6
Black slate	0.6
Slate	1.0
Sand rock	9.0
Slate	10.0
Sand rock and blue slate	8.0
Clear slate	27.0
Dark sand rock	91.0
Sand rock	43.0
Black slate	12.0
Slate	14.0
Grey slate	5.0
Slate and sand rock	20.0
Sand rock	4.0
Total	907 ft.

The boring was discontinued at the above named depth, as the drill had already penetrated farther than it was intended to go when the work was undertaken.

There is a theory that has long been held at Corunna that at a depth of several hundred feet below the surface there exists a 6-feet vein of coal. It is claimed that a boring made years ago discovered this fact, and it was to test the truth of the matter that this late boring was made.

It is a valuable exploration, and has probably upset the deep vein theory. The parties who furnish the capital for operating the Corunna coal mine are residents of Youngstown, Ohio.

Tod Kincaid, general manager.

A shaft for mining coal has been sunk at Sterling in Arenac county. A good vein of coal, it was claimed, had been found. I have made diligent inquiry with a view of ascertaining if anything of sufficient value had been found to make it worth my while to visit the locality. I am informed by a, gentleman long engaged in coal mining that he sunk a good many holes in the vicinity of Sterling, but found the coal vein too thin to work. I have , not examined the "find" personally, but from information derived from parties resident at Sterling and vicinity, I learn that the coal vein is from 20 inches to 40 inches in thickness, at a depth below the surface of about 50; feet.

The overlying formation is slate and indurated clay. They designate the; variety as cannel coal, but of how good quality I am not able to state.

A small force is employed in opening drifts from the shaft, and in this; work have mined about 200 tons of coal. On the whole, it is stated to me the indications are not very favorable.

The following table shows the product of the Michigan coal mines for the years indicated:

	Years previous to 1877.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Williamston mine	.....	.....	.....	.....	.....	.....	10,454	884	.....	.....
Jackson mine	.....	67,697	61,785	65,000	.....	.....	.....	.....	.....	.....
Corunna Coal Co.	.....	.....	22,537	16,215	12,252	7,000	8,624	9,000	8,000	10,000
Other mines	.....	1,500	1,000	800	.....	.....	.....	.....	.....	.....
Jackson Coal Co.	.....	.....	.....	.....	66,780	61,096	60,103	40,412	13,712	15,553
Eureka Coal Co.	.....	.....	.....	.....	30,000	37,477	25,000	.....	.....	.....
Michigan Coal Co.	.....	.....	.....	.....	20,021	23,987	25,000	.....	.....	.....
Porter Coal Co.	.....	.....	.....	.....	.....	.....	6,158	21,000	15,000	13,000
Star Coal Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	5,125
Standard Coal Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,500
	350,000	.....	.....	.....	.....	.....	.....	.....	.....	.....

CLAY, STONE, SOILS, ETC.

CLAY.

The clay that is found in Jackson county is likely to be of greater value than the coal. It already forms the basis of large manufacturing enterprises, and as the supply of clay, suitable for nearly all purposes, is practically inexhaustible, the manufacture of brick, pipe, tile, artificial stone, etc., etc., is soon to greatly increase at Jackson. The Jackson Fire Clay Co. does an immense business in the making of fire brick, common brick, drain tile, sewer pipe, etc., etc. The clay is brought from Spring Arbor, and from a point north of the city a few miles.

Another company engaged in this work is the

BENNETT SEWER PIPE CO.,

of Jackson, Mich. The clay proves very suitable for the purposes of pipe manufacture.

In all parts of the State abundance of clay occurs suitable for the manufacture of common brick, and is everywhere used for that purpose. In every neighborhood where the demand exists a brick kiln is found.

LIMESTONE.

Limestone which is suitable for burning and for mortar is not so frequently found in the lower peninsula as are outcrops of sandstone, and the lime made from it when it does occur is scarcely equal to Ohio lime. The latter is generally preferred for building purposes.

An abundance of limestone, both common and magnesian, exists in the upper peninsula, of every variety and texture, of the granular and crystalline forms.

Some of the deposits which are favorably situated for transportation may in time be utilized in manufacturing caustic and hydraulic limes for shipment into lower Michigan and elsewhere. The manufacture of lime and cement may become one of the industries of northern Michigan—certainly the stone suitable for these purposes is one of its resources.

BUILDING STONE.

Building stone is abundant in Michigan. Numerous quarries of sandstone are found in Jackson county, some of which have been extensively worked for many years and afford a fine quality of building stone. Outcrops of sandstone or of limestone suitable for building purposes occur in many other counties, notably Shiawassee, Iosco, Kent, Eaton, Hillsdale, Barry, Saginaw, etc. The rocks of the Lower Peninsula are limestone, gypsum, sand-rock and slates, all of sedimentary origin and horizontally bedded.

The only disturbance to which they seem to have been subjected since the time at which they were laid down, was the denuding action of the drift period. To these eroding forces must be attributed the destruction of the coal deposits which primarily existed in far greater magnitude than are now found. The Lower Peninsula of Michigan is a drift-covered region, and the underlying sedimentary rocks not unfrequently outcrop in the central and more elevated portions of the State; these outcrops furnish the quarries from which building stone, etc., are obtained. This formation is the youngest of the Michigan series, and is that to which also the coal belongs, and that it suffered immense destruction during the glacial period is apparent from many facts. Sufficient evidence, however, is obtained from the drift itself, from the debris of the great moving ice masses beneath which the soft, yielding rocks of this formation were ground. In this drift all over the peninsula, mingled with the debris of the rocks of the far north, are found the particles, fragments and fossils of the rocks of the coal formation of the Lower Peninsula. It being the youngest and uppermost of the group and thus unprotected by later depositions, it bore the brunt of the erosive action of the great ice period, and in the drift material beneath which the scarfed and eroded surface is hidden from view, is abundantly contained the evidences of the action of this great denuding agency—a force which from the soft and yielding nature of the rock it was little able to withstand.

In the rocks of the Lower Peninsula are found all the elements requisite for building materials—stone, lime and sand. When the rocks are too deeply buried beneath the underlying drift to be available, the drift itself furnishes fragments and boulders in sufficient abundance to afford all the necessary material for foundations of buildings. Few structures in Michigan are without stone foundations from want of suitable material, close at hand, to furnish them.

In the Upper Peninsula building stone exists in endless quantity, varied and accessible and of surpassing excellence. The brownstone of Marquette and elsewhere in the peninsula may challenge comparison with any in the world for beauty, durability and general excellence.

The quarry at Marquette is continuously worked on a moderate scale and the stone finds great favor with the architects of Chicago, Detroit and Cleveland etc.

These brownstone deposits, of which there is but a limited area at Marquette, are placed in the potsdam period and are horizontally bedded, are very homogeneous and free from seams, which when present, tend greatly to diminish its value for the stone-cutter's use.

When first quarried the stone works freely but becomes harder on long exposure; it weathers well, not seeming to be injuriously affected by the action of the elements.

QUARTZ

appears annually among the shipments from the Marquette region; it is employed in lining the bessemer steel converters and for other like purposes. The shipments of this article first began from Lake Superior in about 1872, and the out-put has yearly increased since. It is said to answer the purpose for which it is used admirably.

The parties mining and shipping it are the Iron Cliff Co., the Deer Lake Iron Co., Hiram Burt and the Williams quarries near Marquette.

The products for the year 1885 were as follows:

	Tons.
Iron Cliff Co	4,316
Williams Quarry, Geo. P. Cummings	861
Deer Lake Iron Co	3,873
Total	9,050

SOILS.

Michigan has a great variety of soil; sand and clay, timber soil and1 prairie, pine land and swamp are found everywhere, intermingled in all counties in the State. In general it is of disintegrated and decomposed rock, with a variable portion of organic matter, derived from decayed and animal substance.

The chief constituent is silica, as a large portion of our soil is sandy, or approximately so. No doubt silica comprises 75% to 90% of the pine and oak opening soils. In addition are contained the silicates of alumina, iron, lime, magnesia, potash, and other substances in lesser degree.

The rocks which underlie the superstructure of the Lower Peninsula are deeply covered with the alluvial and drift, largely derived by decomposition and disintegration, from the rocks which out-crop so extensively in the Northern Peninsula.

The materials which make up our soil, the sand, the gravel, the mud and dust, the pebbles and great boulders, are mainly the fragments which once built up the rocky hills in our northern borders that for ages were subjected to the ever active and irresistible forces of nature that slowly diminished their volume and dissemminated the detatched particles and masses, which, borne forward by the rivers and winds, the waves, and the ice, have finally built up the rich and varied region which we possess.

Every particle of earth once constituted a portion, however small, of a preexisting rock, perchance many times removed and re-formed in past time and destined, it may be, to enter again into rock masses in some future period.

The largest rocks ultimately lose their coherence under the action of natural agencies,—the mechanical and chemical forces of nature. In the mountainous districts the rocks are crumbled by the snows and frosts, to be crushed into smaller fragments and rounded or ground into dust by the forces of the moving ice, and thence borne forward by the torrents and mountain streams, the rivers, the waves and the winds to be spread over the valleys and plains, and thus to become soil that is to be further modified and enriched, as time progresses, by the growth and decay of animal and vegetable life.

But these mechanical forces are not the only disintegrating influences to which the rock masses are subject and to which we are indebted for the composition of our soil. The chemical forces of nature, though less apparent to the ordinary sense, are none the less productive of important results. Carbonic acid and oxygen, though invisible, are insidious and never ceasing in their action. The oxygen combines with the protoxide of iron that is found in our soil, changing it into per oxyde, a material much more conducive to the support of plant life. This protoxide exists frequently in the soil of swamps or the subsoil of lands, and is recognized by the brownish color which it gives to such soil. When, through the action of oxygen, it is changed into per oxyde, it gives a reddish hue to the soil. We readily see how quickly iron and many other metals oxydize and disintegrate on exposure to the atmosphere, and it is but natural to infer that the rocks and other substances must succumb to the like influence.

All rocks are composed of one or more of certain minerals, such as quartz, mica, feldspar, hornblende, calcite, etc. These minerals are variously composed of silica, lime, alumina, potash, soda, iron, magnesia, etc., and by the chemical decomposition of these minerals the valuable constituents which compose them are supplied to the soil in form available for plant food. Silica is a feeble acid that often holds in its uncertain grasp important alkalies to form silicates, as the silicates of potash, soda, magnesia, etc., which under favorable chemical conditions, that will occur in the laboratory of nature, are disintegrated and given to the support of vegetable life.

All the silicates which are soluble are decomposed by acids, and, indeed, the moisture which may hold a small percentage of carbonic acid or nitric acid slowly acts to decompose many of the silicates and give the alkali to the soil. This decomposition of a silicate by water and acids proceeds with rapidity proportioned to the quantity of acids which it contains. Carbonic acid and water are important agents in the decomposion of rocks. Especially is this true of the feldspathic rocks, those which are composed largely of the feldspar minerals—minerals which are compounds of silica, alumina, lime and soda.

Dr. Kedzie, of the Agricultural College, has accomplished a very important task in analyzing soils obtained from various parts of the State. He has taken soils brought from thirty-one different localities and subjected them to a complete and exhaustive analysis.

In connection with the simple analysis its popular characteristics are given, the kinds of timber which grow upon it, and the amount of cultivation to which it has been subjected, and the kind of crops which it has produced. Almost every variety of soil which the State affords is here dissected and the results brought together for comparison. To make these analyses was a work of great labor, which no one but a person actuated with zeal for the public good, that Dr. Kedzie always manifests, would have carried out. The results are highly interesting, and when properly interpreted, in the light of experience, are of much practical value.

Dr. Kedzie explains that the "chemical analysis of the soil is of value in determining whether a soil is capable of fertility." There are certain ash elements which are indispensable to plant growth, in the absence of which growth is impossible. If the supply in a soil is moderate the growth of vegetation will be correspondingly meagre. If, on the contrary, these "ash elements" are fully represented in available form, such a soil will be fertile. Here a chemical analysis of a soil is of value in determining the fertility of which it is capable, and of what elements it may be lacking to render it so.

Some of these analyses are of soils from the best portions, agriculturally, of southern Michigan, on which maximum crops have been raised for years; others are from the new counties in the north; but with few exceptions all alike show the soils to possess an excess of essential elements requisite for the production of any of our crops. Even the poorest are moderately rich in essential chemical elements.

Another important matter which Dr. Kedzie very intelligently discusses in connection with the fertility of soil is its capacity for the retention of moisture; and the result of his investigations, which are very thorough and complete, indicate that the soils in the newer counties in the north possess as great a capacity for the absorption and retention of moisture as those in the southern counties, whose fertility and excellence has been proved through years of prosperous cultivation.

The wells which have been dug, the borings which have been made, the many inland lakes, clear and sparkling, which exist, the great forests of hardwood timber which cover the surface, demonstrate that the water in the soil is sufficiently near and in sufficient quantity for the wants of vegetation.

The analyses of soils made by Dr. Kedzie verify what all the other facts also indicate, that the soil of the whole State is of the same origin, it contains, from wherever obtained, the same ingredients, differing in the

proportions only for every variety. The analysis does not seem to indicate, any more than other facts would, whether the soil was taken from the southern counties or from the northern. All the facts go to show that there are equally good soils in all parts of the State, as there are also equally poor. The light sands to be found in places in the north are duplicated in the older counties. And the rich clay loams which have proved to be so productive in the southern counties are alike found in the north, with every indication of possessing an equal fertility. No better soil need be sought for than exists, in abundance, in the Upper Peninsula,—strong, rich loams, such as make the farmer's heart rejoice with gladness and fill his barns with increase and plenty.

Michigan has a great diversity of soil, and for the latitude, an agreeable climate. It is adapted to the production of a great variety of crops. No State possesses greater diversity in either of these particulars, the changes in soil are not confined to particular localities. Clay soils of all degrees of tenacity, timber soils of all kinds, light soils that are poor, sands with good sub-soil, or that have been mechanically triturated to a great degree of fineness, so that they are of the best; rich bottom lands, or swamp lands, etc., are found in all parts of the State alike, in every county, township, and in nearly every section. Almost every farmer has a great diversity of soil on his farm, adapted to a variety of crops; he has exactly the conditions for pursuing the best kind of farming,—a mixed husbandry.

Every part of the State—every variety of soil produces the best of wheat and all other farm crops. The Michigan prairies, unlike those of Illinois, yield their annual crops of wheat now as regularly and continuously as they did when the virgin sod was turned; but the rich, heavy loams of the middle and northern counties are proving to be the ones best adapted to this cereal. The desires of all for any kind of soil can be satisfied in any part of the State—from the quick, warm soil to the heavy loam.

The entire State, from the waters of Lake Huron to those of Michigan; from the once disputed border on the south to the Straits of Mackinac; from these charming waters to the borders of the great lake, is a region for successful agriculture, where all the products most esteemed in the markets of the world may be raised in abundance. All the State is now accessible, since railroads traverse both peninsulas in all directions. One may seek a home in the southern counties, where is every convenience of the most advanced civilization, or in the northern borders, where is equally good soil, cheap lands, abundance of timber and a rapidly developing region.

The Upper Peninsula may almost be designated as the parent of the lower, for it is of the debris of the rocks of that northern region that its soil is largely composed. Everywhere through the drift of the Lower Peninsula, in the soil and over the surface, are found the fragments from the ledges and rocky hills of the north—pebbles, boulders, and masses of granite, sandstone, schist, diorite, jasper, trap, conglomerate, etc. etc., every variety and kind which abound in the far north, has its innumerable representatives in the drift of lower Michigan. And the comminuted and disintegrated particles of these primitive rocks, together with the ruins of the later rocks of lower Michigan, form the basis of that soil which makes such varied and ample return for all the labor of the husbandmen.

MARL.

In every part of the State, in many swamps are found beds of marl underlying the muck. These are of so common occurrence that deposits of marl are accessible in almost every neighborhood, and in an early day, in the older counties, the material was burned in kilns for the manufacture of "quick lime," and sometimes a very good article of lime was thus afforded. I have also known it used as a fertilizer, to be drawn out in the winter and mixed with the muck and spread upon the land, with excellent effect to succeeding crops. This marl is well known to farmers and ditch diggers; it is easily distinguished by its yellowish white color, and also it commonly contains many minute shells.

Dr. R. C. Kedzie of the Agricultural College has recently published a paper on this material, making many practically useful suggestions respecting its use, and also giving analyses of four samples obtained from different counties in the State. These analyses I regard of so much value that I here insert them:

	1.	2.	3.	4.
Carbonate of lime	79.60	66.16	90.60	80.00
Carbonate of magnesia	4.54	6.00	2.00	2.50
Oxide of iron	1.43	1.05		
Clay and sand (insoluble in acids)	13.00	26.79	5.50	16.00
Organic matter and loss	1.43		2.50	
Phosphate of lime				1.50
Total	100	100	100	100

No. 1 sample was from Berrien county, 2 from St. Joseph, 3 from Lenawee, and 4 from Otsego.

As Dr. Kedzie observes, the value of marl depends upon the amount of lime and. magnesia which it contains, and which occur mainly in the form of carbonates, a material that is easily tested by the application of a little acid, causing it, if present, to foam or effervesce in a greater or less degree, according to the amount contained.

Marl is valuable as a fertilizer; the important place which lime holds in a productive soil is well known. It holds a two-fold position; it is essential in the growth of the plant itself, and also greatly aids in the preparation of the humus contained in soil for plant food.

Dr. Kedzie, who is good authority in agricultural chemistry, states that when mixed with the soil, marl decomposes the sulphate of iron which may be present, and affords the alkaline condition essential to the nitrification and preparation of plant food.

I have seen it applied with good results to sandy lands and on low "sour" meadow lands.

Dr. Kedzie recommends 30 to 100 bushels to the acre to be spread on the surface; a good time is in the winter, when the frost may act upon it and aid in pulverizing it. He esteems the marl as preferable to burnt limestone, as it acts more slowly and with equal certainty.

To quote Dr. Kedzie's words: "For arable soils and light lands 30 bushels will do. On lands having a large excess of vegetable matter, such as muck beds, 100 bushels are desirable. There is little danger of injuring the soil by a heavy dose of marl, whereas an extensive dose of caustic lime may produce lasting injury. The marl is 'mild' and entirely wanting in the burning qualities of caustic lime."

GYPSUM.

I have visited the plaster quarries and mills at Grand Rapids since the close of the year, but I find nothing new to record in the manner of working, etc. I have described the quarries, all the details of the mining and manufacture, etc., in previous reports, and I discover nothing of especial interest to add beyond the bare statistics of production.

It will be observed that the production of land plaster has fallen off slightly in the past two years, due to competition in Iowa.

The Michigan plaster trade is now all done through an agency at Grand Rapids. The products are all pooled and each company is allowed an alloted share of the annual trade, both of land plaster and of stucco. The present prices are for land plaster, $2.50 per ton; for stucco, $2.40 per bbl. of 300 lbs.

TABLE Showing the Amount of Land Plaster and of Calcined Plaster, produced in Michigan, for each year since 1866, and previous years.

Years.	Land Plaster, Tons.	Stucco—Barrels, 300 lbs. each.
For years previous to 1866	*100,000	80,000
1866	14,604	.....
1867	17,439	.....
1868	28,837	34,996
1869	20,996	41,187
1870	31,437	46,179
1871	41,128	48,685
1872	43,536	50,707
1873	44,972	82,453
1874	39,126	82,449
1875	37,019	61,120
1876	39,131	64,386
1877	*40,000	*55,000
1878	*40,000	48,346
1879	43,658	50,800
1880	49,570	106,004
1881	33,178	112,813
1882	37,821	135,655
1883	31,225	201,133
1884	27,888	156,677
1885	28,181	141,575
Totals	790,744	1,533,195

*Partly estimated.

TABLE Showing the product of Land Plaster and Stucco produced by the different Companies in Michigan, in the Years indicated.

Name of Company.	Number of Tons of Land Plaster produced by Michigan Companies.							Number Barrels Stucco produced by Michigan Companies for Years given.						
	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
Godfrey & Bro.	9,117	9,000	6,632	6,080	5,682	4,593	4,467	.....	23,000	27,500	30,274	37,000	30,433	30,942
Grand Rapids Plaster Co.	8,970	12,000	6,375	7,512	5,013	3,044	4,143	.....	25,000	20,400	32,854	40,000	24,300	26,498
Wyoming Mills Co.	7,000	10,000	6,000	6,801	4,400	3,052	4,059	.....	.....	.....	.....	12,000	13,108	11,193
Union Mills Co.	4,500	7,000	6,716	8,298	5,500	3,185	3,663	.....	33,000	34,913	23,074	30,000	23,176	15,454
D. Noble & Co.	10,985	9,570	6,572	6,667	4,000	3,332	3,900	.....	24,504	30,000	27,895	38,000	30,288	26,344
Smith, Bullard & Co.	1,500	1,500	1,000	2,993	4,600	4,122	4,366	.....	.....	.....	11,817	30,961	23,961	20,707
Alabastine Co.	.....	.....	.....	.....	4,032	6,600	3,606	.....	.....	.....	.....	10,172	11,321	10,147
Geo. H. White & Co.	1,900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	43,972	49,570	33,178	37,821	31,225	27,888	28,181	.....	106,004	112,813	135,655	201,133	156,677	141,575

SALT.

In 1885 Michigan produced more than one-third of all the salt consumed in the United States, and within a fraction of one-half of all the salt that was made in the same territory.

The advantages which the manufacturers of salt in this State possess are due not solely to the plentitude and richness of the brine, but to the fact that the brine is procured in the vicinity of the great lumber mills in the Saginaw Valley, and at the lumber producing centers in the west margin of the State, thus securing cheap fuel—the slabs, pine saw-dust and waste steam. The same parties who own the mills own also the salt wells and carry on the manufacture of lumber and of salt simultaneously. The fuel costs them nothing; it would be otherwise, were it not put to this use, absolute waste. It is for this reason that salt in Michigan is made so cheaply and the producers are able to successfully meet foreign competition.

Heretofore it has been assumed that the salt basin was practically limited to the Saginaw region, but borings made on the west side of the State in the vicinity of Muskegon, Ludington, Manistee, etc., show that the salt basin,, instead of being confined to the eastern part of the State, is equally productive on the west side of the State. There are six new steam salt blocks at Manistee, three at Ludington, one at Algonac, one at Frankfort, four at Marine City, etc., to go into operation the coming season. The estimated capacity of these new blocks is 700,000 barrels.

The total amount of salt consumed in the United States in 1885 was 9,850,000 bbls., derived as follows—to wit.:

	Barrels.
Imported from foreign countries	3,100,000
Manufactured in Michigan	3,300,000
New York	1,749,000
West Virginia	200,000
Ohio	530,000
California	176,000
Pennsylvania	170,000
Utah	96,000
Virginia	85,000
Louisiana	330,000
Kentucky	16,000
Illinois	50,000
Massachusetts	1,900
Total barrels	9,850,000

The total receipts from sales of salt in 1885 were $3,001,721.81.

The manufacture of this commodity began in Michigan in 1860. In 1869 the present law requiring all salt to be inspected went into effect. The following table shows the salt produced each year:

Years.	Barrels.	Fine, Barrels.	Packers, Barrels.	Solar, Barrels.	Second Quality.	Total, Barrels.	Average Price.
1860	4,000						
1861	125,000						
1862	243,000						
1863	466,356						
1864	529,073						
1865	427,200						
1866	407,077						
1867	474,731						
1868	555,000						
1869		513,989	12,918	15,294	19,117	561,288	$1 58
1870		568,326	17,809	15,507	19,650	621,292	1 32
1871		695,923	14,677	27,645	19,930	758,175	1 05
1872		672,934	11,110	21,661	19,876	724,481	1 46
1873		746,702	23,671	32,267	20,706	823,346	1 37
1874		980,757	20,080	20,391	16,741	1,038,979	1 19
1875		1,027,886	10,235	24,336	19,410	1,081,865	1 10
1876		1,402,410	14,233	24,418	21,668	1,462,729	1 05
1877		1,590,841	20,380	22,949	26,818	1,660,997	85
1878		1,770,361	19,367	33,541	32,615	1,855,884	85
1879		1,967,350	15,641	18,020	27,029	2,058,040	1 02
1880		2,589,057	16,891	22,237	48,023	2,676,508	75
1881		2,673,910	13,885	9,093	53,821	2,750,244	85
1882		2,928,502	17,208	31,235	60,222	3,037,317	75
1883		2,828,987	15,424	16,735	33,528	2,894,672	81
1884		3,087,033	19,388	16,957	38,428	3,161,806	73
1885						3,300,000	90
Totals		26,014,098	292,794	371,746	477,180	30,425,818	

The average depth of the salt wells is about 880 feet and the average strength of the brine is 91¼ degrees, while the Onondaga brine is given as 69½ degrees.

THE COPPER MINES.

ONTONAGON COUNTY MINES.

Public interest in the mineral deposits of this county is at present concentrated in watching the developments which are rapidly making in the newly opened iron district. The Agogebic range, where the fortunes, real and prospective, that the investors have made, or hope to make in the near future, is the theme of much comment. The mines of this iron range are elsewhere described in this volume and need not at this point be further alluded to. This iron range occurs in the south part of the county, where the iron bearing rocks and the copper series come in contact. The latter, starting from the extremity of Keweenaw point at the north, trend southerly along the western border of the peninsula to the southerly line of the State into Wisconsin, comprising in this State a total distance of about 160 miles. Throughout its entire length this range is the most interesting feature of the landscape; rising as it does so prominently above the adjoining country. Near the extreme northeastern limit Mt. Bohemian and Mt. Houghton tower to heights respectively of 864 and 884 feet, and their beautiful, symmetrical forms are plainly discernable at a great distance. Away to the south in Ontonagon county, the Porcupine mountains, in this range, looming far above the horizon, are the first objects to attract the attention of the beholder and the last which his lingering gaze relinquishes.

The general trend of the iron, ranges is east and west, and here in Ontonagon county is the only locality where the juxtaposition of the copper and iron ranges is apparent.

There has not been much copper mining done in Ontonagon county for many years, nor in any portion of the range south from the vicinity of Portage Lake. There are many old mines, however, most of which were worked to a very limited extent in the earlier years of the mining industry in this region; but mining has greatly changed since that day, and the limited openings which were made at most of these locations would scarcely be deemed as sufficient explorations now. Many of these early companies expended considerable capital, but this was due more generally than otherwise, to the incompetence or ignorance of the management and to the comparative necessarily excessive cost of all work in a region so isolated at that early day.

The period of mining activity in Ontonagon county was prior to the extension of railroads to within hundreds of miles of the district, prior to and contemporary with the building of the Sault canal. It was during a time when all materials, supplies and laborers had to be transported by the long circuitous water route, in sailing vessels, in the brief months of summer. The primitive methods of mining which were then pursued would even now, with all our increased facilities for transportation and the consequent cheapening of the cost of materials and of labor, lead only to failure if adopted at the best of our mines.

The career of the Ontonagon county mines was begun and ended before the advent of the compressor and air drill, the improved Ball stamp, the Collum washers and the high explosives. No stamp mill was ever, until recently, operated in Ontonagon county that was capable of reducing as much rock in a year as some of the mills on Portage Lake will reduce in a single week. It cost them then $3.00 per ton to break their rock that is now manipulated for 50 cents and less. In all the early Ontonagon mines mass copper only was sought, and when these masses were not of sufficiently frequent occurrence to meet the cost of the operations, the stockholders were called upon to make up the deficit until the work would be finally abandoned.

No stamp rock was ever worked in this county except at the Nonesuch, and even here it is not apparent that a profit could not be made if the mine and operations were properly managed; in point of fact when worked on a lease a few years ago in a limited way it paid nicely.

There are good stamp lodes in the county which could be worked at a profit. Certainly if operated on an equivalent scale with those that are worked at Portage Lake there would seemingly be as reasonable an assurance of success.

Those belts which I have examined somewhat and of which I speak with the most confidence, are the amygdaloid deposit and conglomerate vein at the National and Minesota mines and the Knowlton vein at the Mass. These will be further described in connection with my remarks under those heads. At these mines paying stamp lodes exist and can be seen and examined. It is apparent that copper is held in paying quantity, and they also afford mass copper which has heretofore constituted the main product. Open these mines extensively and the combined mass copper and stamp work would make a showing of some magnitude.

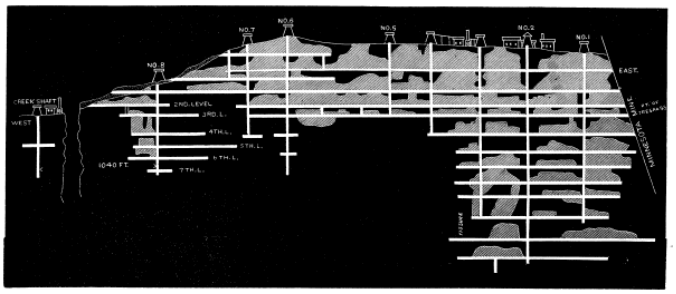
The Belt Co. has a stamp mill of the approved pattern, but it has done no-work, only to test the rock, and there are no others in condition to be used except the small one at the Mass and the still less effective one at the Ridge mine.

The Ontonagon copper district also needs a railroad; it is inaccessible. To reach Rockland requires one to ride 36 or 40 miles over a rough road from any railroad. The Ontonagon & Brule R. R. was built from Ontonagon village to Rockland and there it has stopped. If completed or if the M., H. & O. Co. extends its line to this point, the district will no doubt be greatly benefited. The country has an excellent soil for farming, and those who engage in this industry prosper as well as farmers do elsewhere.

There are many reported discoveries of rich silver lodes and also of heavily mineralized copper deposits made frequently by ignorant parties who bring in and exhibit the specimens, but fail to refind the localities from which they were obtained. It is a mineral region of great possibilities and it is altogether probable that in the future, discoveries of mineral deposits may be made that will prove of much value. The old mines are usually in irregular, undefined belts of amygdaloidal trap or belts of trap in which there are seams and crevices filled with amygdaloid and vein matter, calcite and epidote being the predominating minerals. The miners in their work have sought to follow this vein matter, and with greater or less frequency masses of copper would be found. Sometimes the vein matter leads into large "pockets," when a good deal of copper would be extracted. These veins also contain more or less stamp rock, that is rock which holds native copper so line that the rock must be crushed into sand and the copper saved by a system of washing, which carries away the valueless matter and retains the copper by reason of its greater specific gravity. At the present time the stamp mills have reached a high degree of perfection both as to their capacity and economy of working, but in the days when active mining was in progress in the Ontonagon district, the methods of stamping and working were comparatively crude. The old Minesota stamps were of wood, shod with iron, and others were little better. They were without exception placed by little rivulets that afforded but a meagre supply of water. Of course the stamp copper was of small account, the mining was almost exclusively for mass copper on barrel work, the latter being the small bits or pieces of copper obtained and which were put into barrels and so shipped to the smelting works. The mines that gave to the Ontonagon district its celebrity are the Minesota and

THE NATIONAL.

LONGITUDINAL SECTION OF THE NATIONAL MINE, JAN., 1886.
Scale, 300 ft. to one inch.



These mines are contiguous, the former upon the east and the latter on the west, and the property extends upwards of a mile in the line of the mine to the Ontonagon River. The river cuts through the Mineral range and from the mine the land descends rapidly to it. The collar of No. 2 shaft is 570 feet above the river.

Creek shaft is 253 feet above the river or 317 feet below the collar of No. 2 and is 1,040 feet west of No. 8 shaft, which latter is 2,230 feet west of No. 2, and 124 feet below it; reference to the accompanying map will show the relative positions of these shafts, etc.

The formation is very straight and regular and the copper-bearing lodes are continuous and can be traced to the foot of the bluff to the west. The formation here is spoken of as being east and west; the dip is northerly 54° with the horizon.

The National was opened at first west of No. 3 shaft; all the territory to the east of it was claimed by both the Minesota and National companies, but was finally secured by the latter, and immediately thereafter the mining force was all transferred to the new ground adjoining the Minesota line.

It will be seen from the map that west of No. 3 shaft no stoping has been done below the third level, although the ground above was fairly rich in copper. The belts embraced within the limits of the workings of these mines are first, sandstone 40 feet wide; overlying this is a bed of conglomerate 30 or 40 feet wide, and upon this is a belt of trap 140 feet in width; but below the conglomerate land this trap is a belt of vein matter—generally assumed to be a contact vein—having a variable width of from, perhaps, 6' to 15' wide. Overlying the trap is a belt of amygdaloid varying also from 6' to upwards in width, sometimes also making out into large pockets; this was called the north vein and was never much worked, as it is a stamp lode, though affording some mass copper and barrel work. So far as opened by the old company in former years it afforded some rich ground, about 3 feet wide along the foot wall, and thence to the hanging it was lean. Some of this foot wall part of the lode was very rich; 300 tons of it were stamped

which yielded 3% of copper; a larger portion, which included the body of the lode, yielded a little under 2%; these facts I got from Capt. Chynoweth, who was an officer of the National at the mine for 25 years.

Running through the trap from the conglomerate to the north vein are frequent fissures and in these and in their vicinity in the main vein the bulk of the copper was found. Especially was this true of a diagonal fissure that extends through the trap to the amygdaloid west of No. 2 shaft. This was found to be very rich in copper in all the levels; as it dips at a less angle than the formation it tends to intersect the conglomerate vein and in this line of intersection, it is probable, much copper may be found; the work now is towards reaching this result. This fissure was first found by a crosscut, at right angles to the formation, and was thought to be an independent vein, but upon following it in both directions if intersected the main lodes; other fissures, of less importance, also yielded copper in considerable quantity. The conglomerate does not hold any copper; masses of copper were sometimes found in the conglomerate where an opening or fissure in the conglomerate had become filled with vein matter. One of these openings extended through the conglomerate to the sandstone and was very productive in copper, in fact was almost completely filled with pure metal. It was in a fissure in the conglomerate that a 500-ton mass of pure copper was found in 1857, probably the largest native mass of copper ever discovered. (The Phœnix mine produced a 600-ton mass a few years later but it wanted the completeness of the Minesota mass. The details of these discoveries I have heretofore given in the report for 1880.)

The great success of the National and Minesota mines was due to the constant occurrence of masses of copper and of barrel work; each of the companies had, finally, a small stamp mill erected on a rivulet that runs through the valley south of the mines, but this only afforded sufficient water for a portion of the year, and the copper thus obtained was but a small percentage of the aggregate products.

The mines yielded very richly in proportion to the openings made. This work of opening and stoping was excessively costly as compared to the same work now. It was all hand drill work and black powder for explosive. I was in a drift but a few days ago in the Osceola mine when four men were driving with an air drill—two men at each shaft—and they had advanced 98 feet the previous month, the drift 7½'x5½'. They had just blasted and the blast had opened ahead 5 feet, half the size of the drift. The next blast would take the remaining half. Such work was unheard of in the days when the National worked, and so it happened that when the masses of copper failed to occur in sufficient quantity to pay the usual profit the officers of the company, who were cautious, conservative men, shut down and allowed the mine to fill with water. But as will be noticed from the section the drifts afforded drainage to a considerable depth and this portion they allowed to be worked on tribute. From the company's share of the copper thus obtained from the old workings in the upper levels and the gleanings of the burros, the sum of $40,000 in dividends was afterwards paid to the stockholders.

The old company stopped work in 1871 and the mine was sold to Boston parties some years afterward and was not again worked, on company account, until in May, 1880, when the new company began the work of preparation to pump out the water. This proved a much more serious task than was anticipated. A 12" plunger pump was used and No. 2 shaft selected as the scene of operations. The shaft was found to be filled with timbers and rock, the debris of the tributers, who for ten years had been using this receptacle as a dumping ground for their refuse.

After nearly two years the work was completed and the mine was freed of water; the shaft was lined up in excellent shape and the skip road reached the bottom, a depth of 950 feet.

In the meantime a shaft was sunk in the amygdaloid vein to a depth of 340 feet, drifting was done to the east 100 feet, and to the west 250 feet. In all 14 tons of mass and barrel were obtained from this vein; of the stamp rock taken out no use could be made. Two cross-cuts connect the workings in the two veins, one from the second and the other from the fourth level. A shaft-house was also built over this new shaft, but all work has been discontinued in this vein, as it is mainly stamp lode.

Since the completion of No. 2 shaft two additional levels have been sunk 100 feet apart, making the total depth about 1,150 feet on the plane of the vein.

These levels constitute the 11th and 12th; the first has been drifted about 800 feet and the latter about 400 feet. In the stopes shown in the section in these levels considerable copper is to be seen and the winze west of the shaft is in very rich ground. Several large masses of copper were already broken down into the bottom of the level and an apparently still greater one was discovered in the foot wall, in the 12th level, west of the shaft. I should say that I saw in the mine at least 50 tons of mass copper ready or nearly ready to be cut up and hoisted. Capt. Parnell estimates the winter's product at from 100 to 150 tons, and he expects to have that amount at Ontonagon in the spring ready for shipment, and I am certain that he is safe in his estimate, as 30 tons are already there, and, with what I saw in the copper house and in the mine, the lower estimate is at least sure. He has a force of 14 men at work.

The most annoying trouble experienced now arises from the periodic flooding of the mine by the water which pours in from the Minesota. This occurs each spring when the snow melts away. All the ground along the vein in the Minesota and Rockland mines for a distance of three-fourths of a mile, has been dug out by the tributers until it has left a wide depression into which the water from the melting snow is conducted, filling the mine to the top and pouring through an opening between

the mines into the National, floods it also beyond the capacity of the pump to control.

The point where this aperture is found is indicated in the map, just above the third level, and is claimed to have been made by the Minesota Co. many years ago, through the men inadvertantly encroaching upon the National ground.

The distress arising through this difficulty has led to a suit in trespass instituted against the Minesota Co. by its neighbor, that has been recently decided in the supreme court of this State in favor of the defendant, on the ground, as I understand, that upwards or 20 years having elapsed since the alleged trespass was committed, no action could be maintained.

Cap't. Parnell is anxious to get the copper out of the mine before the annual flood arrives, which must, as heretofore, cause the suspension of work for a month or two, until the snow is all gone and the mine is again pumped out. It is a pretty large reservoir to empty—a mile in length. After the water in the Minesota is lowered below the point of connection there is, of course, no more trouble from it. Ordinarily the National, like most of the copper mines, "makes" very little water. The 12" plunger will remove all the water that naturally collects in the mine, by running six hours a week. In former times a 6" plunger sufficed to keep out all the water, and that by only running a portion of the time.

It seems very probable that the National mine contains a good stamp lode in the amygdaloid belt and also a fair portion of stamp rock in the conglomerate vein, and both of these extend through the whole length of the company's property, which runs to the river. The river is 570 feet below the surface at the east part of the mine, and it would seem that the best method of operating the mine now is to open with an adit driven from the river east on the amygdaloid or in the old vein. The advantages of this work would be many; it would prove the lodes for the entire distance. It would furnish many years of stoping ground above the adit. It would afford drainage for the entire mine, for all the water it could gather; it would do away with the necessity of hoisting, as the rock could all be run out of the mine through the adit in cars drawn by a small locomotive, as is now done at the Copper Falls mine; and above all, it would furnish the company with all the requisites for a stamp mill, without which the mine cannot be successfully worked. The stamp mill must be at the river; there is no other place possible, that I can see, and if the rock is hoisted to the surface in shafts and then run down to the river over an incline gravity road, it would be far more difficult and expensive to operate than the adit, and would also be more expensive mining. Banning the rock down to the adit would be easier than hoisting it to the surface, to say nothing of the saving of the expense of a hoisting plant and the building of a long gravity surface incline; and keeping it in repair and free of snow in the winter is a serious matter.

The adit would be about a mile in length, but it would be all the way in the vein and thus be easy driving, and would be opening and paving the mine and thus would not be "dead work." The adit would furnish an outlet for all the rock that the mine could produce; sufficient evidence of this, fact is afforded at the Copper Falls mine.

Even the matter of pumping the water for the mill can be avoided, I think, by bringing it in a launder from the falls in the west branch of the river above, a less undertaking than is done at the Atlantic mill.

The driving of this adit would not be a serious matter to accomplish. The old vein is easy ground to work; it is moderately soft and breaks from the force of the blast admirably. If desired, the opening could be pushed at several points as well as from the west end, by sinking the creek shaft and No. 8 shaft, etc., to the adit level and advancing the drift from them. In the light of recent mining operations in this country, successfully accomplished, the driving of this adit can be undertaken with perfect assurance of the result. There is no question but what it can be done, and at a moderate cost.

Heretofore it has been assumed that stamp mills for these Ontonagon mines should be at the lake; but I do not see the necessity of this, in fact there occur many objections.

The cost of conveying the rock so great a distance—12 miles or more—cannot be lightly assumed; and the beach in the vicinity of Ontonagon is extremely shallow. The sand extends for a long way out from the shore and is covered, but at a slight depth, with water. In the winter the ice piles up along the shore for a great distance out, resting on the shallow bottom; so that to obtain the necessary water for a mill a lengthy launder would be required reaching out into the deep water, or the water must be taken from the river at its mouth.

It might be objected to placing a mill for the National too near the river at the mine, that the refuse sand would be run into the river and tend to fill up the harbor and thus interfere with navigation. But it is doubtful if the sand from a stamp mill, even if run into the river, would be found to make any appreciable difference. For miles along the river are high clay banks, the material of which is washed into the river in immense quantity at every freshet, and is carried down by the current and lost in the great lake. It is probable the same would be the result with the refuse of a stamp mill.

The National company owns also the Rockland mine, which adjoins the Minesota on the east.

At present the plans of the National company seem to be to continue mining with a small force in the vicinity of No. 2 shaft, thus incurring but a small expense and, possibly, obtaining a sufficient amount of copper to meet all expenditures and accumulate a surplus and establish a reputation for the mine before deciding to proceed to open it largely. The No. 2 shaft is sunk to the 12th level;

this latter and the 11th are the ones added since the new company took hold of the work, five years ago.

The 10th level has been opened east and west about 600 feet in length and some stoping done on each side of the shaft. In the 12th level they are now working west of the shaft, stoping out some masses of copper and cutting them up and sinking a winze below the stope in ground which is rich in copper. West of this stope is the fissure in which they have also worked up to the 10th level. As before stated, the ground where the men are working has a very promising look. I went through the mine, so far as the openings will admit of passage, and saw fair indications of copper in the new drifts, much of it, apparently, good stamp rock, which is not disturbed. The sinking being only for mass copper and barrel work. There are no facilities for obtaining copper in other forms.

The National, although an old mine, is not a deep one. It is of small extent, underground, as compared to many others in the peninsula, and yet so far as worked, it was a very profitable one. The original owners, the company that opened it and worked it, only expended in the aggregate a total sum of $110,250. All subsequent expenditures were met by the product of the mine. They received in dividends the sum of $319,255,—$3 for one. The total sales of copper produced amounted to the sum, of $2,295,231.50.

Work was begun in 1848 and continued until 1871, after which the mine remained idle, except for tribute work, until May, 1880. Since that time a small force has been constantly employed, as previously explained, in opening and completing No. 2 shaft, getting the mine freed from water, doing the mining work before described, and repairing some of the houses, etc. In this work the sum of $150,000 has been expended. The work has been done under the superintendency of Wm. E. Parnell, a man of much intelligence and energy, and of life-long experience as a miner.

The location of the mine is in the village of Rockland, on Sec. 16, T. 50 N., R. 39 W.

Aggregate product down to 1883, 5,448 tons, 1,876 lbs.

Since the foregoing was written it transpires that the owners of the National have purchased the controlling interest of the Minesota, so that all controversy between the companies is thus permanently settled.

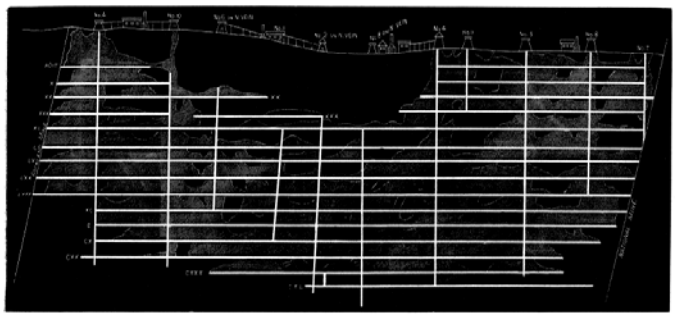
THE MINESOTA

mine lies next to the National, joining it on the east, and much of what has; been said in connection with the latter is also applicable to the Minesota. It is a much larger mine than the National and was also a richer and more productive one and was worked during the same period. Notwithstanding the long period that has elapsed during which the mine has lain idle it is still fourth in the list of the dividend-paying copper mines of the State, that is the amount of dividends returned to the stockholders is only exceeded by those of the Calumet and Hecla, Quincy and the Cliff. The estate is a large one, consisting of 4,653 acres of land. The depth of the mine is 1,200 feet, and its length 2,820 feet, lying between the Rockland mine on the east and the National on the west. Its elevation above the river is somewhat greater than that of its neighbor and does not possess the advantage which the National has of being opened by an adit, since the National lies between it and the river. The property is crossed by the same belts heretofore described and the formation is the same as in the National. Seventy per cent, of the product of the Minesota mine was mass copper, the remainder, small pieces — "barrel work," with a very few per cent, of stamp copper.

It was a wonderful deposit. Sometimes the only work was to cut up the masses of pure metal and hoist them to the surface. In places the stopes were nearly all copper.

The map of the mine, herein contained, shows only the workings on the-south vein—the conglomerate vein—as in the National; but lying north of this, between it and the Amygdaloid, was a fissure vein running also east and west, but finally terminating in a cross-fissure to the west and intersecting the conglomerate vein to the east. In this longitudinal fissure the mine was first opened and worked before the fact of the existence of the other lodes-had been ascertained. The National Company began on the conglomerate vein, and when they found that they were not working in the same vein as the Minesota people, they cross-cutted to find it, and came into a diagonal vein, as previously described. This middle vein in the Minesota mine lies north of the blank space shown on the section of the mine between No. 4 and No. 10 shafts. It dipped at a less angle than the conglomerate vein, and finally intersected it in the line indicated as the margin of the blank space on the map. Along this line of intersection of the conglomerate and the middle vein was the most productive ground found in the mine.

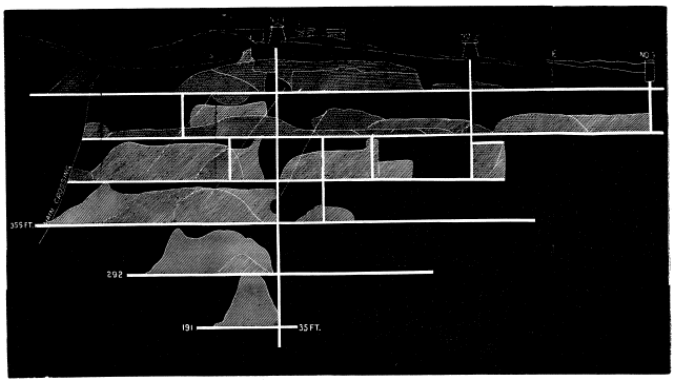
LONGITUDINAL SECTION OF THE MINESOTA MINE.



As has been previously stated, there is a controversy pending between the Minesota and National Companies regarding the water that flows from the former mine into the latter. The upper levels in the Minesota have been all dug out by tributers, making a depression all along the surface over the mine, which gathers a good deal of water in the spring, that fills the mine and runs through the opening into the National, flooding it for a time. But I should judge that the tendency of the water in the two mines would be to find its level anyway. The rock is so

porous and the workings are so near together that the water must seep through. Of course, in time of a flood, it will rush through an aperture in far greater volume and in less time. There has been no change at the mine for years, and there are no changes contemplated, so far as I could learn.

LONGITUDINAL SECTION OF THE MASS MINE, JAN., 1886
Scale, 120 ft. to one inch.



The mine has produced in the aggregate 17,353 tons, 668 pounds of copper. The dividend paying point was reached in 1852, five years after mining was begun. The stockholders had advanced $60,000, and the balance of the expenditures ($320,000) was furnished by sales of copper produced, besides $30,000 for a dividend and a sufficient surplus.

The total of dividends paid to stockholders of the Minesota Company is $1,920,000.

A few tons of copper are annually produced in the mine by tributers. The amount obtained in this way in 1885 was 6 tons 608 pounds.

Office, New York. Geo. D. Pond, President; T. D. James, Superintendent, Rockland, Mich.

Since the foregoing was written, it transpires that the ownership of the Minesota mine has passed to the National Company. D. L. Demmon, Secretary and Treasurer, and Capt. Parnell, Local Agent. The two mines can be worked together to advantage by opening through both with a deep adit from the west end of the bluff. The National Company now holds the three-contiguous mines—National, Minesota and Rockland.

THE MASS MINE.

I regard the work done at this mine as a valuable experience. When Capt, Chynoweth began in 1874 it was merely a wild location. The little work that had been previously done was of small account in the subsequent operations. The company raised by assessment the total sum of $26,000; all the rest of the money that has been expended in opening and working the mine and supplying all the machinery and other necessary equipments has been derived from the sales of the copper, which the mine has produced; each year the expenditures have held within the income thus obtained. The mine has produced fully 450 lbs. of copper to the fathom of ground.

The mine is a small one, opened in the Knowlton vein which passes through the northwest corner of the property. The vein being where it cuts the north line only 17½ chains east of the northwest corner, and from the same point south to the intersection of the vein with the west line is 25 chains, and the average dip is exactly 45° towards the northwest corner. It will thus be seen that the company owns a triangle shaped portion of the vein in this corner that is easily estimated. South and west of the Mass property lines, the vein passes to the Knowlton. There are six contiguous quarter sections belonging to the Knowlton Co., which if owned by the Mass and the vein properly opened and worked, there is every reasonable prospect would afford a profitable mine. There would be upwards of a mile of surface length of the Knowlton vein and an indefinite extent of it in the direction of the dip.

The Flint Steel River runs through the Knowlton property, curving northwesterly, and at a mile or two below the mine a stamp mill could be advantageously located. The Mass stamp mill is below the bluff, west of the mine, on a small tributary of the Flint Steel. The main water course would gather the drainage of the entire valley and the hillsides which border it, and would furnish a sufficient amount of water to work up 300 tons of rock per day.

The mine could be opened by an adit from the south end of the bluff oil the line of the vein, giving 500 feet of stoping ground above this adit level. A railroad track and a small locomotive would afford the facilities for running the rock to the stamp mill.

The mine could be worked very cheaply in this way. The productiveness of the vein in copper has been sufficiently shown in the Mass, in the Knowlton and in the Ogima mines, to establish confidence in that regard. There is a reasonable assurance that a mine thus largely opened and operated would be a paying one. Along the foot wall of the lode there is a frequent occurrence of small masses of copper that afford a cheap product which, when combined with enough stamp work, will furnish a profitable aggregate. I have so fully described all the characteristics of the lode in the previous reports that it would be mere repetition to dwell upon them here. The mass and barrel work amount to about one-half of the annual product, and the work of the mine has been confined to the capacity of the stamps. The mine is small, with a very limited supply of water, but the percentage of refined copper obtained from the rock treated is about 1¼%. In looking over the record of the mine for the past ten years, I observe a remarkable uniformity in the monthly production; when any great discrepancy is found it is accounted for by the fact that the stamps were idle or through some equivalent fact. It is shown to be a fact in this mine that the same amount of openings of stoping each year affords about the same amount of copper.

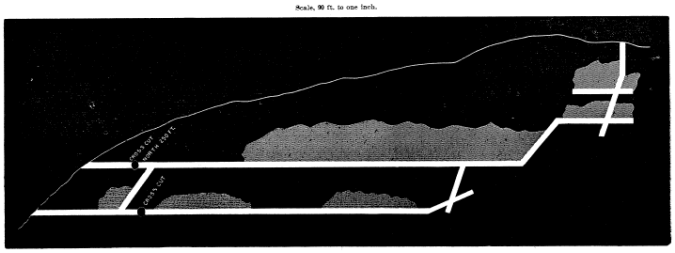
The mine is a small one and could soon be exhausted within the limits of the Mass property lines, and the chief officers and owners are too old or too indifferent to

undertake the purchase of adjacent property. The owners of the Mass are the once famous Pittsburgh Company that were the first to begin copper mining on Lake Superior, at the old Cliff mine and later at the National. The company was distinguished for its good fortune and its conservatism, its good fortune in owning two of the most profitable mines, and its great caution manifested in shutting down as soon as the mines ceased to pay dividends.

Most of the prominent men in this company have passed away—Messrs. Avery, Howe & Cooper. The only one of the original officers equally prominent with those mentioned is Dr. C. G. Hussey, president of the company, but past 80 years of age. I am told the company would like to sell the Mass and that it can be purchased at a very moderate price; if the Knowlton can be had on equally favorable terms, the two would form the basis of a good mining enterprise for any parties who wish to undertake it.

The mine is as productive now as it has been at any time in its history, but the great fall in the price of copper rendered it doubtful if the mine could be worked without loss, so that the company, with its usual caution as ever shown in such matters, decided to shut down. It was worked on .company account until September, 1884, when it was taken on lease by Messrs. Benj. Chynoweth, L. Collins, and L. Stannard. The company .receives one-tenth of the product. The leasors have a store and furnish the men with all their supplies, and the profit on the goods sold helps them out on the mine. Though they estimate the cost of the copper at nine cents per pound, Mr. Chynoweth thinks he can produce it at that price.

LONGITUDINAL SECTION OF THE CALEDONIA MINE, JAN., 1886.
Scale, 90 ft. to one inch.



The mine has produced as follows—refined copper:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1857	8	228	1874	5	1,925
1858	6		1875	1	1,014
1859	26	682	1876	40	1,952
1864	4	1,452	1877	54	238
1865	6	936	1878	206	339
1866	5	112	1879	228	294
1867	5	40	1880	256	1,159
1868	9	920	1881	233	1,084
1869	1	1,213	1882	368	1,446
1870	1	1,408	1883	329	1,474
1871	9	632	1884	291	718
1872		1,403	1885	181	1,500
1873	4	265			
Total				2,279	1,607

The mine is down to the sixth level; they are sinking to the seventh. The work is mainly south of the shaft and they work up to near the west line of the property. The length of the shaft is 580 feet; depth; vertically, is 390 feet. The dip is 45° northwest. No pumps are used. What little water gathers in the mine is conducted into a "fork" near the shaft, and two or three times a week it is dipped into the skip and thus taken to the surface.

B. F. Chynoweth, Agent, Greenland, Mich.

THE OGIMA MINE

joins the Mass on the north. The company owns a fractional ¼ section that is crossed by the Knowlton vein, which was opened to a limited extent on this property many years ago. It never could be profitably worked by itself, but should be joined with the Mass and Knowlton.

A small amount of copper has been taken from this mine annually for 30 years, aggregating 491 tons, 156 lbs.

The product for 1885 was 6 tons, 291 lbs., ingot copper.

L. Collins, Agt., Greenland, Mich.

THE KNOWLTON MINE

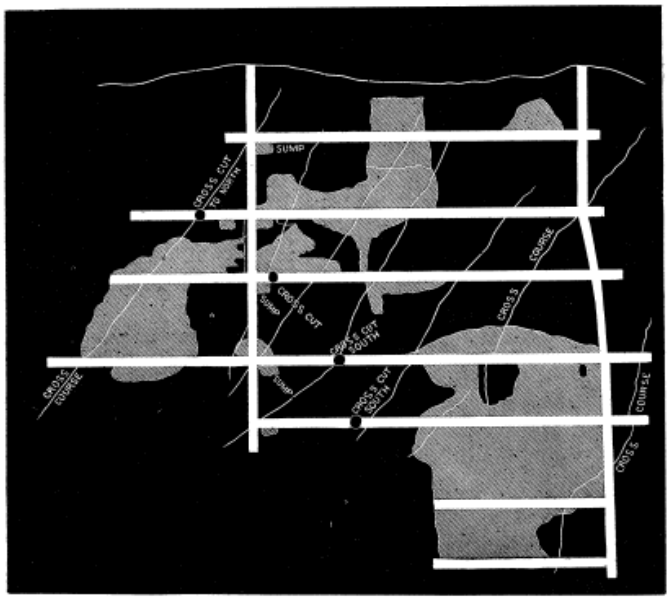
lies southwest of the Mass, in the same vein, and has not been worked on company account for many years. The mine is near the south end of the bluff, fronting the Flint Steel valley. A few tributers annually mine a few tons of copper, always made up of small masses. In this way were obtained 10 tons, 1,976 lbs. in 1885. The total product since 1862 is 285 tons, 317 lbs.

The estate consists of 550 acres in all.

F. W. Capin, Sec. and Treas., New York, N. Y.

There are on the property a number of comfortable miners' houses, and some idle machinery.

LONGITUDINAL SECTION OF THE RIDGE MINE, IN THE BUTLER LODE, 1886.
Scale, 120 ft. to one inch.



THE FLINT STEEL CO.

is an organization which owns the old Caladonia and Flint Steel mine properties, where some unavailing work was done in years gone by. All the facts that could be gathered that are of interest have been heretofore set forth, and I find nothing to add to my previous description.

Walter Furguson, Sec. and Treas., 35 Pine street, New York.

Altogether the mine has produced 604 tons of refined copper.

THE EVERGREEN BLUFF

reveals nothing new. The company was organized in 1853 and expended considerable money with poor results. The mine is in what is called the Evergreen lode, which shows much irregularity and very little copper. Altogether the mine has afforded 679 tons and 864 lbs. of refined copper.

F. W. Capin, Sec. and Treas., 44 Exchange Place, New York.

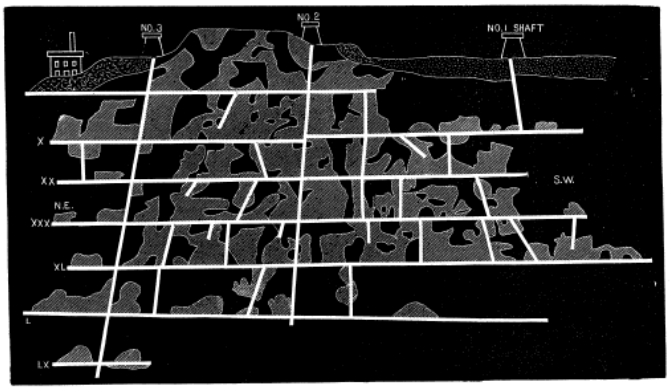
The estate comprises nearly 1,000 acres of land.

Adjacent to the Evergreen Bluff is the

RIDGE MINE,

which is one of the oldest and most reputable mines in the Evergreen range, but which now is in the retired list. Two mines have been worked in this property, one in the Champion and the other in the Evergreen vein; both in the S. W. ¼ of Sec. 35, T. 51 N., R. 38 W., and 435 feet apart. The former was abandoned many years ago, and the latter has not been worked since 1883.

LONGITUDINAL SECTION OF THE RIDGE MINE, 1886.
Scale, 180 ft. to one inch.



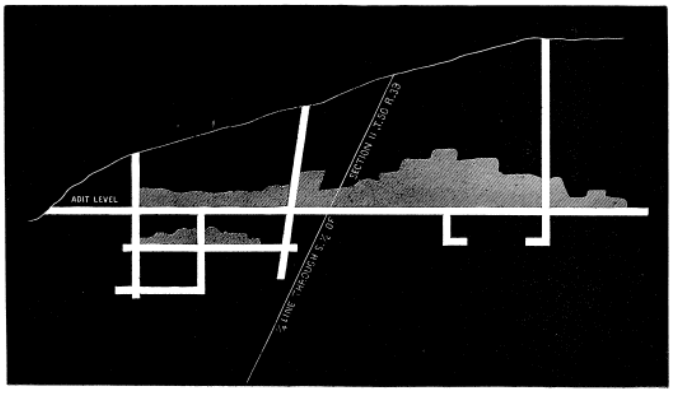
The Ridge has a good record. It has produced pretty well, considering the primitive manner of working—all hand-drilling—and the little stamp mill has a very small capacity; but the Ridge has been somewhat of a favorite with the public, and very hopeful things have been expected of it in times past. The Company is not likely to start up working at the mine again until copper advances considerably beyond its present figures.

The following table shows the product for each year previous to 1885:

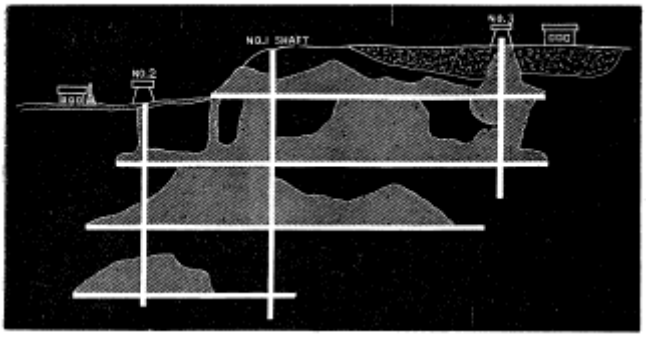
Ridge Mine.

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1855	30		1871	175	150
1856	35	631	1872	128	1,910
1857	36	1,574	1873	115	1,140
1858	29	790	1874	187	113
1859	39	660	1875	164	447
1860			1876	145	18
1861			1877	148	815
1862			1878	125	1,837
1863			1879	107	1,669
1864	8	917	1880	111	1,358
1865	85	483	1881	117	1,606
1866	71	411	1882	51	966
1867	94	1,537	1883	30	155
1868	86		1884	37	130
1869	126	1,860	1885	31	1,990
1870	122	1,700			
Total				448	1,992

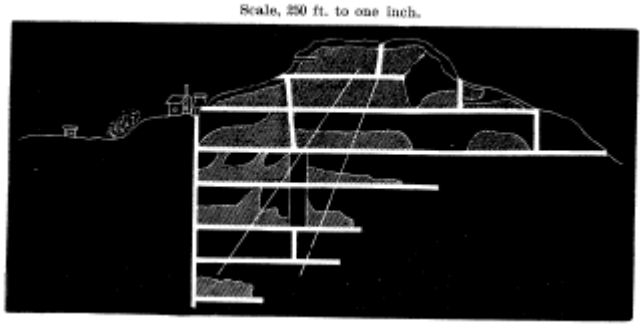
LONGITUDINAL SECTION OF THE FLINT STEEL MINE, JAN., 1886.
Scale, 216 ft. to one inch.



LONGITUDINAL SECTION OF THE KNOWLTON MINE, 1886.
Scale, 180 ft. to one inch.



LONGITUDINAL SECTION OF THE EVERGREEN BLUFF MINE, 1886.
Scale, 250 ft. to one inch.



The copper obtained for the past three years is the result of tribute work.

W. Hart Smith, Sec. and Treas., 4 Exchange Place, N. Y.

The same gentleman is secretary and treasurer of several other mines in this vicinity—detailed descriptions of which have been heretofore given, and will be found in the Commissioner's Reports for the years 1880-81-82.

These are the ADVENTURE, HILTON, the LAKE SUPERIOR, none of which have been worked on company account for more than 20 years. Each affords annually a small amount of tribute copper.

The work that I described as doing at

THE AZTEC

three years ago, has been discontinued.

All told, the mine has afforded 353 tons, 863 pounds of refined copper.

August Page, Sec. and Treas., Boston, Mass.

THE BELT COPPER MINES, LIMITED.

This company also has placed its mine on the retired list. The chapter recently added to the former history of this old mining location is one of misfortune and failure. It is proper to add that the result of this undertaking is in accordance with the expectations of nine out of every ten of the intelligent mining men in the copper districts.

The first company organized to mine in this property was as early as in 1848, and from that time on for many years, a good deal of work was done and very much money expended. The first organization was under a special charter from the Legislature. The company worked on assessments until its capital stock was exhausted, but only receiving from the sales of copper obtained down to 1862, all told, the sum of $13,320.17. In 1862 a reorganization was made, assessments called, and work resumed on a so-called large scale. This continued during four years, until 1866, when through the want of funds and their inability to find any copper or to squeeze the stockholders any further, they again shut down. Four years subsequently, in 1870, funds having been procured, under the stimulus of good times and high prices, work was again resumed and prosecuted, but with the same want of success.

The name has been changed several times but never the fortune of the mine. That has never varied, it has been failure from the start.

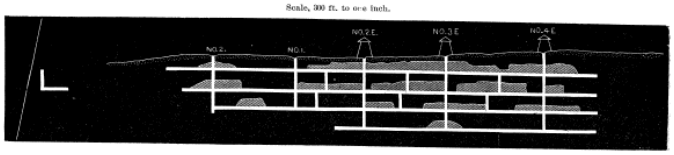
Three years ago the property was purchased by its present owners and christened the Belt. The new company issued its prospectus from London, document that created no little astonishment in the mining region here. The statements were so at variance with the well-known facts regarding this property that it could scarcely be credited that sane, intelligent men, acting in good faith, could make them.

Knowing that the mine had been operated for 20 years; that hundreds of thousands of dollars had been expended in the vain effort to secure a paying mine, and that the total product was but 216¼ tons of refined copper in all that time, how can men coolly state,—"The situation is the best on the mineral range; with proper machinery, etc., nothing can prevent making a larger output than the Calumet and Hecla, and receiving equal dividends!" It seemed then, as now, almost incredible that mining engineers, said to be competent men, recommended by the royal society of mining engineers, and in the employ of reputable companies, should state, as did Messrs. Rathbone & Coxan in a cablegram to England from Ontonagon, after having examined the property as they were sent here to do, "That the quantity of mineral in the rock is practically inexhaustible;" "that 2% of copper in the rock is a very low estimate;" "$200,000 will put the mine in shape to furnish an output of 200,000 tons of rock per annum, yielding 2% of copper."

In the same dispatch these gentlemen state "that having examined the leading mines in the district, they are convinced that the Belt is one of the most valuable properties on Lake Superior."

There was nothing in the history of the mine during its former years of working; there was nothing to be seen in the mine or on the property to justify these gentlemen in making any such report. The water had been pumped out of the mine so that they could examine it, and I went through it myself, afterwards, and without any exception I found it the most barren, unpromising mine I ever saw. No mine in the whole range could show so little copper; in fact there was not a particle to be found. It was barren trap with very little vein matter, calcite and epidote here and there sparsely disseminated; what the other veins might prove to be was unknown. They had not been tried, had not been discovered, and yet they state that, "after a careful examination of your ore, and comparing it with the produce of neighboring mines, I am of the opinion that 2% of copper is a very moderate estimate of its richness."

LONGITUDINAL SECTION OF THE TOLTEC MINE, 1886.
Scale, 300 ft. to one inch.



No one would question but what the Belt is a good property to explore, and all would concede the possibility of the discovery of rich bearing lodes, but we can only know of their existence when they are found. The probability of their existence is food for conjecture and a stimulus to discovery, and while the Belt property is undoubtedly crossed by all the mineral lodes of the Evergreen range, the discovery of these lodes had not been made on this property up to the time of its purchase by the present company; so that the

surpassing richness so freely attested to by the various gentlemen whose evidence was taken regarding the value of the property, was wholly imaginary, based upon things unseen. The same could be said with equal truth of the whole mineral range. There is no part of it of the same extent, where an equal amount of work has been done, where less success has been met with than here. All this by no means condemns the property, but it should make persons cautious not to risk extravagant statements for which there is only an imaginary basis.

At the time of my recent visit to the mine it was closed down and all work had ceased. Capt. John Trevarrow was resident at the mine and employed to look after the property. Hon. James Nercar of Ontonagon is the company's resident agent. I gathered from Mr. Brand, the former agent, many of the details of the work. The mine closed down in October, 1885; the new stamp mill was completed and started in February, 1884, and was; run until the following August. They tried stamping the old burro rock; but it produced no copper. The same proved to be practically true of the so-called stamp rock obtained from the old mine. Mr. Brand states that the last month he run through 700 tons of selected rock taken from the Knowlton vein which gave 1½% refined copper. Subsequently, under the superintendency of Mr. Rathbone, an English engineer sent over by the company to investigate matters, 1,500 tons of rock taken from the Knowlton vein, without any attempt at making any special selection, was tested, which gave about .9% of copper.

The accompanying sketch represents the old mine as it now is. They seem entirely satisfied that the old mine is valueless.

The work in the Knowlton vein is mainly opening. The southerly shaft—the Knowlton—is 300 feet down to the third level. Woolsely shaft is 720 feet north of this, and is down below the first level 160 feet deep. These: shafts are connected in the first level, which reaches nearly 200 feet further north beyond Woolsely shaft. Great Western shaft is 540 feet north of Woolsely, and is down 120 feet deep, to a little below the first level, which latter has been driven south 80 feet from the shaft.

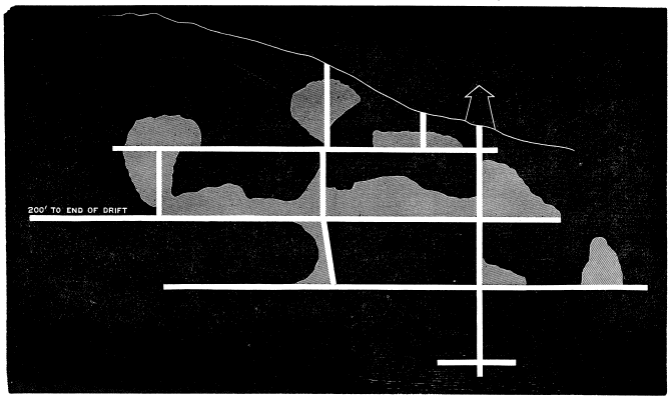
The second level extends 480 feet north of Knowlton shaft and 160 feet, south of it. A winze north connects it with the first level. The third level was driven 100 feet north of Knowlton shaft. A few small blocks of ground have been stoped, the main shaft being a block north side of Knowlton shaft, up from second level.

The Belt mine has produced in

Belt Mine.

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1882	2	1,624	1884	99	351
1883	8	462	1885	13	1,488
Total				115	1,811
To which add the product of previous years				216	475
				330	286

LONGITUDINAL SECTION OF THE BELT MINE, IN THE BUTLER LODE, JAN., 1886.
Scale, 90 ft. to one inch.



The new stamp mill cost $100,000, has one Ball stamp in place and a second one ready to put up, 40 Collum washers, iron frames, three Evans Slime tables. The mill is on the Fire Steel River, 1¼ miles from the mine, with which it is connected by railroad. The company has a locomotive and rock cars for drawing the work.

They have also built a rock house at the mine, furnished with two Blakes crushers 10"x15"; have also built an office, and an agent's house nearly complete; have procured a second-hand hoisting engine, also new Rand duplex compressor and 16 air drills. They have everything ready to work; seem only to lack copper, or at least lack it in quantity sufficient to pay to work the mine at present market price of that metal.

At the time of my visit, the company's books had been sent to England. The following was shown me, however, and given as embracing the essential facts, financially:

THE BELT COPPER MINES, LIMITED.

Balance Sheet, 30th Sept., 1885.

Dr.		
To CAPITAL:		
Nominal Capital—		
50,000 shares at £5 each	$1,215,000 00	
of which there have been issued—		
36,984 shares, fully paid, to the vendors	855,711 20	
17,820 ordinary shares, on which £5 per share has been called	433,026 00	
1,834 Preference Shares of £5 each (with preference rights of £10 per share in dividends per annum, cumulative), on which £5 per share has been credited as paid, issued on the surrender of the like number of ordinary shares to the allottees of 917 debentures, in terms of special resolutions passed 31st December, 1884	44,566 20	
	$1,333,303 40	
Less calls unpaid	4,671 22	
		$1,328,632 18
To DEBENTURES:		
917 debentures of £25 each	$111,415 50	
Less instalments unpaid	23,262 39	
		88,153 11
To VENDORS OF MINE:		
1,016 fully paid shares as yet unissued		24,688 80
Debenture interest accrued to date		3,132 00
Sundry creditors		5,966 60
Amount received on forfeited shares		607 50
		$1,251,043 78

Cr.

By purchase of the "Penn," "Bohemian" and "Great Western" mines, with buildings, machinery, and plant, etc., under agreement of 14th July, 1882, viz.:—in cash	$137,500 00	
in fully paid shares	689,400 00	
		$801,000 00
By Expenditure, etc., at the Mines:		
As per statement to 30th September, 1884	$827,031 12	
Expenditure since, viz.:		
Plant and machinery, including freight, etc.	$14,371 10	
Wages in erection of machinery and development of mines	33,870 59	
Stores	10,702 29	
Fuel	3,531 80	
Salaries, traveling and general expenses	6,331 97	
Insurance	1,704 78	
Stamp mill wages and smelting charges	4,671 20	
Local director's fees	121 50	
	75,304 34	
	$902,395 46	
Less, sales of copper, year to date	$22,197 67	
Stock of copper, 30th September, 1885	1,568 26	
	$24,305 85	
Deduct stock, 30th September, 1884	18,054 00	
	6,251 84	
		396,143 62
By cost of administration in England, including preliminary expenses:		
Amount expended to 30th Sept., 1884, as per last statement	$30,211 80	
Expenditure since, viz.:		
Engineer's remuneration	$1,530 00	
Office salaries	1,562 74	
Directors' fees	2,065 50	
Trustees for debenture holders	1,822 50	
Traveling expenses	745 10	
Office rent, stationery and incidentals	1,119 98	
Law and accountant's charges	1,408 32	
Bankers' interest, balance of account	270 80	
	$10,565 86	
Less transfer fees	4 86	
	10,561 00	
		$40,772 80
By debenture interest		6,250 23
cost of remittances to the mines		1,504 97
office furniture at cost		949 40
sundry debtors		385 83
stock of copper		1,568 17
By cash		
At bankers	$1,180 12	
In hand	13 42	
At Houghton Bank	362 40	
At the mines	115 13	
		1,758 75
		$1,251,043 75

We have examined the above account, and find it to agree with the books and vouchers in London and with the accounts received from the mines.

London, December 1, 1885. Price, Waterhouse & Co.

The belt embraces what were formerly known as the Bohemian, Great Western and the Penn mines.

Bohemian, one of the early villages in Ontonagon county, which after so many years of abandonment was revived, is again deserted and the post-office discontinued. It is not known what action the company will take.

Joining the belt is the

TOLTEC,

one of the important mines of an early day. A half million dollars, it is claimed, were expended here, resulting in a total production of copper of 206 tons, 1,433 lbs.

Joseph Vila, Sec. and Treas., Boston, Mass.

THE VICTORIA MINE,

which I examined and wrote up very fully in 1882-3, because it seemed likely to possess importance from the fact that Capt. Thomas Hooper was at work pumping it out with the view to testing the value of the mine. After freeing the mine of water, Capt. Hooper did not find it to be as promising as he had been led to anticipate. This, with the depreciation in the price of copper, led to his abandoning the mine. The estate comprises 2,000 acres of land and is property worth exploring, since, if a productive lode were found, the location has important advantages for economical working, as was explained two years ago.

The aggregate product of the mine down to the present time is 186 tons, 1,279 lbs., refined copper.

A. W. Coffin, Sec., Boston, Mass.

THE NORWICH

was once an important mine and is still one of the best known locations in Ontonagon county, though no mining work has been done there since its abandonment, in about 1865. The mining at the Norwich was mostly done, however, prior to 1856.

The total of the products is 496 tons, 1,360 lbs.

Sec. 12, T. 49, R. 41; the mine being only a half mile from the Ontonagon River.

THE NONESUCH MINE

affords an example of great extravagance and folly. Four hundred thousand dollars, it is said, were expended by the new company in the construction of buildings, machinery, etc. All this was described in the report of 1882, since which time no work has been done, except a small amount of tributing. The aggregate product is 180 tons, 1,072 lbs.

H. L. Horton, Sec. and Treas., Chicago, Ill.

"It takes a mine to make a mine" reads the Spanish proverb, and the history of Lake Superior copper mining proves the truth of it. But unfortunately, as in the case of the Nonesuch, the Belt and some others of a similar unfortunate recent history, the mine expended did not create its substitute.

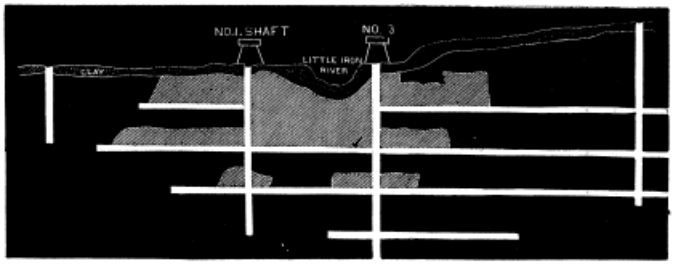
The money has gone in, but there is none flowing out. Stamp mills and rock houses, etc., no matter how elaborate and expensive, are valuable only as adjuncts in creating wealth. If they are permanently idle they are practically of no more worth than the dead trees that cumber the ground.

The fine stamp mill at Lac La Belle, costing $184,000, and other surface expenditure aggregating $1,000,000, represent only so much absolute waste of capital, unless some mineral discovery shall be made that shall make all this preparation available.

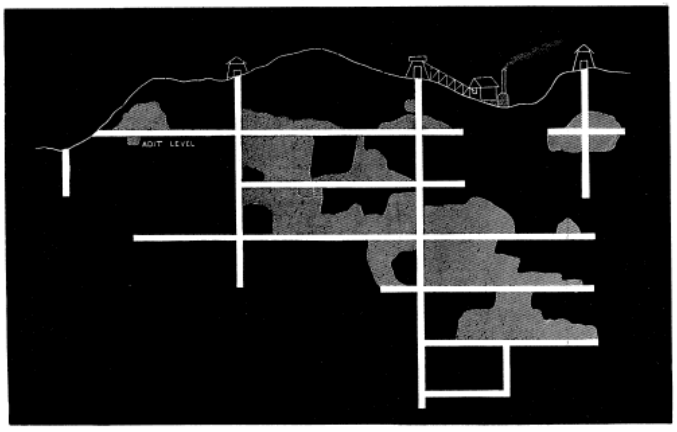
One would think that experience should have taught men, by this time, that the proper thing to do is to develop the mine before making such extensive preparations to work it. The all important thing is to have a good mine, everything else is only accessory. All intelligent efforts in the way of exploration is justifiable, but until the essential facts regarding the mine are reasonably established, elaborate surface expenditure is folly.

LONGITUDINAL SECTION OF THE NONESUCH MINE.

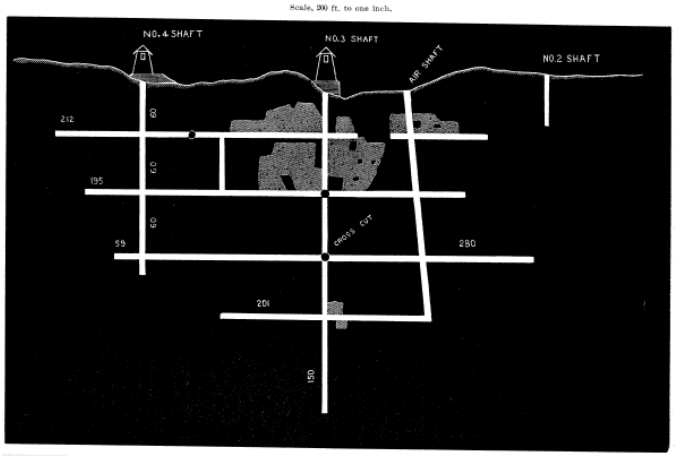
Scale, 200 ft. to one inch.



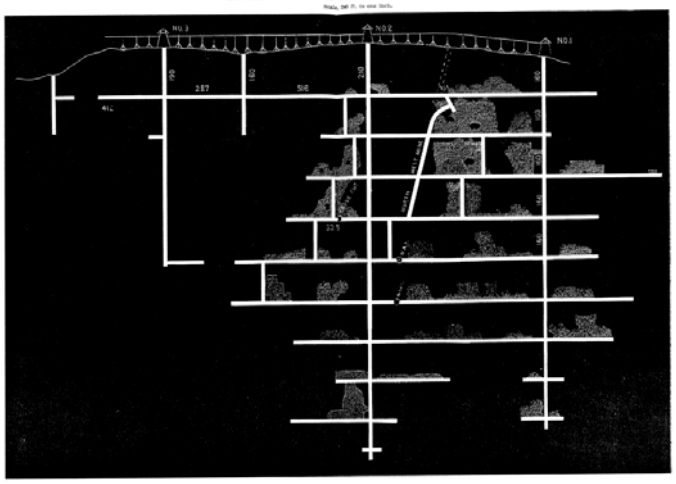
LONGITUDINAL SECTION OF THE HENWOOD MINE, JAN., 1886.
Scale, 120 ft. to one inch.



LONGITUDINAL SECTION OF THE VICTORIA MINE, 1886.
Scale, 200 ft. to one inch.



LONGITUDINAL SECTION OF THE CONGLOMERATE MINE, JAN., 1886.



History seems to repeat itself in mining as in everything else. People of this generation will recite the mistakes of their predecessors of a former time; will relate how stamp mills were built and great expenditure of money made at locations "down on the point," before actual mining was scarcely begun, and where, in instances, it was pursued to but a limited extent. But alas, for our consistency ! we have but to look around us to behold that at these very places, which have so long stood as monuments of the folly and mismanagement of the past, the self-esteemed wise ones of the present generation have but just repeated the errors and inconsistent management which they have been so ready to condemn, have exemplified, in a greatly exaggerated and magnified form, the very follies which have constituted the darkest shadow in the history of mining.

But fortunately there is a new generation growing up who will be far wiser in such matters than those of the present or were those of the past. They will assume the burdens of our work ere long and, probably, in spite of the teachings of experience, while condemning the mining errors and follies of the past, will forthwith proceed to do likewise and repeat them on a still greater scale.

These reflections naturally suggest the Keweenaw peninsula and bring us to the consideration of the

CONGLOMERATE MINE,

which affords, perhaps, the most notable example of injudicious outlay that the region presents. It is a location where mining work has been prosecuted for 40 years, and the record of every successive attempt is the record of a failure. But the primitive operations of the predecessors of the present company are dwarfed into insignificance by the lavishness of their final successor. Horace Greeley, Oliver Johnson, and James G. Clark, among the original corporators and officers of the old Northwest, would rub their eyes in astonishment to behold the transformation that the scene has undergone.

The early companies,—the Northwest, Pennsylvania, and the Delaware,—worked fissure veins, of which a number were mined in and were known as the Stoughtenburg, Northwest, Clark, Hogan, Kelly, Delaware, etc., veins. The history of all these old companies was given in the Commissioner's report for the year 1880, at which time all the lands, property, etc., formerly held by these old concerns were merged into the new organization, the Conglomerate, which began operations Jan. 1, 1881, and worked continuously until 1884, when all operations ceased. In these three years the company opened a large mine, as will be seen by refering to the map of it contained in this report, built many new dwellings, store, office, stone-house for compressor, for boilers, for hoisting machinery, etc.; built seven miles of railroad to Lac LaBelle, where a new stamp mill was erected, etc. In all this work the new company raised and expended in the three years' time, the sum of $1,300,000. And now it is perfectly apparent that the mine will not pay to work. Unless some new mineral deposit can be found in which a profitable mine may be opened, something that has not yet been discovered, all this preparation, the result of so much labor and cost, will go for naught.

The mine, as will be remembered, is in the conglomerate belt which underlies the great greenstone formation that constitutes the most prominent feature of the northeastern part of the Mineral range.

At this mine the conglomerate belt is 25 feet in width. In the same belt are the Allouez and the Peninsula mines,

many miles to the south of here; neither has ever proved profitable.

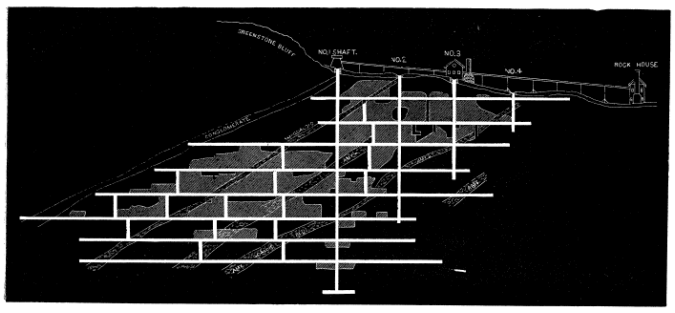
At the time of my visit to the Delaware, in Dec., 1880, when the whole plan of future operations was explained to me, it did not seem probable that the scheme would be carried out until the mine should be opened and the richness of the lode practically determined, as could be very easily done, since the company had a stamp mill and other machinery used in operating the old Northwest vein, the mine which they were at that time working. The whole plan, which has since been carried, out fully, was all determined in advance, and heralded far and wide as one of the most magnificent mining schemes of the time. The mine was described as a veritable bonanza; and yet at that time the only tests that had been made in the lode were embraced in four shafts that had reached to a depth of 20 to 40 feet, and only one of them showed copper in paying quantity. And yet at that stage of development, with that meagre showing, I was confidently assured that this lode was to redeem all the disasters of the past! Rather it was to climax all the disasters of the past.

The company ascertained the fact that the lode was not a paying one long before the new stamp mill and the railroad, etc., were built. In 1882 56% of the rock actually broken in the lode was ground and treated in the old mill, 41,104 tons, which yielded 671,681 pounds of copper, $^{81}/_{100}$%. Yet no halt was called, however inevitable failure must have appeared. The channel connecting Lac La Belle with Lake Superior was dredged out so that vessels could enter and load, etc., at the company's dock.

In the spring of 1883, Mr. Chas. H. Palmer, C. E., was appointed agent of the company, which position he still holds. Mr. Palmer has kindly furnished me with the following interesting statistics of the last year of work, when every effort was made to give the business a fair test.

VERTICAL SECTION OF THE DELAWARE MINE (CONGLOMERATE MINING CO.), 1886.

Scale, 240 ft. to one inch.



Details of the mining costs at Conglomerate mine during the year 1884. The total credit account is proportionately deducted from the department costs in making these details:

Total No. of tons of rock stamped in 1884	120,868 tons.
Yield of mineral copper	1,082,100 lbs.
Per cent of mineral copper in rock treated	.895 per cent.
Yield of ingot copper	1,140,173 lbs.
Yield of ingot copper	570 tons 1,781 lbs.
Per cent. of ingot copper in rock treated	.47 per cent.
Pounds of ingot copper in tons of rock treated	9.43 " "

ITEMIZED MINING COST PER TON OF ROCK.

	Cents.
Mining cost (underground)	.7374
Compressor cost	.0102
Pumping	.0101
Hoisting	.05.9
Handling in shaft-house	.0282
Transportation to rock-house	.0216
Breaking in rock-house	.3080
Transportation to stamp mill and maintenance of 7 miles of railroad, etc.	.0625
Stamping, working and drilling the rock—the copper	.4119
General surface expense	.0385
Office, etc., expense	.0556
Total cost	1.5789

RECAPITULATION.

	Cents.
Total cost of rock delivered on the surface	.8808
Handling of rock between mine and stamp mill	.1921
Stamping, dressing and delivery to dock	.4119
Superintendent and general expense	.0941
Total cost per ton of rock treated	1.5789

COMPARATIVE COST PER TON OF ROCK IN DIFFERENT MONTHS.

	Cents.
Cost per ton in January was	2.149
Cost per ton in March was	1.913
Cost per ton in June was	1.471
Cost per ton in September was	1.319
Cost per ton in October was	1.271

DETAILS OF MINING COST BASED ON THE ROCK STAMPED.

	Cents per ton.
Contract cost of breaking rock	.0031
Mine captains and foremen	.0383
Timbering, including labor and materials	.0083
Carpenter, blacksmith, machinist work and surface labor connected with mine	.0920
Laborers in stopes	.0780
Trammers	.1039
Drill repairers	.0917
Total cost per ton of rock	.7274

DETAILS OF COMPRESSOR COST IN CENTS PER TON OF ROCK, 1884.

	Cents.
Labor and supplies	.6104
Fuel	.0301
Repairs	.0017
Total compressor cost per ton	.0422
Cords of wood consumed for drill per day	.569

DETAILS OF STAMP MILL COST PER TON OF ROCK, 1884.

	Cents.
Labor and supplies	.1829
Fuel	.1899
Repairs	.1891
Total cost per ton stamped	.4119
Tons of rock stamped per cord of wood consumed	10.79

The total expenditures amount to	$1,300,000
Stamp mill cost—construction	184,000
Hoisting plant, 3 14' Love drums, etc., engine, building, all complete, cost	70,000
Compressor, plant and building	62,000
Railroad—7 miles—and rolling stock	146,000

Electric light plant for stamp mill is very complete: it cost for the year to light the building, $412.

The stamp mill is a very complete one,—4 Leavitt heads, 84 iron washes. If it should run again, a launder to bring the water to the mill will probably be used instead of pumps. Mr. Palmer states that the cost of running the pumps to supply the stamp mill was 5 cents per ton of rock. All the water necessary to supply the mill could be easily brought from Lake Gratiot.

There are some other changes that, if the mine were working, could be made to advantage. But then it is not much matter; as shown above, it costs $1.58 per ton to mine and treat the rock, while the rock yields but 943 lbs. of copper to the ton, which at 11 cents per lb. gives 103 cents, leaving a loss of 55 cents on every ton of rock treated; mining is not likely to go on much under such circumstances.

The misfortune of it is that this could just as well have been known without spending but a small portion of the million and a quarter of dollars that seem to be as good as wasted.

The only thing to do would seem to be to explore the property. The company has a diamond drill, and by test pits and boring the whole formation can be proved south

of the bluff (at this portion the range runs east and west), and possibly a paying lode could be found.

A young man residing in the location, came in last summer, bringing with him a piece of copper in a matrix of epidote, which he claimed to have broken from a ledge of the same,—12 or 14 feet wide. He states that he peeled the bark from a small birch tree near where the outcrop was found; hut neither he, nor the others who have since accompanied him, have been able to find the spot.

The estate is a large one, and now that the company has expended so much money, they had better put forth every endeavor to find a mine.

In contrast with the Conglomerate is its neighbor,

THE CENTRAL MINING CO.,

which is an economical, conservative corporation. The Central mine has been a valuable one and is well managed.

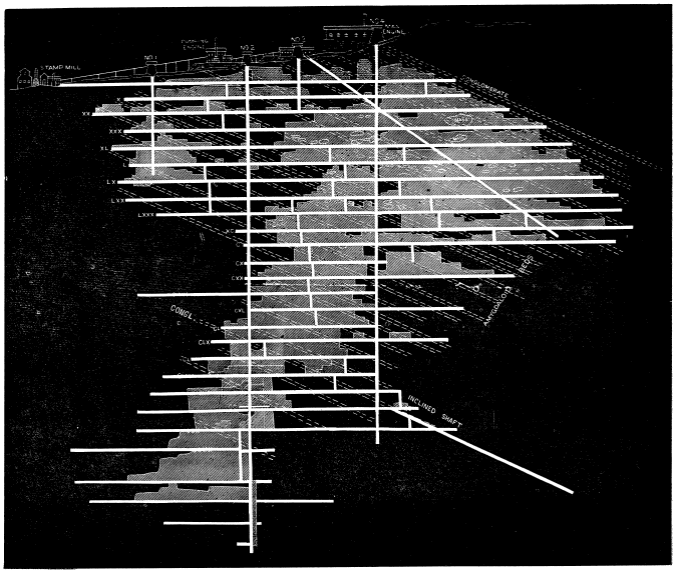
The product of the mine for each year, in refined copper, has been as follows:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1856	32	403	1872	623	56
1858	71	1,011	1873	751	1,117
1859	84	312	1874	870	900
1860	125	1,370	1875	733	952
1861	70	139	1876	1,090	1,400
1862	133	1,972	1877	907	1,640
1863	278	1,548	1878	945	1,013
1864	381	1,855	1879	899	1,495
1865	340	1,300	1880	1,013	78
1866	574	1,842	1881	709	465
1867	687	745	1882	676	1,595
1868	1,358	1,827	1883	634	556
1869	903	1,801	1884	723	747
1870	663	1,156	1885	1,078	1,408
1871	716	662			
Total tons				18,241	287

which has been sold for the aggregate sum of $7,872,230.44. All the stockholders ever advanced was the sum of $100,000, and real estate was subsequently sold considerably in excess of the sum paid in. The mine itself has furnished all the funds, and has for years given a surplus to the stockholders in the form of dividends, which amount to the total sum of $1,740,000, and to all appearance the dividends will continue in the future,—a safe conjecture, since the product of the mine in 1885 was one of the largest in its history. The facts about the Central possess a good deal of interest; it is in a fissure vein, crossing the formation south of the greenstone and extends vertically down, the bottom being 2,160 feet below the surface. It is a small mine; there is only one hoisting shaft—No. 2, and the copper bearing ground, which has a gradual pitch to the south, is now all south of the shaft—No. 2. The mine looks about the same as it has heretofore; there is no change whatever. The small Conglomerate belt, which has been worked downward north of No. 4, has been abandoned, the belt no longer proving productive. The mining work is all confined to the copper shoot, which has, practically, afforded all the mineral that the mine has produced. The vein is continuous, sometimes only a ribbon of vein matter, which widens to 8' to 10' in width and contains the masses of copper; the most copper is found in the widest portions of the vein. When the vein matter is soft and spongy it is found to lack productiveness; a firm, hard vein yields the most copper.

LONGITUDINAL SECTION OF THE CENTRAL MINE, JAN., 1886.

Scale, 300 ft. to one inch



The man engine is down to the 22d level. They open very little in advance of the stoping. In 1885 the total cubic fathoms of ground broken in the mine was 2,800, yielding 770 lbs. of refined copper to the cubic fathom. Pretty rich ground, certainly.

In 1884 the yield was 580 lbs. of refined copper to the fathom.	
The copper sold in 1884 at 11.79 cents per lb.	$170,692 56
The silver amounted to	486 25
Total	$171,177 81
The total amount broken in the mine in 1884 was	2,454 cubic feet.
The cost of stamping and working per ton, 1884, was	85.03 cents.

The following is a summary of the statistics at the mine for 1885:

GROUND BROKEN.

Sinking in shafts and winzes 206 8-12 feet, average cost	$19 88
Drifting on vein, 859 5-12 feet, average cost	9 00
Stoping on vein, 1,869 35-36 sup. fathoms, cost	12 07
Stoping on vein, 24 116-216 cubic fathoms, cost	32 82

The total amount of ground broken in openings and stopes is 2,800 cubic fathoms.

PRODUCTION.

979 bbls. stamp copper, weighing	1,488,595 lbs.
171 bbls. barrel copper, weighing	522,295 lbs.
325 masses copper, weighing	700,910 lbs.
Total	2,714,800 lbs.
Or 1,357 800-2000 tons.	
Average yield of mineral per fathom of ground broken	969 lbs.
Average yield of ingot per fathom of ground broken	785 lbs.

STAMP MILL.

The expenses at the mill were as follows:	
Labor	$5,985 49
2,000 cords wood consumed	6,500 00
Lights, oils, shovels, etc	410 04
Repairs, materials, fixtures, etc	305 52
Lumber, freighting and teaming	90 23
	$13,297 28
Tons of rock stamped	17,832
Yield of rock in mineral	4 16-100 per cent.
Yield of rock in ingot	3 37-100 per cent.
Cost of stamping and washing per ton	74 31-100 cents.
Running time of 24 heads	140 3-4 days.
Rock stamped per head, 24 hours running time	3 27-100 tons.
Rock stamped and washed per cord of wood consumed	8 91-100 tons.
Cost per ton of breaking and selecting rock and tramming to mill	9 80-100 cents.

PRODUCTION.

Copper and silver delivered	1,800,889 lbs.	$117,418 69
Copper on hand, sold	556,509 lbs.	63,151 54
(Averaging about 11 15-100 cents per pound.)	2,157,408 lbs.	$240,570 23
Silver		390 90
		$240,961 13
Mineral at mine Dec. 31st, '84, 139 90-2000 tons, at $145 per ton	$20,155 00	
Mineral at mine Dec. 31st, '85, 164 1925-2000 tons, at $145 per ton	23,919 56	
		3,764 56
Net value of product of 1885		$244,725 69
Add interest received		2,333 06
		$247,058 75

COSTS.

Central Mine, payments for labor, supplies, etc	$130,151 27	
Add decrease in available assets at mine	24,079 56	
Working expenses at mine	$154,230 83	
Smelting, freight, and all other expenses, as per balance sheet	36,185 42	
Net operating expenses		190,416 25
Showing a profit of		$ 56,642 50
The surplus from 1884, after disposal of copper on hand and payment of dividend, was		211,639 48
Making the net surplus, Dec. 31st, 1885, as shown in detail in the annexed statement of assets and liabilities, and out of which a dividend of two dollars per share ($40,000 was paid February 1st, 1886.		$268,281 98

The foregoing figures show a gratifying improvement on the business of the previous year, which was due to the large increase in product. Some of the ground stoped during the year proved to be much more productive than could have been anticipated from the appearance of the levels, and gave an increased quantity of copper without increased cost; the running expenses at the mine being about the same as in 1884. It is too early in the year to estimate the amount that will be produced in 1886, but the product for the first two months is about equal to the average of 1885.

The mine having reached a depth of more than 2,000 feet vertically, the capacity of the hoisting arrangements is now strained to the utmost, and will not be adequate to hoist from a greater depth. It has, therefore, become imperative that more powerful hoisting machinery should be erected during the coming summer, and preparations are making for a plant that will meet all probable wants for a long time to come. In view of this large expenditure the directors have not considered it prudent to divide the entire earnings of the year among stockholders, but have reserved a portion of same to be applied towards payment for the new machinery.

ASSETS AND LIABILITIES, CENTRAL MINING COMPANY, DECEMBER 31, 1885, EXCLUSIVE OF REAL ESTATE AND MINE PLANT.

Assets.

Cash		$82,174 67
Loans		64,359 60
Silver on hand		390 90
Copper on hand, sold (556,509 lbs.)		63,151 54
		$210,076 71

At Mine.

164 tons 1,925 lbs. mineral, at $145	$23,919 56	
Cash	2,579 82	
Merchandise in store	19,684 27	
Supplies	29,900 08	
		76,083 73
		$286,160 44

Liabilities.

Agent's drafts	$ 3,696 00	
Indebtedness at mine	19,684 27	
Accounts payable	4,495 81	
		27,876 46
Balance of assets		$258,281 98
(Less dividend, February 1st, 1886, of $40,000.)		

BALANCE SHEET, CENTRAL MINING COMPANY, DECEMBER 31, 1885.

Capital advanced by stockholders		$100,000 00
Real Estate.		
Sale of timber	$100,000 00	
Less cost of real estate	20,988 25	
		79,011 75
Sales of Copper.		
Sales previous to 1885	$7,634,472 01	
Sales in 1885	240,570 23	
Silver in 1885	390 90	
		7,875,433 14
Interest received in 1885		2,333 06
Accounts payable		4,406 83
		$8,061,253 78
General expenditures to Dec. 31, 1884		$5,025,748 31

Expenditures in 1885.

Central Mine	$130,151 27	
Freight	8,256 11	
Smelting	19,041 37	
Insurance	715 29	
Brokerage	1,955 61	
Expenses	5,849 04	
Storage	46 00	
Taxes [N. Y.]	175 00	
		166,339 69
Dock and warehouse		5,112 07
Cash		82,174 67
Loans on call		64,359 60
Copper on hand		63,151 54
Silver on hand		390 90
Dividends		1,740,000 00
		$8,061,273 78

Average number of miners employed for the year	78
Average wages paid miners per month	$44 31
Average wages paid surface men per month	34 23
Average number of men (surface) employed	41
Average number of stamp mill men employed	14
Average wages paid stamp mill men per month	$34 63
Average number of underground laborers employed	21
Average wages paid underground laborers per month	$34 26
Number of square feet of copper cut	59 109-144
Dividends paid in 1885, $2.00 per share	$ 40,000 00
Dividends paid in 1884, $1.50 per share	30,000 00
Dividends paid in 1883, $0.00 per share	00,000 00
Total dividends paid to date	1,740,000 00
Total expenditures at the mine, 1885	166,548 87

AGENT'S REPORT.

No. 5 shaft has been sunk 97 feet, and is now 15 feet below the 26th level. A winze has been sunk from the 25th level to the 26th level. In sinking this winze, the vein has been very small for the greater part of the distance, but in the last 15 feet it has improved, showing a small but good vein in the north side of winze.

DRIFTING.

At the bottom of the winze at the 26th level we have drifted north about 25 feet, the vein is about two feet thick and well charged with copper; for the last ten feet of drifting we cannot take down the vein until some stoping is done, it being so strongly charged with copper. The 25th level south of No. 2 shaft has been extended 364 3-12 feet. The vein has been very variable, sometimes very small and poor, and again it opened out to 10 or 12 feet wide, and has exposed considerable good ground.

The 24th level has been driven 127 6-12 feet south of No. 2 shaft. The vein here also has been variable, but during the year it has shown some very good copper ground.

The 23d level, south of No. 2 shaft, has been extended 189 4-12 feet. The vein has been small, but has yielded some good stamp rock. At present it is so poor that we have discontinued this drift, as it will not pay to work at the present low price of copper.

STOPING.

Most of the sloping for the past year has been done in the backs of the 24th and 35th levels, which have produced much better than anyone would have expected from their appearance at the beginning of the year. We have not had any very large masses, but have had very rich stamp rock, with small masses and barrel copper. In the back of the 25th level, south of No. 3 shaft, we have twelve men now cutting a mass estimated to be about 40 tons. Most of the other stopes are looking very well.

CONSTRUCTION.

In the way of construction, we have built a new boiler house at the stamp mill, and placed therein two new fire-box boilers, and a smoke-stack 4 feet diameter and 70 feet high, and also one new boiler and smoke-stack at No. 3 boiler house, which puts us in excellent position, as far as boilers are concerned. We have taken out two of the old boilers at No. 3, and have had them repaired and re-set again, and we will have to do the same with the others.

Our steam hammer still continues to work well and effectively in cleaning our barrel copper and small masses to a very high percentage, which you can readily see by comparison of percentage of 1883, which was cleaned by hand labor, and that for last year, which we cleaned with the steam hammer, with much less expense.

In conclusion, I am pleased to say that the mine looks much better than it did at the beginning of 1885. The low price of copper seems to be the only thing that is against us.

Yours respectfully.
JAMES DUNSTAN,
Agent.

The Central requires a new hoisting plant; 2,200 feet vertically down is reaching a great depth for a single skip shaft. The matter of a new plant is under consideration, but it is not yet decided what it shall be.

The company has a large number of good houses for the men, has an excellent school building, church buildings, etc., so that the men. mostly have families and there are very few changes. It is a common remark that a man at the Central stays for life, but the reason is that the company can provide them with good places to live and the educational and social advantages are also good. There are no more changes among the officers than in the mine; everything remains the same. The map has been marked up to the close of the year.

John Stanton, Sec. and Treas., 76 Wall street, N. Y. ; John Dunstan, Agt.; J. F. Robert, Clerk; Samuel Bennett, Mining Captain.

THE COPPER FALLS MINE,

The Copper Falls mine is coming to the front as a large producer. If any company deserves a good mine as a reward for faithful efforts, courage and persistence, the Copper Falls company is certainly one of them. The stockholders seem always ready to respond to any demand that is made upon them, and when the mine fails to meet all the requirements, they make up the deficiency and create a fund for the future. Thus it has been for nearly 40 years. And now, when added to all the discouragements which the company has borne, is the great depreciation in the price of copper, below a point to which it would seem possible for the work to pay, the company so far from giving up, is putting forth greatly increased effort. If the rock were a little richer, if the lode stood up at a steeper angle and were double Its present width, the company would be assured of success. But these drawbacks are serious,—the rock yields but .70 per cent, of copper; the lode is but seven feet in width and lays at an angle to the north of about 27°; the rock is so soft that it will not run down on the foot wall, but has to be shoveled from the stopes down to the level, requiring as many extra men for this work as it takes to mine; and yet, with all this, the work is cheaply done. The arrangements are most admirable, considering the circumstances, for economical work. The most telling innovation that the company has recently made is the substitution of a locomotive for the mules to haul out the cars from the mine. It is a diminutive affair, but it does its work all right and could haul 1,000 tons of rock a day if the mill could work it up. I came out of the mine on the locomotive at noon, and it had hauled out that forenoon 105 cars of rock, 2½ tons each. It weighs, when loaded, 9,000 lbs.; has 22-inch drive-wheels; cylinders, 5x10 inches.

The work in the mine is all in the ash-bed west of the Owl Creek vein. They are at an extreme distance in this direction of 1,415 feet. The adit level is the ninth, and the workings reach to the 14th below and to the fifth above, making a maximum length up and down on the plane of the vein, of about 1,150 feet. Altogether the company has worked out on the ash-bed about 50 acres, east and west of Owl Creek vein. They reckon 20 tons to the superficial fathom of the bed. The 8th, 9th and 10th levels are in west to about the same distance.

These levels are to within 250 feet of the west line of the property. The cars are drawn into the mine and are taken up or down the inclines to the level desired, thence run out to the stope and filled and run back to the incline and taken up or down, as the case may be, to the adit level. All cars come into the mine and go out in the adit level. The locomotive goes on this level to the west end of the mine, making a nearly right angle in leaving the Owl Creek vein to go into the ash-bed west. There are two shafts or inclines up and down, in the mine. No. 1 is 160 feet west of Owl Creek vein, and goes down to the 14th and up to the 5th. These inclines are a short distance apart, east and west, to give room for a turn-table at each to change and move the cars. A small engine that operates a drum is placed at this level to assist in working the inclines. From the drum a rope runs up to the head of the incline and over a pulley, and thence down the track to be attached to the car. A second rope is provided for the track that descends from the 9th. If two empty cars are to be sent away to be loaded, they are run, one upon each turn-table, and quickly put into position, the ropes attached, the signal given, the one descends to the required level, the other goes up to the corresponding one above. The friction of the ascent, not overcome by the descending car, is the work of the small hoister to take care of. In the same manner the descending loaded car from above brings up one also loaded from the corresponding level below. It all works very completely and expeditiously. No. 2 shaft, or incline, has been made up to the 7th and down to the 11th; its location is about 850 feet west of the vein. The ash-bed is faulted at three different points in this mine, west of the main adit. The main faults are 65 feet, and cause a good deal of dead work in the drifts in each level. The ash-bed mines very cheaply, the main drawback is in the matter of getting the rock down from the stopes. They want to save the cost of shoveling it. Mr. Emerson has a scheme to accomplish this work that I think will succeed all right. The device consists of two wire ropes suspended up the bed, attached at the extremities and made taut, a space being left between the ropes and the hanging wall, sufficient for a narrow sheave-block to run in. A car is suspended from the sheave-block on one of these ropes—capacity 1,000 pounds—and a suitable counter-weight from the other. A rope passes from the car or sheave up over a pulley,

controlled by a brake and situated between the two ropes, and is attached to the counter-weight. The car being filled at any point in the stope desired, descends the rope, dumps automatically into the main car and is carried back to position for refilling by the counter-weight. Of course the wire rope track can be run up the bed at any angle to suit the circumstances.

The company has greatly increased its stamping and washing facilities, having added two improved stamp heads, one of which is already at work and the other soon will be. These stamp heads are a modification of the Ball stamp. The steam cylinder is set closer to the stamp. The iron cross-head dividing the frame is dispensed with, and thus the whole is more compact—weight is 50 tons; 18 inch cylinder, 8 inch shaft; rolling valves made by E. P. Allis & Co., Milwaukee; the three heads were working up 470 tons per day, February, 1886. The mill has been greatly enlarged, naturally, for the increased work. The mill building is now 110x142 feet, all under one roof; then there are attached two slime-table rooms, 60x78 feet, under one roof.

The whole mill has 15 hydraulic separators, 60 "rough machines," and 44 finishers—104 washers, or 119 washing machines in all, and 15 Evans' slime tables. They are striving to save the fine copper and are making every provision to do so.

In the stamp mill boiler-house are eight steel boilers, five of which are now in use. The coal costs $4.00 per ton at the mine.

To secure the water for four heads, a new pump has been added for raising the water from below the mill back again to be used over in the mill. The pump is made by Gordon, Maxwell & Co., Hamilton, O.; size 12x22x17½—24-inch stroke. It is called Compound High Pressure Duplex pumping engine, outside packed.

Have added to the mill a new engine 14x20 inches, also one of same size for the rock house. Have added three Blake's crushers, 9x15 inches, and one 13x15 inches.

The cars of rock for the old stamps are drawn up the incline as heretofore which is now covered; but for the new stamp the cars are elevated by direct hoist. From the mouth of the adit to the rock house they have laid several tracks, so as to make as much of a yard as admissible. The hoist consists of two platforms, one runs up as the other descends, each carrying a car. The hoist is 48 feet. Ropes—one from each end of the platform, passing over a large wooden drum—wind up or unwind as the platforms either pass up or down.

Each platform holds a low skeleton iron car with the wheels set on a track to run east and west with the line of the rock bins. The top of the skeleton carries two short rails bent up in a curve at the far ends to receive the car to be hoisted or let down. The loaded car is run onto the platform on the skeleton, and when it reaches the level above, the skeleton carrying the loaded car is pushed along on the track to the point to be dumped, where it discharges over a screen composed of T rails set with lower face up, 2½ inches apart; the fine dirt runs through, the larger pieces run down on the irons and are thrown into the breakers, six men sufficing to handle all the rock.

There are four dogs—chairs—one at each corner, to catch the platform when it gets to the right place, and it sets on these, thus taking the strain off the ropes. The "chairs" work by springs automatically, and when ready to descend are thrown back with a lever. Only one of the platforms is now used to hoist; the other carries an empty car up and down. When the No. 4 stamp is ready to operate, loaded cars will be hoisted up on both platforms.

It is a simple and effective hoisting arrangement, and works nicely. Railroad tracks run to all the shops—machine shop, blacksmith, carpenter, etc., so that anything to be repaired is run from the mine, or from one shop to another, directly on the car. Heavy shafting, etc., can be run on the car to the lathe before unloading, and the little locomotive rests at night in the machine shop. The company only works day shift. No mining work is done at night except a few drills used in driving through the faults, etc. There are 28 power drills in all, of which about 20 are run. A new Burleigh No. 10 compressor has lately been added—this, in addition to the No. 2 and No. 3 Burleigh, old style,—four steel boilers furnish the steam for the compressors and for the little hoisting machines in the mine.

No. 3 stamp head was started 22d of December last, and they are greatly pleased with it. Certainly the quietness and effectiveness with which it does its work is greatly in contrast with the work of the two old Ball heads working near it.

They are doing no work east of Owl Creek vein, though the old workings on that side are quite extensive and are said to have been, in the upper levels, very rich, for the ash-bed, in copper, but of late years the ground has been poor and only exploring has been done.

It was mentioned that the 8th, 9th, and 10th levels had approached within a few hundred feet of the west boundry, but the 7th is 500 feet and the 6th 800 feet from it yet, and the 11th and those below are yet more than 1,000 feet away.

There is no change in the method of mining as I have heretofore described it in previous reports. The drifting and stoping are carried on together, the work being paid for by the fathom. The lowest stopes are reckoned at 35 feet high on the width of the vein. The remainder of the back is taken down in succeeding stopes, leaving only the pillars.

It is probable that the Copper Falls mine will be worked very cheaply another year. Were it not for the pump, for throwing back the water, the stamp mill cost would be very low. The ash-bed is one of the best known lodes in the copper country; it has long been a problem how to work it cheaply enough to make it pay. The Copper Falls company may possibly solve it.

The company has expended the total amount of $2,925,491.39.

Expenditures for year closing December 31, 1885, were as follows:

Total running expense		$127,778 99
Construction and openings		74,370 76
		$202,149 66
Total mining cost, including breaking the rock in the mine and putting it into the cars		80,619 52
Main adit cost		4,111 91
Rockhouse		5,338 30
Stamp mill		31,264 45
Other cost		4,450 72
Number tons of rock mined and treated	88,800	
Number tons of mineral produced	776 475-2000	
Number tons of refined copper	675 588-2000	
Per cent. of ingot to rock treated	65 per ct. min.	
Pounds of copper in a ton of rock	13 per ct. min.	

The following table shows the product of the Copper Falls mine for past years:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
Previous to 1855	158		1870	286	960
1855	100		1871	239	883
1856	104	10	1872	260	882
1857	153	1,305	1873	663	540
1858	151	1,892	1874	535	379
1859	173	174	1875	300	1,587
1860	255	818	1876	8	1,488
1861	280	11	1877	5	1,950
1862	360	200	1878	5	1,700
1863	159	1,348	1879		
1864	179	808	1880	3	845
1865	235		1881	334	1,121
1866	568	1,109	1882	295	1,500
1867	1,128	1,485	1883	402	
1868	239	1,384	1884	445	1,168
1869	345	1,400	1885	525	538
Total product				8,805	1,454

The original company was organized in 1845, and the Copper Falls Mining Company began work at this mine in 1846. The stockholders have received dividends to the amount of $2.50 per share—$100,000—and have paid in in assessments probably $20 per share.

David Nevins, Jr., President, Boston, Mass.; B. F. Emerson, Agent, Copper Falls, Mich.

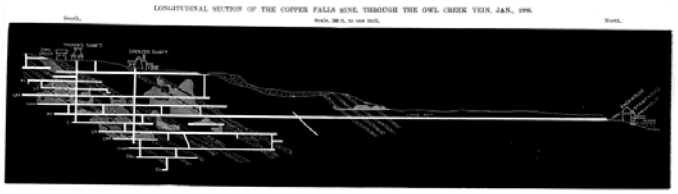
THE ASH BED MINING CO.

has done nothing for years, and there is no probability of work at this mine at present.

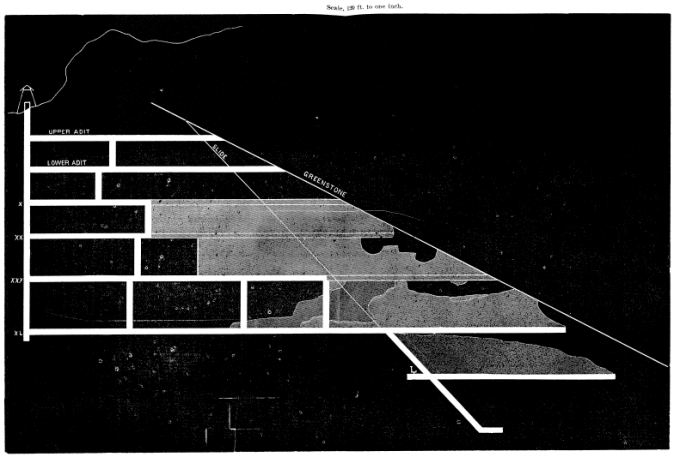
THE ST. CLAIR MINE

has continued to be worked on company account until September last, since which time has been worked on tribute.

The mine is in a small fissure vein which crosses the formation south of the greenstone. It is considered a pretty good vein but has never developed much width. The product was mostly in small pieces. I find nothing to add to previous descriptions. The financial affairs of the company are said to be in a somewhat unfortunate shape.



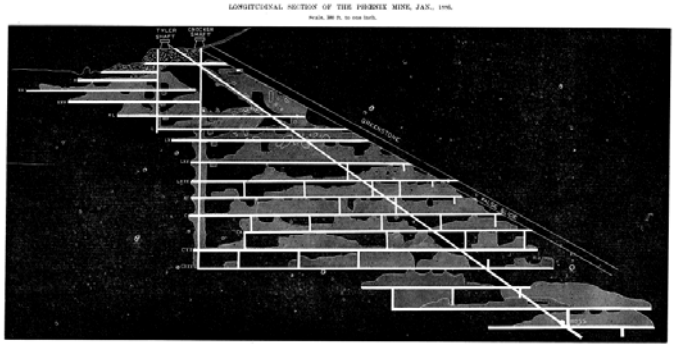
LONGITUDINAL SECTION OF THE ST. CLAIR MINE, JAN., 1886.



The product of the mine:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1805	4	815	1874	2	1,700
1806	31	200	1880	6	1,195
1807	43	1,783	1881	62	1,493
1868	65	665	1882	43	1,120
1869	23	197	1883	62	1,225
1872	9	72	1884	69	1,407
1873	40	1,847	1885	39	1,686
Total tons				505	1,071

M. A. Delano, Prest., Phœnix Mine, Mich.



THE PHŒNIX COPPER CO.

"No company on the lake has had a longer struggle against adversity than the Phœnix. The original company was organized in 1844, and the capital stock has been exhausted by assessments and the company reorganized several times in the course of its history. But the impression prevails that the company is now bankrupt, that its affairs are involved beyond the hope of redemption.

The indebtedness is given as $80,000.

The estate is a large one, lying on both slopes of the Mineral range. The mine on this property that has given the best results is the one of which the section is herein given, known as the Old Bay State mine. This has produced nearly all the copper that the company has obtained. The section shows the mine up to the close of the year 1885.

Since July, 1883, the mine has been worked on tribute by the former agent, Mr. M. A. Delano. I have written it up very fully heretofore, especially in the reports for the years 1880 and 1881, and I have nothing of interest to add.

The following table prepared from the books of the company gives the summary of the results of the mining work since 1872 for each year. It will be seen that for this period of 14 years the average yield of the ground stoped in the mine has been 473 lbs. of refined copper to the fathom of rock. It would seem that the mine has yielded well for the opening made. For many years it has been with the company, a struggle for existence. They have opened no faster than the ground was stoped. Those best acquainted with the Phœnix mine regard it well and say if it were opened as it should be, and provided with suitable machinery, it would be a paying mine. The maximum depth is 1,200 feet. It is looking as well as usual in the bottom. Mr. M. A. Delano, the agent, is still working the mine on tribute and has a force of 20 miners:

PHŒNIX MINE.

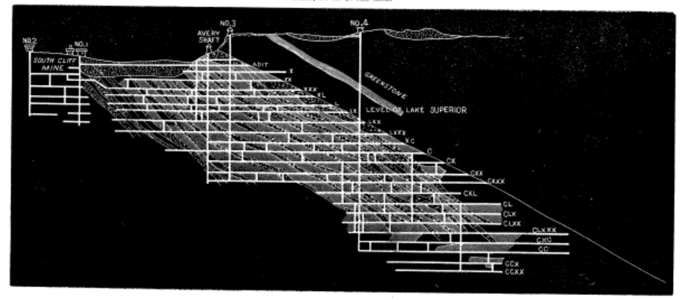
Table Showing Results of Fourteen Years' Work.

Year.	Sinking, Feet.	Drifting, Feet.	Cross Cutting, Feet.	Stoping, Fathoms.	Total Ground Broken, Fathoms.	Tons Rock Hoisted.	Tons Rock Stamped.	Percentage of Rock to Mill.	Percentage of Ingot in Rock Hoisted.	Mineral Produced, Pounds.	Ingot Produced, Pounds.	Yield in Smelting.	Ingot per Fathom Stoped.	Ingot per Fathom Broken.	Year.
1872	170.7	589.5	212.2	775.29	965.81	20,408	6,324	.3100	.0086	455,342	350,600	.7735	452	363	1872
1873	952.3	1,257.5	126.8	920.50	1,468.65	37,287	12,908	.3462	.0087	858,655	647,709	.7544	704	441	1873
1874	967.3	1,525.8	86.6	1,244.46	1,835.62	47,400	18,527	.39	.0145	1,765,770	1,374,632	.7785	1,105	749	1874
1875	500.6	1,391.6	137.8	2,014.99	2,469.76	54,778	20,683	.3767	.0135	1,884,198	1,479,890	.7854	734	599	1875
1876	755.3	1,330.7	126.7	2,365.98	2,865.46	53,822	20,893	.3882	.0110	1,548,918	1,183,183	.7639	501	413	1876
1877	513.7	1,180.3	104.	2,414.24	2,790.51	56,454	22,985	.4072	.0078	1,182,120	874,480	.7414	362	312	1877
1878	513.2	1,536.5	179.4	1,345.41	1,802.46	30,376	10,964	.3613	.0073	600,545	443,880	.7391	330	246	1878
1879	....	234.9	....	2,235.42	2,274.57	25,421	18,121	.7128	.0109	707,280	551,078	.78	246	243	1879
1880	126.3	342.7	118.5	1,424.62	1,543.59	28,902	9,542	.3295	.0077	580,480	445,518	.7675	313	289	1880
1881	247.	556.4	....	1,085.34	1,290.40	25,172	11,561	.4595	.0090	607,075	452,192	.7449	417	350	1881
1882	231.6	909.4	....	1,174.99	1,489.63	30,205	8,246	.2730	.0085	664,350	515,000	.7753	438	346	1882
1883	129.3	742.2	42.5	1,831.16	2,000.24	34,353	14,255	.4149	.0092	818,765	637,408	.7785	348	319	1883
1884	....	409.5	....	1,320.68	1,388.93	27,390	9,176	.3350	.0133	729,510	568,698	.7795	431	409	1884
1885	26.	225.3	....	723.67	768.92	15,163	5,079	.3349	.0151	458,680	351,235	.7657	485	457	1885
......	5,232 3/10	12,311 1/5	1,134 7/10	20,876 74/100	24,959 53/100	487,289	189,214	38 83/100	.01.01	12,850,088	9,876,339	76 83/100	473	396	......

Product of the Phœnix mine:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
For years previous to 1855	19	....	1871	609	1,802
1855	3	....	1872	394	490
1856	8	....	1873	290	1,080
1857	17	....	1874	609	400
1859	28	500	1875	702	276
1860	30	62	1876	698	530
1861	34	790	1877	511	493
1862	31	1,290	1878	150	1,172
1863	72	118	1879	272	1,436
1864	142	187	1880	218	10
1865	202	1,000	1881	304	1,355
1866	306	....	1882	268	1,177
1867	155	115	1883	256	291
1868	130	....	1884	310	1,004
1869	308	930	1885	180	1,308
1870	490	1,040			
Total				7,673	738

LONGITUDINAL SECTION OF THE CLIFF MINE, JAN., 1886.
Scale, 600 ft. to one inch.



THE CLIFF COPPER CO.

There is nothing new to record of the Cliff. It is still regarded with a sort of romantic interest as the great bonanza of its time. People will scarcely cease to conjecture as to what might he the result if it were again worked as of old. The Cliff was undoubtedly poor in the bottom when the old company abandoned it, but it is by no no means certain that they had not struck into an extensive bar of poor ground that would in time have given way to better, if the company had had more faith and persistence. Very much poor ground is encountered in all mines, and requires perseverance to push through it until better is found. The history of all the copper mines that have been successful shows this, and it is possible that the Cliff Co. encountered a greater amount of poor ground than is common; and it is also possible that the vein below is as rich as it was found to be above; 1,000 pounds of copper to the fathom of ground, was about the average at the Cliff during its most productive period.

The stockholders only advanced $110,905, and in four years after work was begun they received their first dividend, 1849. The total of dividends paid to the stockholders was $2,627,660. It has been a remarkable mine, and it is but natural that public curiosity in the mining region, should still continue active regarding it.

The property is owned by Mr. W. H. Simpson, of New York, and is still in charge of Mr. D. D. Brockway, Phœnix, Mich.

The following shows the product of the Cliff mine:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
Prior to 1855	3,400	....	1870	222	381
1855	937	197	1871	71	238
1856	1,110	984	1872	59	396
1857	1,118	850	1873	375	1,208
1858	1,130	433	1874	527	901
1859	707	1,007	1875	581	872
1860	921	1,303	1876	450	146
1861	984	11	1877	80	1,319
1862	1,002	900	1878	207	415
1863	1,050	354	1879	67	336
1864	675	1,334	1880	30	962
1865	747	635	1881	39	1,382
1866	821	428	1882	33	53
1867	560	1,725	1883	5	374
1868	613	746	1884	14	255
1869	362	1,247	1885	4	332
Total tons				19,053	1,301

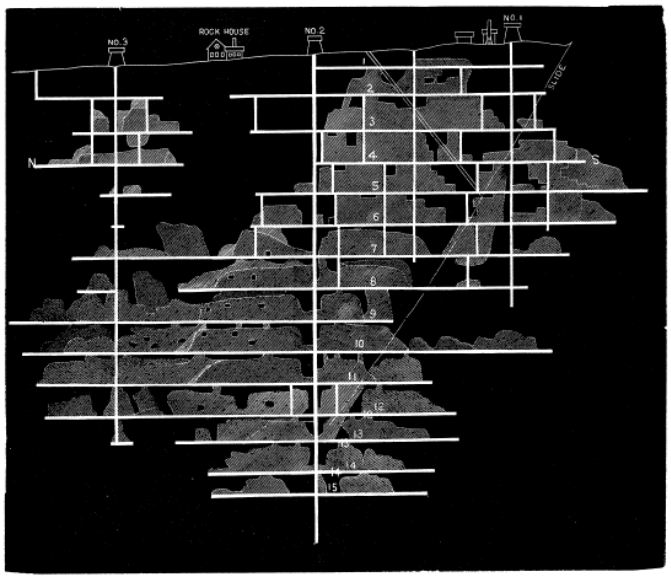
is again working on tribute. Messrs. Watson & Walls, the same parties who formerly worked the mine on a lease from the company, from 1877 to 1880, are now operating it. The Allouez mine is in the well known conglomerate belt that underlies the greenstone of Keweenaw Point, and which has come to be designated as the Allouez conglomerate. I have, heretofore, in previous reports, very fully described the mine and will but mention the additions which have since been made to the plant, etc.; also the map has been marked up to the close of the year. No. 2 shaft is now 1,500 feet deep, measured on the plane of the vein, the angle of the slope being 38° with the horizon. No. 3 shaft is 1,150 feet deep; but the lode there did not prove good, and the work has been discontinued. They are working mostly north of No. 2.

The rock breaks in large blocks, so that while it is harder to stamp than amygdaloid it is cheaper to mine.

A new stamp head was added in 1884, making three Ball heads now in use at the mine. The capacity of the new head is 160 tons in 24 hours. In one month they treated 13,500 tons of rock. Twenty-one Collum washers have been added, making the total number now 56. Six hydraulic separaters, five slime tables; a new locomotive has also been obtained, a thing that was very much needed.

LONGITUDINAL SECTION OF THE ALLOUEZ MINE, JAN., 886.

Scale, 300 ft. to one inch.



The mine was worked on company account for only five months of the year. Since June 1st, it has been under lease to Messrs. Watson & Wall, who now operate it. The following statistics, which are very complete, I was permitted to copy from the books of the company, and they convey a clear idea of the productiveness of the lode and of other matters pertaining to the working of the mine. They cover the first five months of the year 1885:

MINING COST TO COMPANY.

Occupation of Employes.	Average Wages.	Amount.	
Mining Captains	$75 00	$1,182 31	
Timbermen and helpers	38 58	2,135 21	
Miners and block holers	31 19	1,816 73	
Laborers	27 74	918 66	
Trammors (46,809 skips)	37 60	7,801 87	
Machinists	46 28	149 84	
Blacksmith	50 50	40 38	
Carpenter	40 42	110 30	
			$14,105 49

SUPPLIES USED.

550¾ cords of wood at $2.00	$1,623 75	
Explosives, powder, candles, etc	2,034 06	
Sundry teaming	202 63	
		3,860 44

POWER DRILLS.

Drill carriers	$35 00	$158 65	
Compressor runner	42 00	463 04	
Machinists	55 87	468 48	
Blacksmith	45 20	514 36	
			3,322 55
Amount of contracts			16,260 65
Total			$19,584 00
Less profit on supplies (mining)		$3,000 00	
Receipts of change house		165 00	
			3,165 00
Total mining cost			$16,419 00
Average monthly force			139¾
Average net wages per month			$41 03
Total hoisting expense—labor account			$2,496 02
Total hoistang supplies			6,874 74
Total			$9,370 76
Average monthly force			13 6-26
Average net wages per month			$37 08
Total number of tons of rock hoisted			67,180
Average hoisting cost per ton			13 9-10 cts.
Total for labor for selecting and breaking rock			$6,894 28
Total for supplies and sundries for selecting and breaking rock			4,496 46
Total cost for selecting and breaking rock			$11,390 74
Average monthly force, selecting and breaking rock			43 12-13 men
Average net wages			$31 39
Total tons of rock treated			67,180
Average cost per ton for selecting and breaking rock			17 cts.

RAILROAD EXPENSE.

Total for labor	$2,380 44
Total for supplies	2,201 11
	$4,581 55
Average monthly force	13¾ men.
Average net wages	$35 20
Total number of tons of rock transported	62,500
Average cost per ton for transporting rock	7 33-100 cts.

This transporting cost is high, as it was mostly done in the winter, when the snow was deep. There were 41 men employed in shoveling the snow from track.

SURFACE EXPENSE.

Total for labor	$1,574 12
Total for supplies	256 23
Total for all purposes	$1,830 44
Average monthly force on surface	9 6-13 men.
Average monthly net wages	$33 32

STAMP MILL EXPENSES.

Number cords of wood used	5,093¼
Cost—total	$15,689 80
Cost of supplies	851 60
Cost of foundry repairs, etc	2,320 09
Cost in wages	8,226 09
Cost of drainage	300 00
Total running cost—stamp mill	$27,386 58
Total number of men employed	250 4-13
Total tons of rock treated	62,500
Total tons of rock treated, per cord of wood	12 26-100
Pounds of copper produced (mineral)	1,412,015
Per cent of mineral in rock stamped	1.13 per ct.
Cost per ton for stamping and treating the rock	44 41-100 cts.
Average number of men per month	31 7-14
Net monthly wages	$32 17
Total tons of rock treated	67,180
Total tons of rock rejected	4,680
Pounds of ingot in rock hoisted, per ton	15.03
Pounds of ingot in rock treated, per ton	16.89

DIVISION OF COST IN STAMPING PER TON OF ROCK.

	Cents.
Labor, per ton	13.51
Fuel, per ton	25.10
Shoes and castings—mostly shoes for stamps—per ton	4.43
Oil	.55
Supplies	.89
Total	44.41

	Pounds.
Total amount of ingot produced in the five months	1,030,275
From low grade stuff	14,268
Tribute copper produced in succeeding seven months	1,050,543 1,119,980
Total for the year, of ingot	2,170,523
Total cost of handling mineral, getting it to smelting works, barrelling, etc	$2,892 82
Average on each ton of rock	4.48 cts.
Expense account not otherwise classified	$1,901 44
Average on each ton of rock treated	3 04

GENERAL SUMMARY FROM JANUARY 1ST TO JUNE 1ST, 1885.

Mining cost	$36,019 16
Hoisting expense	9,330 76
Selecting and breaking	11,380 74
Railroad expense	4,581 55
Surface	1,810 44
Stamp mill expense	27,756 58
Smelting cost	2,802 85
Expense account, total	1,901 44
Total expense at the mine	$96,183 49
Less credits	1,826 20
Total cost for five months	$94,375 51
Total average of men employed in all departments	253 23-26
Total average net wages paid men per month	$57 72
Total number of tons of rock hoisted	67,180
Total average cost per ton mined	$1 40 4-10
Average cost of rock per ton stamped	$1 51

Mr. Fred Smith, the agent, resides at the mine, and cares for the company's interests.

The following table shows the product of the mine in past years:

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
1869	1	1,575	1879	715	1,432
1873	10	1,161	1880	658	471
1874	504	130	1881	736	1,007
1875	692	1,574	1882	841	1,667
1876	780	1,785	1883	855	1,377
1877	650	479	1884	964	174
1878	565	1,146	1885	1,085	476
Total				9,084	980

ALLOUEZ MINE REPORT,

NEW YORK, March 9, 1886.

The directors make the following report of operations during the year 1885:

In the report made to stockholders a year ago, the directors stated as their belief that with the present outlook of the copper market, it is for the best interests of stockholders that operations at the mine should be suspended at an early date." In accordance with this policy, it was determined to cease work as soon as consistent with the necessity of working up the larger part of the supplies and fuel on hand, thereby incurring the minimum of loss incident to suspending work in so large an undertaking.

The 1st of June was fixed as the date for suspending work, but shortly prior to that time the directors received from a firm of merchants doing business on the mine location and elsewhere—and who had experience in mining—a proposal to lease the mine, buildings, machinery and tools, and a lease therefor was made to them for a term of three years from June 1,1885, on a royalty or rental of one-tenth of the copper produced, to be delivered at the smelting works at Hancock, Michigan. In conformity therewith the lessees took possession early in June, and began to make a regular production with the month of July.

The following is a summary of the business of the year:

PRODUCTION.

By the company, January to May inclusive, 1,050,546 lbs. Ingot sold for		$115,855 51
By lessees, 1,119,980 lbs. Ingot, of which the company received one-tenth, or 111,998 lbs., sold for		12,339 83
		$128,195 34

EXPENDITURE.

Mining 67,180 tons rock, including hoisting, selecting and breaking, and all surface expenses	$60,032 77	
Railroad transportation of 62,500 tons rock to stamp mill	4,581 55	
Stamp mill reduction and treatment of 62,500 tons rock	27,756 58	
Transportation of mineral to smelting works	2,802 85	
Constructions (additions to machinery)	1,373 66	
Total expenditure at mine to May 31	$97,117 37	
Smelting, freight and marketing expenses on 1,050,546 lbs. copper, including New York office expenses	21,564 95	
Total expenditure to May 31	$118,682 32	
Add expenditure since date of lease, viz.:		
Insurance on mine buildings	$1,160 00	
Other expenses	1,729 26	
	2,889 26	
Total expenditure in 1885		121,571 58
Net gain in 1885		$6,614 76
The balance of assets from 1884 was		41,997 90
Leaving balance of assets, December 31, 1885, as per statement below, of		$48,612 66

ASSETS.

Cash in bank		$3,075 04
Cash in United States Trust Company		30,000 00
Copper on hand, 41,833 lbs. @ 10 7-10 cents, net		4,498 25
Accounts receivable		451 58
AT MINE.		
Cash in hand	$1,576 93	
Supplies and tools (exclusive of power drills and machine tools)	9,092 69	
Standing timber, not on company's lands (mostly sold to lessees, to be paid for as cut by them)	10,045 28	
		21,004 90
		$49,025 67
LIABILITIES.		
Accounts payable	$92 99	
Indebtedness at mine	320 42	
		413 01
Balance of assets, December 31, 1885		$48,612 66

By order of the Directors,
JOHN STANTON, *Treasurer*.

Office, 76 Wall street, New York. The mine is 4 miles north of Calumet and on the south line of Keweenaw county, in the S. ½ Sec 31, T. 57, R. 32.

THE WOLVERINE MINE

is worked on tribute by Messrs. Wilcox and Funkey, who leased in 1883 and have since operated it. As a result there has not been much additional opening made, while the old stopes have been completely exhausted. The map given herewith was made in 1883 and does not show the subsequent underground work.

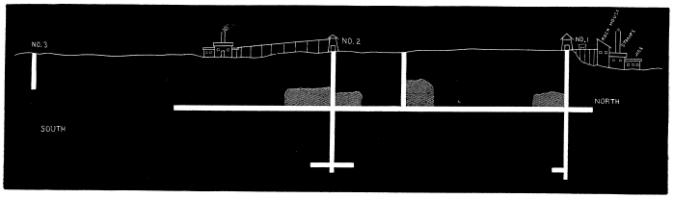
The Wolverine is a new mine, and for some reason the company does not seem to have met with the success anticipated. The construction account has naturally been heavy and the company has become involved in debt to a serious extent. The lode is epidote that possesses the characteristics of that class of deposits, having some very rich pockets and much poor ground. It is one of those lodes that experience has shown must be extensively opened and worked so as to avail themselves of the good ground and leave the poor. The mine was opened in 1882, producing in that year 12 tons and 1,623 lbs. of copper.

Product:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1883	349	1,622	1885	185	925
1884	400				
Total				948	170

T. W. Edwards, President, Houghton, Mich.

LONGITUDINAL SECTION OF THE WOLVERINE MINE.
Scale, 150 ft. to one inch.



THE CENTENNIAL MINE

has been idle for two years. The affairs of the company have been involved in the settlement of the estate of Mr. J. Hoyt, deceased. Capt. Josiah Hall., who had charge of the mine and does still, states that the mine is looking

well, and if properly worked would be a profitable one. It joins the Calumet on the north.

THE CALUMET AND HECLA

company has for some years been making extensive changes in its mining plant. These modifications include the substitution of heavy and more powerful machinery in place of that which was formerly used. The changes have been going on during a period of six years and are now completed. The numberless powerful engines, pumps, compressors, and the ponderous winding drums that one may see at this mine are indeed a sight worth beholding. Nowhere else on this continent, if indeed in the world, is there so much powerful and costly machinery employed in mining work. The machinery is duplicated throughout. The plan has been to open the mine several years in advance of actual stoping, and by the substitution of heavier machinery, and its duplication to secure a larger output, and to insure against any contingency arising that shall diminish the output. It has been done at the cost of an immense amount of money.

The undertaking of the Tamarack company was a valuable exploration for the Calumet and Hecla; it has strengthened the belief that this marvelously rich copper bearing lode underlies all the great extent of surface which the company here possesses. If it is a fact that this conglomerate deposit, without diminution in richness or in magnitude, continues throughout the Calumet and Hecla lands,—a supposition for which there is every possibility,—the wealth that the company holds is almost limitless. But the mining plant, the arrangements for operating the mine, although designed for meeting the wants for a long period to come, are cumbersome and costly, perhaps unavoidably so, as the conditions were fixed early and the mine has so far outgrown all that could have been formerly anticipated regarding it. Possibly radical and expensive modifications will still be required.

No. 1 Calumet and No. 1 Hecla shafts are down to the 36th level. The other shafts are to the 34th and 35th levels, but there has not been a great deal of stoping done below the 24th and not much in the 23d even. The levels are 60 feet apart perpendicular; some of the upper ones are slightly less than that. The mine has a vertical depth of 2,139 feet maximum, or a depth measured on the plane of the vein of 3,390 feet. The maximum length, leaving out the "Black Hills" mine, is 5,000 feet in round numbers. The latter is adjacent to the Osceola, south of the main mine, and in it only sinking and drifting have been pursued,—no stoping. It is claimed that the rock obtained from the openings has paid all the cost of the work. This Black Hills deposit is wider, but less rich than the vein further north. There is considerable of the lode left in the mine in the shaft pillars and in the floors of the levels. A very large amount of timber is used for stulls to hold up the hanging wall. The two man engines,—one in the Hecla and one in the Calumet mine,—are down to the 28th level, and will be soon completed to the 30th level. It takes about 20 minutes to go the bottom, using the man engine. They seldom Lave an accident to anyone on these machines. The shafts are all single skip except No. 5, which is double, but only one is used. The skips are steel and hold 2¼ tons each. The skips travel, in the Calumet shaft, 1,000 feet per minute, using the new engine—Superior.

They work about 1,000 men underground all told, working two shafts. The total force in October was 2,500 men; now—in January—it is 2,200,—men reckoned as so many days' work; they sum up the number of days' work done and divide by 26 to get the number of men. The total number of tons of rock mined and treated during the year was 535,820. The total product of ingot copper obtained was 47,247,990 lbs. All of this was from the stamp rock except about 2%, which was obtained from the "nigger heads," or small copper boulders, which are found in the Conglomerate. Taking out the 2% we have 46,303,030 lbs.; as the yield of the stamp rock we get 4.32% as the average yield of the rock.

At the average price at which copper sold for during the year, this copper brought, probably, $5,250,000. The company paid dividends to the amount of $1,700,000—which leaves $3,550,000 to be absorbed by the expenditures,—assuming the reserve to remain as it had been. The cost of copper was 7.4 cents per pound, which still leaves a margin for reduction, though probably the cost is as low as in any previous year. There has been a pretty heavy construction account the past year, mainly at the stamp mill and building the railroad down to the dock at Lake Linden.

The following table shows the amount of rock mined and stamped each year for 11 years, and the per cent, of yield:

Year.	Tons of Rock Stamped.	Yield Per Cent. Ingot.	Year.	Tons of Rock Stamped.	Yield Per Cent. Ingot.
1875	240,704	4.3	1881	340,080	4.61
1876	259,365	4.37	1882	344,132	4.59
1877	247,935	4.55	1883	372,570	4.45
1878	271,000	4.66	1884	435,392	4.63
1879	284,715	4.61	1885	535,820	4.32
1880	334,343	4.75			

It is estimated that the company owns 80,000,000 feet of standing pine.

A new hoisting engine has been put into the Hecla engine house, 2,500 horse power, the former one has been taken to Lake Linden to duplicate the pumping engine. They are also adding a powerful compressor to the plant in the Hecla mine. This is to use in case of anything happening to the old one. At the stamp mill the railroad has been built down to the dock, giving a grade from the head of the incline to the lake of 190 feet to the mile. They are preparing to do away with the inclines, and hereafter the locomotives will haul the rock cars directly to the bins at the head of the stamps. It is a very singular circumstance that the rock bins should have been set so low as to require the shoveling of the rock under the stamps instead of their being so placed that

the rock could be run under the stamps automatically, as is everywhere else the case; in the new arrangements this defect will be remedied. They have been changing the stamps, throwing out the Ball heads, and putting in the Leavitt. There are seven heads in the Hecla mill, and five in Calumet. The mills are a short distance apart; each head works up about 225 tons in 24 hours,—or the six running stamps in the Hecla mill stamp 1,400 tons of rock per day, and the Calumet mill stamps 800 tons. The rock is stamped down to the fineness of a three-sixteenth" screen. The shoes last five or six days; they are of chilled iron, held in place by dove-tail; do not differ from the shoes used in other mills; their weight is 675 lbs. each. The stamps are fed with water through a three-inch pipe running under 15 lbs. pressure; the force of the blow is 80 to 90 tons; mortar, 10 tons; anvil, 15 tons; shaft, 3,500 lbs.; piston, 1,500 lbs. It takes 64 tons of coal to each stamp per day.

There are four hydraulic separators, 52 jiggers all told for each head; making—7x52=364 in the Hecla mill. This mill turns out 60 tons of copper per day; the other mill 35 tons. They work 12 hours shift,—75 men and 70 boys in Hecla mill. Both mills have the same arrangements. The one is the duplicate of the other except in size. The slime is conducted through a discharge launder to a building, where it empties into the bottom of a huge wheel, 40 feet in diameter and 12 feet face. The water is taken up by the buckets on the inside of the wheel, which carry it up and empty it at the top into a launder that carries it out on a trestle into the lake. A portion is drawn off to the slime mill. The wheel is cogged on the outside and slowly propelled by a pinion on a shaft; the shaft being moved by a 30" rubber belt. The motion of the wheel is 4½ revolutions per minute. In the building is an engine 24"x48", which at any moment may be connected to run the wheel in case of emergency, but the power that drives it is obtained by wire rope transmission from the main engine-house.

The tail house is an experimental concern where they work up a portion of the tailings obtained from the big wheel. They work up as much of this refuse as two small heads will stamp, and thus save about 30 tons per month of mineral yielding 35% in copper. The company use no slime tables or vanners, or similar machinery other than the jiggers, to save the fine copper. The intention is to use slime tables in the future as soon as the arrangements are perfected. The tail house screens are three-thirty-seconds holes. A new boiler house 85'x210' has just been completed of brick, with slate roof, which will hold all the boilers at the stamp mills,—14 in all—6' diameter each, and 30 feet long. All the machinery in the mills is run from the main engine-house by wire rope transmission. In the same manner are run the incline, the slime discharge wheel, tail house, etc. All possibility of stoppage is provided against by having duplicated engines to run every portion of the machinery at any moment. There are nine shives for transporting the power by wire ropes. The shives are rubber lined; three-fourths-inch wire ropes are used. The shives are seven feet in diameter. The rubber lining is made of grooved sections 2½ feet long. The two engines, each with power for the whole business, are named respectively, the Erie and the Wabeck; the latter was doing the work when I visited the mill.

The great pumping engine that raises all the water for both mills is the Ontario,—its duplicate the Huron; the latter was lying idle. These four great engines in the one room are really an interesting sight. The mills are neat and orderly, and to stand in the Hecla building, watching the ponderous stamps and more quiet, but equally active, jiggers, one looks over a busy and pleasant scene. All the stamps in the Hecla mill have been changed, and the same is doing in the Calumet mill. This change effects a great increase in the output, as the new heads have a capacity of 225 tons per day, against 160 tons, the work of the old heads. The Hecla mill had originally only three heads, subsequently increased to four; but the building has been enlarged and three additional heads put in the past year, so that there are now seven. In the Calumet mill there are five.

The railroad extension is two miles; they are building a strong, heavy trestle to run the cars to the stamp mills.

Smelting works will be built the coming year on the lake about a mile from the stamp mills.

The changes that have been made at the stamp mills in the past year are certainly great improvements and must result in great saving to the company.

The Calumet & Hecla Company has the reputation of pursuing a very liberal policy with its employés. It pays better wages than any other company. The men are anxious to work for the company and are loth to leave its employ. In some other respects the policy of the company and its methods of work are the subjects of much criticism. The Calumet & Hecla is a great mine now, and it is not likely to be of less magnitude for many years to come. It is scarcely possible that the future of a mine could be better assured than is this. The estate is so large and all the developments go to establish the fact of the continuance of the lode under the whole of it, so that the only question in the remote future, it seems likely, will be how best to reach the copper.

It is a curious fact that the stock which in April last was only at $135, had advanced in Oct. to $220. The total dividends paid to Jan. 1, 1886, is $28,550,000.

The following table gives the product of the Calumet & Hecla mine for each year:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1867	657	1,173	1877	11,284	468
1868	2,549	375	1878	12,625	1,128
1869	6,157	1,771	1879	13,135	943
1870	7,030	1,584	1880	15,837	1,239
1871	8,111	590	1881	15,080	781
1872	8,081	183	1882	16,026	1,528
1873	9,424	295	1883	16,562	1,045
1874	10,062	1,235	1884	20,296	1,585
1875	10,736	1,054	1885	23,623	1,960
1876	10,845	732			
Total tons				218,689	1,217

The Calumet & Hecla Company, contrary to the custom that prevails among the copper companies of Lake Superior, is not disposed to give any details of the cost of production, etc., neither is the management willing to allow me to examine the map of the mine or to allow a copy of it to be printed in this report, a thing I very much desired to do. Such details as I have given were furnished me by the officers of the company, or deduced from the facts so obtained, and there is very much more of a descriptive character that I might have added, but it has been said before, in the main.

The officers are J. N. Wright, Agt., Calumet, Mich., Chas. W. Seabury, Sec. and Treas., Boston, Mass.

THE TAMARACK MINE

is now a reality; it is no longer a matter of conjecture, a thing of the future, a problemetical shaft, driving downward vertically a half mile into the earth, but it is an accomplished fact.

The Tamarack is now a mine, already producing copper on a large scale, and rapidly stepping to the front, soon to be second only to its great neighbor in the list,—the youngest and among the most vigorous of our mines.

In every particular this great enterprise has been a success; from its conception, from the time the first blow was struck, there has been no deviation, no change and no delay; the work has progressed steadily to its conclusion. All the statements and estimates that were primarially set forth by the promoters of the scheme, are fully verified in the result. The lode was found at the estimated depth and within the time and cost allotted for the work. And now that it is probed, after the long traverse through seemingly impenetrable rock, the deposit is proving to be all that the most sanguine could reasonably hope for. Altogether the Tamarack shaft is one of the boldest and most successful mining enterprises on record, and reflects immeasurable credit upon those who have planned and executed the work.

The Tamarack Mining Co. was organized January 1, 1882, for the purpose of sinking a shaft to the Calumet and Hecla conglomerate, which it was believed existed in the company's property at a depth of one-half a mile and upwards beneath the surface. All that could be certainly known was that the Calumet lode had thus far, in its downward course, proved persistent and there was a reasonable probability that it must continue in its course and its richness, and thus be possessed by the Tamarack people to the extent of that company's domain. But the matter could only be proven by years of labor and great expenditure, to result, if successful, in an abundant reward, and, if the reverse, in corresponding failure and loss. Messrs. Clark, Bigelow and Daniell fortunately possessed the faith and courage to undertake the enterprise and the ability and persistence to carry it through and in the end to see the realization of their strongest hopes.

The work of sinking this remarkable shaft was begun in February, 1881, and on June 20, 1885,—3½ years from the date of the commencement,—the lode was struck. It is an example of the most rapid sinking, in hard rock, that has anywhere been done.

The lowest monthly rate of sinking in 1882 was 42 feet, and the highest, 59.8 feet; the average per month for the year was 41.4 feet. In 1883 the lowest monthly rate of progress was 44 feet, highest 67 feet; average for the year, 59.7 feet. In 1884 the lowest monthly rate of progress was 58 feet, highest, 70 feet; average, 63.4 feet; 1885,—lowest, 60 feet; highest, 68 feet; average, 64 feet. Total depth from surface to Calumet lode, 2,270 feet. The varying rate of progress is due, it is said, to the character of the rock which was encountered. Thirty-two different beds of rock were met with in the first 1,200 feet, dipping northwesterly about 39° with the horizon. Among these beds was the Allouez conglomerate, which was but two feet in thickness at the point where it was cut, and carried but little copper. An amygdaloid bed that was intercepted proved better,—three tons of copper were obtained in passing through it, and other similar beds were cut, showing more or less favorable indications.

From a depth of 350 feet down very little water settled in the bottom of the shaft; the percolation above, however, is sufficient to keep the timbers thoroughly saturated and to cause some dripping down the shaft,—a good security against fire. The timbers are 10"x14" in size, and there is not the least particle of evidence of an excess of pressure.

The cost of sinking, all expenses included, was $61 per foot. Band's little giant drills were used in sinking the first 1,400 feet, and then two of Band's "sluggers" were introduced; the latter were found very suitable in extremely hard ground. The little giant is admirably well adapted to the work of penetrating rock of ordinary texture. Eighteen to 24 holes were drilled in each 24 hours' time, varying in depth from five feet to seven feet. They worked six days per week.

Giant powder was the explosive used in the early part of the work; later, that made by the Hancock Chemical Co. was used; the per cent, of nitro glycerine varying from 40 to 50, according to the hardness of the rock.

The total expenditures to January 1, 1886, have been, in round numbers, $274,000; the assessments amount to

$330,000. The expenditures in December last were $14,060, and against this 125 tons of copper were taken out.

They pay now for sinking $28 per foot. The cross-cuts from the shaft to the lode costs $8 per foot average, and driving in the conglomerate, costs $12 to $15 per foot. The cost of stoping varies from $10 to $14 per cubic fathom. Objection is raised to the great depth of the shaft before the lode is reached; but this seeming obstacle is speedily dissipated into thin air when we consider the perfection of the mechanical appliances for overcoming it. One can go to the bottom of the Tamarack shaft or rise to the surface from its greatest depth in nearly a moment of time and with nearly as much quietness and safety as he may ride in a hotel elevator. The rate of hoisting in the copper mines has usually been not in excess of 400 feet per minute. The Calumet and Hecla with its new machinery hoists 800 to 1,000 feet in this time, but its skips run on rails inclined 39° to the horizon. The Tamarack in its vertical, cage, shaft, operated with the minimum friction, will as easily hoist 1,600 feet to 1,800 feet per minute, the same load, so that they are, in point of time, no deeper, practically, at 2,000 feet down than others limited to the old rate of speed are at 500. The shaft is now (February, 1886,) 2,360 feet deep. The plumb lines, which Mr. Klepetko, the mining engineer, has dropped to the bottom, show it to be perfectly straight and true. It is substantially made, 19x7 feet inside the timbers, divided into three compartments, and every provision is made for safety.

The ropes are new, made of the best steel wire, and possess a strength far in excess of the strain to which they are subjected.

Each cage is provided on either side with automatic, self-acting, safety dogs that instantly clutch the guy posts and stop the cage, if by breakage or other cause the rope slackens.

Two compartments will be used for hoisting; the third one for carrying the men, and for timber, etc.

This latter cage will have an entirely independent plant of machinery designed especially for it; the compartment is not yet in operation, but is rapidly approaching completion. The rock house is joined to the shaft house, the screen dump being but 25 feet from the mouth of the shaft. The capacity of the rock house is equal to 1,000 tons per day; it is one of the best on the lake; is covered with iron to render it fire-proof, and is of ample size, well arranged and provided with every facility to meet all the future work of the shaft. The present shaft house is of wood, but it will soon be displaced by one wholly of iron,—iron frame and iron covering. The engine house is 112 feet southwest from the shaft; it is sheeted with iron inside, and such other precaution taken as to eliminate as far as possible the danger from fire. The two hoisting engines are each 30"x72". The winding drum is coned at the ends, the central portion being cylindrical; end diameters 14 feet, central diameter 18 feet. The engineer can tell at any moment at what point the cage is in the shaft.

It is possible that the maximum product the company will hoist in this single shaft will be 600 tons per day, but the shaft has, undoubtedly, a capacity of 1,000 tons of rock per day.

By using the two compartments,—doubled-decked cages in each,—1,000 tons can be hoisted per day and cared for in the rock house.

This amount would employ a force of about 350 men; at present the company has, all told, 122 men,—66 drill men working 11 drills, 5 landers, 20 trammers, 12 timbermen, 5 men in engine house, and three men and a boy in the rock house. The average underground wages being $2.00 per day.

They are now hoisting an average of 200 tons of rock per day. The December product was 125 tons of mineral; January, 174 tons, and February, 200 tons—the product for March was 250 tons—obtained from a total of 12,000 tons of rock, thus showing a yield of 4 1-6% of mineral, which yields 76% of copper. In January they stamped 4,310 tons of rock, obtaining 174 tons of mineral, equal to 133 tons of copper, or to a percentage of 3 1-12% ingot. The rock is treated in the Osceola mill, at Torch Lake, 7 miles from the mine, and reached by the Hancock & Calumet Railroad, a line that has been built and equipped from Calumet to Hancock, via the Osceola and the Tamarack mines, with a branch to Lake Linden and a switch to the stamp mill, etc., during the past year by the Tamarack and Osceola Companies.

Of course, the first thing in order is a stamp mill, and one will be built in the near future adjacent to the Osceola mill. It is expected that the earnings of the mine will provide the necessary funds. The mine produced in February 150 tons refined copper, worth 11 cents per pound. The cost is not much above $3 per ton of rock now, and the rock yields 61½ lbs. refined copper to the ton, so that the cost of the copper is not much above 6 cents per pound—a good margin of profit, to accumulate the money to build a mill and for other necessary expenditures.

The mine is looking well; the lode averages about 12 feet wide, and so far as opened is all good ground, that is, all the vein carries copper; not in equal amount, however; some of it is very rich, but the rich rock and the poor are everywhere, in all parts of the lode. If a light is thrown upon a smooth, vertical section of the deposit, it shows the rich and poor rock nicely; the dark, barren portions are strongly contrasted with the segregations of light colored rock richly impregnated with mineral,—a small amount of rock—5%—is rejected; this comes in part from the hanging, but also, mainly, from a deposit of sandstone that occurs in the vein south of the shaft. It is of variable width, but at no place takes more than five feet of the vein; sometimes against the hanging and again leaving a few feet of rich conglomerate between it and the hanging; in places it is simply a thin seam and wedges out entirely. So far they have no rich shutes of

copper, as are found in the Calumet and Hecla, to bring up the average percentage, a difference, however, that is more than compensated for by the comparative diminished cost of production in the Tamarack.

There is nothing non-essential to be seen about the mine. The machinery, etc., is simply what is required for the work. The whole plant and arrangements are snug and compact and economically operated. I deem it altogether probable that the Tamarack may produce copper more cheaply than any mine in the world. The mine itself is airy and comfortable; there is no pleasanter mine to be in, nor one which can be more easily entered or ascended from. It may be remembered that the shaft is in the corner of the company's property, which afforded the shortest distance to the lode, in the S. E. corner of the W. ½, S. E. ¼, Sec. 14, T. 56, R. 33. The whole estate comprises 1,280 acres, all in sections 10, 11, 14 and 15, town and range above given. The shaft is 260 feet from the corner horizontally measured at right angles to the strike of the formation, and the length of vein passing through the shaft from the east line to the south line is 570 feet; that is the triangular portion of the lode embraced between the lines and having its apex at the corner and lying above the shaft, is 570 feet base by 335 altitude. The dip of the lode—39°—gives nearly 100 feet of length of vein for each 60 feet of perpendicular, i. e., of vertical depth.

The ground above the shaft is opened in three levels; the upper being 104 feet, horizontally, from the corner, and the length of the lode between the lines is 224 feet. The second level is 65 feet, vertically, below No. 1, and has a length of lode between the lines of 400 feet. The third level is 57, vertically, below the second, and may be opened a length of 570 feet. At the time of my visit they had sunk the winze and driven the cross-cut for the fourth level. The winze was throughout as rich conglomerate as any I saw in the mine. Of course the mine is not largely opened, as only five months have elapsed since this opening work began. The levels are connected by winzes in the lode, and there are heavy pillars to protect the shaft when it passes through the conglomerate. Otherwise than those the vein will be all taken out, leaving in addition about 40 feet of the deposit standing along the lines of the property.

The shaft will be continued down vertically and the lode reached by crosscuts from the shaft, driven at suitable intervals, probably at every second level. Of course these cross-cuts lengthen as the shaft deepens, but the matter of driving now is so quickly done and costs so little, comparatively, that it is of minor importance to what it would formerly have been. Aside from the mere question of cost, the vertical shaft possesses advantages that are very great; these are the concentration of work done to the rapidity of hoist; the safety and permanency of the shaft, due to the fact that it is all the way in solid rock, in the foot wall, where nothing can disturb it; also the fact that but little timbering will be necessary; the copper deposit will all be taken out, saving the cost of timbers and of pillars. The obviating of the necessity of having pillars is a valuable consideration, when we remember that the rock is worth $3.50 per ton standing in the mine, and the further fact of the great cost of timbering that would have to be met if the system of mining adopted should require that the mine be kept intact.

One cage comes up as the other descends, but one drum being necessary; in fact there is the least machinery for the amount of mining done of any mine in the district.

It is planned to sink No. 2 shaft, the location for it has been made, and preliminary steps taken to begin the work of sinking. The shaft will be 731 feet north of No. 1 and will intersect the lode at 325 feet below the horizon in which No. 1 intersects it. The north and south line connecting No. 1 and No. 2—parallel with the east line of the property—forms the hypothenuse of a right angled triangle of which No. 2 is at the angle of the base, No. 1 at the apex, and the perpendicular and base are respectively 416 feet, and 600 feet in length, measured horizontally.

The former distance is the length of the cross-cut from No. 1 at right angles to the formation; the base is the line of the strike of the lode at the point where the shaft will intersect it. The distance from No. 1 at right angles to this line of strike and measured on the plane of the vein, will be 528 feet, that is No. 2, which will be the same distance from the east line of the property as No. 1, will be 731 feet further north from the south line, and also 676 feet from the southeast corner, measured at right angles to the formation. This location of the new shaft was determined with the view of making a proper distribution of the ground to be stoped, and so dividing it as to make the most economical working of the two shafts. It will be 6'x18' inside the timbers and be divided into three compartments same as No. 1. These two shafts have a capacity of 2,000 tons of rock per day, equal to a daily product of 60 tons of ingot copper, which I venture to predict will be produced, as I before stated, at a lower cost than any equally large amount of copper has been heretofore put on the market. But while restricted to the Osceola mill it is not probable that a greater average monthly product than 350 tons will be reached.

The capital stock of the company is divided into 40,000 shares having a par value of $25 each, but which were worth in April last $33, and at the present time are quoted at $90, at about which figure they have been held since October.

Joseph W. Clark, Prest.; A. S. Bigelow, Sec. and Treas.; John Daniell, Agt.; John B. Quick, Mining Capt.

The following rules for the government of employés are of general interest to mining men, as showing the precautions that are taken:

TAMARACK MINE.—RULES AND REGULATIONS.

1. The officers at the head of the several departments of work shall be on hand every day before the whistle blows.

2. Chief machinist shall see that indicator-points for the guidance of engineers in hoisting are correct every morning. It is his duty to examine ropes and cages and to report their condition weekly. To see that shieves are in good repair and properly oiled.

3. Chief mining captain will be responsible wholly for proper timbering of the mine. He shall ride slowly through the hoisting shafts not less than twice weekly, so that an examination of the guides can be carefully made, and the condition of timbers in sides and ends of shaft noted.

4. The under captain shall be ready with the trammers to go into the mine at 6:50 a. m. Contract miners will be at liberty to go down ten minutes earlier than this, and men on company account must follow the trammers. An officer of the mine must be in the shaft house when men are being lowered, and he shall not be at liberty to change this rule without good reasons. The number of men in the cage at one time shall not exceed ten.

5. On change of shift it shall be the duty of one mine officer or one timberman appointed by the chief captain, to come out of the mine with last cage. This to make sure that all the men are out of the mine, and that no lamps, candles, or fires are left burning underground.

6. The signalling of engineer must be done at surface by the lander. He must ring four bells invariably when men are in the cage. Men must start from lower floor of shaft-house until the captain reports them as all down. Afterward, if it is necessary for anyone to go into the mine, he must start from the landing floor above.

7. The lander shall not signal engineer to stop or reverse engine while he may be hoisting except in cases of extreme urgency.

8. In the time devoted to hoisting nothing shall be sent into the mine that will not go into the car, and so be run on to the cage, without special instructions from the mine captain. Such cases shall be reported by the lander.

9. It is understood that at no time shall all the working officers leave the mine location. The mine captain and surface captain, shall make such arrangements as may be necessary to comply with this rule.

10. Every day the chief machinist shall try the fire pump, and test the fire hose at least once a week, oftener in the summer season. It shall be his duty also to know that the mine pump is always in order for forcing water to the roof of the shaft-house.

11. No smoking shall be allowed in engine-house, rock-house, in the shops of the mine, nor in the change-house. For mutual protection employés are requested to assist in enforcing this rule.

12. No admittance is allowed to engine-house without business, and every person is forbidden to hail or talk with engineer while he is on duty. This is deemed very important and must be enforced.

13. Engineers must, on being signalled, make due allowance for hoisting and lowering men, and be sure to know the brake gear is in good order before the commencement of work.

14. It must be understood that an empty cage is not to be sent to surface. When this is absolutely necessary engineer must be signalled by four bells.

15. Miners' supplies will be delivered at shaft-house when orders are left with the supply clerk. The mine captain will order the time of sending same underground. Deliveries will be made twice weekly—Monday and Thursday.

16. Orders from mine captain or timbermen sent from underground to machinist or surface captain for supplies, must be attended to promptly.

17. Employés quitting the service of the company should give a week's notice. In default of this, settlement will not be made until the expiration of that time.

18. Watchman will allow no stranger to enter shaft-house at night.

JOHN DANIELL, *Agent Tamarack Mining Company*.

Dated December, 1885.

THE OSCEOLA MINE

has a valuable history. No company has achieved better results, all things, considered, that the Osceola. At no mine has the success which has been attained been more dependent upon the use of modern appliances in mining work and the intelligence and energy of the management.

The lode possesses every degree of irregularity, and there is so much dead ground that the mine has had to be very largely opened in order to secure the product that has annually been made and the work has been done in a most effectual and economical manner. The misfortune in the Osceola mine is that the best ground is in the north end; the levels in this end are constantly shortening as the mine deepens. This is due to the fact that the Calumet and Hecla joins it on the north, and that the line of division of the properties, up to which the workings closely reach, bears north, 39° east, while the dip of the mine averages about 39° northwesterly, thus the boundary cuts diagonally across the lode, shortening it on the Osceola and lengthening it on the C. and H. The reverse is the case at the south end of the property, where the company has plenty of room to extend, but unfortunately the ground has not proved as productive in that direction. However there are signs of improvement; the south end is certainly better in the bottom than it has been heretofore.

The company began the year by making an output of rock of 500 tons per day, which continued until May 20, when the work of removing the mill was begun. It was taken down and reërected at Torch Lake, and on Nov. 17 two heads of stamps were again at work. In December 3 heads, and in January 4. During the time of removing the mill most of the force was employed on the new railroad, which was built to connect the mine with the mill. The underground openings were pushed, so that the mine is extensively opened. The mining cost for the five months when the mill was wholly idle was $46,076.60, which is really an investment to be realized upon the coming year, since it is mainly for opening, etc.

Omitting the expenditure for the five months, from June to October, and the cost of handling the rock was cheaper than ever before.

The No. of tons hoisted while the mill run were	14,515
No. of tons hoisted while the mill was idle	5,095
No. of tons hoisted from west amygdaloid	982
Tons of rock sent to mill were	22,954
Tons of rock rejected	22,310

The proportion discarded was in excess of the usual quantity because the stopes were so long unworked.

	Lbs.
Mineral obtained from the mill	2,104,790
Barrel work from mine	89,868
West amygdaloid	67,440
Total	2,262,098

The yield of ingot was	1,969,169 lbs.
Per cent. of ingot in mineral	85.724 per cent.
The rock hoisted was equivalent to	5,290 fathoms.
The yield in ingot was per cubic fathom	266.57 lbs.
The yield in ingot per fathom in 1884 was	332.57 "
The rock yielded in ingot to the ton hoisted	20.36 "

No. of feet of shafts sunk	965.7
No. of feet of winzes sunk	246.9
No. of feet of levels driven	4,333.3
Total	5,545.9

No. of feet of winzes sunk in west amygdaloid	61.6
No. of feet of levels driven in west amygdaloid	336.0
	397.6
Total feet of openings	6,243.52

	Feet.
No. 1 shaft was sunk 97.5 feet, its total depth from surface is	1,397.1
No. 2 shaft was sunk 261.1 feet, its total depth from surface is	1,636.3
No. 3 shaft was sunk 254.3 feet, its total depth from surface is	1,846.1
No. 4 shaft was sunk 322.7 feet, its total depth from surface is	1,357.6

No. 1 is 18 feet below the 15th level; No. 2 is 8 feet below the 18th level; No. 3 is 25 feet below the 18th level; No. 4 is 8 feet below the 15th level.

The drifting down in the 8th level was 124.5 feet; in the 11th level 267.6 feet; in the 12th level 443.5 feet; in the 13th level 485.7 feet; in the 14th level 530.5 feet; in the 15th 1,068.6 feet; in the 16th 583.3 feet; in the 17th 668.3 feet; in the 18th 151 feet.

There has been no effort to extend south of No. 4 shaft. The shaft has been sunk and the connections made with No. 3. It is intended to open south of No. 4, however, the coming year, and good results are anticipated, based on the apparent tendency of the copper to make from above in that direction. The mine is so variable that there is very little use to conjecture what any opening work will develop. The quality of the ground is very uncertain. Nos. 2 and 3 are connected in the 15th, 16th and 17th levels and the ground is generally good; the 18th is good all the way north of No. 3,—south it is poor. About No. 3 shaft, it is thought that the ground is better than the average of the previous year and that it is better than it was a year ago.

The Conglomerate mine has been drained to the third level during the past year, and a cross-cut 67 feet long in the third level, made to the Amygdaloid west; drifting south of the cross-cut, 166½ feet, has been done. The opening showed copper nearly all the way, in quantity sufficient to pay for working; but in following the copper ground it brought out into the Conglomerate. A winze is sinking under the second level and is down now 40½ feet in good ground; they are stoping to meet it in the third level. When the connection is made they may get at a better knowledge of the facts. I should regard this west Amygdaloid as very unsatisfactory ground to work, it is so very irregular and very uncertain. It the second level they have opened a length of 520 feet, but it is not as productive as in the third. The product is mainly mass and barrel work, not much stamp rock. In 1884 this mine yielded 150 tons of copper. The Conglomerate (C. and H.), which underlies this west Amygdaloid has in places a remarkably good hanging wall. Where it was worked out 10 years ago in large chambers the roof remains perfect. At other points it was broken up,—where the the hanging is broken and poor the conglomerate is said to have carried copper, but in the portion having a firm hanging, the conglomerate was proportionally barren, and the amygdaloid was good,—giving rise to the theory that the broken rock between the lodes allowed the copper to pass from the amygdaloid into the conglomerate.

The moving of the stamp mill and additions and changes, etc., cost $63,659.74. The mill is now as good as new, is built on the sandstone ledge; the R. R. track to the rock bins is 75 feet above the lake, and the floor of the tail house 14 feet. Everything about the new mill is convenient and of the most approved and substantial character. A dock and warehouse have been built; the former is 324 feet long, provided with facilities for handling freight. Also there are a new blacksmith shop, cooper shop, and five good dwelling houses,—all at the mill site. The company has three-fourths of a mile frontage on the lake.

A new hoisting plant has been put in at No. 3 in the past year. The shaft is double skip track, and one of them is used for hoisting rock, the other for taking the men up and down. The track for this purpose has been carefully lined up, it is straight as an arrow and laid with steel rails. The car for the men is in the form of stairs on which the men stand in rows on each step. The best steel rope is used and the hoisting machinery is employed for no other purpose. I judge it to be a very excellent arrangement for taking the men in and out of the mine.

The old machinery was removed to No. 4 and suffices for that shaft. The mine is fully equipped for some years to come. They are hoisting in No. 3, 200 skips in 10 hours,—with the old machinery could only hoist 60 skips in same time. The new machinery has many devices that makes it a very desirable plant.

STATISTICS OF COST AND OF WORK.

PERCENTAGE OF WHOLE EXPENSE IN EACH DEPARTMENT OF WORK.

Of rock-house to whole expense	.04856
Of transportation to whole expense	.06432
Of stamping to whole expense	.10701
Of incidental to whole expense	.09305
Of surface to whole expense	.01203
Of office to whole expense	.03045
Of amygdaloid mine to whole expense	.62891
Of west amygdaloid to whole expense	.06824
Total	1.0000

COST OF AIR DRILLS.

Miners	$650 50
Smiths, carpenters, machine labor	3,067 36
Steam, fuel	9,918 02
Supplies	2,581 97
Total	$16,147 85

TRANSPORTATION EXPENSES.

Tons of rock transported	72,923	
Amount paid railroad company		$12,557 48
Shovelling snow		729 19
Loading cars		466 55
Total		$13,748 22
Transportation cost per ton of rock		$18 85

STAMP MILL EXPENSES.

Superintendent	$784 80
Engineers	635 76
Firemen	1,014 13
Carpenters	691 05
Watchmen	271 75
Machinists	574 90
Smiths	415 70
Head trammer	510 08
Stamp feeders	2,166 41
Oilers	510 52
Sundry labor	899 77
Tramming	254 45
Overseers of wash-house	496 00
Copper washers	684 35
Laborers on machines	2,137 55
Tail house	565 35
Total	$12,660 12
Cost of fuel	$11,496 00
Illuminating oil	250 80
Lubricating	482 88
Hardware	109 67
Iron and steel	142 21
Tools and machinery	261 00
Waste	58 68
Packing	34 13
All other supplies	247 33
Total supplies	$13,082 60
Labor account brought down	12,660 12
Incidental	253 92
Credits—stamping for Tamarack Co.	3,131 00
Total stamping expenses	$22,965 64
Labor account per cent	.5304
Supply account per cent	.4695
Total number of days run	304.33
Total No. of tons of rock stamped	76,054
Total No. of tons stamped per ton of coal used	24 431-1000
Pounds of mineral produced at the mill	2,104,700
Per cent of mineral in rock	1.443
Cost of stamp and washing per ton of rock	$1.35 cents.
Barrels and masses	157,500 lbs.
Total lbs.	2,262,098
Total lbs. of ingot	1,939,169
Per cent of ingot	.85724

EXPENSES.

Total incidental expense	$6,421 00
Total office expense	6,612 67
Total surface expense	2,049 81
Total construction expense	22,996 05
	$48,019 44
Total cost of removing the mill	$63,659 78
Cost of ingot per lb.	8.843 cents.
Total average No. of men employed	435

OSCEOLA CONSOLIDATED MINING COMPANY.

BOSTON, February 11, 1886.

The following statement of business for 1885 shows that the surplus of the Company has been reduced from $231,530.20, as it stood on January 1, 1885, to $102,281.60 on January 1 of the present year.

The Mineral Range Railroad Company, in years gone by, has transported the rock of this Company from its mines to its stamp mill on Portage Lake, a distance of about twelve miles, but has charged most exorbitant rates for doing the business. There was also reason to expect that the United States Government would interfere with all the stamp mills of Portage Lake at no distant day, and compel them to desist from filling it up with their sands.

It was therefore decided by the Directors, early in the year, that the only way open for the Company to relieve itself of the burdensome railroad charge, and at the same time to anticipate any action which the Government might take, was to move its stamp mill from Portage Lake to Torch Lake, and to participate in the building of a railroad to connect its mines with that point. A most favorable site was found and purchased, and on the 20th day of May last the stamp mill was stopped and the work of removal begun. On the 17th day of November following, the mill resumed work at its new location, with the new railroad, called the Hancock and Calumet Railroad Company, running regular rock trains from the mines; and the Directors can now assure the stockholders that their mine is in a condition of equipment equal to any mine in the district for economical production. During this change the opening work of the mine was prosecuted with all vigor, and almost a year's reserve was added to the visible supply of productive ground. We have also the old mill site left, with its dock and warehouse, carpenter's and blacksmith's shops, barn and five dwelling houses. This property is valuable, and should be in demand.

These remarks explain how the surplus of the Company has been decreased. The work of moving the mill and setting it up on its new site cost, altogether, $63,659.78. This is made up of the following items:

Taking down, freighting and re-erecting old plant, making additions and completing	$41,476 96
Cleaning land, making roads, etc.	2,000 79
Dock and warehouse	3,475 55
Adit and pump shaft	2,000 00
New pump	2,142 88
New washers	2,400 00
Constructing dwelling houses, carpenter's and blacksmith's shops	9,000 00
The other construction work which was necessary was new engine and plant at No. 3 shaft, and moving the former engine there to No. 4 shaft, and providing pump house and pump on West Amygdaloid, which has amounted to	22,006 05
And the expense of keeping up the openings in the mine while the mill was being moved, was	46,076 60
Making an aggregate sum of	$132,942 43

Which was taken almost entirely from the surplus. The Directors wish to say that the foregoing summary was taken in the main from the elaborate report of their Superintendent, Captain John Daniell, which is on file at the office of the Company, and open at any time to the inspection of the stockholders. It is impossible to predict as to the future price of copper, but the Directors feel warranted in saying that there is more than a reasonable prospect of the Company's earning a handsome profit the present year with copper at to-day's price.

STATEMENT OF BUSINESS FOR 1885.

For sales of 1,669,169 pounds copper at 10 75-100 cents		$208,858 65
From sales of real estate		3,662 25
From interest receipts		2,857 60
Add balance of assets January 1, 1885		231,530 20
		$445,993 19
Expenses at the mine were	$213,674 08	
Other expenses, such as smelting, transportation, insurance, etc., were	43,771 68	
Expenses of construction were	86,265 83	
Total expenses		$343,711 59
Leaves balance of assets, January 1, 1886		$102,281 60

The Osceola has paid in dividends, $1,135,000.

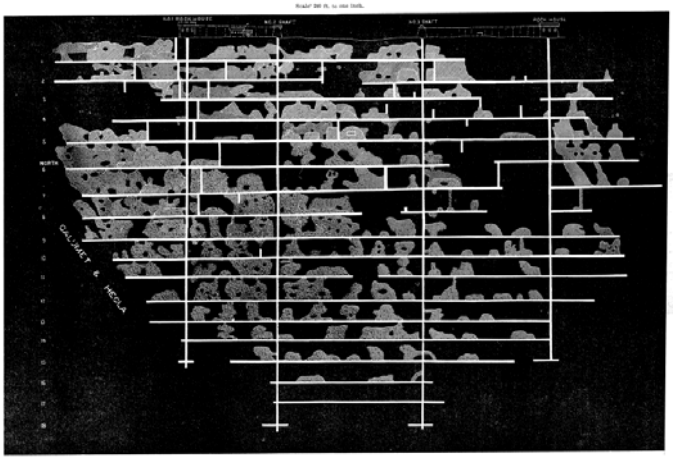
The yearly product has been as follows:

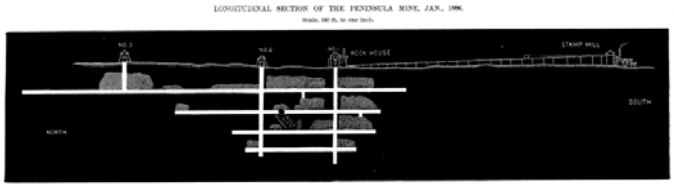
Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
1874	408		1880	1,691	1,387
1875	695	201	1881	2,089	1,876
1876	846	1,737	1882	2,088	782
1877	1,332	777	1883	782	2,128
1878	1,512	1,668	1884	2,125	1,630
1879	1,519	1,387	1885	960	1,169
Total				17,405	1,705

The capital stock is divided into 40,000 shares, $25 each, par value. Assessments to date $17.60 per share. Market value of the stock, January 1, 1885, $8 per share; January 1, 1886, $14 per share.

J. W. Clark, President, Boston, Mass.; A. S. Bigelow, Secretary and Treasurer, Boston, Mass.; John Daniell, Agent, Opechee, Mich.

LONGITUDINAL SECTION OF THE OSCOLA MINE, IN THE AMYGDALOID DEPOSIT, JAN., 1886.





THE PENINSULA MINE

is idle, having shut down in 1884. The company has reörganized with Hon. S. D. North, of Hancock, as president. It is contemplated to pump out the water from the mine and do some exploring. The mine is in the Allouez conglomerate and the lode here seems to hold its unusual characteristics, having some rich places, but a general average of leanness. The C. and H. conglomerate should cross the property, but has not been found. It is hardly possible for the company to work with profit at the present price of copper. The new mill has two,—Ball, improved,—stamp heads. The estate comprises 1,763 acres of land, and the company is free from indebtedness. A history of this mine will be found in the previous reports of Commissioner of Mineral Statistics. The Peninsula is the successor of the Albany and Boston, which company expended $840,000 derived from assessments and collapsed. The Peninsula began in 1882 and has expended about $270,000. The capital is divided into 40,000 shares, par value $25 each. S. D. North, Prest., Hancock, Mich. From 1862 to 1877 the total amount of 440 tons, 36 lbs. of copper; 1883,—424 tons, 1,400 lbs.; 1884,—612 tons, 1,981 lbs. No product in 1885.

THE HANCOCK MINE

has been closed down. It has been fully described in previous reports and there is nothing of interest further to record. It is a small mine situated in the village of Hancock, and is well equipped. But it has never proved rich enough to pay very well, certainly not when the price of copper rules at the present rate. The mine has one shaft, and is opened to the 10th level, 1,000 feet below the surface, on the floor of the vein.

Years.	Tons.	Pounds.	Years.	Tons.	Pounds.
From 1861 to 1880 the mine produced	1,403	388	1883	242	900
1881	285	1,897	1884	291	600
1882	270	575	1885	101	1,037
Total				2,584	1,384

Mining work was discontinued in the 1st of June, 1885, owing to the low price of copper. The officers state that if copper advances, the company will resume mining.

August Mette, Treasurer, Hancock, Mich.

THE ATLANTIC MINING CO.

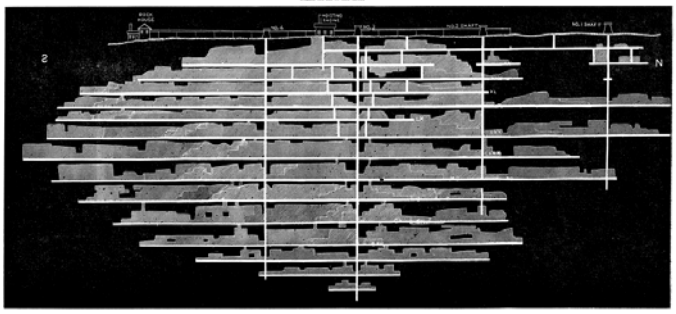
still holds the even tenor of its way and continues to secure the extraordinary low mining cost which has characterized its history and in this particular has placed the mine at the head of the list of mines in this country, and probably of the world. It does not seem possible that rock which affords less than 15 lbs. of copper to the ton, worth in the market $1.65, can be mined and manipulated so cheaply as to enable the company, each year, after paying all expenses, ordinary and extraordinary, to return to the stockholders a dividend of $1.00 to $2.00 per share; yet this has been regularly done, even with copper at a lower price than it has ever before sold for in the history of the country. How this is done I have endeavored to explain in the previous reports.

It is due, in brief, 1st to the deposit itself, which is a comparatively soft amygdaloid, not so soft but what it breaks well under the action of blasts, and dipping at an angle which allows all the dirt to slide freely to the bottom, and which is wide—having an average of 14 feet in width—and uniform, so that it is all stoped out; 2d, to the completeness of all the arrangements and facilities for doing the work economically, and 3d, to the excellent management both at the mine and at the stamp mill. The work in all its details seems to leave nothing to be desired, I have been underground through the mine recently, and I observe no change since three years ago, except in the matter of depth and extent of opening. The method of mining is the same; the contracts are let for the whole lode, $8 per cubic fathom, and in addition the company pays $7 per running foot for a drift 5'x6'; shaft pillars are left and floors to the levels, otherwise the lode is all mined out. Some stull timbers are used to hold up the hanging where it is necessary, and also for a floor in the upper back stopes. No. 3 is the only shaft that is sunk. They drift each way from it to No. 2 and No. 4, and rise up to hold these shafts. Sometimes the hanging wall is troublesome, owing to the occurrence of crossings and slips in the rock. In the fifth level, south of No. 2 shaft, is a block of good ground that is standing on account of the poor hanging. The plan is to take it out and to fill it with rock. The map shows the work done and the ground opened that is to be taken out. The skips hold 1½ tons; larger ones would be used, but the shafts are too small. The shafts are not well distributed; there is too long a tram south of No. 4 shaft. No. 1 has been lowered six levels since 1883—from the xxx to the xc. The lode under No. 1 is harder ground than in the south part of the mine; it looks leaner, but Capt. Tonkin states that the average yield is about the same, though the copper is coarser. The mass copper and barrel work amount to four to eight tons per month, most of which comes from the north end.

The depth of the shafts is, respectively, No. 3, 1,210 feet; No. 4, 1,040 feet to the 13th level; No. 2, 900 feet. They hoist in No. 2 from the ninth level. The maximum length of the mine is 3,560 feet, varying in width from 10 feet to 25 feet, with an average of about 14. A new stamp level has been added at the mill, making five now in use. The launder is two miles long and has an inclination of one-eighth of an inch in 16 feet; its transverse section is 16"x16". In point of economy the launder is far preferable to pumping the water from the

lake. They work 21 air drills and have a new single compressor to be used in case of emergency; same size as the others.

LONGITUDINAL SECTION OF THE ATLANTIC MINE, JAN., 1886.



They have had two fires at the mine within the year or two past; in October, 1884, the roof of the engine-house was burned off which delayed the work in the mine four days. Candles are generally preferred in the copper mines to lamps. Capt. Tonkin states that he introduced lamps in the mine on trial, and found the relative cost to be $1.00 per day in favor of candles. The trial lasted for a month.

The following table gives the important results of the mine's operations for the past 11 years:

	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
No. of tons of rock stamped	80,000	96,696	105,780	121,708	112,668	160,825	170,555	189,800	185,668	239,510	241,010
Yield of ingot per ton, in pounds	19.58	18.99	19.42	18.50	19.00	14.37	14.36	13.898	13.708	15.1	14.86
No. of fathoms broken in mine	5,628	6,550	7,091	8,296	8,095	9,929	9,240	10,170	11,163	12,210	13,403
Yield of ingot per fathom, lbs	278	280	290	243	266	244	2,735	259	240	259	267
Cost in cents per ton for stamping and washing	8,706	6,709	5.779	4.885	4.244	3.813	4.254	3.707	3.535	3.895	3.056
Total cost per ton of rock mined, etc.	3.90	3.58	3.08	2.78	2.33	2.25	1.96	1.9082	1.7789	1.71	1.436
Total average cost per pound, ingot	22.12	18.85	16.37	16.83	12.30	15.84	13.68	13.76	12.50	10.87	09.36
Average price per lb. received for copper	.2247	.2125	.1854	.1615	.1630	.1997	.1712	.1756	.1500	.1181	.1116
Dividends paid				20,000	30,000	40,000	80,000	80,000	40,000	20,000	40,000
Net profit per ton of rock		.44	.51	1.01	.87	.5000	.4711	.4068	.2483	.0919	.2395
Per cent of copper in rock	.976	.940	.971	.925	.95	.713	.718	.626	.685	.755	.743
Gross value of products per ton of rock								2.40	20.272	1.734	16.595

The total expenditures of the mine down to the close of the year 1885 amounted to the sum of	$5,712,117 83
The capital stock paid in, $17.50 per share	700,000 00
Assessments	290,853 15
The aggregate sales of copper amount to	4,893,229 79
Dividends paid	320,000 00

The following facts were given me by Mr. H. A. Van Tassel, the clerk at the mine, and also in part taken from the Company's Annual Report:

SUMMARY OF RESULTS, 1885.

Ground broken in openings and stopes	13,403 cu. fathoms
Rock stamped	241,010 tons.
Product of mineral	4,913,167 lbs.
Product of refined copper	3,582,256 lbs.
Yield of refined copper per cubic fathom of ground broken	267 lbs.
Yield of rock treated, 14 86-100 lbs. copper per ton, or	743 per cent.
Gross value of product, per ton of rock treated	$1.6595
Cost per ton of mining, selecting and breaking, and all surface expenses, including taxes	.7932
Cost per ton of transportation to mill	.0480
Cost per ton of stamping and separating	.3036
Cost per ton of running expenses at mine	1.1378
Cost per ton of freight, smelting and marketing product, including New York office expenses	.2545
Cost per ton of working expenses	1.3923
Total expenditure per ton of rock treated	1.4360
Net profit per ton of rock treated (exclusive of interest earned)	.2395

STATEMENT OF WORKING EXPENSES AT THE ATLANTIC MINE FOR THE YEAR ENDING DECEMBER 31ST, 1885.

UNDERGROUND EXPENSES.

Sinking 81 feet, average $22		$1,782 00	
Drifting 3,402.1 feet, average $7.38		25,096 20	
Stoping 12,898 130-216 fathoms, average $7.97		102,780 63	
Timbering, tramming and labor		37,306 16	
Timber, materials and supplies		7,388 71	
Pumping and operating air compressors, etc.:			
Labor	$ 3,280 67		
Fuel	12,909 44		
Materials and repairs	2,111 88		
		18,401 99	
		$192,760 69	
Less profit on mining supplies		52,596 78	
			$140,163 91

SURFACE EXPENSES.

Superintendence and labor of all kinds, less sundry credit items		$20,280 37	
Supplies and materials		8,580 79	
Fuel		10,376 17	
Feed for teams, etc		1,093 80	
Fire insurance		360 00	
Taxes		2,928 30	
Canal tolls		366 81	
Expenses		446 76	
		$53,345 00	
Less amount received for rents		4,018 28	
			49,326 72

RAILROAD EXPENSES.

Labor		$5,618 83	
Fuel		3,783 51	
Supplies		2,165 25	
			11,567 59

STAMP MILL EXPENSES.

Labor		$20,193 60	
Fuel		35,002 24	
Supplies		10,679 15	
Insurance		665 00	
Taxes		340 00	
Teaming mineral, etc		302 00	
			73,175 08
Total running expenses			$274,233 30

CONSTRUCTION ACCOUNT.

At Mine.

Fire-box tubular boiler		$1,450 00	
Air compressor, 16½x30 inches		2,200 00	
Masonry, walls, settings and foundations		766 55	
Supplies, materials and new stock		821 66	
Labor		495 00	
Air drill		270 00	
Three dwellings		475 00	

At Mill.

Fire-box tubular boiler		1,500 00	
Materials and supplies		961 89	
Labor, additions to boiler-house, superintendent's house, foundations, etc		474 54	
One dwelling		200 00	

Railroad.

Six rock cars, complete		1,200 00	
			10,514 64
Total expenditures at mine			$284,747 94

The production of mineral was 4,913,167 pounds, which yielded 72 91-100 per cent., or 3,582,256 pounds of refined copper. The shipments to market during the year amounted to 3,566,066 pounds, which realized an average price of 11 16-100 cents per pound.

The following is a summary of the year's business:

PRODUCTION.

Copper sold and delivered	2,729,588 lbs.	$302,316 72	
Copper on hand, sold	836,478 lbs.	95,464 49	
	3,566,066 lbs.	$397,781 21	
Copper at smelting works, Dec. 31st, '84, 348,791 lbs., valued at 9 cents, net		$31,391 19	
Copper at smelting works, Dec. 31st, '85, 364,981 lbs., valued at 9 cents, net		32,848 29	
			1,457 10
Net value of product of 1885			$399,238 31
Add balance of interest account			3,065 92
			$402,304 23

COSTS.

Working expenses at mine as per clerk's tables		$274,233 30	
Freight	$11,673 40		
Smelting	40,227 54		
Expenses	6,147 58		
Brokerage	1,976 23		
Insurance	1,194 60		
Storage	111 50		
		61,330 85	
			335,564 15
Showing a mining profit in 1885 of			$66,740 08
There has also been expended for addition to plant, as per detailed statement hereafter			10,514 64
Leaving a net gain for the year of			$56,225 44
The surplus from 1884, after disposal of copper on hand and payment of dividend, was			246,471 36
Making the net surplus, Dec. 31st, 1885			$302,696 80

as shown in detail in the annexed statement of assets and liabilities, and out of which a dividend of one dollar per share ($40,000) was paid January 28th, 1886.

ASSETS AND LIABILITIES, ATLANTIC MINING COMPANY, DECEMBER 31ST, 1885.

ASSETS.

Cash		$120,230 49
Copper on hand, 836,478 lbs., sold for		99,464 49
Copper at smelting works, 394,961 lbs., valued at 9 cents, net		32,848 29
		$254,543 27
At Mine.		
Cash	$ 2,863 24	
Coal	13,480 80	
Wood	1,887 50	
Supplies	25,375 82	
Merchandise in store	41,536 76	
		85,143 82
Total assets		$339,686 59

LIABILITIES.

Indebtedness at mine	$20,143 44	
Agent's drafts outstanding	6,261 30	
Accounts payable	10,580 05	
		36,989 79
Balance of assets		$302,696 80

(Less dividend payable January 28th, 1886, $40,000.)

The following is Capt. Tonkin's statement regarding the mine:

No. 3 shaft has been sunk to the 15th level, and drifts extended north and south. Some stoping has been done in the back of the level. Drifting and stoping have been carried on in the 14th level, north and south of No. 3 shaft; also in the 13th level north and south of No. 3 shaft. The south drift of this level has been connected with No. 4 shaft.

Considerable work has been done in the 12th level. The north drift and stopes have passed the transverse vein, without encountering barren ground. In all the upper levels the lode has been barren for 50 to 75 feet in length in the immediate vicinity of the transverse.

We have also been working, with fair results, in the 9th, 8th, 7th and 5th levels, north of No. 2 shaft. No. 4 shaft has been extended to the 13th level. South of this shaft we have been, drifting and stoping in the 13th, 12th, 11th and 10th levels.

The water in the mine has increased to that extent that it became necessary to replace the 6-inch pump at the 10th level with a 7-inch pump. The larger pump fully supplies the pumps at the upper levels, and thereby lessens the speed of the pumping engine.

The skip roads and pumping machinery are in very good condition for future work.

We shall immediately begin to extend No. 2 shaft to the 11th level, No. 3 shaft to the 16th level, and No. 4 shaft to the 14th level.

You will observe by the map—which is filled up to date—the pillars and arches which have been left for the protection of the mine; also, that but little work is required to connect No 2 shaft with the 11th level, and No. 4 shaft with the 14th level, as the stopes have passed beyond the line of the shafts.

STAMP MILL.

At the stamp mill, the results attained have been very satisfactory. The rock has been treated at a considerable less cost than in any previous year. We found it necessary to add to the mill plant a new tubular boiler, 23.6 feet long by 5 feet diameter, with 83 3-inch flues, and to accommodate it, erected an addition to the boiler-house 72x12 feet, with stone foundation. We also built a copper-shop, 16x18 feet; a log dwelling, 20x26feet, and an addition, 14x15 feet, to. the superintendent's house. The machinery is in very fair condition, excepting No. 1 head, which requires a new frame and a mortar, both of which are on hand, and will be put in place at an early date.

RAILROAD.

The railroad has been operated very successfully throughout the year. The road and rolling stock are in very good condition. We have put in the road 1,104 new ties and one-quarter mile of new steel rails, and have built six new rock cars. The locomotive "Atlantic" has been refitted with a new set of flues and four new tires. The present plant is all that is necessary to do the work on the road for some time to come. A large washout occurred last spring, which carried away 100 feet in length by 20 feet in depth of an embankment, and the expense of rebuilding has added somewhat to the running expense of the road.

MACHINERY.

The plant at the mine is in fair condition. The rock-house machinery has ample capacity for years to come. The hoisting machinery for Nos. 3 and 4 shafts has done the work very satisfactorily. We have removed one of the old two-flue boilers, and replaced it with a new tubular boiler 22 feet long-and 5 feet diameter, with 84 3-inch flues. To make room for this boiler, a stone addition, 10x66 feet, was built on the boiler-house. The new boiler has reduced the consumption of fuel.

CONSTRUCTION.

The old boiler has been added to the battery at the pump and compressor house, which has been enlarged by a stone addition, 10x60 feet, covered with a slate roof. A sheet-iron stack 50 feet high has also been erected, standing upon a stone base 10 feet square and 15 feet high.

It was necessary to add to the compressor power to give opportunity for repairs to the old compressor, and to assist, when necessary; and we have purchased a new compressor, 16½x30 inches, from Messrs. S. E. Cleaves & Son, Hancock, and set it upon a stone foundation, 32x11 feet and 8 feet high. The new machine works very well.

I notice a change in the screens in the rock-house, which seems to me to be an improvement. The rock now passes over two sets of screens instead of one, as formerly; the one is directly under the other, with the bars at right angles. So that while the upper one discharges to the south, for instance, the lower one inclines to the east. The bars in the upper screen are six inches apart, in the lower one 2 inches. The fine rock is thus separated from the coarse, and there is less handling of it than heretofore.

I have fully described the Atlantic mine in the Commissioner's Report for 1881, and that description will suffice now with very little change, mainly such as the maps themselves show. The Atlantic is the most southerly of what are called the south side mines—south of Portage Lake.

The following table gives the product for each year:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1860	6	1,475	1876	917	1,041
1867		1,760	1877	1,027	304
1868	704	258	1878	1,132	1,692
1869	823	857	1879	1,152	1,822
1870	180	617	1880	1,170	1,195
1871			1881	1,294	9
1872			1882	1,315	1,708
1873	431	1,736	1883	1,341	197
1874	686	493	1884	1,586	1,585
1875	783	1,036	1885	1,791	533
Total				16,378	1,761

John Stanton, Treas., New York; Wm. Tonkin, Agent, Houghton, Mich.

THE HURON COPPER CO.

is to be congratulated on its success with an abandoned mine. The Huron is an old mine; work was begun here in 1855 in the Isle Royal lode. Upwards of $1,000,000 were expended in the vain effort to secure a paying mine. From 1868 to 1871 it was called the Agawam, when its name was changed to the Houghton, and so continued until 1880, when under the present organization the old name was restored.

Messrs. Demmon and Vivian, the gentlemen to whom, I judge, the credit of the success of the Huron is chiefly

due, have accomplished an excellent result in many ways, in placing this mine upon a paying basis. It is an illustration of what mining skill, energy and good management will do. It is a valuable experience for the south side mines, and for the mining country generally. So well has it been managed and pushed that if copper were at the price it held a few years ago, the Huron would be in an assured position. The stamp mill has been enlarged and perfected and is, within the limits of its capacity, a first class mill. It contains two Ball stamps,—15" cylinders. The steam power is in excess of what is at present required at the mill, even though it runs the stamps and pumps the water for the boilers at the mine. Capt. Vivian designs to run the main shaft out to the west 75 feet and erect a third stamp and the necessary washing machinery. An addition to the building will be required for this purpose. Capt. Vivian expresses confidence that there is sufficient water for four heads of stamps and thinks they may ultimately use that number. The walls of the mill are stone, built on the solid ledge. The blows of the stamp heads make no sensible vibration. About 70% of the rock that is broken in the mine goes to the mill and yields 1.18% of ingot copper. The mine is very peculiar; the characteristics of this lode are well understood; it is bunchy,—the prevailing mineral is epidote. There is a great deal of barren trap, with occasional bunches of ground rich in copper. There are two shafts used, No. 6 and No. 8, both of which are down to the 13th level, a depth of about 1,000 feet, measured on the plane of the vein. The length of the mine is 1,620 feet, bearing N. 32° E. and dipping northwesterly. The barren portions of the lode through which opening is made, are left standing, as will be seen by observing the map of the mine herein contained,—the dark portions represent those which, are left. All the way from the 70 down, between the shafts, the mine has been poor. During the past year all the stoping has been done to the north of No. 6, and south of No. 8.

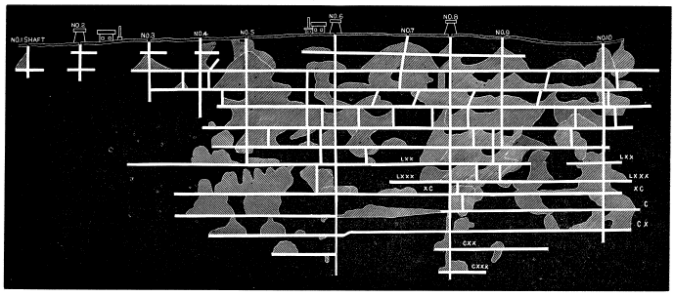
The 5th level has been extended north 40 feet, and some stoping done at the end of it; also in the 6th level, north, a small amount of work has been done at two points; but the 8th has been extended 160 feet north and near the end of its former terminus a large quantity of stoping has been done. They have worked out a chamber 80 feet high and in lateral dimensions 60'x 60'. At the extreme south also, in this level, some stoping was done and the level extended 20 feet. In the 9th, in the past year, the extension north has been 70 feet, and three large blocks of ground have been removed to the full height of the level. They are situated from No. 6 shaft, respectively, 200 feet, 400 feet, and 480 feet. Also 500 feet south of No. 8, some work has been done. In the 6th level, 550 feet north of No. 6, a large block was taken 100 feet long and of the full height and width of the vein. This is new ground, reaching beyond the old workings. On an old stope, 160 feet north of the shaft, the back was taken out to the level above. At the south end, 540 feet from the shaft, some stoping was done, somewhat more than in any level above, showing an improvement in the vein at this point, which was still further manifest in the level below, where as good ground was found as any in the mine. The level was driven south 200 feet, and No. 10 shaft sunk to near the 12th level.

In fact all the work shown in the map at the south end of the mine, in the vicinity of No. 10 shaft and below the 7th level, has been done in the past year. The extension south 220 feet of the 12th level was all in good ground; the driving will be continued 200 feet further, and it is believed that the ground will be equally good, judging from the experience in the level above the 12th. No. 8 was sunk one lift to the 13th. They are now driving south 70 feet from the shaft, in good ground. From the 11th down the shafts have not been connected, the ground is too poor; the distance between them in the bottom is 345 feet. The southwest part of the mine promises well for the coming year. No. 6 is nearly to the 13th, no drifting has been done at the bottom, but in the 12th they have drifted north 250 ft. from the shaft, and at the end have stoped a block of ground 60 feet long and 40' high. Also in the 11th, at 200 feet north of shaft have taken a block of ground 70 feet long to the full height of the level. The total distance to which the level has been extended is 440 feet north. It is only good at the points where the stoping has been done. The openings in the coming year will be pushed south of No. 8 and north of No. 6 as heretofore, with, so far as present indications go, as good prospects of success as now.

They work 16 power drills. There is evidently all possible economy exercised about the mine.

LONGITUDINAL SECTION OF THE HURON MINE, JAN. 1886.

Scale, 300 ft. to one inch.



The following statistics will illustrate the work:

The mining labor cost		$43,251 38
Total number of feet sunk—shafts		278 7-10
—winzes		210 1-10
Average price paid per foot for sinking shafts was		$18 41
winzes		10 32
Total paid for sinking shafts		5,140 57
winzes		2,799 18
Total paid for sinking		7,939 55
Average number of men in this work		10

DRIFTING AND CROSS-CUTTING.

Average number of men engaged in this work		20
Number of feet drifted		1,849
Average price paid per foot for drifting		$10 41
Number of feet of cross-cutting		168
Average price paid per foot		$11 11
Amount paid for drifting		19,243 66
Amount paid for cross-cutting		1,971 73
Total		$21,215 39

STOPING ACCOUNT.

Total number of men employed in this work	73
By air drills (cubic fathoms)	5,701
Average price paid per cubic fathom	$9 77
Total amount paid for stoping	54,669 22
Total mining cost	143,082 03
Number company account men, average	97
Number contract men, average	111
Total number of men employed	208
Total number of tons of rock hoisted to the surface	120,129
Total number of tons of rock dumped in the mine	4,503
Total	139,129
Number of tons rejected	43,653
Number tons sent to mill	95,476
Per cent. of rock rejected	31.37
Average surface force	14½ men
Total wages	$8,746 83

STAMP MILL EXPENSES.

Average number of men	33
Cords of wood consumed	7,465
Tons of coal consumed	1,702
Cost of wood	$21,701 39
Cost of coal	6,619 44
Cost of labor	11,906 80
Repairs, etc	3,834 97
Total	$44,063 00
Average cost for stamping, etc., 1 ton of rock	46.15 cts.
Average number tons stamped per cord of wood used	9.87
Pounds of mineral produced	2,757,848
Per cwt	1.64
Pounds of refined copper	2,258,885
Per cent. of copper in metal	82

TRAM ROAD EXPENSE.

Number of men	8
Cost of labor	$3,460 30
Total tram road expense	4,121 34
Cost per ton of rock	4.31 cts.

ROCK HOUSE EXPENSE.

Average force	36 men.
Total labor cost	$13,460 15
Total cost	14,423 94
Cost per ton of rock stamped	15.11 cts.
Average cost of handling one ton of rock hoisted	10.71 cts.
Cost of mineral at smelting works, per lb	8 cts.
Cost of ingot smelting, charges added	9.77 cts.
Average cost per ton of rock hoisted	$1 59
Pounds of ingot per fathom of rock hoisted	292
Pounds of ingot per ton of rock hoisted	16.23
Per cent. of ingot to rock hoisted	.811
Pounds of ingot in ton stamped	21.66
Per cent. of ingot to rock stamped	1.18
Fathoms of rock hoisted	7,720
Tons of rock hoisted	139,129
Total running expenses for the year	$220,729 58
Cost per ton for rock hoisted, less construction account	$1 58
Tons of rock on hand, Jan. 1, 1885	20,000
Tons of rock on hand, Jan. 1, 1886	10,400

The following is taken from the company's published report for the year 1885:

CASH RECEIPTS AND EXPENDITURES OF THE HURON COPPER MINING COMPANY FOR THE YEAR ENDING DECEMBER 31, 1885.

Cash on hand January 1, 1885	$6,266 33
Cash received from sales of copper, 2,220,685 lbs., at 10 930-100 cents	251,120 64
Cash received from sale of silver	315 73
Cash received from interest	105 15
Cash received from loans	431,180 95
	$689,034 75

Contra.

Cash paid loans	$417,412 73
Cash paid mine agent's drafts	222,214 75
Cash paid smelting, freight, copper charges and brokerage	38,548 13
Cash paid interest, expense, insurance, storage and taxes	10,169 38
Cash on hand December 31, 1885	689 16
	$689,034 75

ASSETS AND LIABILITIES OF THE HURON COPPER MINING COMPANY, JANUARY 1, 1886.

Assets.

Cash on hand	$689 16
306,586 lbs. copper at 11⅜ cents	34,490 92
Supplies at mine	49,358 41
Notes receivable	9,090 40
Rock broken in the mine ready for hoisting, say 10,400 tons, valued at	10,000 00
	$103,628 89

Liabilities.

Mine agent's drafts	$18,963 35
Loans and bills payable	135,991 27
Liabilities at mine	28,093 16
Due for smelting and freight	4,881 11
	$188,873 89
Less assets	103,628 89
Balance liabilities December 31, 1885	$85,245 00

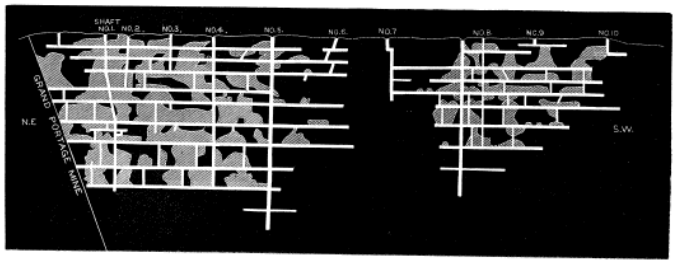
To offset which we have, exclusive of the mine, machinery, buildings, etc., valued at $127,202 71.

D. L. DEMMON, *Treasurer.*

March, 1886.

LONGITUDINAL SECTION OF THE ISLE ROYAL MINE, 1886.

Scale, 300 ft. to one inch.



Below we give a detailed statement of expenditures at Lake and Boston for the past year:

Mining expenditures, labor, etc	$43,251 38
Sinking 378 feet shaft and 210 feet winzes	7,993 55
Drifting and cross-cutting 2,017 feet at $11.11	21,215 29
Stoping 5,501 fathoms	54,620 22
Sundry labor, etc	681 76
Supplies and fuel	15,334 23
Surface expense	6,281 65
Stamp mill expense, 95,476 tons at 46 15-100 cents	44,063 11
Tram-road expense, at 4 31-100 cents	4,121 34
Rock-house expense, 95,476 tons	14,423 94
General expense at mine and office	8,757 51
Or a total of	$220,729 58
To which is to be added smelting, freight, insurance, expense, etc., paid in Boston	44,510 65
Or a grand total of	$265,240 23

The total production of mineral for the year was 2,757,848 lbs., which gave a yield of 81 90-100 per cent, refined copper, or 2,258,885 lbs., being a gain over 1884 of 371,510 lbs. mineral, 78-100 per cent, of yield, or 331,225 lbs. refined copper.

The highest price obtained in 1885 was 11½ cents; the lowest price obtained in 1885 was 9 8-10 cents; or an average for the year of 10 920-1000 cents. The average of 1884 was 13 887-1000 cents, making a difference in earnings of 2 967-1000 cents per lb., or a total of $67,021.12 for 1885 at same price as 1884.

The comparison is made only to show that at a reasonable price for copper the mine would have been nearly free from debt at this date, and easily on the way to a paying condition.

The mine and mill have done all that was ever predicted for them, and the only failure has been from the low price obtained for our product. The average price for the year previous was the lowest ever known to that date, i. e., 13 877-1000 cents; but a much lower point was reached in 1885, and our average was but 10 920-1000 cents, or nearly 3 cents per lb. less than 1884, making a difference in our receipts of over $67,000. It will be seen that the mine has made the handsome gain of 371,510 lbs. of mineral, or 331,255 lbs. refined copper over 1884, and our agent expects to give an increase over that amount in 1886.

His report will give full information and figures regarding operations there, and also show that the property in all its belongings is in first-class order and condition, and the fact that the cost of handling and manipulating the rock mined was but $1.59 per ton, tells its own story to every practical mining man.

SURFACE WORK.

Nothing of much importance has been done in this department, except the general running work, and the usual repairs to houses, work-shops, etc., all of which are in good condition.

STAMP MILL.

The mill, all things considered, has worked very satisfactorily. The amount of rock treated was 95,476 tons. Everything in this department is in good running order.

MINING WORK.

The openings made are as follows:

	Feet.
Sunk in shafts	278 7-10
Sunk in winzes	210 1-10
Drifted on the lode	1,848 6-10
Drifted in cross-cuts	168 4-10
Total	2,705 8-10

The amount of rock hoisted was 139,139 tons, which cost to manipulate, $1.59 per ton, which is a saving of 69 cents per ton over 1884, or a total for the year of $95,999.01. No. 6 and 8 shafts have been sunk from the twelfth to the thirteenth level, and No. 10 from the ninth to a point 40 feet below.

The lode in No. 6 shaft showed, from time to time, some good stamp work. No. 8 shaft, owing to the copper-bearing portion of the lode being near the hanging wall, is poor, but by cross-cuttings west, at the bottom level, we found some ground that will pay to remove with stopes, and which is still showing quite well in all grades of mineral. We have opened by drifts north of No. 6 shaft, from the fifth to the twelfth level, with about the same success we met with in former years. The bunches of productive ground seem to be regular both in size and value. The eleventh, twelfth and thirteenth levels have been extended south of No. 8 shaft, in the aggregate, 540 feet, and the eleventh level has been opened south of No. 10 shaft 80 feet. At some points in this part of the mine, as well as north of No. 6 shaft, the lode is showing some good stoping ground, while at other places the lode is very lean.

Our openings are well ahead of the stopes, consequently we have no trouble to supply all the rock the mill can treat, and if we had another head of stamps it could be kept running full time on the same class of rock as we are now handling, which would doubtless make a product from 175 to 380 tons per month, and leave, at present price for copper, a good profit.

PROSPECTS FOR 1886.

All things considered the prospects for the ensuing year were never better than they are to-day. If the mine continues to show as it does at this writing, and the machinery works well, as we have every reason to expect it will, a product of from 125 to 130 tons of copper per month can be kept up, which will give us a little profit.

Capt. T. H. Odgers severed his connection with the company in October last. His place has been filled by Capt. Thomas Whittle, who is a thorough, practical miner. His services will doubtless be of great value to the company.

Mr. J. H. Vivian, the clerk, has also left us to take charge of the office at the Osceola mine. His place has been filled by Mr. Alex. Loranger, who, with Capt. Whittle, are attending to the duties of their respective positions, to my entire satisfaction.

I am, yours respectfully,
J. VIVIAN, *Superintendent*.

The Huron mine has yielded as follows:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1855	3		1871	134	1,453
1856	12		1872	276	1,684
1857	35		1873	237	1,883
1858	24		1874	125	1,005
1859	22	1,387	1875	31	1,289
1860	4	1,000	1876	51	1,857
1861	49		1877	41	161
1862	69	1,905	1878	32	1,100
1863	69	306	1879	14	1,760
1864	50	1,745	1880	35	285
1865	258	11	1881	127	515
1866			1882	182	579
1867	683	1,164	1883	360	213
1868	740	80	1884	983	1,000
1869	841	863	1885	1,135	1,163
1870	42	183			
Total				6,616	561

THE ISLE ROYAL MINE

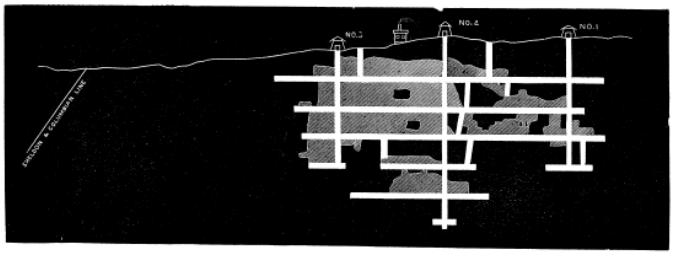
joins the Huron on the north. It is in the same lode. It is the oldest mine in the vicinity of Portage Lake but has not been worked, except by tributers, for many years. Possibly the success of the Huron may stimulate the owners of the Isle Royal or someone else to again undertake the working of the mine. The company owns an old stamp mill on Portage Lake, which is but a short distance from the mine.

The following table shows that the mine has produced well in the past:

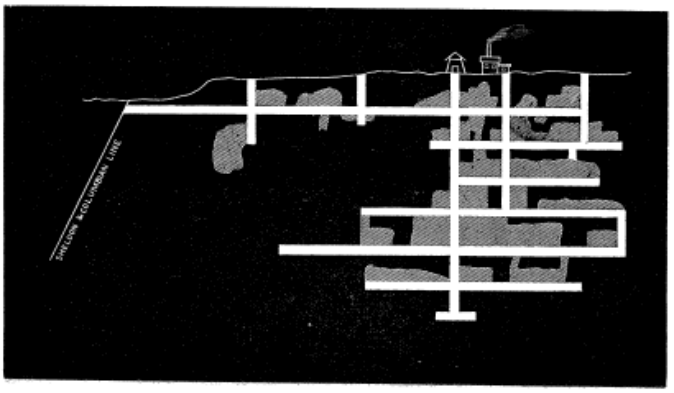
Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
Previous to 1855	58		1870		
1855	93		1871	90	1,217
1856	232	1,124	1872	125	164
1857	210	117	1873	120	100
1858	178	810	1874	90	876
1859	208	56	1875	48	682
1860	168	198	1876	14	199
1861	458	1,274	1877	15	1,985
1862	448	139	1878	15	1,933
1863	300	1,841	1879	13	880
1864	291	386	1880	80	1,469
1865	344	1,836	1881	23	1,908
1866	308	1,356	1882	17	1,447
1867	381	852	1883		
1868	147	1,093	1884	8	74
1869	75	672	1885	15	364
Total				4,092	71

Graham Pope, Agent, Houghton, Mich.

LONGITUDINAL SECTION OF THE GRAND PORTAGE MINE, EAST LODE, JAN., 1886.
Scale, 300 ft. to one inch.



LONGITUDINAL SECTION OF THE GRAND PORTAGE, WEST LODE, JAN., 1886.
Scale, 300 ft. to one inch.



THE GRAND PORTAGE MINE

was shut down in 1883. The mine was fully described in the report of 1882 and there is nothing to add beyond the fact above given. The mine has produced 1,613 tons 434 lbs. of copper.

Peter Ruppe, Sec. and Treas., Hancock, Mich.

Of the

SHELDON, COLUMBIAN,

there is nothing new to be said. In previous reports I have fully described the mine, etc. The aggregate product is 708 tons 548 lbs.

Graham Pope, Agent, Houghton, Mich.

THE QUINCY MINE

is perhaps first in popular regard among the copper mines of the peninsula. It does not possess the surpassing richness of the Calumet and Hecla, to be sure, but its experience is more in accord with the other mines. It is not so much of an exception. It is in an amygdaloid belt and the same difficulties and irregularities are met with that has been the common lot of all amygdaloid mines. Certainly, the Quincy is exceptionally rich, but that fact only stimulates the hope that others may finally prove equally so. The Quincy always comes up to what is expected of it; no one need ever to have lost money in the Quincy. Copper stocks may depreciate, but the Quincy stock as sure to get back to its maximum figures and the fortunate ones are sure to be those who purchased when the quotations were low. There are many persons in the copper district who have from time to time quietly added to their surplus by judiciously investing in Quincy stock, and there is no reason for any slacking of confidence in the mine. It is likely to be equally good for many years to come. Thus far, about 35 acres have been mined out and the estate comprises three quarter sections, and the mining right under the fractional lots along the lake margin, and also the Quincy lode on the one-fourth section of the Hancock Mining Company. The mine shortens, however, as will be seen from the map, to the north against the Pewabic line. The Pewabic comes in between the Quincy and the Franklin, the south line running east and west shortens the northerly extension of the Quincy levels more and more as greater depth is attained. Still the mine will soon reach the southwest corner of the Pewabic property, after which its levels can extend as far north as the company is pleased to go, since it owns the one-fourth section west of Pewabic.

The Quincy amygdaloid is a broad belt 200 feet wide, through which runs a main, irregular, deposit and east and west of it, within the limits of the belt, is a series of pockets which constitutes what are called the east and west deposits. The most productive is the east branch, reached by borings and cross-cuts in the foot wall; 600 feet of these cross-cuts have been driven in the past year, all to the east into the east branch. Altogether there has been 4,150 feet of drifting done in the past year, mostly in the 22d, 32d, 33d and 34th levels.

The rock treated yielded 3.052% ingot, or taking out the mass and barrel work and estimating only the washed copper, what went under the stamp heads, the yield of rock was 1.915%.

The stamp mill cost per ton of rock tested, including barrel work, was 54.5 cents. The total mining cost per ton of rock mined was $1.50. Tons of rock hoisted, 114,402; mined, 147,626 tons; treated at mill, 108,181; fathoms stoped, 6,755. They reckon 216 cubic feet and 18 tons to the fathom of ground. The following shows the items of the cost per ton of rock:

Cost per ton, total mining expense	$1.50
Cost per ton, sorting and breaking	.112
Cost per ton, stamping	.400
Cost per ton, surface and general expense	.067
Cost per ton, building and construction account	.121
Cost per ton, sundries	.057
Total cost per ton mined	$2.31
The product of 1885 exceeds that of 1884 by	100 tons.
The expenses of 1885 exceed those of 1884	$51,356 35
The expenses of 1884 exceed those of 1885	50,000 93
The cost of copper per pound in 1882 was	$0.096
The cost of copper per pound in 1883 was	.089
The cost of copper per pound in 1884 was	.086
The cost of copper per pound in 1885 was	.075

The average force employed was 400 men,—exclusive of choppers and teamsters. The average price paid the men was $44 per month; most of the men have families and live in comfortable houses; the board is $16 per month. The company charges the men $2.00 per month for rent for a good house. Some of the houses cost the occupants nothing; generally the men have land enough for a garden.

The company now use steel skips holding three tons each and weighing 3,800 lbs. The man engine is down to the 29th level. Both shafts are in rich ground; generally there has been an alternation in this respect, when one was in rich ground the other was in poor, and vice versa.

From the 24th level down there has been but little stoping in the east branch. North of No. 2 shaft the east branch has been, and still continues, rich; this is towards the Pewabic.

In No. 4 shaft no stoping has been done in either branch from the 24th down, but the openings and borings show that both branches are good. The cross-cuts into the east branch average about 60 feet in length.

No. 2 shaft is 2,714 feet in length, on the plane of the vein, and No. 4 is one level short of this. The levels are 90 feet apart. The 18th level,—the longest one,—is 3,500 feet in length. Water for the boilers at the mine is raised from the lake 540'; the length of pipe for this purpose is 4,400 feet; use a small Duplex Wellington pump. It requires one cord of wood per day for this purpose.

The Mineral Range R. R. Co. is building a branch to the Franklin and Quincy mines.

The vein bears N. 32° E., and dips N. W. 52° with the horizon. In the mill are 80 stamps,—old style small stamps; 72 in the large and eight in the: small mill. The latter is used for treating the barrel work, or "A" copper, as it is called.

The following, from the company's report, will explain all further facts likely to be of interest:

QUINCY MINE ANNUAL REPORT.

The directors submit the following report of the business of the mine for the past year, and statement of the financial condition of the company.

The shipment of the season was 7,091,765 pounds of mineral, which has been smelted at Detroit, and yielded about 82 47-100 per cent., or 5,848,497 pounds of refined copper.

The product of the mine, as prepared for shipment, was 7,091,895 pounds, or 3,545 1805-2000 tons of mineral, of the following description, namely:

Stamp copper	6,604,125 lbs.
Mass copper	487,680 "
Total	7,091,805 lbs.

for which, estimating the product left over at the mine at 82 per cent. yield, and all copper on hand unsold, at 11½ cents per pound, has been realized the gross sum of	$965,575 19
Realized from sale of silver	2,941 25
	$968,516 44

The expenses of the year were as follows:

Running expenses at the mine	$523,414 21
Building and construction account	17,829 67
Smelting, transportation and other expenses	97,377 06
	$638,620 99
which, deducted from gross earnings	968,516 44
leaves as a mining profit	$229,895 45
There has also been realized during the year, from interest on loans	3,238 28
From real estate, "Hancock"	2,500 00
	$235,633 73

The statement of assets and liabilities in our last report showed a balance on hand, as of date:

January 1, 1885		$517,346 68
Add earnings of 1885		235,653 73
		$753,000 41
Deduct dividend of February 16, 1885	$100,000	
Deduct dividend of August 17, 1885	80,000	
		180,000 00
Leaving balance of assets, Jan. 1, 1886		$573,000 41

A dividend of $4 per share, or $160,000, payable February 15, has been declared, which, with dividend of $2 per share, paid August 17 last, makes total from the year's business $240,000.

The usual financial statements are submitted, and also the report of the agent, which states clearly the present condition of our property.

THOMAS F. MASON, *President*.

GENERAL SUMMARY OF RECEIPTS AND EXPENDITURES OF THE QUINCY MINING COMPANY, FROM ITS ORGANIZATION TO DECEMBER 31, 1885,

Receipts.

From capital stock paid in	$200,000 00
Proceeds, copper and silver (82,320,408 lbs. copper)	16,878,493 79
Interest	106,240 07
Profit on sale P. L. & R. Improvement Company stock and other investments	79,637 16
Sales of real estate, Hancock, Mich	56,890 43
	$17,321,757 45
By balance brought down, being receipts over expenditures	$4,743,000 41
Deducting dividends declared, Nos. 1 to 34 inclusive	4,170,000 00
Leaving balance as per statement in detail below	$573,000 41

Expenditures.

For expenditure on location previous to 1850	$42,097 98
Expenditure on Quincy vein, 1858, not now worked	35,000 00
Openings and explorations on 3,800 feet "east" or Pewabic vein, extending to Portage Lake preparatory to future work	11,500 00
Real estate and permanent improvements on same, including dwelling houses, stamp mill, machinery, steam engines, tram road, dock, warehouse, and other buildings and roads	914,946 19
Mining and surface labor, expenses of smelting and marketing copper, and all incidental expenses	11,555,211 87
Balance carried down	4,743,000 41
	$17,321,757 45

STATEMENT OF ASSETS AND LIABILITIES, EXCLUSIVE OF REAL ESTATE, MINE PLANT AND SUPPLIES IN USE, JAN. 1, 1886.

Assets.

Loans on call	$200,000 00
Cash in bank	39,202 96
Cash on hand at mine	2,595 05
Copper on hand—East	261,635 17
Accounts receivable—since paid	27,946 78
	$512,379 96

Liabilities.

Drafts unpaid	$379 32	
Dividends unpaid	686 50	
Accounts payable in New York	18,200 00	
Accounts payable at mine	34,233 84	
		53,499 66
		$458,780 30
Add at mine 321,165 lbs. mineral at 82 per cent., 427,355 lbs. of copper	$49,145 63	
Add at mine supplies per inventory on file	46,299 30	
Farm account (horses, wagons, etc.)	18,579 01	
Accounts receivable	196 17	
		114,220 11
		$573,000 41
Less dividend payable February 15, 1886, $4 per share		160,000 00

AGENT'S REPORT.

QUINCY MINE, LAKE SUPERIOR, MICH
JANUARY 30, 1886.

During the year 1885 the principal openings made by drifting in the northern part of the mine were at the twenty-second level, north, and at the thirty-third and thirty-fourth levels north and south of No. 2 shaft.

In the southern part of the mine the principal drifting was at the thirty-second, thirty-third and thirty-fourth levels north and south of No. 4 shaft.

Other drifting and cross-cutting—mostly of an exploratory nature—was done at different places, and usually with good results. The drifting done in the main levels showed the usual peculiarities of lean stretches and rich deposits of vein at irregular intervals.

No. 2 shaft was sunk from the thirty-third to the thirty-fifth level, the last 20 feet being in a good looking vein carrying a fair percentage of copper.

No. 4 shaft was sunk from the thirty-second to the thirty-fourth level, and connected at the thirty-third level with No. 2 shaft.

The stoping done in the northern part of the mine was at various places between the twenty-second and the thirty-fourth levels. The most productive ground worked was at the thirty-second, thirty-third and thirty-fourth levels, but there are valuable blocks of stoping ground still remaining from the twenty-second to the thirty-fourth level.

Most of the stoping done in the southern part of the mine was at the thirty-first, thirty-second .and thirty-third levels north and south of No. 4 shaft.

The thirty-fourth level is now well opened and is showing a good vein, but no stoping of any consequence has yet been done there.

The thirty-second, thirty-third and thirty-fourth levels are opened, on what is called the "East vein."

During last February and March a cross-cut at the thirty-third level, near No. 4 shaft, was driven east, and at a distance of about 50 feet from the line of old workings it intersects a wide coppery vein. Cross-cuts to the same vein were subsequently made at the thirty-second and the thirty-fourth levels with like good results.

The diamond drill was used successfully during the year. The work done was at different points in the thirtieth, thirty-second and thirty-third levels north of No. 2 shaft, and in the twenty-ninth, thirtieth, thirty-first, thirty-second and thirty-third levels north and south of No. 4 shaft.

The extension of the man-engine shaft was not taken up until late in the year, but will soon be completed to the twenty-ninth level.

During the summer the old man-engine structure at the surface was removed, a new foundation of masonry built, new iron bobs erected in place of the old wooden ones, and all enclosed with a substantial frame building.

At No. 2 hoisting engine the worn-out friction gear was replaced with a new one of improved con-: struction.

A substantial stone engine-house was built for No. 4 shaft, and a new hoisting drum 18 feet in diameter is being made to take the place of the old one now in use. This work will soon be completed, and will add materially to our hoisting capacity.

The question of tram-road, or railroad facilities for the transportation of coal and other freight between the dock and the mine has been satisfactorily settled by making an agreement with the Mineral Range Railroad Company, who will complete a branch road to the mine early in the coming season.

No extraordinary repairs were made at the stamp mill during the year. The mill did its usual good duty, as shown by the tabulated statements prepared at this office by Mr. Kloeckner.

The following are some of the principal improvements under consideration for the present year:

The completion of the hoisting equipment for No. 4 engine-house.

The erection of trestles and coal-sheds for the delivery and storage of coal at the mine boiler-house.

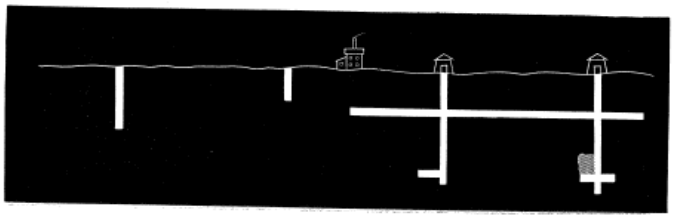
A set of new iron balance bobs for the man-engine at the fourteenth level, to replace the worn-out wooden ones now in use.

A partial extension of the old dock for the purpose of making room for a more economical disposition of a portion of the stamp sand.

S. B. HARRIS, *Agent*.

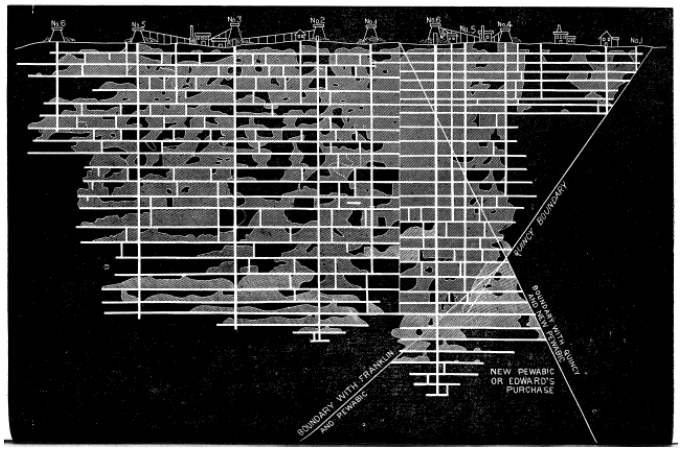
LONGITUDINAL SECTION OF THE MESNARD MINE.

Scale, 150 ft. to one inch.



LONGITUDINAL SECTION OF THE FRANKLIN AND PEWABIC MINES, JAN., 1885.

Scale, 400 ft. to one inch.



The product of the mine for each year is as follows:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1856	6	1,462	1871	1,304	1,501
1857	61	762	1872	1,134	1,134
1858	153	772	1873	1,000	.....
1859	178	1,114	1874	1,525	654
1860	970	414	1875	1,334	281
1861	1,282	852	1876	1,536	1,171
1862	1,153	218	1877	1,427	336
1863	1,115	1,737	1878	1,480	449
1864	1,251	586	1879	1,251	1,458
1865	963	1,500	1880	1,848	263
1866	1,172	1,000	1881	2,753	884
1867	1,013	1,000	1882	2,832	1,700
1868	737	1,000	1883	3,006	229
1869	1,208	1,365	1884	2,835	436
1870	1,248	1,777	1885	2,024	407
Total tons				41,089	622

Capt. S. B. Harris, Agent, Hancock, Mich.

THE PEWABIC MINE

is the subject of legal controversy, the suit now being in the U. S. Supreme Court. Without doubt the ownership of the mine and property will ultimately pass to either the Quincy or to the Franklin companies,—both need it very much, especially the Franklin, to whom the Pewabic would be of great advantage. It is altogether probable that the Pewabic is a valuable mine. It has had very rich ground in the past, and while at present the lower levels are poor, a change is likely to occur and the ground be again found rich as formerly. The mine, pending the litigation, is wholly idle ; the Franklin company uses the Pewabic man engine shaft. The Pewabic has produced since 1855 in the aggregate, 13,894 tons, 620 lbs. of copper. It has been very fully described in previous reports, and as no work has been done in the past year I find nothing to add beyond what has been previously written.

Johnson Vivian, Agt.; D. L. Demmon, Sec. and Treas., Boston, Mass.

THE FRANKLIN MINE

is one of the best examples of the results of what faith, energy and good management will accomplish when directed in the proper channel, that the mining region affords. For years, prior to 1874, the mine had been worked on tribute until it was nearly a complete wreck. The stopes had been entirely exhausted; the machinery worn out, buildings dilapidated, treasury empty, reputation and credit at the lowest ebb. Under these most unfavorable circumstances the owners resumed work with a cash capital of only $16,000, and so well have Messrs. Demmon and Vivian managed the affairs and conducted the work, that without having raised a penny by assessments, the mine has been brought to a dividend paying basis, with a large surplus in the treasury; the mining plant, buildings/etc., put into excellent condition, $40,000 having been spent on the stamp mill alone; in fact $250,000 have been expended in this work of improvement.

The mine is not a rich one; it possesses no extraordinary advantages. The success is due to the fact that capable, energetic men have held the control and were determined to succeed. Their energy and confidence inspired faith in others for themselves and for the mine, and assured them credit, which was the next thing to having the requisite capital. And thus from its ruinous, nearly bankrupt condition, the Franklin mine has been wholly metamorphosed, its affairs placed in sound financial shape, and the company, instead of begging of the stockholders an annual stipend to carry on the work, is returning to them a yearly dividend from the profits of the work. An excellent illustration is thus afforded in the recent history of the Franklin mine of the value of having the right men in the right place.

The accompanying map shows the mine as it was three years ago. Since that time lower levels have been extended north, and the three shafts have been deepened four levels. No. 2 is now to the 27th level. The increase in the depth of the mine in the past 11 years has been 14 levels.

No. 2 shaft is 450 feet north of the Pewabic line, is down to the 27th level, about 2,000 feet on the lap of the formation (54° dip), and is within about one level of the north and south boundary line of the property. No. 3 shaft is to the 26th level; it is 900 feet from the Pewabic line, and is about 1,900 feet deep. No. 4 is 1,380 feet from the Pewabic line. No. 6 is 1,890 feet north of this line, is not used and is only 210 feet deep. The maximum length of the mine is 2,240 feet.

The mine is in the S. W. ¼, Sec. 24, T. 55, R. 34 and begins at the south line and runs diagonally N. E. across the ¼ section; the dip is to the N. W. toward the west boundary line, and of course must ultimately cease at this limit. No. 2 shaft, at the south end of the mine, as previously stated, has nearly reached its final depth. The portion of the company's property in which the copper deposit is embraced may be designated as a right angle, triangle in which the surface line is the hypothenuse; the west and north line of the property are respectively the base and perpendicular, towards which the deposit inclines and by which the company is limited. The company owns also the one-fourth section adjoining on the north, so that as the formation bears N. 33° E. and thus the lode rapidly widens to the north within the limits of this property, it possesses sufficient working ground for an indefinite period to come. The one-fourth section lying on the west belongs, to the Pewabic Co., and is known as the Edwards purchase. The Pewabic mine workings have extended deeper than those of the Franklin and are thus not only deeper but directly under the south end of the Franklin. If the Franklin owned this land with No. 6,—the Pewabic shaft,—it would be in an assured position for product and economic working. The Franklin, Pewabic and Quincy mines are contiguous and in the same lode, long called "the Pewabic vein." The Pewabic was very rich in the old mine, but is now poor in the bottom. The Quincy has very rich places and the ground stoped averages above 3%. The Franklin has never been so rich in copper, but is good enough to pay well, at least when under the present management.

The following are the details of the work for the past year:

Total number of tons of rock hoisted, 173,616; rejected, 36,340; tons sent to mill, 137,276. Per cent, of rock rejected, 20. Two thousand and four feet of diamond drill boring was done during 1885.

The openings made are as follows:

Sunk in shafts	543 feet
Sunk in winzes	247 "
Drifted	2,924 "
Total	3,714 feet

The fathoms of ground broken, openings included, are $9{,}751^{824}/_{1000}$. The amount of rock hoisted was 173,616 tons, which cost to manipulate $1.95 per ton, which is a saving of 27 cents per ton over 1884, or a total of $46,876.32, for the year. The percentage of ingot copper in a ton of rock hoisted was 1.15.

No. 2 shaft has been sunk from the twenty-sixth to the twenty-seventh level. No. 3 shaft has been sunk from the twenty-fourth to the twenty-sixth level; and No. 5 from the twenty-third to within a few feet of the twenty-fifth level. The lode exposed in these openings seems to show about the same amount of copper as heretofore. The openings by drifts from the above mentioned shafts have been made from the eighteenth to the twenty-seventh level, with the same regularity as in past years, and the general appearance of the lode exposed seems to be as productive as at any time during the past few years.

Number of tons of rock stamped per cord of wood used was 13.69.

There are four Ball stamps in the mill, of the old style; they were procured in 1862.

The percentage of ingot in rock hoisted was	1.15
The percentage of ingot in rock stamped was	1.47
Pounds of ingot in ton of rock hoisted	23.04
Pounds of ingot in ton of rock stamped	27.58
Pounds of rock in fathom of rock hoisted	434
Cost of mineral at smelting works per pound	8.47 cts.
Cost of ingot at smelting works per pound	7.04 cts.
The total force averages 465 men.	
Stamp mill cost 41.44 per cent. of whole expenses.	
Rock-house expenses	$15,694 65
Tram-road expenses	9,039 28

STAMP MILL EXPENSES.

Average number of men	54
Cost for labor	$30,730 53
Average number of surface men	35
Total wages paid them	16,231 31
Total mining expenses	$225,198 69
Total surface expenses	11,568 07
Total stamp mill expenses	60,899 63
Total expenses for the year	$358,995 49

FRANKLIN MINING COMPANY CASH ACCOUNT FOR YEAR ENDING DECEMBER 31ST, 1885.

Cash on hand January 1, 1885	$24,138 79
Cash received from sales of copper, 5,398,387 lbs., at 11 044-1000	595,962 16
Cash received from sale silver	1,511 81
Cash received from sale supplies	189 14
Cash received from interest	795 59
Cash received from loans	57,000 00
	$679,597 49

Contra.

Cash paid dividend July 1, 1885	$40,000 00
Cash paid dividend account, November 11, 1872	2 00
Cash paid loans	102,000 00
Cash paid mine agent's drafts	328,037 91
Cash paid interest	732 25
Cash paid insurance	1,289 53
Cash paid storage	1,635 63
Cash paid smelting	41,537 15
Cash paid freight	10,576 51
Cash paid expenses, brokerage, taxes, etc	9,173 73
Cash on hand December 31st, 1885	140,782 97
	$679,597 49

RECEIPTS AND EXPENDITURES OF THE FRANKLIN MINING COMPANY FOR THE YEAR 1885.

Receipts.

Sales of 5,291,806 lbs. copper sold, averaging 11 044-1000	$593,547 05
707,366 lbs. on hand (sold at 11½ cents)	81,347 09
Sales of silver	1,511 81
Sales of supplies	189 14
Received for interest account	795 59
	$447,390 68

Expenditures.

At mine, as per yearly cost sheet	$318,995 99
All other expenses, smelting, freight, insurance, etc	62,134 12
Profit and loss. *Profit for 1885*	46,260 57
	$447,390 68

Highest price in 1885, 11¾ cents.
Lowest price in 1885, 9 80-100 cents.

D. L. DEMMON, *Treasurer*,

ASSETS AND LIABILITIES OF THE FRANKLIN MINING COMPANY, JANUARY 1, 1886.

Assets.

707,366 lbs. copper sold 11½ cents	$ 81,347 09	
Cash on hand	140,782 97	
Supplies at mine	78,047 06	
Received sales of silver	1,113 47	
		$311,290 59

Liabilities.

Drafts accepted and in transit	$30,686 39	
Liabilities at mines	29,747 75	
Due for smelting and freight	11,384 21	
		71,818 35
		$239,472 24
From which deduct dividend January 1, 1886		40,000 00
Balance assets January 1, 1886		$199,472 24

D. L. DEMMON, *Treasurer*.

Yield in 1881, 2,667,932 lbs. refined copper.
Yield in 1882, 3,264,120 lbs. refined copper.
Yield in 1883, 3,489,308 lbs. refined copper.
Yield in 1884, 3,748,602 lbs. refined copper.
Yield in 1885, 3,999,172 lbs. refined copper.

FRANKLIN MINE REPORT.

To the Stockholders of the Franklin Mining Company:

Herewith you will find the usual annual reports of your company for the year 1885, including agent's report regarding the workings of the mine, its present condition, and its prospects for the future; also, statements of receipts and expenditures, assets and liabilities, etc. You will observe that, as usual, the mine has increased its yearly production, and that it bids fair to continue to do so.

The openings are more extended, there is more rock broken in the mine ready for hoisting, and the buildings, machinery, etc., are in good order and repair, and all looks well for a successful year, which we are assured of, unless copper should decline lower than the past year, which seems improbable.

It may be a matter of interest to some of the stockholders to know what the mine has produced since its commencement, and to that end we give you the following figures:

Work was commenced in 1857, and carried on by the company 12¾ years, say to 1870, during which time the production of ingot copper was	14,565,729 lbs.
The mine was then leased to trustees, who held possession four years and produced	2,206,774 lbs.
The company took possession in July, 1874, and to the present time, say 11½ years, have produced	30,968,327 lbs.
Making a total of	47,740,834 lbs.

The present management producing in 11½ years 14,195,830 lbs. more than the previous workings for 16½ years.

The total amount expended in opening and equipping the mine to December 31, 1885, is $3,992,584.56. This is exclusive of smelting, freight, etc., of course. The dividends paid during same period were $640,000.

The property in all its departments is well equipped, and the underground workings are showing as well, or better, than ever at the present time.

Captain Johnson Vivian is still at his post as agent at the Lake, and has so systematized the; various departments that the property is second to none for neatness, order and economy of working, and your directors take pleasure in testifying to that effect.

There is in the mine, broken and ready for hoisting, 25,000 tons of rock, which is not valued as an asset.

During the year 137,276 tons of rock were treated at the mill, a gain over 1884 of 8,394 tons, producing 4,812,565 lbs. of mineral, which gave a yield of 83 13-100 per cent, of refined copper, or 3,999,172 lbs. being a gain over 1884 of 250,520 lbs. of refined copper.

The amount of mineral per ton of rock was 1 75-100, or 3-100 per cent, less than 1884.

The total cost of mining and manipulating per ton of rock hoisted was $1.95, or 27 cents per ton less than 1884.

Total amount of rock hoisted was 173,616 tons, a gain over 1884 of 12,549 tons.

Surface Work.

No. 5 shaft house, being unfit for further use, has been replaced with a new one. Also a new rock bin has been constructed at this point. Owing to the very dilapidated condition of one of our tenement houses, which is located near the barn, it was necessary to remove it and build a new one. All necessary repairs to buildings of all kinds have been made as usual.

Machinery.

We have added to this department two boilers, which are located at the hoisting engine, to take the place of three of the old cylinder boilers, which were too expensive to operate. The steam pump that was put up at the Pewabic mill, on joint account, for pumping water from the lake to the mines for feeding boilers, has been taken put and erected at our mill, and is now in successful operation. The distance from the mill to the mine is 7,200 feet. The pressure on the water pistons, to force the water to the mine through a four-inch pipe, is 255 pounds per square inch.

Stamp Mill.

We have done a large amount of extraordinary repairs in this department. The frame of the-building in some places was badly decayed, consequently it was necessary to remove a large portion of one end of the mill and rebuild it. The amount of rock treated was 137,276 tons, which is 8,394 tons more than was stamped in 1884.

Future Prospects.

At this writing everything seems to indicate that we shall see another prosperous year, so far as product is concerned, and if the price of ingot remains as it is at present, a good profit will be made.

The following table shows the results of the mining work since the present management took hold. The mine in the meantime has doubled in depth:

Cost of Hoisting and Manipulating One Ton of Rock and Cost of Stamping One Ton.

Year.	Total Cost Per Ton.	Stamping 1 Ton.	Year.	Total Cost Per Ton.	Stamping 1 Ton.
1875	$4 70	$1 02	1881	$2 32	$0 60
1876	3 45	81	1882	2 35	55 1-2
1877	3 03	1 00	1883	2 40	53 34-100
1878	2 71	96	1884	2 22	49 81-100
1879	2 37	52	1885	1 95	44 35-100
1880	2 68	57			

The Franklin mine has produced as follows:

Year.	Tons.	Pounds.	Year.	Tons.	Pounds.
1857	3	699	1872	186	....
1858	56	1,104	1873	183	....
1859	116	1,911	1874	293	1,790
1860	157	1,860	1875	582	800
1861	783	43	1876	963	641
1862	733	645	1877	1,169	1,817
1863	639	684	1878	1,299	1,528
1864	605	1,335	1879	1,414	1,703
1865	779	1,481	1880	1,168	466
1866	819	994	1881	1,338	1,932
1867	701	455	1882	1,637	120
1868	737	1,236	1883	1,744	1,308
1869	779	970	1884	1,882	1,697
1870	589	....	1885	1,909	1,172
1871	300	1,000			
Total				23,650	181

D. L. Demmon, Sec. and Treas.; Johnson Vivian, Supt.

INGOT COPPER.—MONTHLY LOWEST AND HIGHEST PRICES FOR A PERIOD OF TWENTY-SIX YEARS.

Years.	January.		February.		March.		April.		May.		June.	
1860	21¾	24	21½	24	23	23½	23	23¾	22¾	23¼	21¾	22¾
1861	19	20	19	19¾	19½	19¾	19	19¼	18¾	19¼	18	19
1862	27	28	25	28	23	25	21½	23	20¾	21¾	20¾	23
1863	31	35	35	37	31	37	30	31	30	30¾	30	30¾
1864	39	41¾	41¾	42	41½	42¾	42¾	44	43¾	44	44	48½
1865	46	50¾	44	46	34	44¾	34¾	35	30	34¾	28¾	31
1866	38	42	35½	38	29¾	35¾	28¾	30	28¾	30¾	30¾	33¼
1867	27	29¾	27¾	27¾	24	27¾	23½	24¾	24	24¾	24	24¾
1868	21½	23¾	22¾	24	23¾	24	23¾	24¾	24	24¾	23¾	24
1869	23¾	26¾	26	27	24	26¾	23¾	24	23¾	24¾	22	23¾
1870	21	21¾	21½	21¾	19	20½	19	19¾	19	19¼	19¼	20½
1871	22	22¾	21¾	22	21¾	21¾	21¾	21¾	21¼	21¾	21¼	21¾
1872	27¾	28¾	28¾	28¾	28¾	37¾	37¾	45	33	40	32¾	34¾
1873	33¾	35	34¾	35	34	34¾	32¾	34	29¾	32¾	28¾	29¾
1874	24¾	25	24¾	25	24	24¾	24¾	25	24¾	25	24	24¾
1875	21¾	23¾	21¾	22	21¾	21¾	21¾	22¾	22¾	23	22¾	23
1876	22¾	23	22¾	22¾	22	22¾	22	22¾	21	22	19¾	21
1877	19¾	20¾	19¾	20¾	19¾	19½	19¾	19¾	19	19¾	19	19¾
1878	17¾	17¾	17	17¾	16¾	17	16¾	17	16¾	16¾	16¾	16¾
1879	15¾	16	15¾	15½	15¾	16	15¾	16	15¾	16¾	16½	16¾
1880	21¾	24½	23¾	24	22	24	20¾	21¾	18	20¾	18	19
1881	19½	19¾	19¾	19¾	19	19¾	18¾	19	18	18¾	16¾	18
1882	19½	20¾	18¾	19¾	18½	19¾	17¾	18¾	18¼	18¾	18¾	18¾
1883	17¾	18	17¾	18	16¾	17¾	15¾	16	15¾	16	15	15¾
1884	14¾	15	14¾	14¾	14¾	14¾	14	14¾	14¾	14¾	13¾	14¾
1885	11	11¾	11	11¾	10¾	11¾	10¾	11¾	11½	11¾	11¾	11¾

Years.	July.		August.		September.		October.		November.		December.		Years.	Low	High.	Av'ge.
1860	21½	21¾	21¾	21½	21¾	22	21½	22	20¾	21¾	19¾	20¾	1860	19¾	24	22.24
1861	17¾	18	17¾	19	19	20¾	20	20¾	20¾	22½	22½	27	1861	17¾	27	19.77
1862	22¾	24¾	24	24¾	24¾	27	27	32¾	30¾	32¾	30¾	31½	1862	20¾	32¾	25.76
1863	29	32	29	31½	31	32¾	32¾	34½	34½	39½	38½	38¾	1863	29	39¾	32.02
1864	48¾	55	50	52¾	47¾	52¾	47	48	47	49	48¾	50	1864	39	55	46.23
1865	28	30¾	30¾	32	30¾	32¾	32¾	32¾	32¾	45¾	39¾	45½	1865	28	50½	36.25
1866	31	33¾	29¾	31	30¾	31¾	30¾	31	26¾	30¾	26¾	29	1866	26¾	42	31.80
1867	24	26	25¾	26¾	26¾	27¾	22¾	26¾	22¾	23	21¾	22¾	1867	21¾	29¾	25.12
1868	23¼	24¾	24	24¾	23¾	24	23	24	22¾	24	23¾	24¾	1868	21¾	24¾	23.62
1869	21¾	22¾	21¾	23¾	22	23	22	22¾	22	22¾	21½	22	1869	21¾	27	23.40
1870	20¾	20¾	20	21	20¾	21¾	21¾	22	22	22¾	22¾	22¾	1870	19	22¾	20.69
1871	21¾	22¾	22¾	23	23	23¾	23¾	24¾	24¾	25	25	27¾	1871	21½	27¾	22.64
1872	33	33¾	33½	33¾	32¾	33¾	31¾	32¾	30¾	32	31	33¾	1872	27¾	45	33.02
1873	26¾	28¾	26¾	27¾	25	27	21¾	25	20	24¼	24¾	24¾	1873	20	35	28.07
1874	19¾	24	19	21	21	21¾	21¾	22¾	22¾	23¾	23¾	23¾	1874	19	25	23.21
1875	22¾	23	23	23¾	23¾	23¾	23	23¾	23¾	23½	23¾	23¾	1875	21¾	23½	22.70
1876	19¾	20¾	18¾	19½	19	20¾	20	21	20	20¾	19¾	20¾	1876	18¾	23	20.91
1877	18¾	19	17¾	18¾	17¾	18¾	17¾	18¾	17¾	17¾	17¾	17¾	1877	17¾	20¾	18.80
1878	16¾	16¾	16	16½	15¾	16½	15¾	15¾	15¾	16	15¾	16	1878	15¾	17¾	16.42
1879	16½	16¾	16½	16¾	16¾	18¾	19	21¾	21	21¾	21½	21½	1879	15¾	21¾	17.35
1880	18¾	19	18¾	19	18¾	19	18¾	19	18¾	19	18¾	19¾	1880	18	24¾	20.18
1881	16	16¾	16¾	17	17	18¾	18	18¼	18	19¾	19¾	20¾	1881	16	20¾	18.27
1882	18¼	18¾	18¾	18¾	17¾	18½	18	18½	18	18	17¾	18	1882	17¾	20¾	18.41
1883	15	15¾	15	15¾	15¼	15¼	15	15¾	14¾	15	14¾	15	1883	14¾	18	15.85
1884	13¾	14	13¾	13¾	12¾	13¾	12¾	13	12	12¾	10¾	12	1884	10¾	15	13.72
1885	11½	11¾	11	11¾	11	11¾	10¾	11	10¾	11	11¾	11¾	1885	10¾	11¾	11.14

Prices of	1869.		1870.		1871.		1872.		1873.		1874.		1875.		1876.	
Steel Rails.	120	145	98	110	95	106¾	104	120¾	118	122¾	75¾	117¾	65	71	52	67
Pig Iron...	39¾	42	31¾	36¾	30¾	37¾	37	53¾	32¾	48¾	24	32	23¾	27	21¾	23¾
Chill Bars.	......		......		......		......		......		47¾	87	79¾	83	71¾	81¾

Prices of	1877.		1878.		1879.		1880.		1881.		1882.		1883.		1884.		1885.	
Steel Rails.	40¾	49	41	43¾	41	67	58	85	60	63	39	58	34¾	40	26¾	34	25	35
Pig Iron...	18	20¾	16¾	18¾	17¾	30¾	23	41	24	26	25¾	26	21	25	18	21	15¾	17¾
Chill Bars.	64	73¾	55	66	54	68	55	74	57	71	62¾	71¾	56¾	67	47	58¾	38¾	49¾

Iron Rails, highest $153¾ per ton, Sept. 1864. Steel Rails, highest $174, in 1868; lowest $25, 1885. Pig Iron, highest $73¾, 1864; lowest, $15¾, in 1885.

The following are taken from J. G. Martin's Boston Stock Reporter:

Lake Superior Copper Mining Co.'s	1882. Lowest and Highest.		1883. Lowest and Highest.		1884. Lowest and Highest.		No. of Shares.	Assessed up to Date Per Share Total, Jan. 1885.	Jan. 1886.	Dividends, When Paid. 1885.
Allouez	198¾	3½	100	200	50c	11½	80,000	$15 75	$15 75	
Atlantic	13	19	10	17	6	10	40,000			50c. Feb. 1885.
Calumet and Hecla	*231	295	*230	253	124	240	100,000	12 00	12 00	$5 Feb. 2; $7 July 13; $5 Nov. 2. $1.50 Feb. 2, 1885.
Central	30	31	20	25	5	20	20,000	2 50	2 50	
Copper Falls	1½	4¾	1	2	50c	1¾	40,000	22 75	25 00	
Franklin	10	17	9	15¾	5¾	11¾	40,000	8 00	8 00	$1 July; $1 Jan. 4, 1886.
Huron	106	4	50c	2	15c	2	40,000	6 00	6 00	
National	1½	3½	50c	1¾	15c	50c	40,000	7 00	7 00	
Osceola	*30	*38	17½	33	8	17¾	50,000	17 00	17 00	
Pewabic	6¾	17	15¾	103½	50c	2	40,000	14 63	14 63	
Quincy	*40	70	40¾	63½	26	*48	40,000	5 20	5 00	$2.50 Feb. 16; $2 Aug. 17; $4 Feb. 15, 1886.
Ridge	25c	4¾	62½c	75c	45c	75c	20,000	20 50	20 50	
‡Tamarack							40,000	10 00	15 00	

Lake Superior Copper Mining Cos.	1885. Jan. 2	Jan. 2 to April 1. Low.	High.	1885. Apr. 1	April 1 to July 1. Low.	High.	1885. July 1	July 1 to October 1. Low.	High.	1885. Oct. 1	Oct 1 to Dec. 31. Low.	High.	1886. Jan. 2
Allouez	50c	37½c	50c	50c	37½c	60c	60c	55c	60c	60c	60c	$1	1
Atlantic	6	6	7½	6¼	6¾	7⅜	6⅜	6½	8	7¼	6⅜	10¾	9⅛
Calumet & Hecla	187	*185	163	160	160	182	*172	172	225	214	*205	220	212
Central	10			7			7			7			7
Copper Falls	50c			50c			50c			50c			50c
Franklin	6	5¾	7	6	5¾	9	*6½	6¼	8⅞	7¼	7¼	13	*11
Huron	75c			50c	30c	50c	35c			50c	35c	2½	2
National	15c			15c			15c			15c	15c	1	1
Osceola	8	8	10	8¾	8	10	9¼	9¾	13	12¾	12¾	15	14
Pewabic	1			75c			50c			1	1	3¾	3
Quincy	26½	26¾	33	28	28	36¾	36¾	*32½	*39	33¾	38	55	53
Ridge	50c	40c	75c	50c			50c	50c	75c	75c	75c	1	90c
‡Tamarack	33			33	35	60	60	46	76	76	74	90	90

Lake Superior Copper Mining Companies.—Monthly Products.—Official.

Calumet and Hecla.

Date.	1883-4. Tons.	Lbs.	1884-5. Tons.	Lbs.	1885-6. Tons.	Lbs.
May	1,915	1977	4,354	143	2,640	1099
June	1,836	1409	2,178	1391	2,669	1757
July	1,725	1768	2,339	1967	2,684	813
August	1,904	1014	2,360	1213	2,667	406
September	1,747	1651	2,434	1420	2,556	1739
October	1,881	1953	*1,498	1235	2,557	831
Six months	11,009	1832	15,156	1435	15,776	1285
November	1,895	1856	2,135	880	a2,306	165
December	1,845	98	2,449	1114		
January	1,918	1534	2,489	811		
February	1,989	404	2,080	1630		
March	2,150	1747	2,498	1534		
April	2,224	684	2,489	255		
Year	22,966	155	27,290	1039		
Per cent	77.13		77.97			
Ingot	17,707	07	21,278	154		
Ingot lbs	35,414,007		42,556,154			

Osceola.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	201	635	207	1270	102	662
February	204	1485	205	550	169	1617
March	207	305	215	695	177	1097
April	208	845	210	700	192	1900
May	205	1785	210	1060	156	1646
June	205	535	205	445	—(c)—	
Six months	1,231	1650	1,252	700	898c	962
July	205	950	215	921		
August	204	1750	200	20	Mill not running.	
September	200	725	207	1885		
October	210	815	221	1880		
November	216	275	233	1975	80	1785
December	212	610	206	595	180	—
Year	2,483	775	2,507	1970	1,159c	737
Per cent	85.74		84.73		80.186	
Ingot	2,130	1962	2,125	93	901	913
Ingot lbs	4,261,942		2,125,186		1,802,913	

Quincy.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	170	375	180	440	160	1285
February	175	330	200	360	180	810
March	225	520	230	955	210	630
April	250	310	251	580	220	1715
May	261	40	245	560	250	175
June	275	675	281	1570	270	415
Six months	1,357	270	1,609	475	1,292	1,030
July	300	495	300	1105	300	400
August	332	465	334	185	315	915
September	330	170	330	1575	320	1240
October	350	1730	351	1040	370	580
November	451	1055	440	1665	430	465
December	242	1965	260	405	260	1165
Year	3,371	150	3,442	1390	3,345	1835
Per cent	82.30		82.50			
Ingot	2,774	790	2,840	290		
Ingot lbs	5,548,790		5,680,290			

Franklin.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	132	1530	175	1755	170	680
February	151	240	175	575	183	180
March	160	210	174	1900	184	1735
April	170	1705	172	420	194	450
May	170	25	178	1055	190	635
June	177	825	175	415	180	1440
Six months	962	535	1,052	180	1,112	1620
July	179	1810	175	900	191	1220
August	188	700	175	1805	188	1130
September	187	1020	183	1215	201	1735
October	195	1900	201	65	208	15
November	200	530	188	1695	227	1430
December	262	1005	227	680	230	1085
Year	2,152	10	2,302	540	2,401	555
Per cent	81.15		81.41		83.557	
Ingot	1,746	704	1,874	695	2,010	1226
Ingot lbs	3,492,704		3,748,912		4,021,226	

Fire in mine October, 1884. (a) November, not official. (c) Eleven months. (c) Osceola; mill shut down May 17 to November 17.

Lake Superior Copper Mining Companies.—Monthly Products.—Official.

Allouez.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	91	775	109	275	147	425
February	80	35	96	475	130	350
March	90	540	109	550	142	575
April	100	640	102	215	142	1070
May	102	985	108	650	143	1495
June	111	1235	100	350	—(b)—	
Six months	576	210	602	1115	705	1915
July	111	710	100	215	1645	055
August	111	510	102	150	120	1095
September	105	530	120	150	120	960
October	100	175	145	1045	125	655
November	100	315	150	10	119	995
December	100	226	150	470		
Year	1,304	676	1,371	1155	1,354d	860

Copper Falls.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	39	325	46	1595	63	1045
February	37	1925	35	1255	60	10
March	40	280	24	480	60	410
April	401,615		42	680	63	1780
May	47	1575	47	660	65	790
June	50	430	45	1895	65	1950
Six months	256	130	242	555	378	1935
July	41	1795	49	1185	67	1955
August	39	820	58	1485	67	487
September	37	580	61	600	64	1250
October	43	295	67	1850	63	1890
November	50	345	63	915	68	50
December	50	948	63	1565		
Year	595	1830	548	20	710d	877

Atlantic.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	166	1920	163	1003	108	1880
February	153	530	172	03	185	1440
March	164	825	174	1422	194	680
April	152	794	188	978	186	1540
May	162	385	191	1365	215	980
June	158	540	186	1300	212	616
Six months	957	994	1,076	1871	1,193	1156
July	158	660	184	1540	213	355
August	165	1335	181	1400	205	500
September	158	1461	191	1815	213	1634
October	166	540	206	365	227	1040
November	160	1045	180	05	202	1050
December	161	603	681	1400		
Year	1,928	1228	2,018	996	2235d	1737

Huron.

Date.	1883. Tons.	Lbs.	1884. Tons.	Lbs.	1885. Tons.	Lbs.
January	14	1760	71	1460	119	100
February	17	131	75	1040	112	500
March	18	1268	75	10	118	1200
April	11	494	66	100	102	600
May	13	1030	70	1505	115	—
June	16	431	108	695	115	700
Six months	91	1114	467	860	682	1578
July	17	1552	116	498	101	100
August	52	1785	118	875	102	400
September	57	631	120	1035	115	200
October	69	1979	125	430	120	630
November	73	100	125	300	126	384
December	70	1885	120	440	135	700
Year	433	1100	1193	338	1382	1710

(b) Allouez, leased late in June and product carried to July. (d) Eleven months.

RAILROAD EXTENSIONS IN THE UPPER PENINSULA.

Among the most important things affecting the development of any region is the extension of its railroad system.

Particularly is this true of a mining region like the Upper Peninsula,, which is off from the thoroughfares of traffic, and in which the chief productions, aside from its timber, are iron and copper; the former, especially, a weighty mineral requires great accessibility and cheap transportation to render it of any commercial value.

Our mining region, though isolated, is very fortunate respecting its means of communication with the outside world. Its advantages for water transportation are unequalled, and the progress made in the development of its railway system has reached a point where there is every assurance of securing all that need be desired.

The completion of the Detroit, Marquette and Mackinaw road, from Marquette to the Straits of Mackinaw, 151 miles, and its connection there with the roads that have been extended from Detroit and Grand Rapids, enable the people in the Upper Peninsula to reach the east with

speed and directness and to visit any part of the State without passing outside its borders.

The line of the road is through what was, at the time of its construction, an unbroken wilderness, but which was known to be a region of valuable timber—pine and hardwood—and the country thus opened to settlement is rapidly improving; many farming settlements have already been formed, and the adaptability of the soil to many of the essential farm crops is so well shown as to insure the ultimate settlement of the entire region and its use for the purposes of agriculture. An important aid in this work of subduing this region is the Vulcan furnace at Newbury, on the line of the road. The necessary wood and charcoal required to operate the furnace affords a market for the cord wood and enables the farmers to clear their lands. There is also a large furnace at St. Ignace, the eastern terminus of the road; but for some cause this has remained idle almost since it was built. These two furnaces in operation, drawing their supplies of charcoal from along the line of the road, would rapidly promote the clearing of the lands of the hardwood timber and their conversion into farms.

At one point on the road there is a large area of wet prairie, well adapted to the cultivation of celery, and some beginning has been made the past year for the prosecution of this branch of industry. The D., M. & M. built a branch to the iron mines and also an ore dock at Marquette. This extension of the road and the dock have been transferred to the M., H. & O. R. R. Co

The Compaq, however, possesses an ore dock at St. Ignace, built three years ago on the most approved model. Has 800 ore cars and carried 120,000 tons of ore over the road the past season. The rate from Negaunee to St. Ignace the past season has been 75 cents per ton. The facilities of the road for handling ore or other traffic are greatly in excess of all demands upon it.

The Company owns a large body of lands in the Upper Peninsula which are offered for sale on very reasonable terms. A. Watson, General Superintendent, Marquette.

THE MARQUETTE, HOUGHTON & ONTONAGON R. R.

is the pioneer in the ore carrying business, in so far as a part of its line is the original road built from the harbor of Marquette to the mines. Branches have been built to the mines as occasion required and important extensions of the road have been made from time to time, until now it makes connection with Marquette and all points in the Marquette iron range and the copper district.

Within the past two years the company has extended its line to Houghton from the former terminus at L'Anse, thus making direct railroad connection, with but one change of cars from Portage Lake to Chicago, a distance of 500 miles. Those who have been accustomed to traverse the route from the head of Keweenaw Bay to Portage Lake during the period when navigation was closed can appreciate the greater ease and comfort with which they may now make the journey, and bestow benedictions on the company that has thus contributed to their happiness.

In the spring of 1885 the company purchased the Marquette & Western road, which extended from Ishpeming to Marquette, and included also in the purchase the ore docks which the M. & W. Co. owned. Thus the M., H. & O. now has four large ore docks for receiving ore from the cars and loading into vessels; three of them are at Marquette and one at L'Anse.

The purchase gave the company also access, by rail, to the mines north of Ishpeming, known as the Teal Lake Range, and also an additional equipment of 500 ore cars and 10 locomotives. The ore cars carry eight tons, and the new ore docks have a capacity of 24,000 tons. The pockets hold from 30 to 115 tons each. The cost of carrying ore from Ishpeming to Marquette, including dockage and loading into vessels, has been, the past season, 45 cents per ton. Of course this low rate was necessitated by the depression in the ore market. The total amount of ore transported by this company the past season was 890,508 tons.

The company still holds in contemplation the extension of the road from L^Anse westward to Ontonagon. There is a grant of public lands to aid in this work and it is quite probable that the enterprise will be consummated in the near future, especially since the opening of the Agogebic iron range, to which the road could be readily extended, thus giving connection with the Wisconsin system of roads and opening a route to the copper region and to Marquette, etc., and to the east from northwestern Wisconsin, etc. This extension will also open a fine country to settlement—one of the best farming regions, barring the climate, to be found in the State. All the way from L'Anse to Ontonagon and southwesterly to Agogebic is a fine timbered country with excellent rich, loamy soil. I have traversed the country several times and have always noted with admiration the valuable qualities of the timber and the soil. The soil will raise any crop that the climate will permit to mature. A railroad through this country and a few blast furnaces along on its line would hasten the improvement and settlement of the region rapidly.

Men who come to be laborers would remain to be farmers. There are many Swedish settlers on the road west from Baraga who are already in a fair way to live, having good homes and fine, productive fields. It is but a few years since they began, and I don't know of settlers anywhere in the wilderness who have done better. They are contented and greatly pleased with their prospects.

The M., H. & O. Co. will also, it is stated, bridge the lake at Houghton and send their trains through to Calumet over the Mineral Range R. R. by laying a third rail on that track.

John Hornby, Gen'l Manager, Marquette.

THE MINERAL RANGE R. R.,

narrow guage, extending from Hancock to Calumet, now has a rival in the HANCOCK AND CALUMET RAILROAD, which has just been completed and opened to the public. Though organized under the general railroad law and fully equipped for general traffic and business, the road has been built by the owners of the Osceola and the Tamarack mines mainly for the use of these companies to transport their stamp rock from the mines to the lake, to the mills, and the mineral, etc., thence to the smelting works. The two roads have different routes altogether. The new road follows the margin of the water to Dollar Bay, where is now the Osceola stamp mill, and thence to Calumet, with a branch from Calumet to Lake Linden, where are the Calumet and Hecla stamp mills. With these two roads the travel and transportation between Portage Lake and the district about Calumet must be fully accommodated.

THE CHICAGO AND NORTHWESTERN RAILWAY CO.

has been one of the most important factors in the development of the mineral interests of the Upper Peninsula. The enterprise, liberal spirit and financial ability of this great corporation have been uniformly exerted in the direction of promoting all undertakings which tend to the settlement and improvement of the country.

Before the connection between Escanaba and Green Bay was made in 1872-3, the whole Lake Superior region was practically isolated after the close of navigation in the fall; now there is daily communication by train to and from Chicago with all portions of the Upper Peninsula. The Lake Superior branch is known as the Peninsula Division C. & N. W. R'y, with the main branch from Ft. Howard to Ishpeming—180 miles—of which 9 miles are double track. Connected with this is the Menominee branch, leaving the main line at Powers and going west to the Menominee Range mines. It is 68 miles in length, and has 18 miles of double track; this portion laid with double track being where the ore traffic is greatest. From the Menominee line there is a branch to Crystal Falls of 9⅓ miles in length. Also a branch from the main line, at Nasenta, to Metropolitan, 35 miles in length. In addition to these it has 20 miles of track to mines. The company has three ore docks at Escanaba with an aggregate capacity of 60,000 tons. The company transports all the ore from the Range mines and a good portion from the Marquette county mines also.

The rate from the latter, Ishpeming to Escanaba, the last season, was 70 cents per ton; in 1883 the rate was $1.10 per ton. The lake freight from Escanaba to Cleveland, the past season—1885—has been from 60 cents to $1.10 per ton. In 1883 the rate was 80 cents to $1.75.

To Chicago the lake freight has been the past season 65 cents against 90 cents in 1883.

Escanaba has an advantage in length of shipping season, the straits being open ten days before vessels can pass through the Sault canal.

It is said that the C. & N. W. Co. contemplates an extension of the Menominee River branch westward from Iron River to Agogebic iron range; this would give the mines of that range another and important outlet for their ore.

THE MILWAUKEE AND NORTHERN R. R. CO.

have built a line from Milwaukee to Menominee, over which trains run regulary between these points. An extension of the road to Iron Mountain is contemplated. Of far more importance is the

MILWAUKEE, LAKE SHORE & WESTERN,

or what is sometimes designated as the Rhinlander road. The road is built from Milwaukee via. the Agogebic iron range to Ashland on Lake Superior. At this western terminus the company has built an ore dock, and the shipment of ore over the line began in August last.

It is stated by the president of the company that it is the intention to build a line fifteen miles north and east from Watersmeet the coming season. It is expected that this will ultimately form part of a through line to Republic and thence east to Sault Ste. Marie, to connect with the Canadian Pacific which will be built to that point. In this arrangement the D., M. & M. may be absorbed as part of the line. If this plan is carried out there will be a line the entire length of the Upper Peninsula, east and west, as part of the great continental thoroughfare,

THE ONTONAGON & BRULE R. R.

has made no further extension of its line. The road was built from the village of Ontonagon, on Lake Superior, to the Minesota mine, a distance of 20 miles, when further work was deferred, awaiting the action of congress regarding the grant of lands, originally set aside to aid in building this road.