

years the expenses continued much greater than they should have been, and assessments began to be called for pretty heavily, and it was resolved to suspend work on the company account, but to continue only on tribute. The pumps were stopped in 1870 and the mine was thereafter allowed to fill with water.

From this date the mineral raised was by tribute working, and as there were plenty of miners living in the vicinity, no lack of tribute workers was felt. They would push into dangerous ground, where they could not be got to work when employed by the company. The number of miners engaged in the mine in 1870 was 43, and in August of that year 50½ tons were taken out, and in September 40 tons; in all for the year the product was 270½ tons, which sold for \$93,336.48. The cost of production was \$77,587.07, leaving net earnings of \$15,747.14. The company held a previous surplus of \$42,336.44.

The Minesota organized a number of mines, which gave it the name of the mother of mines. Among these were the Rockland, Flint-Steel, Lake Superior, West Minesota, Peninsula, etc.

The large scope of its operations, justified, perhaps, by its immense income, had a bad effect on minor organizations in this district. The Minesota became the pattern, and many of them followed her teachings to their ruin.

In 1874 the real estate was valued at \$24,034.72, and other property per inventory, making total \$167,418.35, and the cash on hand was \$28,000; 93 tons, 373 lbs. ingot, were obtained.

During the work, the Minesota and National mines had been connected between the 60th and 70th levels, so that neither could work without pumping from the other.

The Minesota estate now comprises 5,000 acres; 500 or 600 acres were formerly under cultivation, and produced heavily in root crops, hay, and oats. This farming was an important item to the company, in the prosecution of its work.

The greater portion of the village of Rockland is the original plat of the Minesota Company, called Rosendale. The western part of Rockland was laid out by the National Company, and called Webster. The property has been well cared for by Resident Agent, Capt. Thomas D. James, who has been in the employ of the company 19 years; first as mining captain, and after the resignation of Capt. Wm. Harris, succeeded to the office of superintendent. Every thing about the mine remains intact, with the natural deterioration that time effects.

Captain James is now prosecuting explorations along the south bluff—Peninsula Bluff—which runs parallel with the old mine. The work formerly done here consists of two shafts 275 feet apart, and sunk to a depth of 300 feet from the surface, and an adit driven through the bluff from south to north.

The diamond drill work was begun in July last, and has been prosecuted along the bluff about 1,300 feet, and to a depth of 350 feet. The purpose is to continue this work of exploration along the lode to the limits of the property, and ultimately to commence work at what may be deemed the most feasible point. The drill cores are sampled and washed to determine percentage of copper, and other notable facts are recognized as the work progresses.

The product for 1880 is 50,054 pounds crude copper, yielding 72 to 75 per cent of ingots. This product was obtained in the old mine above the fourth level, below which the mine is filled with water. The number of men kept employed is about 35.

A longitudinal section of this mine is herewith given, and shows the depth and extent of the workings. The mine has really never been proved to a great depth. At the time work ceased, or shortly before, the agent reported to the directors: "The chances for copper in the bottom might be greater than in the upper levels, yet this could only be proved by sinking shafts and extending drifts, which cannot be done without considerable expense. I wish it might be done to further prove the mine, as there is a chance of striking rich copper ground."

This matter of proving the mine at greater depth never has been done. The theory assumed in the productive days was that the mine was inexhaustible, that it must grow richer as the depth increased. But subsequently the opposite theory was embraced, that the vein was necessarily shallow and was therefore exhausted. Theories and hypotheses are of little value in the Lake Superior copper region. They know what they have when they discover it and prove its value, but it is nearly useless to predict anything beyond what can be seen.

The diamond drill is the best instrument to use to determine the value of of predictions, and it would be interesting and might prove important to those more immediately interested, to employ the drill in the bottom of the old Minesota mine. Until it is thus tried it is useless to conjecture one way or the other regarding the existence of copper in paying quantity at still greater depths. The following shows the dividends paid by the company:

Years.	Dividend paid.	Years.	Dividend paid.
1854.....	\$90,000	1860.....	\$120,000
1855.....	40,000	1861.....	100,000
1856.....	100,000	1862.....	60,000
1856.....	100,000	1862.....	100,000
1857.....	150,000	1863.....	60,000
1857.....	150,000	1863.....	100,000
1858.....	120,000	1864.....	60,000
1858.....	180,000	1872.....	50,000
1859.....	100,000	1876.....	10,000
1859.....	80,000		

Officers of the company are: H. F. Emory, President; Geo. D. Farr, Secretary and Treasurer; office, New York.

NATIONAL MINING COMPANY.

The most important of the mines of Ontonagon county, after the Minesota, is the National, which adjoins it on the east—T. 50, R. 39 W., Sec. 16.

This successful enterprise was inaugurated under a special charter granted by the State of Michigan, April 1, 1848, with Geo. W. Page, James Anderson, Morgan L. Drake, James A. Weeks, and Henry B. Marsh as corporators, with office in Pittsburg, Pa. But its mining work was then in the location above described, until 1852, when the company acquired the title to 1,540 acres of land in township No. 50, range 39. In this purchase was included 595 acres in section 16, and it was over the title of a portion of this land—115 acres adjoining the Minesota—that a long and costly litigation arose, that went thrice to the U. S. Supreme Court, but was decided fully in favor of the National.

The National Mining Company derived its title to its lands on section 16 by deed from Alfred Williams, who bought them from the State of Michigan, who sold them under virtue of the act admitting her into the Union, wherein it is provided that section 16 of each township shall be given to the State for school purposes, etc. The matter came before the Legislature, which passed a confirmatory act, and recognizing the patent of Williams from the State as fully valid, etc.

Subsequent to the sale of the land by the State the Minesota Company obtained a conditional patent from the United States to a portion of the same land, being a strip 80 rods wide, two 80-acre lots on the east side of section 16. The patent derived from the general government expressly reserved all the rights due the State of Michigan in these lands. But another basis to the Minesota title was the fact that these lands were included in the "homestead lease." Permit No. 98 was issued by the War Department in 1845. The Minesota patent from the United States bore date September 16, 1852, and included the lands embraced in the homestead lease; but, as before stated, reserved the rights due to the State of Michigan to lands on section 16. These lands adjoined the richest part of the Minesota mine, and were crossed and contained nearly 90 rods in extent of the Minesota lode, so that it was too valuable a prize to be given up without a struggle. Every legal effort was made by both parties to the suit, and it was fully tried upon every issue that could be made. It was tried in the Ontonagon circuit, in the State Supreme Court, before the Legislature, in the U. S. District Court at Detroit, in the U. S. Supreme Court at Washington; then back again to the District Court, and a second time in the U. S. Supreme Court, where a final decision was rendered in 1857, after five years' litigation, confirming the title of the National Company to the land.

The property was purchased by the owners of the Cliff—Messrs. Hussey, Howe, Cooper, etc., and in July, 1852, a party in charge of A. Rudolph, began exploring work upon the conglomerate vein, the vein, which lies between the trap and the conglomerate before described in the history of the Minesota. The outcrop was plainly marked by ancient excavations, and proceeding to open one of the largest of these, which proved to be 50 feet in depth, having become filled up with clay, sand, and vegetable matter, there was found in it the remains of timbers which once formed a scaffolding across the shaft, and down the side was found a broad sheet of copper, which covered nearly one side. From the bottom of this opening the first shaft was sunk; and very soon, in the progress of the work, were intercepted masses of copper. No. 2 shaft was begun immediately, at a distance of 240 feet to the west, in the vein. At suitable depths these two were connected by levels, and winzes sunk. The character of the vein was found to be entirely similar to its extension on the Minesota, with the exception of proving less productive in masses. During the next year, 1853, copper was shipped from the mine, amounting to 34,908 pounds in masses, and 46,406 pounds of barrel-work, yielding 72 per cent refined copper.

From the conglomerate a cross cut was made to the north to intersect the Minesota vein. In 1854 Capt. John Chynoweth took charge of the mining department and remained in the employ of the company, subsequently as agent, for upwards of 25 years.

The total expenditures of the company up to 1854 amounted to \$61,308.27, and the receipts from sales of copper, \$13,618.39; from assessments, \$39,658;

expenditures to July, 1856, were \$154,351.15; assessments, \$109,860, and sales of copper, \$49,419.15; force employed in 1856, 80 men, of whom 46 were miners. The machinery for a stamp mill was procured, but in view of the small amount of stamp rock obtained it was deemed advisable to postpone the erection of the mill until a quantity of stamp rock had accumulated.

The copper raised from the commencement to June 30, 1864, was 90 1307-2000 tons; to June 30, 1855, was 55 1042-2000 tons.

The first agent was Wm. Petherick, afterward of the Copper Falls mine, who was succeeded in 1855 by Mr. Wm. Webb, who had been agent of the Cliff. The last assessment was made in April, 1856, making, as before given, \$109,860. From that time forward the mine furnished sufficient copper to pay current expenses. The product of the mine for 1856 was 187,141 pounds of mineral, yielding 76 per cent refined copper.

The product for 1857 was 165 942-2000 tons of ingot copper = 82 per cent of mineral produced.

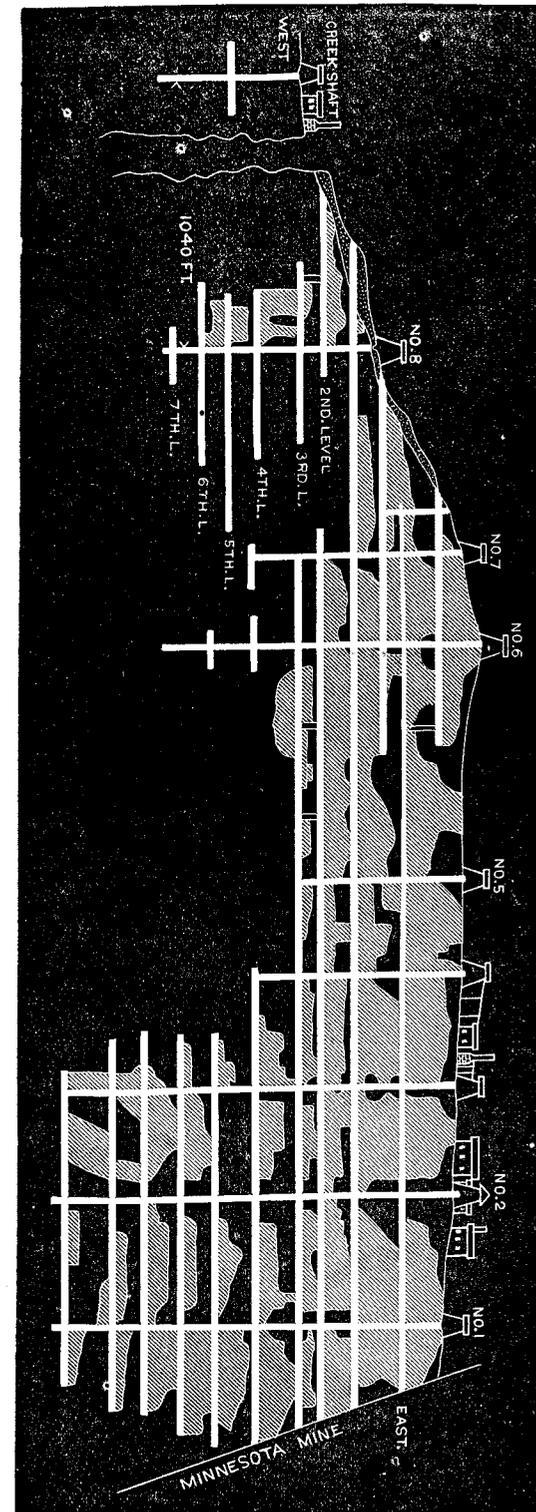
A hoisting and pumping engine, 17-inch cylinder, 5-foot stake, to operate Nos. 1 and 2 shafts, was erected in 1857. The mine was found to be the richest to the east adjoining the "disputed track," and the mine was more extensively worked in that direction, ready to push into this coveted territory as soon as the title should be confirmed in their favor, as the company confidently expected it would be. As soon as the company entered upon the possession of this land its mining operations were thenceforward transferred to it, and a new mine was begun. In the next 12 months five new shafts were sunk at a distance apart of 275 feet, and connected by levels, which made a total amount of drifting of 1,933 feet, and in doing this work copper enough was obtained in the ground that was opened to pay the entire cost of the work from first to last; the first instance of the kind, so claimed, to be found on Lake Superior. The average mining force during this year, that was employed, was 72 men. The shipments to the close of navigation, 1858, were 231 masses, 171,582 pounds; 203 barrels, 139,317 pounds; which, smelted, yielded 264,621 pounds of ingot, being 82.1 per cent.

The company's legal title to the new territory was assured; the mine was realizing all that had been anticipated, and the company entered upon a career of remarkable success. During this year the National, as had been done by the Minnesota, laid out a village plat and sold lots, upon which 40 houses, 4 stores, shops, etc., were built the first season. The town was called Webster. The lots were sold at \$300 each. The company also had 50 acres of land under cultivation. A dock at the landing on the Ontonagon river was built, and a flat-boat constructed to convey products to and from the harbor. This boating in the river, however, soon gave way to the more expeditious and safe method of conveying by wagons over the plank road that was finally built, mainly by the Minnesota and National mines, to Ontonagon village. This road was begun in 1857.

The greater portion of the product of the mine was in masses, but the discrepancy was not as great in this respect as it was at the Minnesota mine. Up to the close of 1858 the total receipts from sales of copper were \$219,174.01.

Product, 1859: Mass copper (305), 459,744 pounds; barrel copper (250), 186,622 pounds; total, 646,366 pounds, which yielded 75.5 per cent = 488,176 pounds refined copper, which sold for net cash, \$105,768.50. The two mines were completely connected, making one mine.

In 1859 the local authorities at the mine being somewhat troubled with the



LONGITUDINAL SECTION OF THE NATIONAL MINE, JAN., 1881.
Scale, 300 ft. to one inch.

accumulations of stamp rock, conceived the plan of improvising a stamp mill. Accordingly, the old machinery that was got when the mine first started was brought into requisition, and the deficiencies supplied by borrowing or purchasing of neighboring mines, and eight heads were set to work, with washing floors, etc., attached to the saw mill engine. A dam was built across the little rivulet that winds between the bluffs, and 8 or 10 tons per month were thus added to the product.

The product for 1860 embraced stamp work for the first time: 628 masses, 923,418 pounds; 521 barrels, 437,606 pounds; 94 barrels stamp, 94,384 pounds; total, 1,455,418 pounds, yielding in refined copper 73.96 per cent = 1,078,608 pounds, which sold for net cash, \$221,417.68 = 20.5 cents. The entire receipts of the company, from commencement of operations to date, were \$748,061.17. This year the company declared its first dividend—\$4 per share paid in January and in July, 1861.

The product for 1861 was 762 masses, 1,109,796 pounds; 613 barrels, 499,962 pounds; 215 barrels stamp, 274,559 pounds; total, 1,884,317 pounds. This yielded 73 286-2000 per cent = 1,383,761 pounds refined copper, which sold at an average net price of 20.29 cents = \$280,763.57. The cost of production, by which is meant all mining expenses, transportation of all materials and products, fuel, salaries, timber, etc., etc., \$149.36 per ton of mineral. Two dividends of \$2 each were declared.

But for the first time since opening the new mine there began to be a falling off in the product. The decline was very noticeable in the last two months of the year. Up to this time there had been a steady increase of product; every increased effort had been rewarded by an increased product, but they were at length overtaken by one of those lean streaks that have occurred in nearly all mines on the lake, but which are generally overcome. The fifth level was opened on the whole line of shafts, and great expectations were entertained; but they were unfortunately not fulfilled; only a small amount of mass copper, which at that time was deemed to be the essential portion, was found. Nos. 1, 3 and 4 shafts were furnished with iron track railway, and with iron skip wagons, drawn up and down with wire rope. These arrangements, since so common, were deemed then a great improvement. Much of the hoisting had been done with buckets holding 1,000 pounds, drawn up with ropes or chains, and there were frequent mishaps and damages. The plank road, 13 miles, had been completed. The distance by the river was 22 miles to Ontonagon. The cost for hauling to Ontonagon was \$1.50 to \$2 per ton. One hundred and twenty-seven acres of land were bought, and the number under cultivation was 300, producing in 1861 75 tons of hay, 25 tons of oats in straw, 2,000 bushels of potatoes, and 1,000 bushels of turnips. The number of stamps was increased to 24 heads, and the number of men employed was 129, of whom 61 were miners, who received an average price of \$40 per month. The average yield of mineral per fathom stoped was 520 pounds.

The product for 1862: Mass copper (474), 481,638 pounds; barrel copper (423), 370,218 pounds; stamp copper (28½), 340,244 pounds; total, 1,192,100 pounds, a falling off from the previous year's product of 364 tons. The yield per cent was 72.08 refined copper = 865,752 pounds ingot, which sold for 24.17 cents per pound net, or \$209,230.56. The cost of the mineral for the year was 14.65 cents per pound, and cost per pound for ingot, 20.33 cents.

The suit, which had been decided in the Supreme Court of the United States in 1857, was started by the Minnesota Company, in the form of an ejectment, in the State circuit, and decided in favor of the National, was appealed to the

State Supreme Court, and there the decision of the local circuit was affirmed. But it again went to the Supreme Court of the United States, and was again decided in 1866, making three times it went to this court.

The yield per fathom stoped in 1862 was 274.5 pounds; total dividends declared, \$160,000.

The company was crippled in stamping facilities, arising from the crudity of the stamp and the insufficiency of water. Product of the mines for 1863 was 230 masses, 244,801 pounds; 298 barrels, 253,845 pounds; 282 stamp barrels, 294,313 pounds; total, 792,959 pounds; this yielded 70.90 per cent = 516,179 pounds ingot copper, which sold for 32.97 cents per pound = \$185,027.94. The net profit for the year was \$38,134.86; the cost of the mineral was 18.56 cents per pound; the cost of the refined copper was 26.17 cents per pound, showing a profit of 6.80 per pound.

The directors thought that the mine had now reached its minimum production for many years to come; henceforth they declared better results might be looked for. This expectation was based upon the developments made in what was called the middle vein. It was first intercepted by a cross-cut from the main lode, and was nearly equi-distant from the north lode and the south conglomerate, and ran angling so as to intercept them both. It was worked by drifts from the main lode, and carried mass copper in considerable quantity.

The conglomerate is made up here by a mixture of a great variety of minerals, cemented together by a silicious matrix. The vein is a fissure in it. The conglomerate carries but little copper. The vein, while in it is not of it, so that the company was now working two lodes. The north lode had only been slightly explored, but it was not thought to carry much mass copper, but to be good in stamp rock, and not having stamping machinery, the company had not worked it. No. 8 shaft was fitted with engine and hoisting machinery, and pumping machinery, etc. This shaft was near the west end of the mine, but was not worked for want of men, which were scarce at this time in the mining region.

The product for 1864 was 385 masses, 433,458 pounds; 318 barrels, 260,336 pounds; 299 barrels stamp, 314,883 pounds; total, 1,008,677 pounds, which yielded 65.69 per cent = 688,516 pounds ingot copper, realizing 46.19 cents per pound = \$318,075.06. The cost per pound was 20 cents = 30.645 cents per pound refined copper; the average force employed was 108 miners, 122 laborers; the aggregate sales for copper and silver, \$1,431,831.40; the average wages paid to miners were \$57.22 per month; the average wages paid to surface men were \$50.69 per month. A severe storm in July carried away the dam and wash house, etc., and did other serious damage. The dividend for the year was \$80,000.

In 1865 the product was 383 masses, 516,424 pounds; 364 barrels, 294,342 pounds; 252 barrels stamp, 256,584 pounds; total, 1,067,355 pounds, yielding 66.71 = 690,271 pounds refined copper, which sold for 29.71 cents per pound = \$205,076.74. The expenses of every description were \$246,453.25; the average number of miners was 122; average wages, \$51.61; the average number of surface men was 137; average wages was \$46.75; aggregate receipts to date were \$1,784,655.74. Smelting works were built at Ontonagon by M. DePon-talpa, and the National product was smelted there, proving satisfactory.

The middle vein, branching off from the conglomerate at an acute angle, starting from a point between Nos. 1 and 2 shafts, runs westerly, and dips at a greater angle than the conglomerate, and intersected in the tenth level. It was found to continue to yield well.

The product for 1866 was 356 masses, 446,396 pounds; 233 barrels, 188,062 pounds; 254 barrels stamp, 276,834 pounds; total, 911,292 pounds, yielding 71.77 per cent = 647,371 pounds ingot; this sold for 29.20 cents per pound = \$189,008.76. There was also obtained 679 ounces of silver, which sold for \$916.71. The total expenses of all kinds were \$177,659.37. The average number of miners was 122; average wages per month, \$42.20. Number of surface hands, etc., 128; wages, \$39.95. Total receipts, \$2,015,685.70. Total number of acres, 1,899.25. Surplus, \$30,985.16.

Mr. Wm. Webb, who had been agent until this time, retired, and Capt. John Chynoweth assumed the duties. The product for the eastern part of the mine was found to decline; the stamp rock proved too scarce and poor; the directors decided to reduce the force and curtail expenses. The farm products for the year were 100 tons of hay, 15 tons of oats and straw, 1,200 bushels of potatoes, 2,500 bushels of turnips. Number of tons of rock stamped per month, 1,300; the total cost for stamping and washing was \$1,200; the total cost of producing one ton of copper was \$105.64; the profit on a ton of rock was \$1.67, exclusive of mining cost.

The product for 1867 was 238 masses, 257,175 pounds; 160 barrels, 126,454 pounds; 272 barrels stamp, 264,635 pounds; total, 648,264 pounds, yielding 71.965 per cent = 475,633 pounds refined copper, which sold for 23.80 cents per pound = \$113,486.46; silver sold = \$495.66. The total expenses were \$131,121.92; the total receipts to date, \$2,144,267.48; the average number of miners employed was 74; whole number of employes, 156. The average cost of treating the rock in the stamp mill was 99 cents per ton of rock, which yielded 1.03 per cent of copper. About one-half of the rock stamped was taken from the old burrows, which accounts, in a measure, for the ton percentage. The Ontonagon smelting works suspended work.

In 1868 the product was 197 masses, 400,783 pounds; 90 barrels, 74,507 pounds; 174 barrels stamp, 162,258 pounds; total, 637,548 pounds, yielding 71.48 per cent = 443,048 pounds refined copper, which sold for 22.81 cents per pound = \$101,083.51, and silver sold for \$178.74. Total expenses, \$88,594; total force of men, 112, of whom 50 were miners; added surplus, \$10,123.57; aggregate receipts, \$2,244,340; cost of treating the rock in the stamp mill, 93 cents per ton. The conglomerate rock, upon which belt work had been begun, was found to be hard to treat, and yielded about one per cent of copper; 75 tons of the product were obtained from the middle vein.

In 1869 the product was: Masses, (121), 229,391 pounds; barrels, (60), 46,384 pounds; barrels stamp, (139), 135,557 pounds; total, 411,332 pounds, yielding 69.34 per cent, which sold for 21.89 cents per pound; silver amounted to \$336.60. Total expenses for the year were \$60,787.45; number of miners employed, 36; total force, 86; aggregate receipts, \$2,300,356.16.

The work on the north or conglomerate failed to realize as fully as was expected, and was stopped after a cross-cut was made to No. 1 level in the main mine.

So great had been the falling off in the product, and so much effort was necessary to keep the expenses within the income that the stockholders became discouraged and alarmed lest there should be assessments. The mine had been run for several years without profit, and at a meeting of the stockholders October, 1870, it was resolved to shut down.

Discontinuing work for a length of time in a mine that had been conducted on so large a scale as the National, is a serious matter, as it occasions great destruction of machinery and of property of all kinds. Under the advice and

direction of Capt. Chynoweth, work was resumed in the mine in 1871, on tribute. Up to 1874 there was produced 461.5 tons, which sold for \$218,456.98. The total receipts to 1874 for copper were \$2,295,231.50; the total receipts to 1874 for silver were \$6,315.78. And there had been paid in dividends \$319,255; and the total assessments had been \$110,250.

A limited amount of work was done by the company, through the advice of the agent, in 1874, in the west end of the mine, in what is called the creek shaft, but was abandoned soon after, and only tribute work has been done in the mine until 1880. Tribute work proved profitable; the tributors, by tearing up the levels and taking out the pillars, got out annually considerable amounts of copper. One party struck a 40-ton mass, which afforded to them a profit of several thousand dollars.

In 1878 the control of the affairs of the company passed into the hands of Boston parties, and the office was removed from Pittsburg to Boston. Capt. Chynoweth remained in charge until 1878, when he resigned and moved to the Mass mine. He had been in charge of the National mine for 26 years, and the owners had frequently expressed their great consideration for his efficient services, and their unbounded confidence in his integrity.

When it was decided by the present owners of the National to unwater the mine, and to resume work, the services of Capt. Ed. Parnell were secured for this work. Captain Parnell had for years been an employé at the National, and previous to 1870 had been mining captain, since when he had been at the Phoenix and at the Franklin mines, so that his experience as a practical miner, and his familiarity with the National mine fitted him for this important task, and those who know him, and are familiar with the work to be done, regard his selection as a very judicious one.

Capt. Parnell took charge of matters at the mine in May, 1880. Ten years of only tribute work, with no expenditures for repairs, had naturally brought everything to a dilapidated condition. The ground had been worked away from under the shaft houses and machinery; in instances, causing the surface to fall in. The mining plant and buildings are much out of repair. Captain Parnell has cleared out No. 2 shaft, from the surface down to the water, and lined it up, and built over it a large, substantial shaft house, in which he has placed the large pumping engine on a strong foundation of masonry. This engine has a 20-inch cylinder and 4-foot stroke, and is deemed of sufficient capacity to work the pumps. The bed for the large hoisting engine has been made, laid in masonry, and thoroughly done, and the engine will be got in place during the winter. In the meantime the hoisting will be done with a small engine that is already at work, and placed at a short distance south of the pumping engine, the hoisting ropes being carried up from the small winding drum to the top of the shaft house, and thence down the shaft. A new stone boiler house has been built west of the shaft, and three large locomotive boilers are in place, ready for work. The water pipe—14-inch—and pump rod are down to the water in the mine—235 feet, and the working of the pump will soon begin (December, 1880). Captain Parnell estimates that a year will be consumed in this work of unwatering the mine and clearing it of rubbish left by the tributors.

Above the 50-fathom level the mine is connected with the Minesota and the Rockland mines, so that above that point the water must be pumped from all three; also a greater amount of water finds its way into the mine than formerly, owing to sinking in of the long adit, and about the shafts, etc., giving more surface drainage into the mine. Were it not that the long adit had

become completely obstructed it could be used to great advantage in clearing the mine of water; but as it is, the water must be brought to the surface.

When freed of water and debris, the purpose is to sink and explore the mine to greater depth. It is hoped that this work may develop riches that shall cause the future history of the National to rival the best period of its past.

It is an undertaking fraught with much interest; for if it proves favorable, doubtless the Minesota will also resume operating—thus restore to the now comparatively idle village of Rockland, a measure of its former activity.

A favorable result of these explorations will also tend to establish the fact, which the history of the Quincy has determined, regarding stamp lodes: "That in a mass vein, although barrenness may occur, it is not conclusive evidence of utter exhaustion."

YEAR.	No. of Pounds of Mineral.	No. of Pounds of Refined Copper.	Per Cent.	Price.	Cash Received for it.
1854 and previously.....	78,834	55,689	-----	-----	\$ 13,618 39
1855.....	149,226	105,217	-----	-----	24,246 91
1856.....	223,688	176,483½	79	\$.22½	39,156 86
1857.....	403,795	330,942	82	-----	73,363 86
1858.....	310,899	264,621	85.5	-----	57,162 70
1859.....	646,366	488,176	75.5	-----	105,768 50
1860.....	1,455,418	1,078,608	73.96	20.5	221,417 68
1861.....	1,884,317	1,383,761	73.286	20.29	280,763 57
1862.....	1,192,100	865,752	72.08	24.17	209,230 56
1863.....	791,416	516,179	70.90	32.97	185,027 04
1864.....	1,008,677	688,516	68.59	46.19	318,075 06
1865.....	1,067,355	690,271	66.71	29.71	205,076 74
1866.....	902,040	647,371	71.77	29.20	189,008 79
1867.....	660,924	475,633	71.96	23.86	113,486 46
1868.....	619,820	443,048	71.48	22.81	101,083 51
1869.....	411,332	256,947	69.34	21.84	56,257 21
1870.....	320,966	-----	-----	-----	61,249 00
1871.....	555,440	386,776	-----	-----	84,165 24
1872.....	484,998	224,568	-----	-----	105,201 02
1873.....	243,963	155,521	-----	-----	39,431 98
1874.....	127,968	55,871	-----	-----	11,132 42
1875.....	146,721	-----	-----	-----	-----
1876.....	228,870	-----	-----	-----	-----
1877.....	103,329	-----	-----	-----	-----
1878.....	35,496	-----	-----	-----	-----
1879.....	22,560	-----	-----	-----	-----
1880.....	-----	-----	-----	-----	-----

The officers are D. L. Demmon, Secretary and Treasurer, No. 19 Congress street, Boston; Capt. Ed. Parnell, Agent, Rockland, Mich.

ROCKLAND MINING COMPANY.

The Rockland Mining Company was formed under the general mining laws of the State, September 27th, 1853; capital stock \$500,000 in 20,000 shares. The location was set off from the Minesota estate, and was conveyed to the Rockland Company at an estimated consideration of \$100,000, paid in Rockland stock at \$5 per share, fully paid up. The track conveyed adjoins the Minesota on the east, and consists of 480 acres, being the S. E. ¼ Sec. 10, the S. W. ¼ Sec. 14, and N. E. ¼ Sec. 15, T. 50, R. 39, and is crossed by the Minesota veins. The bluff in which the Rockland mine is situated rises 40 or 50 feet

above the surface of the Minesota mine, and affords on the north side towards the valley, through which courses a small stream, an excellent opportunity for drainage by an adit.

An adit was begun in 1853 from the north, and driven to the south, and at a distance of 390 feet intersected the north vein at a distance of 170 feet below the surface; 100 feet further south is the south lode. Then shafts were sunk in the vein to the adit level, and connected with drifts. Assessments were made to the amount of \$3 per share during 1854; and during that year—the first year of work—46,000 pounds of mineral were obtained, which smelted, yielded 75 per cent = 34,554 pounds ingot copper, and sold for \$8,824.91. The improvements, buildings, etc., \$10,000.

The total product to February 1, 1856, was 160 tons of mineral, two-thirds of which was in the form of masses. One mass weighing 6,075 pounds, taken from an ancient pit, and bearing the marks of the rude mining tools of a former period and an unknown race, was sold and sent to England as an object of great curiosity. The balance of the year's product was smelted, yielding 70 per cent = 139,801 pounds, which sold for, including the mass, \$40,660 = 27.7 cents per pound. At this time the total length of the four shafts was 520 feet, the deepest one being 200 feet, and the shallowest 80 feet; and the total length of the three levels, adit, and cross-cut was 1,837 feet.

The mining affairs were conducted by Mr. James B. Townsend, agent of the Minesota.

In 1855 and 1856 a stamp mill was erected with washing floors, etc., and 8 of the 12 heads were put in operation. The rock was drawn from the mine to the stamp mill in cars run on a railroad track.

In 1856 a cross-cut was run to the south lode, and drifts extended east and west on the vein, which overlies the conglomerate. The vein was found to be about two feet thick, and yielded barrel-work. The rock, etc., from this vein had to pass out of the adit 550 feet, as no shaft had been sunk. It was found that there was not enough water to do the stamping and washing, notwithstanding such an abundance had been predicted.

Great expectations were entertained respecting the success of this company, and the directors expressed their predictions with a good deal of confidence.

The product for 1856 was: Masses, 249,774 pounds; barrels, 140,497 pounds; stamping, 99,667 pounds; total, 489,938 pounds; amount smelted, 384,891 pounds, yielding 73.48 per cent = 282,067 pounds ingot, which sold at an average of 26 $\frac{3}{4}$ cents per pound = \$68,524.36. The expenditures for the year were \$87,194.88. The company deemed itself to be out of debt, and ready to coin dividends. A force of 153 men was employed, of whom 73 were miners. An additional one-fourth section of land was purchased, and the right of way of the Ontonagon and State Line railroad, through the company's location was granted.

The total expenditures for the year 1857 were \$129,652.77. The mineral shipped for the year was 780,554 pounds, yielding 73 per cent = 568,264 pounds ingot copper, which sold for 23.63 cents per pound = \$132,740.74; balance on hand, \$10,895.54. Total depth of the 7 shafts, 1,194 feet—deepest, 293 feet; total length of levels, 4,871 feet; average yield per fathom, 654 pounds of mineral; number of men employed, 167, of whom 92 were miners. The stamp mill was leased to the Minesota a portion of each year, at \$500 per month.

The dividend which the directors promised the stockholders in 1857 was not forthcoming. Hoisting and pumping engines and machinery were put up on

the north vein, and work resumed in the stamp mill, expecting that the north vein would supply the stamp rock, which it failed to do. The mineral being insufficient to meet the expenses, assessments amounting to \$4 per share were made.

The total product for the year 1858 was 503,750 pounds, yielding 74 per cent = 372,647 pounds ingot copper, which sold for 22.58 cents per pound = \$81,762.60. The total expenditures for the year were \$128,761.43; \$3 per share of the amount assessed was called in, making \$60,000.

The directors announce that they believe the critical period has passed, and henceforth the mine will be a successful and profitable enterprise. But they were doomed to disappointment; nevertheless the business of 1859 was an improvement on its predecessor.

The shipments for the year were 693,747 pounds, yielding 74.3 per cent = 515,788 pounds, which sold for 22.17 cents per pound = \$114,393.64. The total expenditures were \$122,570.86; no assessments were called in.

The Rockland Company struggled faithfully to make the mine a success, but could not make it self-sustaining—much less pay dividends. The stockholders hoped to have a mine that would rival the Minesota, and pushed matters with considerable vigor, employing a large force of men, working in the same veins as the Minesota, but they did not yield as well. The outlay and expenditures were doubtless greater than the production justified. It started off well, but after a few years the product began to run down, and so continued.

In 1865 new openings were made in the southeast corner of the property, in the bluff, where two parallel veins about 30 feet apart are exposed. Here two shafts were sunk in the southerly vein; this vein was selected from the fact of its greater length on the company's property; an adit was driven for drainage, etc.; seven acres of land were purchased from the Minesota Company to give room for this adit, to get rid of the waste rock, etc.

The product at this time, 1865, was 177,301 pounds, yielding 66.47 per cent = 116,077 pounds ingot, which sold for 31.09 cents per pound. The total expenditures were \$65,347.39, leaving a deficiency on the year's business of \$22,254.82.

Work was continued in these new openings until 1870, when the company shut down, the stockholders having contributed nearly the entire amount of the capital stock, and received no return.

The property passed into the hands of Boston parties—the same who own the National. The company had 400 acres under cultivation; own 760 acres at the location. The stamp mill has fallen in, and much of the mining plant, buildings, etc., are in a somewhat dilapidated condition. The main shaft house, containing engine and hoisting apparatus, was burned in 1878, and greatly damaged the machinery, which had been put in but a short time before the old company shut down.

The mine has been worked by tributers more or less for the last ten years, and some large masses have been found, one of nearly 40 tons weight. The product for 1880 was 47,000 pounds rough copper, yielding 72 per cent of refined metal.

D. L. Demmon, Secretary and Treasurer; office, Boston, Mass. James E. Hoyt, Agent, Rockland, Mich.

LAKE SUPERIOR COPPER COMPANY.

The Lake Superior Copper Company was organized by the stockholders of the Minesota to work a portion of their estate. The location comprises 895 acres in Secs. 13 and 14, T. 50, R. 39. The company was formed in 1859, and the mining work was done on the E. $\frac{1}{2}$ Sec. 14. An adit was driven in from the north side of the bluff about 150 feet, to intersect the Minesota vein, and two shafts were sunk—one on the north vein, and one on the south vein—to the adit level, 75 feet. A second adit was subsequently driven in from the east side of the bluff to where a surface pit showed promising indications of copper. A shaft was sunk, and considerable copper was obtained from this point. This latter work, near the Flint Steel line, was done in 1873-74, since which time no mining work has been done by the company; but some tribute copper has from time to time been taken out. The total product of the mine since 1868 is 17 tons; product of 1874, 7,270 pounds; 1875, 7,029 pounds; 1877, 2,789 pounds of mineral. The total assessments amount to \$40,000.

The company never had any machinery at the mine, except horse whims. A few buildings constitute all that there is now to be seen.

D. L. Demmon, Secretary and Treasurer; office, Boston. S. B. Harris, Agent, Greenland, Mich.

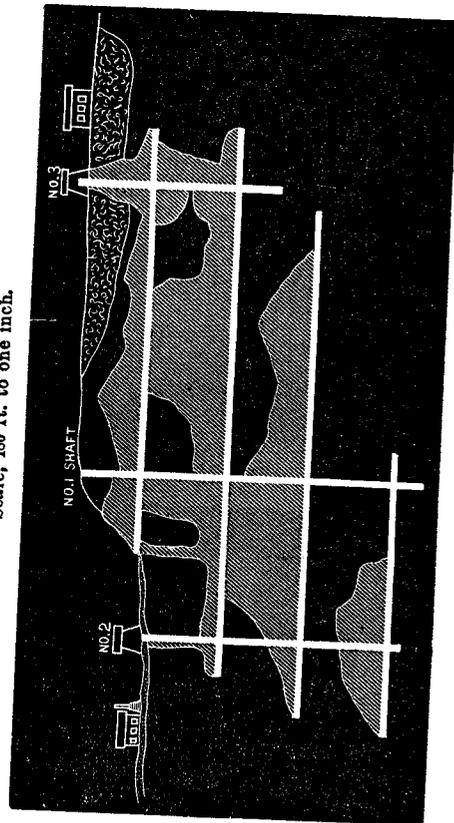
FLINT STEEL MINING COMPANY.

The Flint Steel Mining Company was an early organization, owning the S. W. $\frac{1}{4}$ and W. $\frac{1}{2}$ of the S. E. $\frac{1}{4}$ of Sec. 12, also the S. E. $\frac{1}{4}$ Sec. 11, T. 50, R. 39. Work commenced by opening some old Indian pits, in which several short shafts were lowered and some drifting done. The land was set off by the Minesota Company, and the company organized in 1855, but had been worked in 1850; the vein did not prove productive. The location comprises the eastern extremity of the bluff, where it is cut in two by the Flint Steel river, which here makes a broad gap through the range. The river lies several hundred feet below the tops of the spurs, which confront each other upon opposite sides, the western bluff comprising the Caledonia mine, and the eastern the Flint Steel. West of this gap the hills of the Minesota range lie with great regularity and symmetry; their summits are notched in only one or two places, and these superficial indications of regularity are sustained in the underground works of the important mines located in that direction. But to the east of this gap the mines show all the contortions and twistings corresponding with the broken and irregular superficial contour. These two mining locations, occupying the two sides of the Flint Steel gap, are now controlled by one company. The Caledonia was formerly known as the Nebraska; changed to the Caledonia in 1863.

These companies paid in assessments—the Flint Steel \$204,000, and the Caledonia \$140,000, and were consolidated in 1871 as the Flint Steel Copper Company. Prior to their consolidation each had done considerable mining work, and found some copper in isolated masses, but the irregularity of the veins renders it very perplexing and uncertain work. Each of the companies had built a small stamp mill, but the Caledonia mill was burned in 1870. This mine is opened with two adits from the west side of the bluff, extending about one-half way through; the upper one being 625 feet in length, and the lower one 603 feet long; these were connected by two winzes and a shaft 220 feet in depth. On the north side of the bluff are four adit levels; they all intersect the north or Knowlton vein, and the two upper cross-cut levels are driven in

LONGITUDINAL SECTION OF THE KNOWLTON MINE,
JAN., 1881.

Scale, 180 ft. to one inch.



400 feet, to the Butler or Champion vein. There are two shafts, 120 feet apart, down in the Champion vein 250 feet, and drifts from these each way, 200 feet. The shafts are connected by two levels. This mine is at the west end of what is known as the Evergreen range.

On the Flint Steel location two mines have been opened at points several hundred feet distant from each other. The more important one is opened with three shafts sunk to the second level, and these shafts were connected. One mass of 35 tons was found in this mine in 1865, in which year 152 tons of rough copper were taken out. The adits in the Caledonia from the north side were driven in on cross courses, and in one of them three masses of copper were found—the only instance in Ontonagon county of finding copper in fissure veins. In the Norwich and other mines long drifts have been made in these transverse fissures without finding any copper.

The consolidation of the two companies was made through the fact that the same parties owned the controlling interest in both. Immediately after, a stamp mill with 24 heads was built on the Flint Steel river, between the two mines, and a long trestle was made, extending from the mill across the valley each way, north and south to the mine. About \$60,000 were expended in this work. The purpose was to work up the burrows of rock which had accumulated in the previous year's working, especially since the mines had been worked on tribute, and which were thought to contain a good percentage of copper. The rock on top of the burrows looked well, but unfortunately it proved that the rock on the surface of the burrows was the only part that held any copper. As soon as that was worked off, the remainder, the bulk of the piles, was worthless, and the mill had nothing to do. The mines, which carry but little stamp rock, could not supply the mill, and it was obliged to shut down. This work was done under the immediate superintendence of Dr. McKinnie, who was one of the chief owners, and the doctor was, naturally, greatly disappointed. For several years the mill has not been used, and the trestle is becoming dilapidated. In 1873, after the company shut down, the mines were leased to Capt. Martin—an old experienced miner—on a royalty, and during the six years that he has held the lease he has obtained 135½ tons of copper. His product for 1880, taken from the Caledonia, is 33,911 pounds of mineral in mass and barrel copper. The stamp rock has been allowed to accumulate. The period of his lease is eight years. Captain Martin has paid his miners six to eight cents per pound for getting out the copper. The company have realized enough to pay the taxes. He has had, on an average, six men at work. During the past summer four men have been working on the out-crop of the Champion vein, on the top of the Caledonia bluff, in an old Indian pit, and obtained 16 tons of copper, in which was a 4-ton mass. Recently he has set 2 men at work in the Flint Steel mine, and they got out 2,250 pounds the first five weeks. He once found a 40-ton mass in one of these pits on this location.

On the Caledonia location are 14 houses, and there are 11 houses on the Flint Steel. The mining work done on these locations was never very systematic. It has been done at different times, off and on.

Walter Ferguson, Secretary and Treasurer; office, 35 Pine street, New York. Stephen Martin, Agent, Greenland, Mich.

THE KNOWLTON MINING COMPANY.

Adjoining the Flint Steel (Caledonia) on the east is the Knowlton mine. The company was organized in 1853. The mining location comprises 600 acres, situated on Secs. 1, 2, and 12, T. 50, R. 39. The mine is located on the S. E.

¼ Sec. 1, and is opened in the Knowlton vein, which has a length in the property of 1,100 feet. The vein bears N. 35° E., and dips about 33° with the horizon to the northwest. Its width varies from two to twelve feet. The matrix of the vein is epidote, quartz, calcite, chlorite, etc. The dip of the vein carries it into the company's land.

The mine, which is now idle, was opened in 1862, and the extent of the underground openings comprise three shafts—No. 1 and No. 2 sunk to the fourth level, and No. 3 to the third. The shafts are connected at each of the levels with drifts.

The depth of the mine is 240 feet below the surface on the lay of the rock, and the extreme length at which the vein has been opened is 600 feet.

A stamp mill with eight heads was erected in 1864. Nos. 1 and 2 shafts were worked with an engine and winding drum. For several years the company worked about 40 miners, built about 20 dwellings.

The total expenditures of the company to the close of 1864 was \$217,978.81, and the assessments had been \$110,000.

The product, 1862, 37,040 pounds ingot = 62 per cent of the mineral; the product, 1863, 85,451 pounds ingot = 62½ per cent of the mineral; the product, 1864, 122,877 pounds ingot = 61 per cent of the mineral.

The agent, up to 1865, was Mr. J. B. Townsend, agent of the Minesota, and it would seem that the outlay for surface improvement, etc., was too large in proportion to the extent of mine opened. The company expended \$400,000, \$160,000 of which was derived from assessments. Work was discontinued on company account in 1866-67, and until the past year it has since been worked on tribute, producing each year from three tons to 45 tons of copper.

Product in 1872 was 11 tons, 1,300 pounds mineral; product in 1873 was 45 tons, 837 pounds mineral; product in 1874 was 3 tons, 775 pounds mineral; product in 1876 was 2 tons, 623 pounds mineral; product in 1877 was 4 tons, 532 pounds mineral; product in 1878 was 6 tons, 1,102 pounds mineral.

Captain Dunn resides at the mine, and has the care of the property.

MASS MINING COMPANY.

The Mass mine is now the largest producing mine in Ontonagon county, having been brought up during the past five years, under the efficient management of Benj. F. Chynoweth, the agent, to its present flourishing condition.

The success of the Mass develops the possibilities of the series of small mines which make up the Evergreen range, of which the Mass is a member. This range is the northeasterly extension of the Minesota south bluff, and begins on the north side of the Flint Steel gap and is occupied by a succession of mines, beginning with the Caledonia, followed by the Knowlton, Mass, Ogima, Evergreen Bluff, Ridge, etc. This range has an elevation above the lake of about 800 feet, and above the head waters of Flint Steel river, which runs along the southerly base, of about 200 feet. It is coursed by five prominent known veins, which run with the formation and conform to its dip, having a general bearing of N. 37° E., and a northwesterly dip with the horizon of about 44°.

These veins are generally from 100 feet to 300 feet apart, and are named from the location where they were first opened or from the individual who first discovered them. In the order of succession they are now called: The southerly one, the Evergreen vein; the Ogima, the Butler or Champion vein; the Mass and the Knowlton, the latter being the most northerly.

The Mass mine location, S. W. ¼ of Sec. 6, T. 50, R. 38, is crossed by all these veins. The company was organized under the general mining laws of

this State, March 31, 1856, with the president, then as now, Dr. C. G. Hussey, Joseph M. Cooper, Secretary and Treasurer. The other officers, Messrs. Avery, Howe, Clark, etc., all of whom were associated in the organization of many of the early copper companies on Lake Superior, some of which, as the Cliff and the National, are among the widest known and most profitable.

The first shipment of copper, eight and one-fourth tons, was made in 1857, the year following the commencement of its operations. Work here was prosecuted moderately until 1860, when it was suspended, and continued idle until 1864, at which period prices ruled at a height that induced the resumption of work in many such mines.

Prior to 1864 a tunnel had been driven in on a cross-course from the northerly side of the bluff to intersect the veins, which were drifted and stoped out to some extent. The tunnel reached about half way through the bluff, and two air shafts had been sunk to intersect it. In driving this tunnel it was found that the formation had been heaved or thrown at this fissure, the dislocation of the veins amounting to 25 feet, and that the air shafts had been sunk between the dislocations.

On resuming operations in 1864, work was begun on the Evergreen vein in the southerly side of the bluff. In this vein six shafts were sunk, varying in depth from 60 feet to 112 feet, making a total length of 501 feet, which work was done at a cost of (average) \$30.75 per foot, and the levels connecting these shafts comprised a total amount of drifting of 719 feet, representing an average cost of \$17 per foot. But in the spring of 1865 it was determined to discontinue work on this vein, it appearing that no large return could be got without a greater outlay for machinery than the company felt willing to make. The mining work was therefore transferred to the veins intersected by the adit level, and here it was continued until 1868, when all work was again totally suspended. During the succeeding six years some irregular tribute work was done, by which a total amount of 38½ tons of copper were obtained.

In 1874 it was determined by the company to resume work again, and the affairs were placed in charge of Capt. John Chynoweth, who in the following year resigned, and his son, B. F. Chynoweth, was chosen agent. The latter's practical and theoretical training under his experienced father at the National, and in the engineering school at the university, admirably fit him for performing successfully the important duties of superintendent of a mine.

The purpose has been to proceed cautiously, avoiding all unnecessary expenditure, and to make only such surface improvement as was justified by the production. It was determined, if possible, to make the mine at least pay its own way, without calls upon the stockholders for funds.

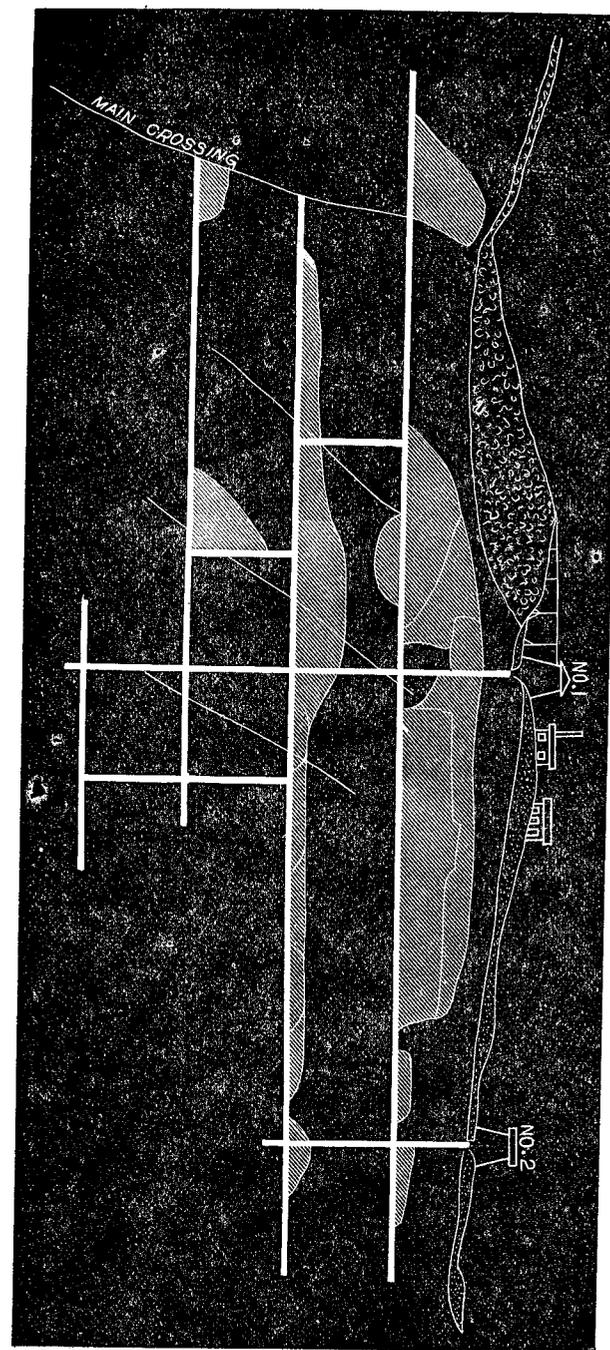
The board of directors in 1874 inaugurated their plan to develop the mine, and levied an assessment of \$1 per share, by which \$14,195 were realized. From this time to 1876 there was opened, in the Knowlton vein, 220 feet of drifting, and 16 cubic fathoms of stoping, done at an average cost, for the former, of \$12.87 per foot, and for the latter, \$21.50 per fathom. In the Mass vein 65 feet of drifting had been done, and 16 cubic fathoms of stoping, costing respectively \$14 and \$22 per unit of measure. In the Champion vein drifting was done to the amount of 81 feet, and stoping to the extent of 14 fathoms. A shaft had also been sunk in the Mass vein 81 feet in depth. The average number of men which had been employed was 25, and the mine had yielded 30,215 pounds of copper, 2,600 pounds of which had been obtained from the Knowlton and Champion veins during the winter of 1875-76.

The Knowlton vein has a width of about eight feet and is thought to be the

most valuable of the Evergreen range lodes; the matrix is quartz, epidote, calc, spar, and diorite; and next to it in importance is thought to be the Mass vein, lying 140 feet south of the former. The Champion is a wide, metalliferous lode, lying 300 feet still further to the south. It is composed of vein trap, with crystals of epidote, laumonite, calcareous spar, etc. The copper occurs in masses, and there is little or no stamp rock in the vein. Still further to the south 100 feet, lies a belt of vein matter 40 feet wide, known as the Ogima vein, from having been first opened in that location. Some years ago an opening made in this vein on the Mass property revealed a 5-ton mass of copper. This vein has been but little explored on the Mass location, but in the adjoining location on the east, it furnishes the basis of the entire operations.

The Evergreen vein is the last prominent one intersected by the cross cut, and lies 230 feet south from the Ogima lode. It has a variable width of from two to fifteen feet, and the vein matter is an amygdaloid trap with crystals of epidote, quartz, and calcite. In some of the other locations, notably the Evergreen bluff, it yields mass and barrel copper, and some stamp rock. Its out-crop shows many ancient diggings and tribute workings; but at the Mass the results from working it were not sufficiently favorable to justify a continuance of the work. The Knowlton seemed to afford a greater proportion of stamp rock, as well as being equally productive in mass and barrel-work. During the past four years most of the work has been done in this lode. The tunnel was completed through to the south side of the bluff, 1,400 feet, and in crossing the Champion vein an 8-ton mass was found. The bottom of the tunnel was laid with T rail, with branches running into the drifts in the several veins. A stamp mill was built in the latter part of 1877, supplied with 16 heads of stamps, Gates pattern. The mill is placed on the Flint Steel river, which runs through the valley south of the bluff, and below the stamp mill a saw mill was erected, run from the stamp engine. The rock found its way to the mill from the south end of the tunnel down a chute 240 feet into cars, which conveyed it on a track 1,000 feet in length to the stamps. Added to the product of the mine was the accumulated stamp rock of the previous years of working. The mill is supplied with water from a pond above, made by a dam across the stream, and is forced up by a 15-inch pump,—a steam pump is provided in case of fire. The main shaft in the Knowlton vein was fitted with a skip road, and worked with an engine and winding drum.

At the present time the rock is hoisted into the rock house directly from the shaft, where it is overhauled, the masses sorted out, and the large portions of rock placed under the hammer, which is a cylinder of iron that works in a frame similarly to a pile-driver. This hammer breaks up the rock to a sufficiently small size for the Blake's crusher, into which it is thrown, and thence dropped into the chute, out of which it is drawn into the cars that convey it along a horizontal track 1,200 feet in length to the top of the bluff, where during the past year a double-track inclined railway has been built, down which the loaded cars are sent to the stamp mill, the descending car drawing up the empty one. The height of the bluff is about 200 feet, and the distance to the mill is 1,350 feet. Since commencing to operate the incline the way by the tunnel is no longer used. The washing apparatus used is Schierman's and additional facilities are soon to be added, together with eight more heads of stamps. Even although there is not a great amount of stamp rock, still the rock is extremely hard and so entangled with copper that the process of stamping is necessarily slow. There is a great lack of water in dry time, and much trouble in holding it in wet time. The rock is not calcined.



LONGITUDINAL SECTION OF THE MASS MINE, JAN., 1881.
Scale, 120 ft. to one inch.

The present work is done in the Knowlton vein, but it is intended, however, to continue work in the other veins as soon as the requisite mining force can be secured and provided for. The vein is bunchy and exceedingly irregular in direction and in dip. Its width varies from four feet to forty feet. The best deposits are found where the sharpest folds occur. Where the vein is very wide much barren rock is found, necessitating much dead work, possibly one-quarter of the rock found in these wide places being fit for the stamps; but when the vein is narrow, not exceeding four to six feet in width, 75 per cent of the rock proves profitable.

During the past year considerable expense has been incurred for improvements. A few dwellings, warehouse and barn have been built, an iron lathe added to the machinery, the new tramway and incline built, etc., causing a total expenditure of upwards of \$80,000; but the mineral product—360 tons, yielding 75 to 80 per cent, at the present price of 19 cents—will still leave a small margin of profit in the year's work. It is expected that during the coming year but little money will have to be laid out in the way of improvement, and with the present favorable indications to be seen in the mine there is every reason to expect, under its present efficient management, the mine will make a good measure of profits. The purchase by the Mass of the Hazzard mining location, being the N. E. $\frac{1}{4}$ Sec. 1, lying north of the Knowlton, was recently made.

The average number of miners now employed is 60. The total expenditures to close of navigation 1880 are \$379,884.55, and the total receipts have been about \$387,884.55. The total amount of the assessment which has been paid is \$149,202.00. The total amount received for copper is \$292,531.17. Total expenditures to date, December, 1880, \$437,705.93. Cash on hand, \$4,037.24. Assets, \$24,591.69. Percentage of rock rejected, 40 per cent.

The number of tons stamped is 7,779, which yielded 40 pounds of mineral per ton. Number of tons stamped per head per 24 hours' work was 2.

Cost per ton, sorting, tramming, stamping, washing, \$1.40. Cost per foot for sinking shafts, \$19.90. Cost per foot for drifting levels, \$12.96. Cost per fathom for stoping, \$34.00. Yield of mineral per fathom, 1,050 pounds.

The officers of the company are C. G. Hussey, President, Jos. W. Brown, Secretary and Treasurer, Pittsburgh, Pa. B. F. Chynoweth, Agent, Greenland, Mich.

OGIMA MINING COMPANY.

The Ogima mining location comprises the N. W. $\frac{1}{4}$ Sec. 6, T. 50, R. 38. It joins the Mass on the north, and is crossed by the Evergreen, Ogima, Champion, Mass, and Knowlton veins. A cross section of the Ogima bluff extending from the surface line to the adit level shows the occurrence of seven distinct mineral lodes, at distances, measured from the north to the south, on the adit level, 150 feet from the mouth of the adit to the Knowlton, then 228 feet to the second lode, 50 feet to the third, 80 feet to the fourth, 65 feet to the fifth, 42 feet to the sixth, 290 feet to the Evergreen lode, and 105 feet to the south side of bluff—total distance through the bluff, 951 feet. The veins here were worked on the surface by individuals, or tributers, cleaning out the old Indian pits, and obtaining small masses and barrel-work copper, until 1860, when the company was organized under the general mining laws of the State with a capital stock of \$500,000, and mining work was begun in the Ogima vein. Previous to 1860 there had been taken out and sold, of tribute copper, 115,000 pounds of ingot. The miners found themselves and received \$140 per ton.

There was also some accumulation of stamp rock, for which there were no facilities for working up. The company shipped in 1861 20,000 pounds of mineral, yielding 14,000 pounds ingot copper. In 1862 there were produced 58,000 pounds mineral, yielding 70 per cent = 40,600 pounds ingot. In 1863 38,000 pounds mineral, yielding 75 per cent.

During these years considerable surface improvement was made,—agent's house, miner's dwellings, etc., and in 1864 a stamp mill was built with eight heads of Gates' stamps, run with an engine of suitable power, also two portable engines for hoisting and pumping were rented. The stockholders were called upon for assessments to the amount of \$140,000. This in addition to the receipts for copper produced. The stamp mill is built on high ground, and the water pumped from a small pond that seems scarcely large enough, under ordinary circumstances to swim a flock of ducks in. It is formed by damming a small rivulet that runs along the valley in wet weather on the north side of the bluff.

The company stopped work in 1868. The underground workings comprise three shafts sunk,—No. 1 and No. 2 to the 4th level, and No. 3 to the first level. The first two are connected by drifts at all the levels, and the veins are crossed by an adit tunnel through the bluff. Since the pumps ceased, in 1868, the mine has been filled with water to the adit level, and above that the ground has been worked off and on by a few tributers.

In 1879 there were taken out by tributers 13 tons, 751 pounds ingot copper; and in 1880, 58,650 pounds mineral, yielding by estimate 70 per cent ingot.

There now remains on the location, the stamp mill and machinery, hoisting engine, agent's house, barn, etc., and 11 miners' houses. The tributers are paid seven cents per pound for the copper which they get out.

A few years ago the directors made a dividend of \$15,000 from an idle surplus lying in the treasury. Office in New York; Samuel Cooper, Secretary and Treasurer; L. Collins, Agent, Greenland, Mich.

THE MERRIMAC MINING COMPANY.

Adjoining the Ogima on the north is the Merrimac mine, comprising the E. $\frac{1}{2}$ Sec. 34, and the S. $\frac{1}{2}$ S. E. $\frac{1}{4}$ Sec. 27 (400 acres), T. 51, R. 38. The property was set off from the Bohemian estate in 1863, when the company was organized, the shares being distributed among the Bohemian stockholders. Assessments were made and collected to the amount of \$117,900, which was expended on surface improvements, and in doing a small amount of mining work on the S. E. $\frac{1}{4}$ Sec. 34. A store and ten boarding and dwelling houses were built, and a hoisting engine procured.

The Evergreen vein probably dips under this property, but the explorations were never conducted sufficiently to determine the extent and character of the mineral veins which cross the location. Two shafts were sunk on the Ogima vein, and a shaft started to reach the Evergreen vein, but was only carried down about 80 feet and abandoned. The property is now advertised for sale. The houses are occupied by miners working in the adjoining locations.

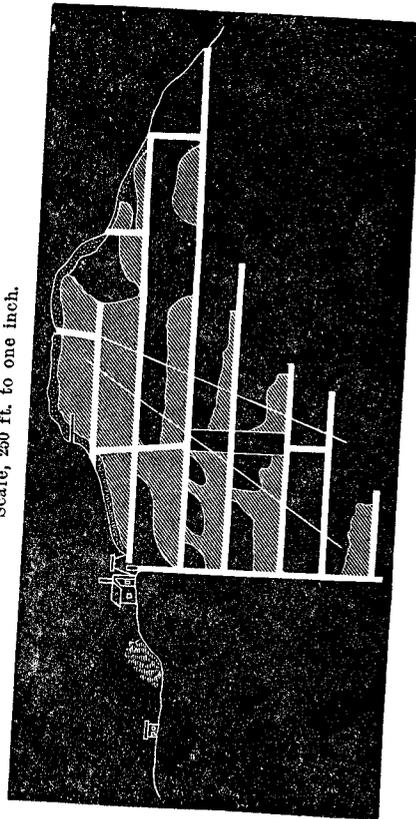
Joseph G. Henszey, President; office, 110 Front street, Philadelphia. Alfred Meads, Agent, Ontonagon, Mich.

THE EVERGREEN BLUFF MINING COMPANY.

This mining property adjoins the Mass and Ogima on the east, and the Ridge on the south, and comprises 680 acres—the E. $\frac{1}{2}$ Sec. 6, N. E. $\frac{1}{4}$ Sec. 7, and W. part of Sec. 5, T. 50, R. 38. The northeasterly continuation of the veins,

LONGITUDINAL SECTION OF THE EVERGREEN BLUFF MINE,
ONTONAGON COUNTY, MICH., 1881.

Scale, 250 ft. to one inch.



which pass through the Mass and the Ogima, cross the northeast $\frac{1}{4}$ of Sec. 6, and it is on this portion that the mining work has been done.

The company was organized in 1853, and the stock was all owned by a few Michigan men, in Detroit and Pontiac. Mining work was immediately begun on the south or Evergreen vein, and continuously prosecuted with a force of from 6 to 28 men, until 1857, when work was suspended for about a year, and again resumed and continued on about the same manner, with the addition of a small hoisting engine, until 1863, when a majority of the stock having been bought by parties in New York, the office of the company was removed from Detroit to that city, and operations were carried on for a few years thereafter on a greatly reduced scale. Up to 1863 the underground work in the mine consisted of an adit driven in the vein 511 feet, and four levels below this of respective lengths of 311 feet, 321 feet, 360 feet, and 50 feet = 1,553 feet in all, and three shafts—240 feet, 60 feet, 240 feet, respectively, = 540 feet in depth. In addition, some work had been done on another vein, consisting of driving a cross-cut 210 feet, and sinking a shaft 80 feet.

A small branch of the Flint Steel cuts through the bluff near the northeast corner of Sec. 6, and exposes the veins and the rock formations upon the opposite faces of the gap, which is thus formed; further to the south is a second depression, and in the south wall of the depression which forms this second valley, the adit is made to enter.

On this branch of the Flint Steel river a stamp mill was built in 1862, provided with 16 heads of stamps, worked with an engine.

The total product of the mine up to the close of 1862 was 208 tons of refined copper, 141 tons having been produced during the preceding three years. The product for the different years up to this time was as follows:

YEAR.	No. of Masses.	No. of Barrels.	Barrels Rough Copper.	Per Cent Yield.	Pounds of Refined Copper.
1854.....	1	5	3,148	76	2,599
1855.....	10	28	21,763	65.5	14,007.5
1856.....	16	41	36,687	68.5	25,110
1857.....	35	73	69,198	68	46,942
1858.....	--	13	9,440	70.5	6,665
1859.....	20	55	54,198	71.3-5	38,811
1860.....	20	78	83,791	76	63,817
1861.....	53	114	141,221	70.5	99,187
1862.....	48	124	163,436	72.96	119,257
1863.....	--	---	144,211	74	105,746

The total proceeds from sales of copper had been \$86,582.24, and the total expenses had been \$223,562.89, and the total assessments, \$108,000.

In March, 1863, the new board of directors assumed control; the mining force was increased to 65; Gates' stamps—16 heads—were put into the mill; new hoisting engines erected; a large number of new houses built, store, shops, etc. The company continued operations on a somewhat extensive scale, with Q. C. Patterson as agent of the mine, and obtaining about 300 tons of copper per year, until 1870, when work was suspended. The expenses were all the while in excess of the product, and exceeded their expectations. Despairing of making of the undertaking a success, the stockholders resolved to quit, and the only mining work that has since been done is by tributers, and very little

of that until 1878, at which time the property was put in charge of Mr. L. Collins, who occupied the store building and the agent's house.

The mine was filled with water up to the adit level, and the tributers have worked above that. Mr. Collins pays them seven cents per pound, and makes some advances in the way of supplies.

In 1878 the product of mineral was 46 tons, 1,467 pounds, and 1879 it was 20 tons, 1,588 pounds. In 1880 there has been produced 13,470 pounds of mineral, which has heretofore averaged 80 per cent in refined copper.

There are five engines on the premises, in place. Some of the houses are occupied by tenants who work in this or in other mines. The property is in charge of Mr. L. Collins, who lives on the location. The general office is in New York; F. W. Capron, Secretary and Treasurer.

THE RIDGE COPPER COMPANY.

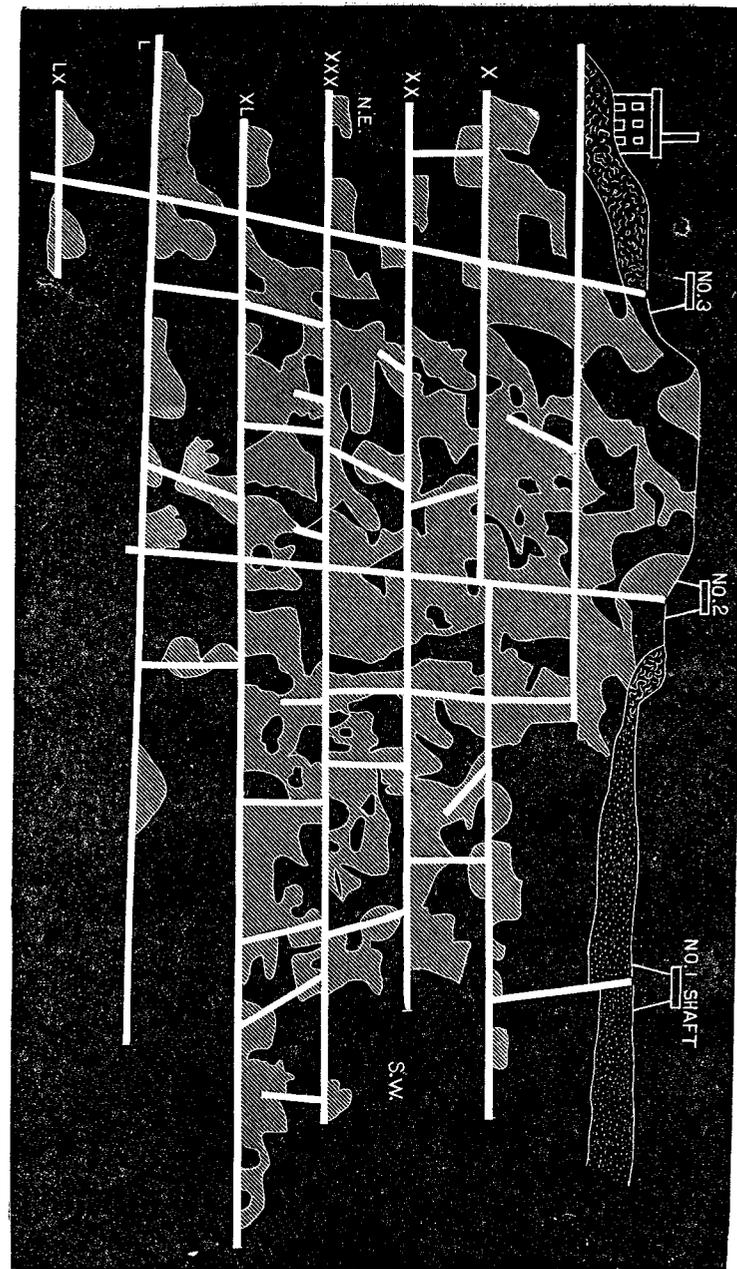
The Ridge mine is situated in a prominent bluff, which forms a ridge transverse to the trend of the range, made by the valley, which lies between it and the Evergreen Bluff mine on the south, and the gap of the Flint Steel branch on the north. The location consists of the S. W. $\frac{1}{4}$ Sec. 35, T. 51, R. 38, and the company is one of the oldest in the district, and has made one of the best records as a mining enterprise of any company in the Evergreen range.

The organization was made under a special charter from the State of Michigan, April, 1850, with Luther W. Clark as President, Justin Shapley, Secretary and Treasurer, and six directors. The property was purchased for the sum of \$800, and is distant from Ontonagon harbor 13 miles. The first meeting of the stockholders was held at Eagle river, October 9, 1849, and work was begun on the location on the 18th of the same month, and by July thereafter some houses and a blacksmith shop had been built, and near the center of the location, in a gorge at a point about 100 feet below the summit of the ridge, an adit had been driven in on the vein a distance of 85 feet, and one and one-half tons of copper taken out. Here, as elsewhere in this region, were numerous Indian diggings, by following which the outcrop of the veins was plainly indicated.

The first mine was opened in the Butler or Champion vein, and in this lode two shafts were sunk to the 70-fathom level, and considerable drifting done at each of these lifts.

The old company continued work for five years, and in 1855 leased the mine to Capt. Stephen Martin, who worked it on his lease until 1860, when the property was purchased by Thomas F. Mason for \$200,000. Captain Martin continued to work the mine from year to year until 1863, when a new company was organized under the general mining laws of the State, with a capital stock of \$500,000. Work was resumed by the new organization, and assessments to the amount of \$200,000 was made during the two succeeding years, since which time the mine has produced sufficiently to meet the expenses, and in 1872 the product was 170 tons, 920 pounds—78 per cent purity; the net earnings were \$87,119.54, and the expenses \$58,780.98, giving a profit which, with the surplus previously accumulated, enabled the directors to declare the first dividend of \$50,000. The product of rough copper was:

Year.	Tons.	Pounds.
1873.....	160,	-----
1874.....	282,	342



LONGITUDINAL SECTION OF THE RIDGE MINE, JAN., 1881.
Scale, 180 ft. to one inch.

Year.	Tons.	Pounds.
1875.....	218,	650
1876.....	196,	465
1877.....	200,	1,085
1878.....	162,	317
1879.....	132,	505
1880.....	132,	430

Average, 72 per cent.

The total dividends paid are \$100,000, the last one being 50 cents per share, declared January, 1880. It is expected that the business of the present year will give a like dividend.

The stamp mill has 12 heads, but four more are soon to be added, and the present imperfect washing apparatus will be changed to Schierman's. There is great lack of water, the small stream affording an insufficient supply in dry weather. It is economized to the greatest possible extent by the use of two dams. The mill is connected with the kiln house by a railroad which crosses the valley, laid on trestle work. No. 2 and No. 3 shafts are furnished with skips, and are worked with engine and winding drums, by which the rock is drawn up in the skip cars and dumped into the shaft houses, where it is sorted, and the stamp rock trammed to the kiln house to be roasted. The mine is now furnishing more stamp rock than heretofore. Formerly about 80 per cent of the rock was rejected, but at present the result is a little better. In 1879 the selected rock was 19.25 per cent of the total amount; in 1880 it is 21 per cent. The yield of the rock stamped in mineral is 1.15 per cent, and the average per cent of the mineral in ingot is 72 per cent. There are now 42 miners employed. Since 1871 the mine has been under the charge of Capt. Samuel B. Harris, a miner of much experience and unquestioned skill, and the present prosperous condition of the company's affairs are no doubt due to his excellent management.

The vein bears S. 43° W., and dips northwesterly 38°. The longitudinal section will show the underground working at the present time, and the accompanying ground plan may serve to convey an idea of the contortions and twistings, and variations in width, which characterize the lode. In the 10th level, near No. 2 shaft, an instance occurred in which the men drifted entirely around a great "horse" of trap, and in lieu of progressing ahead in the vein, as they supposed that they were doing, they found themselves, in due time, much to their surprise, "holing" at the starting point, accompanying what is designated as a "whim around." The company now owns 1,494 acres.

The officers are Thomas F. Mason, President; W. Hart Smith, Secretary and Treasurer, No. 4 Exchange Place, New York; S. B. Harris, Agent, Greenland, Mich.

THE ADVENTURE MINING COMPANY.

The Adventure is one of the earliest mining organizations in the Ontonagon district, and was one of the undertakings of the old Pittsburg and Boston company. It began in 1850 under a special charter from the legislature of Michigan, with a capital stock of \$200,000, divided into 1,000 shares. The officers were: C. G. Hussey, President; James M. Cooper, Secretary and Treasurer, and five directors; office in Pittsburg. The mine adjoins the Ridge on the north and east.

The name of the company was properly assumed; the mining work has been

a series of ventures in searching for mineral, which seems to be disseminated through the trap without being anywhere confined to a single vein, and after four years unsuccessful endeavor to establish a systematic mine they decided to adopt the policy of mining their irregular deposits by the tribute system, which method they were the first to introduce.

More or less irregularity is apparent in all the mines in the Evergreen range, but in the Adventure bluff the mineral is principally found in pockets or bunches, having a general traceable direction, but without being in well defined veins, and determined by inclosing walls. Shafts and levels in any regular order and succession are out of the question.

Accordingly, after having, during several years' work, punctured the bluff in various places with trial shafts, the agent was instructed in May, 1855, to allow the men to work at designated points, and to pay them \$100 to \$120 per ton for all the mineral they could obtain, the mineral to be 50 per cent pure copper; the men to find themselves, except the company should furnish a smith to sharpen their tools. The product for the season thus obtained was 78 885-2000 tons of mineral which, smelted, gave 31 1253-2000 tons ingot copper, and sold for \$13,903. The number of tributers thus engaged was 55. The cleared land was also leased out on shares. A stamp mill with eight heads, run by water, was built during the summer of 1855, and a railway track, extending from the mine to the mill, was made, the cost of the whole being \$2,500. The stamp mill was found to add to the product three or four tons per month.

In 1856 the product obtained was 140 tons of mineral. The product for the previous years was 120 tons of mineral, yielding about 72 tons of refined copper.

The total expenditures to 1856 were \$136,407.83, of which amount \$90,000 were derived from assessments.

The company proposed to continue the tribute work so long as it could be made to meet the expenses, in order, if possible, to develop some regular deposit. The company purchased, in 1858, the Merchants' Company's property adjoining the Adventure, being the N. W. $\frac{1}{4}$ Sec. 35, T. 51, R. 38. The stamp mill was also provided with steam power.

In 1870 the whole property was sold to Thomas F. Mason for \$110,000, and a new company was organized and began work with about a dozen miners. An adit was driven from the north side of the bluff to intersect the lodes, a distance of 600 feet, and 150 feet of drifting done in the Champion lode. And also a shaft was sunk in 1875 to a depth of 385 feet. No work has been done by the company since 1877, but during the three years that have elapsed the tributers have raised 98,464 pounds of copper. The tribute product for 1880 is 3,140 pounds of mineral. The property is owned by the same parties who control the Ridge mine, and the plant that was of any value has been transferred to that location. The total assessments made by the new company are \$100,000. The location comprises 480 acres.

President, Thomas F. Mason; Secretary and Treasurer, W. Hart Smith; office, Exchange Place, New York; Agent, S. B. Harris, Greenland, Mich.

HILTON MINING COMPANY.

This location adjoins the Adventure on the east, and comprises the E. $\frac{1}{2}$ of Sec. 36, T. 51, R. 38. The company was first organized in 1863, and sunk a few trial shafts, and made some effort to find the veins which cross this land.

There are seams of epidote and quartz, which appear to contain but little copper.

The location was abandoned until 1863, when the company was reorganized as the Hilton, having been formerly termed the Ohio. Mining work was again prosecuted for two years, and in 1865 it was definitely suspended.

The underground working consists of two shafts down about 100 feet each, connected with an adit that comes out on the west side of the bluff, its total length being 350 feet. The only hoisting apparatus ever used was a horse whim or man power.

There is no water on the property for stamping purposes. The vein in which the mining was principally done has not been identified. There are several houses, change house, smith shop, etc., on the location. A few tributers have occasionally worked in the mine since 1865, and in 1878 9,489 pounds of mineral were thus got out, and 1879, 2,261 pounds, yielding about 72 per cent of ingot copper. General expenses to present time, \$45,000; assessments to date, \$50,000.

Thomas F. Mason, President; W. Hart Smith, Secretary and Treasurer; office, Exchange Place, New York; S. B. Harris, Agent, Greenland, Mich.

AZTEC COPPER COMPANY.

The Aztec lies east of the Hilton, the N. W. $\frac{1}{4}$ Sec. 31, T. 51, R. 27, and the bluff, which runs nearly east and west, and is locally known as the Aztec bluff, being one of the series which make up the Evergreen range. The bluff slopes to the north and to the south about equally, the rise being 300 feet. The mineral veins run east and west parallel with the slope, and dip about 44° to the northwest. The location takes its name from the unusual amount of ancient mine work, with which the surface was indented; this ancient work being attributed by many people to the Aztecs. In these pits on this location considerable copper was obtained—in some instances in masses of large size. In one pit a mass of 100 tons weight was obtained. This work of clearing out the old pits for copper was mostly done by tributers. The same trouble was experienced here as at the Adventure and at other locations in this part of the range, in regard to the uncertainty and disordered state of the deposits of copper. The prosecution of mining operations in the most judicious manner was a difficult and puzzling task. It has been impossible to find regular veins that continued such to any considerable distance. Short veins, feeders, and fissures are often traced. The first copper was shipped in 1852—6,757 pounds of mineral = 3,381 pounds, which sold for \$840.44. In 1853 the product was 20,435 pounds = 8,826 pounds ingot, which sold for \$3,383.02. At June 1, 1854, \$30,000 had been expended. The owners were the Pittsburg and Boston men—C. G. Hussey, T. M. Howe, J. M. Cooper, etc.

The foot wall or underlying rock is a grayish colored trap, and the overlying, hanging wall being a dark colored trap.

It is a part of the purpose of the present work of the company to determine the clearance walls—the walls of the veins. A tunnel is driving to the north from the bottom of No. 1 shaft, which will be continued until it strikes the dark, unproductive trap—"country rock." When this line is reached they will know that they have attained to the limit in this direction.

Two short adits have been driven in from the south side, the lower one 175 feet, the upper one 80 feet. On the north side an adit is driving in to reach

the Knowlton vein; it is in 175 feet, and it is expected in a short distance further to reach the vein.

The bluff is about 1,000 feet through at the base. There are two shafts down in the south vein, 300 feet apart, which are connected by levels, and sunk to the 60-fathom level, but the vein is so irregular that it has been impossible to determine its outlines. Possibly the developments which will be made in the course of the work now pursued will enable them to reach something definite. From the points of intersection of the adits with the veins levels are driven east and west, and also sinking has been done to 60 fathoms below the adit level.

On the Knowlton vein it is proposed to drive an adit beneath the Indian pits, some of which have proved so rich in copper, hoping that the product, which was so great, has not been exhausted, and also to reach those portions of the upper part of the vein which were overlapped by the trap, and have not as yet been reached. The improvements are a stamp mill with 10 heads of stamp, situated to the south of the slope, rock house, with Blake's crusher, etc., and house room sufficient for 100 men. The mine has the advantage of being easily drained by adit levels to considerable depth. The company own 1,200 acres of land two or three miles distant from the location, convenient for fuel. The assessments have been \$150,000.

In 1871 the mine was bought by P. T. Rogers, by whom it was sold to Dr. Hussey, and a new company was organized in 1880—July—and the mine placed in charge of Capt. John Chynoweth, to work. Capt. J. Huddleston is now at work with about six miners, and has taken out, since he began work in September, 8,000 pounds of mineral.

The capital stock is \$1,000,000; office, Boston; August A. Page, Secretary and Treasurer; Capt. J. Chynoweth, Agent, Greenland, Mich.

BOHEMIAN—INTERNATIONAL MINING COMPANY.

The location of the Bohemian mine is the E. $\frac{1}{2}$ of Sec. 31, T. 51, R. 37, adjoining the Aztec on the east. Work was begun here in an early day, and the first shipment, consisting of about one and one-half tons of pure copper, was made in 1853. It was found difficult to trace the existence of any regular vein. The first shaft was sunk on what seemed to be one, inclining to the north at an angle of 33°. The earliest explorations were made by the Piscataqua Mining Company, who in 1853 sold out to the Bohemian Company for \$3,000. The latter company continued to hold the property, doing a little work during the first few years, until 1862, when a reorganization was made. Up to the time of this reorganization there had been expended in mining on the location the sum of \$181,985.90, \$13,320.17 of which was derived from the sales of copper; the balance by sales of stock and assessments. The estate comprised 1,480 acres.

The Bohemian Mining Company was organized under a special charter granted by the legislature of the State of Michigan, March 27, 1848. The capital stock was placed at \$250,000, divided into 20,000 shares.

Upon the resumption of operations in 1862 additional assessments were called in, and mining work begun in 1863 on an enlarged scale. Among the many improvements that were made were a saw mill, a stamp mill containing 12 heads of Gates' stamps, and a number of houses. Work was continued until 1866, when the mine shut down until 1870, when work was resumed and

prosecuted during a short time. The veins run east and west, and extend for one-half mile on the property, having a variable width of from 2 feet to 15 feet and upwards, and a dip to the north of about 40°. The underground work comprises two shafts, sunk to respective depths of 210 feet and 260 feet; four levels extend from these shafts. The first or adit level having a length of 450 feet; second level, 480 feet; third level, 400 feet; fourth level, 430 feet. Shaft No. 2 is fitted with a skip and with turn tables at the several levels, to send the same cars that tram in the levels to the surface. Other openings have been made on other veins lying to the south and to the north of the principal mine, the openings on the north being connected by a cross course adit with the main mine. Considerable money has been expended and considerable work done on the location, but with poor success. About 220 tons of refined copper have been obtained, all told. The stamp mill was burned in 1873, when it was not being used. There are, on the property, 14 miners' houses, agent's and captain's houses, and other buildings, also boiler, engine, and hoisting apparatus at No. 2 shaft. A small stream supplies the water for the stamp mill in limited quantity. An excellent highway runs through the location, extending to Houghton and to Ontonagon, which latter place is 15 miles away. The village of Maple Grove is three miles distant. The highway now being constructed from L'Anse to terminate here, intersects the Houghton & Ontonagon road in the Bohemian location. L'Anse is distant, east, 36 miles. If the mineral veins are sufficiently rich to repay the cost of working, it would seem that this mine could be again got to work with comparatively little expense. A great deal has been already done. The mine has been more or less worked by tributers for years. The property is still owned in Philadelphia, and is now advertised for sale by E. M. Davis and J. G. Henszey, Philadelphia, Pa. A. Meads, Agent, Ontonagon, Mich.

THE GREAT WESTERN MINING COMPANY.

This company was another of the offsprings of the Pittsburg and Boston, organized in 1863, the location comprising the S. E. $\frac{1}{4}$ Sec. 30, and S. W. $\frac{1}{4}$ Sec. 29, T. 51, R. 27, adjoining the Bohemian on the north. Some copper had been previously obtained from the Indian pits along the mineral outcroppings on the property. A few tons were shipped in 1865. The work was begun in 1863. The veins are so capped over and irregular that the explorations failed to discover anything of value. The property is in charge of Captain Chynoweth, of Greenland, and is owned by Dr. Hussey et al., Pittsburg, Pa.

THE CHIPPEWA MINING COMPANY.

The Chippewa Mining Company held the quarter section north of the Great Western, to wit: The N. E. $\frac{1}{4}$ Sec. 30, T. 51, R. 37. No work of any consequence was ever done.

The Algomah Mining Company worked the location next to the west—the W. $\frac{1}{2}$ Sec. 30, T. 51, R. 37,—in 1852 and thereafter.

THE TOLTEC CONSOLIDATED.

The location of this once important mine lies next west from the Algomah and north of the Hilton, comprising the S. $\frac{1}{2}$ Sec. 25, T. 51, R. 38. The company was organized in 1850, and began work in March, 1851, by clearing some land and erecting a few houses, and in July thereafter mining work was begun.

In 1854 there had been 1,000 feet of shafts sunk, and 1,700 feet of drifting. The copper that was obtained consisted of isolated masses, sometimes of considerable size, one being found at a depth from the surface, in 1855, of 130 feet, weighing 23,300 pounds. But these masses, however gratifying, were of too infrequent occurrence to compensate for the cost in obtaining them, and after working about 10 years, and making an outlay of half a million of dollars, the company was obliged to suspend operations altogether.

Amount of copper shipped from the mine in 1853 was 10,380 pounds; in 1854, 20,000 pounds; in 1855, 163,669 pounds. A stamp mill with eight heads was built. It was expected that the water pumped from the mine would contribute largely towards supplying it, but the calculation failed to be borne out by the subsequently experienced fact.

The agent of this mine made large expenditures in surface improvements, with the expectation that the mine would give a large yield; his anticipations were not realized. There was too much money engrossed on the start in surface improvement, in clearing land and destroying timber that should have been saved for the subsequent use of the mine, raising smiling fields of grain and vegetables, building up a handsome and pleasant village, and generally adorning and improving the landscape, seems to have occupied the attention of the agent, to the neglect of legitimate mining work. These expenditures may, many of them, be well enough when the results of the mine bear them out and sustain them. But until the mine has succeeded in paying, and the fact is demonstrated beyond a doubt that the yield of the mine will be adequate to the great outlay, such improvements are premature and extravagant, and in case of failure of the mine to produce the anticipated result, are a wholly unnecessary and a total loss to the company, possessing, generally, little or no value. In this manner \$100,000 were expended almost wholly in advance of actual need. A stamp mill was built at a cost of upwards of \$20,000, in advance of the production of any considerable amount of stamp rock necessitating its use; \$12,000 were expended in a plank road to Ontonagon before the company were fully aware whether their business would necessitate a great amount of transportation.

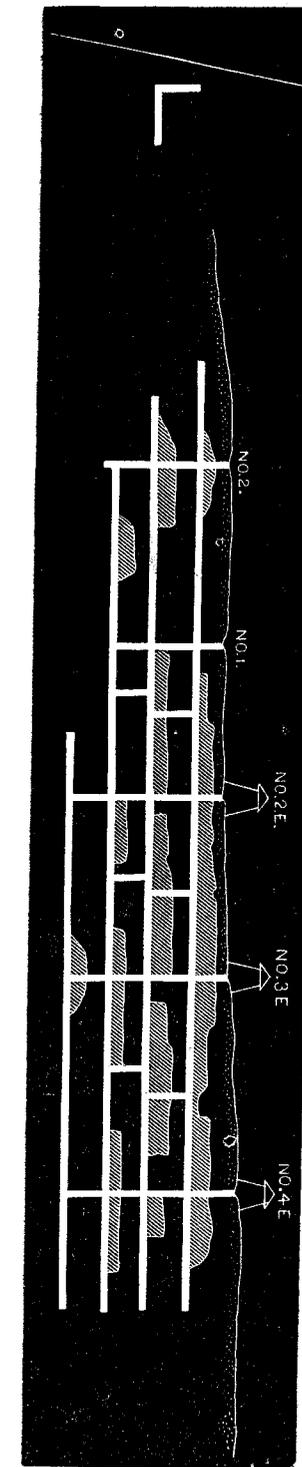
It is true, that at an early day, very many of those who had the management of mines were over certain of ultimate success. They were sanguine of holding another Minnesota, and before proceeding to determine the productive capacity of their lodes they began with a far too liberal surface outlay, and expected that rapid results were sure to follow. Dear bought experience has taught these men the importance of, as far as possible, proving the true wealth of a vein before the expenditure of large sums of money can be justified. A mining enterprise that has only the showing of a large surface improvement, however magnificent the scale, may offer a poor investment.

The Toltec began in 1850, and in 1855 consolidated with the Farm Mining Company. In an early day the stock was quoted well in the stock market—\$18 to \$20 per share. An assessment was made on February 9, 1880, of fifty cents per share, for the purpose of securing funds to pay off indebtedness, etc.

Office of the company, Boston, Mass.; Joseph Vila, Secretary and Treasurer.

INDIANA MINING COMPANY.

The location of this company was Sec. 21, T. 51, R. 37, organized in 1862, and expended about \$200,000. Two shafts were sunk to the third level, a number of houses were built, a hoisting engine erected, a stamp mill erected,



LONGITUDINAL SECTION OF THE TOLTEC MINE,
ONTONAGON COUNTY, MICH.

Scale, 300 ft. to one inch.

etc. The company worked for three years and then suspended operation; the stamp mill was sold to the Petherick Company.

Office of the company in New York; Jas. M. Mills, Secretary and Treasurer.

FIRE STEEL MINING COMPANY.

Adjoining the Indiana on the east, the N. W. $\frac{1}{4}$ Sec. 22, T. 51, R. 37, is the location of the Fire Steel Mining Company, which, in an early day, did some mining work, but operations were suspended in 1855, and the machinery and tools removed to the Douglass Houghton mine.

THE DOUGLASS HOUGHTON MINING COMPANY.

This mining property consists of Sec. 15, except the S. W. $\frac{1}{4}$, T. 51, R. 37. Here, also, some mining work was done in 1854, 1855, and 1856, but with results that bore too small a ratio of profits to the expenses, and in 1858 work was discontinued. The location was afterward known as the Hexwood. In 1853 a stamp mill with eight heads was erected, run by water power. A shipment of five tons of mineral was made in 1853, and 25 tons in 1854.

THE ALGONQUIN MINING COMPANY,

now called the Pennsylvania, owned Sec. 2, T. 51, R. 37, and the W. $\frac{1}{2}$ Sec. 36 and E. $\frac{1}{2}$ Sec. 35, T. 52, R. 37. Work began here in 1848, and was continued more or less for a number of years. The surface work included a road 11 miles long, to a landing on the Fire Steel river, two miles from its mouth, where a warehouse was built, etc.

THE COPPER MINING COMPANY.

Location comprising 320 acres on Secs. 20 and 21, T. 52, R. 36, northeast from the Pennsylvania mine. The company was started in 1864; but little work was done.

WINONA MINING COMPANY.

Organized in 1864 under the auspices of the Hon. J. A. Hubbel. The company opened a mine on the N. W. $\frac{1}{4}$ Sec. 29, T. 52, R. 36. The veins were very clearly defined by the ancient pits, which showed that the early miners had worked these out-crops pretty extensively. The company put a force of miners to work in 1864, and a few barrels of copper were got out and shipped; not much work, however, was done. In 1870 the mine was let to tributers.

The company still preserves its organization and holds the property.

STONINGTON MINING COMPANY.

Five or six miles still further northeast on the range, and eight or nine miles southwest from Carver bay, are a number of early mining locations, of which the most southerly was the Shawmut Mining Company—the E. $\frac{1}{2}$ Sec. 10, T. 52, R. 36. A small amount of copper was got out in 1856. An adit was driven in the vein, but the lode proved hard and poor.

THE FRANKLIN MINING COMPANY.

Location the N. $\frac{1}{2}$ Sec. 2, T. 52, R. 36. A road was cut out to the mouth of Misery river on Carver bay, from the mining location, and a village plat laid out. But little ever came of it.

WEST MINNESOTA MINING COMPANY.

Northeast $\frac{1}{4}$ Sec. 19. Some money was spent here in 1854, to find the Minnesota and the National veins, but nothing valuable was found.

THE ONEIDA LOCATION.

South $\frac{1}{2}$ Sec. 19; south of the West Minnesota. Exploring was also done here in 1854, etc., to find the Minnesota veins.

FOREST MINING COMPANY.

Comprising the S. E. $\frac{1}{4}$ Sec. 25, T. 51, R. 40, and N. E. $\frac{1}{4}$ and S. W. $\frac{1}{4}$ of Sec. 30, T. 50, R. 39, was owned by the same parties who held the Toltec. The location lies two miles west of the Ontonagon river. It was first known as the Cushin location, and was worked in 1849, a mass having been previously found which weighed 1,860 pounds, was found in an old Indian pit, and subsequently a number of masses were found in clearing out these old workings. Several tons of copper were thus obtained near the surface. The company was organized in 1850, under a special charter from the State of Michigan, and work was begun under the direction of Mr. W. H. Stevens, on Sec. 31, which was afterwards set off as the Glen mine. But work was transferred to Sec. 30 to the vein revealed by the line of ancient pits. Ten miners were set to work on this vein, and a shaft 160 feet in depth was sunk and intersected by an adit. In doing this work five tons of copper were obtained, and some stamp rock. After the first year the mining force was increased to 30 men, and a stamp mill with eight heads of stamp was built, a number of miners' houses and other dwellings and buildings were erected, and about 100 acres of land were got under cultivation. The directors were imbued with a good deal of faith respecting the value of the property. They thought that they had the same veins worked on the Minnesota and National. The Forest organized a number of mining companies; the Glen, in 1852, comprising the S. $\frac{1}{2}$ of the S. E. $\frac{1}{4}$ and the S. W. $\frac{1}{4}$ Sec. 31, T. 50, R. 39; and also in the same year was set off the E. $\frac{1}{2}$ Sec. 36, and given to a new company called the Shirley Copper Company. Also was formed the Tremont, and the company set off to it the S. E. $\frac{1}{4}$ Sec. 26, and the N. E. $\frac{1}{4}$ Sec. 35.

The Devon Mining Company was formed in the same way, and had allotted to it the S. W. $\frac{1}{4}$ Sec. 25, and the N. W. $\frac{1}{4}$ Sec. 36, T. 50, R. 39.

After these successive depletions the Forest Company still retained upwards of 1,000 acres of land. The product of the mine in 1853 was 42 tons. In the spring of that year a freshet, which raised the waters of the Ontonagon river 22 feet, swept away much of the company's property.

In 1856 a fire destroyed the stamp mill and other surface property. The product that year was 175 tons. But in 1854 and 1855 no copper was shipped. Up to 1858 \$100,000 were expended in assessments. In that year the company was re-organized under the general mining laws of the State, as the Victoria, and assessments were afterwards made of \$4 per share.

A good deal of work was done at the Forest location, and much money spent, but it all resulted in disappointment. The location possesses an ample water power, and it is thought that the lode in which the principal mine was opened would afford considerable stamp rock.

The property is now offered for sale. Alfred Meads, Agent, Ontonagon, Mich.

THE UNITED STATES MINING COMPANY

originated in 1852 and built a few houses, and did a small amount of work on Sec. 34, T. 51, R. 40.

THE CORTEZ MINING COMPANY

organized the same year, and did about the same amount of work as the above.

ATLANTIC MINING COMPANY

made a small beginning on the S. W. $\frac{1}{4}$ Sec. 34, T. 51, R. 38.

THE NORWICH MINING COMPANY.

One of the most important of the mines that were worked west of the Ontonagon river is the Norwich. This, and the Windsor, the Victoria, and the Nonesuch are the only ones at which any considerable amount of work has been done.

Mining work began here in 1850. The company owned 640 acres of land, and at that time it was very difficult to get supplies to the mine; at first the supplies had to be packed 12 miles on the backs of men. The out-crop of the vein is on the exposed side of the bluff, which afforded convenient opportunity for driving an adit to intersect the vein. The bluff is of trap rock, running nearly east and west, and presents a precipitous face to the south, but a more even one to the north. The out-crop of the main vein is at an elevation of 250 feet above the base of the bluff, and runs east and west, parallel with the formation, dipping to the north into the bluff. To the south the land is rolling, having a gradual descent to the southeast, timbered originally with pine, hemlock, maple, etc., and well adapted, as is evinced by what is now under cultivation, to the production of a variety of agricultural products. To the south of the bluff, about 100 rods, is the north fork of the Ontonagon river.

At the time of commencing operations a good deal of work was done in clearing land, building some houses and getting a road made to the location, so that for the first few years but little mining work was done. However, five tons of copper were got out in 1852, which was increased to 18 tons in 1853, and to 25 tons in 1854. Work progressed with moderate results for six or eight years thereafter. A stamp mill was put up, a portable saw mill, a hoisting engine, pumping engines, etc., an agent's house, office, warehouse, shops, boarding house, and 10 miners' houses were built. A railroad track from the mine to the stamp mill, a distance of 1,000 feet, was laid.

The results of the work of the stamps were about the same as at other mines, but the remoteness of the locality, rendering transportation extremely difficult and expensive, combined with the financial embarrassments of the company, caused a cessation of work in 1858,—up to that date amounted to about 500 tons.

The hoisting engine was placed 145 feet below the mouth of the adit, and the hoisting ropes run up on pulley stands, and thence for 100 feet in the adit and down the shaft. The arrangement worked well. The engine was a 12-inch cylinder, 2-foot stroke. Some work on tribute was continued until 1863, when the company re-organized and consolidated with the Windsor, when work was begun under the superintendence of C. E. Roberts. The mine, having been worked on tribute, was in bad condition, and general dilapidation prevailed.

But the mine was cleaned, the machinery and buildings repaired, and mining resumed and continued for two years, when the company shut down permanently, having expended \$230,000 of its capital stock. For some time the location was occupied by squatters, who derived a profit from the improved lands. The property comprised 320 acres in Secs. 11 and 12, T. 49, R. 41. Adjoining the latter is the Windsor, which was worked quite extensively at the same period, and was finally consolidated with the Norwich. A stamp mill with eight heads was built in 1856; Sec. 12, T. 49, R. 41.

OHIO TRAP ROCK MINING COMPANY

was one of the oldest mining companies in Ontonagon county. The location adjoins the Norwich. It was formed under a special charter granted by the State in 1849. The stock was divided into 6,000 shares, of \$25 each. The company held 2,000 acres of land. The property was first held under a permit from the War Department, and was explored in 1846, and in 1847 Capt. W. H. Stevens took charge of the mine, and for two years thereafter worked 10 or 12 miners in drifting an adit and in sinking two shafts. In 1852 the operations of the company were considerably enlarged. A stamp mill with 24 heads of stamps was built, and other improvements made.

The company originally entered 3,316 acres of land, and subsequently sold 1,614 acres to the Colling Mining Company, leaving 2,002 acres, embracing one and three-fourths miles across the range. A church was built, 120 acres of land put under cultivation, etc.; but very little copper was obtained. Work suspended in 1857. The capital stock—\$150,000, was all exhausted in 1855, and the company was reorganized under the general mining laws, with a capital stock of \$300,000. No work has been done since 1857.

THE HUDSON MINE,

situated 80 rods from the Norwich; shafts were sunk on two veins, 60 feet, and 75 feet, respectively, in depth, and 36 feet of drifting done. Two houses were built, some clearing done, etc., but work suspended in 1856, and has not since been resumed.

THE PITTSBURG MINING COMPANY,

holding 480 acres of land, and situated three-fourths of a mile from the Norwich, also did some work in 1852, 1853, 1854, and 1855; about 18 acres of land were cleared, two dwellings, store house, shop, barn, etc., were built, and some mining work was done on these veins. On the first a shaft was sunk 60 feet; on the second, 80 feet; and a cross-cut of 40 feet was run south from the bottom of the latter. On the third vein a shaft was sunk 15 feet. No work has been done since 1856.

CLIFTON MINING COMPANY.

S. W. $\frac{1}{4}$ Sec. 10, N. E. $\frac{1}{4}$ and S. W. $\frac{1}{4}$ Sec. 15, T. 49, R. 41, situated one and three-fourths miles west from the Norwich. Work was begun on the location in 1852, and continued till 1855. There were some surface improvements made, and the mining consisted of an adit 300 feet long, across the bluff, and two shafts, 123 feet, and 263 feet, respectively, in depth. The location has since been abandoned.

THE SHARON MINING

location adjoins the Clifton, and the operations were carried on at the same time. Two shafts were sunk—80 feet, and 110 feet, respectively in depth; drifted 160 feet; S. E. $\frac{1}{4}$ Sec. 9, T. 49, R. 41.

THE CASCADE

adjoins the latter location, and possesses the advantage of an abundant water power. A small amount of mining work was done.

THE CLINTON

location adjoins the Cascade on the west, and comprises 320 acres. Here one shaft was sunk, a house or two was built, etc., in 1853-4. Nothing has since been done.

THE DERBY

adjoins the latter, and is four and one-half miles from the Norwich. Here work was begun in 1852 and continued for three years. Two shafts were sunk, 60 feet and 80 feet in depth, respectively, and 250 feet of drifting done in the vein. A number of buildings were erected, and 1,200 pounds of copper got out. S. W. $\frac{1}{4}$ Sec. 19, T. 49, R. 41.

These mines,—the Norwich, Windsor, Derby, and Sharon,—were owned by one corporation, incorporated under the laws of Vermont in 1849, with office at Windsor, in that State, called the American Mining Company.

THE EUREKA MINING COMPANY

was organized in 1863, and held what was previously known as the Conklin preëmption or Muryweather mine, situated at a short distance to the northwest from the Norwich, being the W. $\frac{1}{4}$ Sec. 2, T. 49, R. 41. Some mining work had been previously done on the location, and about five or six tons of copper shipped. Several houses had been built, and some other necessary buildings; but the Eureka Company did not do much work.

THE FOREST SHEPARD MINING COMPANY

organized in 1864, and held 2,366 acres of land near Lake Agogebic, and did some exploring at that time; subsequently in 1874 some Marquette men sent an exploring party onto the location, which worked for a while on an outcrop of mineral, but it did not appear to be valuable.

THE HARTFORD MINING COMPANY,

owning 320 acres of land on Secs. 32 and 33, T. 50, R. 40, two miles west from the Victoria. The company was organized in 1864. A small amount of copper was raised—about three tons.

THE GOGEBIC MINING COMPANY.

S. W. $\frac{1}{4}$ Sec. 26, T. 49, R. 42, organized under the general mining laws of the State in 1853. A few thousand dollars were expended on the location, and considerable effort was made to sell the stock.

ANNUAL REPORT OF THE
THE WAUKULLA.

Four hundred and eighty acres in Secs. 19 and 20, T. 49, R. 42. A small amount of work is being done from year to year in driving an adit across the formation, from the side of the bluff facing Lake Gogebic. The mistake seems to be in not selecting a cross course in which to drive the adit, instead of penetrating in the hard trap rock.

THE CARP LAKE MINING COMPANY

was organized in Cleveland, Ohio, in 1858, under the mining laws of Michigan. The company held 1,087 acres of land, but mining work was instituted on Sec. 15, T. 51, R. 43. Two shafts were sunk, and three and one-half tons of refined copper shipped in 1860. The copper occurs in fine particles, disseminated in a belt of altered sandstone. When exposed to the weather, and partially decomposed, the copper assumes the form of a red oxide of various degrees of richness. The shafts were sunk in this vein at several points, developing the continuity of the deposit, which has a northerly dip under the lake. The mine is located on the north side of the hook or curve which the range makes, when it reaches the Porcupine Mountains, the Nonesuch mine being on the south side of the main extension of the range, before it begins to turn to the north. At the Nonesuch the rocks dip to the south, presenting a similar character, as at the Carp Lake. This belt of altered sandstone is about 500 feet in thickness, and is underlaid by a belt of amygdaloid trap. Two adits were driven in the bluff, from the south side, above Carp lake, to the distance, respectively, of 250 feet and 40 feet, some land cleared, a few log houses built, and the machinery for a stamp mill procured, when the company, in 1862, suspended operations. Recently some exploration has been made on the property by Mr. Alfred Meads, of Ontonagon, and an effort is being made by him to revive an interest in the locality, sufficient to cause the resumption of mining work.

THE MUSCOWAUBIC MINING COMPANY

organized in 1859, by Cleveland parties, adjoining the Carp Lake mine. The company did a small amount of work. The company held 1,000 acres of land in T. 51, R. 43.

There were several other locations in this vicinity, formed by Cleveland parties, and a few thousand dollars were expended on each. Among them are the Lone Rock, The Cuyahoga, and the

PORCUPINE MOUNTAIN MINING COMPANY.

organized under the general mining laws of the State, in 1860. The property comprised 480 acres of land, consisting of the E. $\frac{1}{2}$ and S. W. $\frac{1}{4}$ Sec. 28, T. 51, R. 43, contiguous to the Carp Lake and Muscowaubic mines. The Porcupine Mountains here attain an elevation of about 1,000 feet, and Carp lake, in the vicinity of which these mining locations are situated, lies in a deep gorge about two miles south from Lake Superior, at the base of a precipice 500 feet in height, sheltered and hemmed in by the surrounding mountains. Its elevation above Lake Superior is 483 feet, and its length is a little upwards of a mile. Into the east end empties the river of the same name, which also flows out from its western extremity, in a southwesterly direction, following the base of

the mountain range which, for a distance of five miles, presents a southerly wall of rock several hundred feet in height, occasionally broken through by transverse gorges.

At the western base of the mountains the river turns to the north and mingles with the waters of Lake Superior. On the south there are several small streams which empty into Carp lake. Still further to the south is a more elevated range of quartz and jaspery rocks. Beyond these stretches, for many miles, are apparently level, forest-covered plains.

The company sunk exploration shafts, and built a few log houses, but did little else. If the deposits here ever prove to be worth working, the locations are admirably situated for doing so cheaply.

THE CAMBRIAN MINING COMPANY

was organized under the general mining laws of the State in 1854, owning the S. W. $\frac{1}{4}$ Sec. 24, T. 48, R. 49, situated on the north shore of the Montreal river. The company did no mining work.

THE NONESUCH MINING COMPANY.

In the winter of 1865-66 a half-breed by the name of Frank Cadotte discovered, in the bed of the Little Iron river, near the base of the Porcupine Mountains, on the line between Secs. 1 and 12, T. 50 N., R. 43 W., a belt of argillaceous, conglomeritic sand rock, densely impregnated with fine granules and scales of copper. On making known his discovery to gentlemen in Ontonagon, the land, comprising the south half of section 1 and the north half of section 12, was immediately purchased from the government, and a further examination of the property instituted. The occurring series of the formation with which this copper-bearing bed is associated are plainly exposed in the bottom of the stream and in the ledges upon either side of the deep channel, which has been formed by the denuding action of the water. The strike and dip are readily obtained, and indicate the direction of the formation to be N. $49\frac{1}{2}^{\circ}$ E., and having a southeasterly dip of 30° with the horizon. The width of the conglomeritic copper bed is about seven feet, measured at right angles with the dip, and it occurs between a wide bed of blue colored, slaty rock, which overlies it, and a narrow bed of sand rock, which forms the underlay.

The results of the explorations made by the parties owning the property were apparently so favorable that the organization of a company to open a mine was decided upon, and the exceedingly appropriate name of Nonesuch was selected as the title of the company.

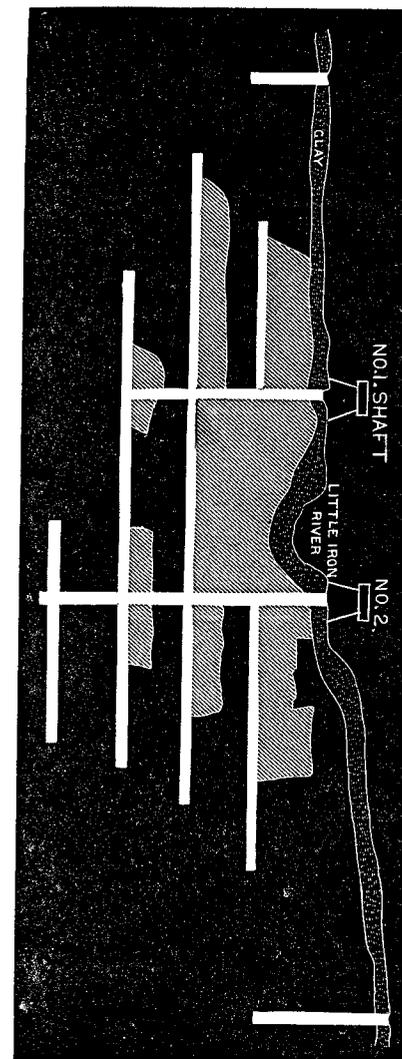
The organization was made in 1867, and the parties thereto—residents of Ontonagon county—were W. Willard, L. M. Dickens, D. S. Cash, W. W. Spaulding, L. C. Patterson, John Willson, Wm. Van Schiehk, F. W. Anthony, F. G. White, and James Mercer, the latter gentleman being continuously, while the office remained at Ontonagon, the company's secretary.

Work was immediately begun, and continued off and on for several years, as assessments could be got in to pay the expenses. It was all dead work; to open the mine and bring it to a paying point required more capital than the stockholders felt able to advance. None of those interested questioned the fact of the lode carrying copper in paying quantity, but the important problem was to find out how to make it available—to save it. The mine was opened by two shafts sunk in the lode at a distance of 250 feet apart, and upon either side of

the river, and carried down, by the original company, to the second level. A dam was thrown across the stream at a short distance above the mine, to furnish the power and water necessary for a small stamp mill, which was built at some distance below, and provided with a 20-inch turbine wheel, run by the water conducted to it from the dam. The results with the stamp mill were unfavorable; they did not, by their manipulations, succeed in saving but a small percentage of the copper; the particles of copper proved to be so fine and thin that they floated away, and were lost in the tailings. Attempts were made to determine the feasibility of smelting the rock. A preliminary trial for the purpose, at the smelting works at Ontonagon, was attended with encouraging results, but subsequently a few tons sent to Detroit gave, as reported, a low percentage of copper.

After the panic of 1873 the affairs of the company had become somewhat involved; the stockholders did not feel willing to pay further assessments—\$2 per share had been thus far paid in—and the expedient was resorted to of watering the stock for the purpose of raising further funds; so that in October, 1875, at a meeting of the stockholders, it was determined to increase the capital stock to \$1,000,000, to be divided into 40,000 shares, thus giving 20,000 shares to be sold, and the avails to be used in the interests of the company in the prosecution of mining work. These extra shares were bought by Messrs. J. H. and R. P. Wade, of Cleveland, and these gentlemen thus obtaining a controlling interest in the concern, removed the office of the company to that city. Mr. R. P. Wade was already largely interested in the Porcupine Mountain district, and was previously a stockholder in the mine, and after the purchase of the surplus stock he himself was chosen President, and Mr. J. H. Wade, his son, became Secretary and Treasurer. The sum realized by the sale of the stock was \$60,000, and unfortunately for the original management, they split upon the very rock which they had sought to avoid. Soon after the removal of the office from Ontonagon to Cleveland, an assessment of \$1 per share was made; this, most of the old stockholders failed to pay, and the forfeited stock was bought in by the Messrs. Wade, who soon became the sole possessors of the property. Immediately after obtaining control of the affairs of the company in 1875, Mr. Wade caused the work at the mine to be renewed with increased vigor. No. 2 shaft was sunk to the fourth level, and No. 3 shaft—the southerly one—to the third level. These shafts were connected at the different levels, and the drifting extended in the first level 250 feet to the north of No. 2, and 214 feet south from No. 1, and in the second and third levels a corresponding amount; in the fourth level about 150 feet of drifting was done. Two other shafts were begun—one, 500 feet to the north of No. 2, and the other 400 feet south of No. 1. These shafts are down to the first level. To the stamp mill was added a 25-horse power engine, the turbine not proving a sufficient power. The road to Ontonagon was improved, and a wagon road to the lake was begun. The product in 1874 was about 14 tons of ingot, and in 1875, 25 tons. The mining expenses for 1875 were \$52,000. In 1876 the president, Mr. Wade, died, and work at the mine was discontinued. The stamp mill was soon after destroyed by fire.

The mine remained idle until two years ago, when Capt. Thomas Hooper, who had been the company's agent in previous years, and was entirely familiar with the location and with the peculiarities of the lode, obtained a lease of the mine for a term of seven years, he giving to the owners 25 per cent of the product. As soon after the necessary funds could be raised, and the materials got to-



LONGITUDINAL SECTION OF THE NONC-STUCH MINE.
Scale, 200 ft. to one inch.

gether, Captain Hooper began the work of preparation for mining. He built a stamp mill, east from No. 2 shaft, down by the water against the north bank of the river, the machinery of which is run by a 30-foot overshot wheel, 8-foot breast, the water being conducted to it from the dam along an open race 700 feet in length. During all the year, except in season of low water, this power is sufficient for the purposes of the mill. But to supply such seasons of emergency, Captain Hooper has, during the past year, got into position the old engine, ready to supply the necessary power when the water fails. The stamp mill is warm and well lighted, and the wheel is sufficiently well enclosed to be free from ice. At the present time the hoisting is done in No. 1 shaft, but both No. 1 and No. 2 are furnished with skip ways and horse whims, the rock being dumped from the skip cars onto the floor of the shaft house, where it is sorted and thence trammed 100 feet across the river on a horizontal track to the stamps. The breaking is done with hard sledges, a not very difficult matter, as the rock is easily fractured. The hoisting is done with a horse whim, raising at present time 24 tons of rock per day, of which 16 tons are taken to the stamp mill, and 8 tons rejected. There are 4 heads—16 stamps—and Captain Hooper intends to add another head—4 stamps—the coming summer.

The average force employed is 15 men, of whom 6 are miners and 5 in the stamp mill. The cost for tramping, breaking, stamping, washing, etc., per ton of rock is about \$1, and the amount of mineral saved by the process employed is 3 per cent cleaned to 62 per cent ingot. Unless the mining force is considerably increased, together with added facilities for stamping and washing, there is ground enough already open for some years to come. The average cost for stoping is \$10 to \$11 per cubic fathom; the cost of sinking shafts is \$10 per foot, and for drifting in levels, \$5 per foot.

There is some talk of buying the Union stamp mill, and of moving it to the mine, and thereby securing facilities for stamping, it is estimated, 100 tons of rock per day.

The washing apparatus is largely an arrangement of Captain Hooper's own devising; the water from under the stamps holding the powdered rock in suspension is distributed through a series of 20 small pits uniformly onto the surface of an oil cloth which lies upon rollers, and inclines upwards towards the stamps. These cloths, of which there are two, are each 20 feet in length and 5 feet in breadth, and are carried slowly upward by the revolution of the rollers on which they rest, against the water which flows downward over the surface. Thus a portion of the particles of copper, having a greater specific gravity than the particles of rock, adhere to the cloth, and are carried upward and over the upper edge of the apron, and are dropped upon the floor beneath as the cloth passes around on the under side. The tailing from the aprons is treated through a system of screens and jigs, and finally in hand buddles.

The plan for washing this rock has not attained to perfection yet, but some parties are now upon the ground preparing to treat it according to a method which they are not prepared to disclose, but which the person, Mr. Jenks, having the matter in hand, claims will cheaply and effectively save the copper contained. Owing to the early close of navigation before all the materials were got on the ground, these gentlemen have been delayed in perfecting the arrangements for giving their theories a practical test. An option for the purchase of the mine and of the lease, in case of success, has been secured.

The mine makes but very little water, and the walls are firm and well

defined; the lode has a uniform width of seven feet, and the copper is distributed through the bed with great uniformity. A cross section of the lode shows the copper in seams or bands, which run and dip with the formation, the alternating streaks being uniformly distributed across the lode. No mass copper occurs, but a small percentage of barrel-work is obtained, chiefly ribbons and leaf copper from the surfaces of contact, and in the seams of the hanging wall. Both the slate and foot wall carry copper, but in less quantity than the conglomerate.

The elevation of the mine above Lake Superior is about 400 feet, and the distance therefrom about five miles. They are connected by a good wagon road, and by a tram road nearly completed. At the lake a dock has been built in 16 feet of water, at which boats may land the supplies and take aboard the product. A good highway connects the mine with Ontonagon village, from which it is distant, in a southwesterly direction, about 22 miles. This highway has been recently greatly improved by the construction of substantial bridges across the streams which lie in the route.

The surface improvements on the location comprise about a dozen good log dwelling houses, office, store house, and some other necessary buildings, and about 50 acres of cleared land, which affords sufficient hay for the teams and other stock. The land surrounding the location is dry, hard-wood land, with a soil of excellent quality, as is evident from the character of the timber and other indications which may be observed.

The product of the mine for the portion of the year worked in 1879, was 16 tons of ingot copper, and for ten months of 1880, 58 tons of mineral, yielding 62 per cent = 36 tons refined copper. The product for the months of October and November last was 10 tons each month.

Captain Hooper is now fairly under way, and is making money with a force of only six miners. He has done very much of the preliminary work himself, and is now his own superintendent and clerk. If he continues to work the mine it is his intention, as previously stated, to enlarge his stamping and washing facilities, and to increase, in a corresponding degree, his mining force. He has demonstrated his ability to successfully work the mine, and is nearly certain of reaping a reasonable profit during the remaining term of his lease. The accompanying longitudinal section will show the underground workings of the mine.

KAOLITE.

A valuable deposit of this mineral occurs in a bluff in the east bank of the Ontonagon river, near the old Minesota landing. A vessel load is got out each winter, and hauled to Ontonagon, and in the summer a vessel is sent up, which takes it to its destination. It is now owned by parties in Akron, Ohio. The kaolite is dug from the bed in which it exists, from high up the steep bluff, and slid down a shute to the bank of the river, where it is loaded into sleighs which haul it down the ice to the harbor, where it is barreled and got ready for shipping. The mineral is said to be of a superior quality, excellent for polish, and for the manufacture of fine earthen ware. The deposit seems to be an extensive one, and possibly the mining of it may grow into greatly increased importance.

In 1875 a company was formed in Marquette to work the deposit, but they soon after sold out to W. Robinson & Co., of Akron, Ohio.

PORTAGE LAKE MINES.

The Portage Lake, Houghton County, mines possess many advantages. Aside from the regularity and the ascertained richness of the important copper-bearing lodes which are found in this county, nature has otherwise greatly favored the region, affording it natural advantages for conducting mining enterprise that are unsurpassed.

Chief among these natural advantages is the broad, deep water channel, which, with the canal that has been cut at its western extremity, extends entirely across the base of the Keweenaw peninsula, really constituting the peninsula an island. By the successive improvements which have been made, this channel suffices for the passage of the largest vessels, affording to the mines of this district the finest facilities for shipping, and to most of them an abundant supply of water for stamping and washing their rock.

Previous to 1860 the freight was discharged at Portage entry, and conveyed thence to Houghton and Hancock in flat-boats towed by a small steam barge. The mining companies, organized to work in the vicinity of Portage lake, early foresaw the necessity of improving the channel from the entry to the lake, sufficient for the admission of the largest vessels. This important work was undertaken in 1859 by the Portage River Improvement Company, an organization made for that purpose, to the stock of which the mining companies immediately interested principally contributed. The work was performed by Messrs. Barton & Williams, of Buffalo, N. Y., under contract with the company. These gentlemen had but recently been government contractors for the improvement of the St. Clair flats.

The following season (1860) 115 steamers and 17 sailing vessels entered the port and discharged their freight and passengers at the Houghton docks. Another important enterprise was added to the mining interests of this locality in 1860, by the erection of the smelting works there. The first regular smelting, 12,000 pounds of mineral from the Huron mine, was done before the close of that year with such satisfactory results, that thenceforward the reputation and business of the establishment was assured.

These works enable the mining companies in the vicinity to have their mineral, produced after the close of navigation, reduced and transported to the eastern markets during the winter, and thus derive a possible advantage of an increased price. Or if they do not wish to transport it by rail, which may be done by hauling in sleighs to L'Anse, the terminus of the railroad, they can have it smelted and in readiness for shipment on the opening of navigation in the spring.

The Portage Lake foundry and machine works were also started in 1860, and became at once an important adjunct to mining business. Up to that time the mining companies were obliged to procure their castings and machinery from Detroit, and in case of breakage, particularly in winter season, long and expensive delays frequently occurred. Some of the mining companies contributed to aid the enterprise at the outset, and it started sufficiently equipped to meet the requirements of its business in a satisfactory manner. An extensive sash, door, and blind, etc., factory was also established at the same period, and contributed greatly to the facilities of building, supplying a want that had been seriously felt.

The important villages of Houghton and Hancock, situated nearly opposite to each other, upon the margin of Portage lake—the former upon the south side, and the latter upon the north—owe their origin to the inauguration of

mining enterprise in the vicinity, and have grown in wealth and importance with the development of the mines. But while naturally dependent upon the prosperity of mining industry for their business and support, they have become something more than merely so called mining towns, and in the elegant and costly private residences and public buildings with which they are adorned, give evidence of the refinement and permanency, which pertain to the large and prosperous villages of our State.

The towns are connected by a bridge, with a draw for the passage of vessels, and along the margin of the lake upon the north side are situated the great stamp mills of the Osceola, Hancock, Quincy, Pewabic, and Franklin Companies, the planing mill, the smelting works, etc. The Hancock, Quincy, Pewabic, and Franklin mines are situated upon the high bluff to the north, and long, gravity-inclined railroads connect the several stamp mills with the top of the bluff, and thence by corresponding tracks to the mines. The Mineral Range railroad, three-foot gauge, extends from Hancock to Calumet, a distance, northerly, of 13 miles. This is the only independent railroad organization operating a line of road, existing in the copper region.

The continuous pounding of the stamps, the hum of the planes, the scream of the little locomotives on the railroad, the ceaseless rattle of the cars up and down the inclines, and, in the season of navigation, the hoarse sound of the whistle of the large steamers which frequently arrive at the docks, and pass on east or west into the great lake, afford evidence of busy activity. Added to this are the lake and the hills which bound it upon either side, making a picture of natural scenery altogether pleasant, and not easily found elsewhere.

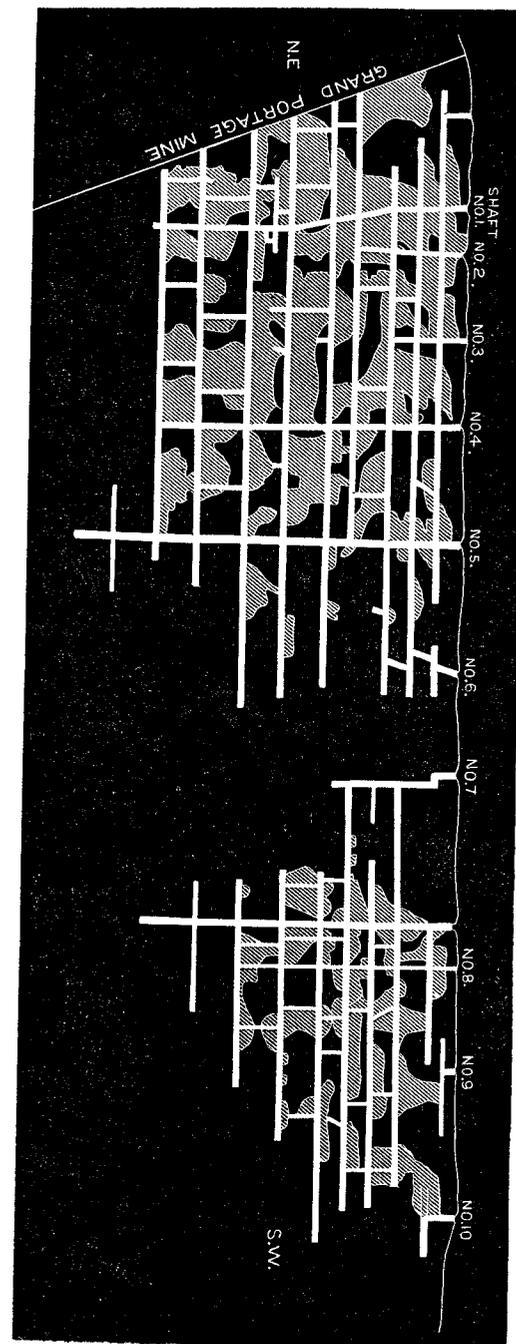
While Hancock has the largest amount of business of the two towns, Houghton yet possesses advantages that make it the most generally resorted to by the traveling public, and the most esteemed as a place of residence. To the south of Houghton are the Sheldon and Columbian, Portage, Isle Royal, Huron, and Atlantic mines.

THE ISLE ROYAL MINING COMPANY.

This company enjoys the distinction of being the pioneer mining company on Portage lake. It began work in August, 1852, on the N. W. $\frac{1}{4}$ of Sec. 1, T. 54 N., R. 34 W., but owning in addition another body of lands, which made its total estate 501.5 acres. The company had been incorporated to mine on Isle Royal, where it was engaged for several years prior to the commencement of operations in the vicinity of Portage lake, but met with no success there. Upon their new location they discovered the existence of three veins about 200 feet apart, and on the middle one of these the mining work was first begun, and this lode has thence been called the Isle Royal. Its selection was determined by the number of Indian diggings, which extended along its outcrop across the greater section. These, when explored, developed a good show of copper; the vein proved to be large and with good walls, running and dipping with the formation, the bearing being N. about 62° E., and the dip about 60° . The bed proved to be even and well defined, with inclosing rock of gray trap.

In 1854 the works had extended along the vein 1,600 feet, and the total sinking aggregated 600 feet, the drifting 1,000 feet, and the amount of copper taken out, mostly barrel-work, was, in 1853, 31,773 pounds, yielding 62 per cent = 18,738 pounds ingot; in 1854, 57,044 pounds, yielding 39,935 pounds ingot copper.

On abandoning Isle Royal the company had conveyed its portable mining



LONGITUDINAL SECTION OF THE ISLE ROYAL MINE.

Scale, 300 ft. to one inch.

plant to the new location; the principal article brought over was a small portable engine, which, when required, was put in place for hoisting and pumping. A stamp mill was built, supplied with eight stamps and an engine, and got in operation in 1853. The number of stamp heads was soon after increased to 16. The company expected to find mass copper, and the mine yielded mainly stamp work.

Some difficulty was naturally experienced in building up a mining enterprise in the midst of a wilderness, without the benefit resulting from the vicinage of older and similar establishments. The managers up to 1854 were Truman Smith, Clement Marsh, C. H. Nichols, Thomas P. Scott, with office in Washington, D. C.

Under a new management the stamp mill was enlarged, and the number of stamps increased to 40, a railroad track was laid from the mine to the mill; but in 1857 mining work was suspended, and in the following year the mine was leased to the Mabbs brothers. The underground workings are shown in the accompanying longitudinal section; the greatest depth is about 800 feet, and in length, 3,000.

The total product to the present time has been about 3,000 tons of refined copper. The lode has a width of from 15 to 20 feet, and a dip to the north-west of 55° to 60° with the horizon. It is an amygdaloid of brownish color, with epidote, quartz, calc spar, and prehnite scattered through it. The copper occurs in bunches or pockets.

The company began under a special charter, and was reorganized under the general mining laws of the State in 1857. Work was resumed by the company in 1863, and continued until 1870, when it again suspended, and the mine has since been worked on tribute. But in the meantime assessments had been made to the amount of \$1,010,000. There has been built a large number of buildings and other surface improvements made, but at present these structures are in a ruinous condition. The stamp mill has for some years been run as a custom mill, doing the stamping, etc., for the tributers at this and at the other adjacent mines; it has a capacity of about 18 tons of rock per day.

The product of the mine for 1880 is 45,860 pounds of ingot copper. The stamp rock was sorted so that it yielded 9 per cent. The average yield of the mineral in refined copper was 80 per cent.

The agent for the property, Mr. Graham Pope, has now about 10 miners opening some new ground, and there is some talk of the company reorganizing. The present estate now consists of 420 acres—the N. $\frac{1}{2}$ Sec. 1, T. 54, R. 34, and N. W. $\frac{1}{4}$ Sec. 6, T. 54, R. 35.

Secretary and Treasurer, F. W. Chapin; office in New York; Resident Agent, Graham Pope, Houghton.

THE GRAND PORTAGE MINING COMPANY.

The Portage Mining Company began work in the Portage vein, which lies parallel with the Isle Royal lode, and 200 feet distant from it. The bed is 10 feet to 15 feet wide. The first shipment was made in 1853, and consisted of about 10,000 pounds of barrel-work. The company worked until its capital stock was exhausted in assessments, when the work was suspended.

In 1860 the company reorganized as the Grand Portage Mining Company, and some work was done on the company account; but during many years the mine has been abandoned to tributers. In 1879 the property was purchased by parties in Hancock for a few thousand dollars, and a new organization made

with a capital stock of \$500,000, and it is proposed to sell sufficient stock to realize a working capital. Mining work was begun a few months ago, and there are now about 40 miners employed in sinking and drifting below the old workings; the old mine reached to about 350 feet below the surface.

Work is being carried forward in both the Portage and the Isle Royal lodes, which are 400 feet apart, the workings on the former being one level below those of the other. Both are of sufficient width, 8 feet to 25 feet,—but there are stretches of barren ground, the copper being in bunches or pockets. The intention is to leave the poor ground to find that that will pay, and to stope it out. At present the mine is looking well. Each mine is provided with a hoisting engine.

There are 27 houses on the location, but no stamp mill. The Isle Royal lode dips at a greater angle than the Portage lode, so that their tendency is to come together. The product for the year—all tribute work—is 80,326 pounds of refined copper. In November, from 146 tons of rock stamped, 17,073 pounds of refined copper were obtained, stamped at the Isle Royal mill.

The work is now in charge of Capt. M. L. Tallon, who worked the mine 14 years ago, and is therefore familiar with it. The location comprises the S. W. $\frac{1}{4}$ Sec. 36, T. 55, R. 34. The company owns beside some timbered land, making in all, 800 acres. There is one-half mile of vein on the property. The company owns a lot on Portage lake, suitable, it is claimed, for a stamp mill.

The Secretary and Treasurer is Peter Ruffe, Hancock, Mich.

THE SHELDON AND COLUMBIAN MINING COMPANY.

This mine is located on the S. E. $\frac{1}{4}$ Sec. 36, T. 55, R. 34. The property joins the Grand Portage mine on the east, and is crossed in the northwest corner by the northeasterly extension of the Isle Royal and Portage lodes. The two—Portage, and Sheldon and Columbian—should constitute one mine. The whole could evidently be much more advantageously worked under one organization than by two distinct companies.

Work began on the Sheldon and Columbian location in August, 1853, inaugurated by the Albion Mining Company, that had previously been engaged in the Keweenaw district, on a location which it had recently abandoned.

Three shafts were sunk on the Portage vein, and mining work was pushed forward with vigor, but in the end was attended with no better success than it had been in the vicinity of Eagle river, on the former location. And after spending considerable money, the operations were brought to a close in 1857. In 1860 the property was sold, and a new company, known as the Columbian, was organized, which began work in June of that year; but in 1861 the operations were again suspended, to be resumed the year after. The company continued to work the old mine, and started a cross-cut to the Isle Royal lode. A pumping and hoisting engine was first introduced to work in the mine in 1863. Up to March, 1864, the new company had received from assessments the sum of \$130,000, and from the sales of copper, \$2,281, derived from the total product of 7,254 pounds of mineral, yielding 5,496 pounds refined copper. In addition to the quarter section upon which the mine was located, the company owned 670 acres of timber land.

In 1864 the name of the company was changed to Sheldon and Columbian Copper Company—these two companies combining and reorganizing as one company, thus extending the location to Portage lake. The property was

valued at \$125,000. The mineral product for 1865 was 160,988 pounds, yielding 71.5 per cent, which sold for \$35,099.49. The expenditures for that year were \$120,000.

In 1866 a stamp mill was built and fitted with two Balls' stamps. The Sheldon property was the south fractional half of the northeast fractional quarter of section 36, so that the combining of the two companies gave to the new company the whole territory to the lake, thus affording dockage and site for stamp mill, etc.

The company shut down in about 1870, and the mine has since been worked to some extent on tribute. All the portable mining plant has been sold, including the Balls' stamps, which latter were purchased by the Osceola Company. The building, etc., yet remains standing. The company has called in \$23 per share = \$460,000 of its capital stock, for the expenditure of which it has little now to show. The product for 1880 is 46,931 pounds refined copper. The property is controlled by Mr. J. H. Forster, Houghton, Mich.

THE HURON COPPER COMPANY.

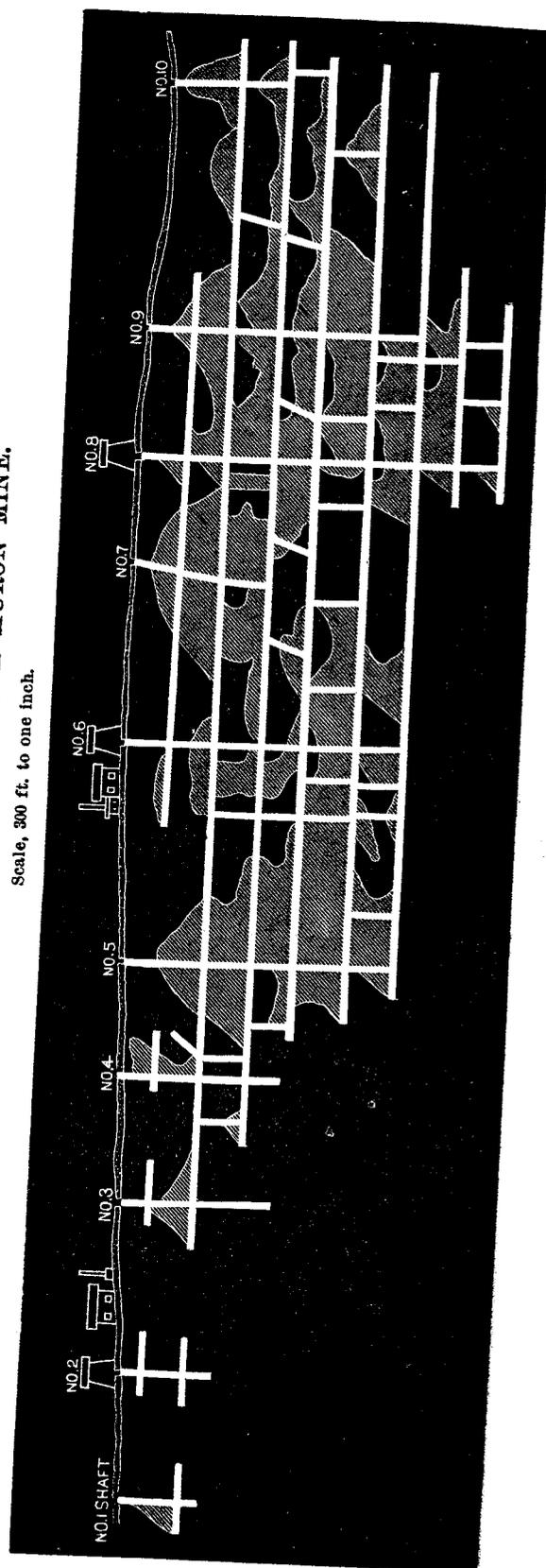
The estate of this company consists of 960 acres of land on the south side of Portage lake, and lying south and west of the Isle Royal mine. It has an extent of two miles on the mineral range, and is crossed by a number of veins, chief of which, so far as is known, is the Isle Royal lode. The description of the property is the S. $\frac{1}{2}$ Secs. 1 and 2, T. 54, R. 34.

Work began in the Isle Royal lode on this location in 1855, but not until 10 years after was much copper produced. The total product of the mine has been about 4,000 tons of refined copper. The Isle Royal vein, from which this product has been obtained, has an extent on the property of about 3,000 feet, and increases in length with the descent, about 1 to 1. The length of the shafts opened in the mine are from 50 feet to 600 feet. No. 7 shaft is distant 1,200 feet from the Isle Royal line. The copper heretofore obtained has been got between No. 5 and No. 9 shafts, a lateral distance of 800 feet. The distance between the extreme shafts, No. 1 and No. 10, being the whole lateral extent of mine operated, is 2,100 feet. Upwards of \$1,000,000 have been expended on the property, one-half of which has gone for surface improvements, buildings, and machinery. Houses for the accommodation of 400 or 500 men were built; a stamp mill was built, furnished with 48 heads of stamps—Gates' pattern, and with Collum's washers. The mill is situated on the Dacotah creek, 4,000 feet from the mine. The hoisting was done in No. 6 shaft, which is fitted with skip road, hoisting engine and winding drums, rock house, Blake's crushers, etc. From the rock house the product passed down a chute into cars that conveyed it along a track, laid mainly on trestle, 1,600 feet to the rock bin, from which it was drawn out through a chute into cars that conveyed it over a similar track, one-half the distance on trestle work, 2,400 feet to the stamp mill. During some years since 1871, until recently, the mine was known as the Houghton.

In 1879-80 the property was purchased by the same parties who own the Franklin, Pewabic, etc., and within the present year has been reorganized under the general mining laws of the State, with a capital stock of \$1,000,000, divided into 40,000 shares. No copper has been shipped from the mine during the past year. The new company is now employing 80 men at the mine, getting ready for mining work. The direction of the work is in charge of

LONGITUDINAL SECTION OF THE HURON MINE.

Scale, 300 ft. to one inch.



Capt. Johnson Vivian, Agent of the Franklin and Pewabic mines. The accompanying longitudinal section shows the workings up to the present time.

It is claimed that the Huron only needs the vigorous, intelligent management, which characterizes the management of the Atlantic mine, to make it correspondingly profitable.

The Atlantic, under former management, as the South Pewabic, expended \$1,000,000, and abandoned the mine as practically worthless. But the new concern has shown that the deposit can be worked at a profit; a result that tends to stimulate mines like the Huron, working similar deposits, to accomplish a like result. The use of compressed air drills, high explosions, etc., have rendered it easy to get out a quantity of rock that was formerly impossible; and the improved machinery that has come into use in the mining work on the lake, gives facility for hoisting, tramping, stamping and washing the rock, etc., that adds to the ease and rapidity, and greatly reduces the cost, so that it is very possible that under the new management that has now taken hold of it, the Huron has a future that shall redeem its past record.

Office, No. 4 Exchange street, Boston, Mass.; D. L. Demmon, Secretary and Treasurer; Johnson Vivian, Agent, Houghton, Mich.

THE SOUTH PEWABIC COPPER COMPANY

began mining work in March, 1865, having organized under the general mining laws of the State, with a capital stock of \$500,000; office in Boston; Wm. B. Frue, Superintendent. The mine was opened on the south side of Portage lake, on what was thought to be the Pewabic lode, on the S. $\frac{1}{2}$ Sec. 4, T. 54, R. 34. The lode opened 10 feet in width, and was estimated to yield 2.5 per cent, but subsequent experience proved the vein rock to yield about one per cent of copper; \$120,000 of the capital stock was paid in, which in the next three years was increased so that the paid up capital was \$497,000, while the total expenses amounted to \$1,105,461.98. The liabilities were \$134,250, and the bonded indebtedness was \$63,517. Under such a condition of affairs the stockholders naturally lost interest in the concern, and failed to attend meetings when there was little except failure to be reported, and reasons given why renewed calls for assessments should be made. Finally, the capital stock being exhausted, the company went into bankruptcy, and the property was sold to the parties who formed the Atlantic.

THE ATLANTIC MINING COMPANY.

This, the most important of the companies operating south of Portage lake was organized in December, 1872, by consolidating the South Pewabic and Adams Mining Companies, making a joint capital of \$1,000,000, divided into 40,000 shares, \$700,000 of which capital stock had been paid up before the consolidation took place. The indebtedness of both mines amounted, at the time of the reorganization, to \$46,215.15, with cash on hand amounting to \$9,004.42. In order to meet these liabilities, and to provide for current expenses, an assessment of \$2 per share was made, payable February 1, 1873. On resuming work it was naturally found that the machinery and surface improvements were badly out of repair, and considerable preparation was necessary for re-opening and equipping the mines. A new engine—24-inch cylinder, 4-foot stroke,—with hoisting gear and pumping apparatus and boilers, was procured, new shaft house built, railroad and locomotive repaired.

The work of unwatering the mine had begun in August, 1872, and was completed in the following year, and a force of 150 miners was employed in sinking and in drifting, principally in the Adams mine. It required a good degree of courage and perseverance to undertake to carry on the working of this mine after the notorious failure which had characterized the operations under the old organization. But the new company took hold of the work, determined to succeed, and profiting by past errors has made for this mine a subsequent history that redeems its ignominious past.

The expenditures were greater than had been anticipated; labor ruled higher than was estimated, and it was also found necessary to build some additional tenement houses. The purchase of 2,000 acres of additional lands for timber was made. These were contiguous to Portage lake. The shipment of mineral to the close of navigation, 1873, was 929,267 pounds, which yielded 77 per cent = 714,711 pounds refined copper. The total production for the year was 863,366 pounds of ingot copper, all of which was stamp work.

But two of the four stamps were used, as the hoisting machinery proved to be insufficient to bring to the surface enough rock to equal half the capacity of the mill to work up. The assessments called for during the year amounted to \$200,000, which, with the copper sold, made the total receipts \$420,630.73. This sum was exceeded by the expenditures, and left an indebtedness at the close of the year of \$5,831.07, rendering an additional assessment necessary, and the sum of \$40,000 = \$1 per share, was called for in February, 1874. The net mine expenses for the year 1873 were \$377,542.95. The average cost for sinking shafts per foot was \$38; winzes, \$19.78; average cost per foot for drifting was \$19.09; for stoping per fathom, \$22.28. The number of tons of rock stamped was 51,088, with a total cost for stamping, washing, etc., of \$53,608.70 = \$1.05 per ton. Yield of mineral per ton of rock was 22 pounds = 16.21 pounds ingot. The force employed consisted of 219 miners, who received average monthly wages of \$59.83; 55 surface men were employed, who received \$50 per month.

In 1874 about one-third of the product was sent overland to market, at an extra cost of one cent per pound, but the gain in price above that obtained for the copper sent by steamer was three cents per pound. The product for the year was 931 1272-2000 tons, yielding 73.65 per cent = 1,372,406 pounds of ingot, which sold at an average price of 22 8-25 cents per pound. An additional assessment of \$1 per share was made.

In the stamp mill two new rotating slime tables were added to the washing apparatus. Number of tons of rock stamped was 69,278, which yielded 26.07 pounds of mineral per ton, or 19.68 pounds of ingot to the ton. The cost of stamping and washing was 99.34 cents per ton, inclusive of all items pertaining to the stamp mill. The yield of ingot per ton of rock was an increase of three pounds over that obtained the previous year. A new pumping engine, hoisting engine, and locomotive were procured. The total force was 293 men.

The succeeding year, 1875, showed an increase of product, the total being 1,087 897-2000 tons, yielding 71.92 per cent = 1,567,036 pounds ingot copper, which sold for an average price of 22.47 cents per pound. The number of tons of rock stamped was 80,000, yielding 27.23 pounds of mineral to the ton = 19.58 pounds of ingot. The cost of stamping, washing, etc., 87.96 cents per ton of rock, inclusive of all work pertaining to the mill. There were employed 316 men, and 17 4-5 fathoms of ground were broken per man.

The trestle, carrying the launder to the stamp mill, was repaired, and other needed improvements made.

In 1876 there was a slight falling off; the product for that year was 1,338 1216-2000 tons of mineral, yielding 917 1041-2000 tons of ingot copper. The number of tons of rock stamped was 97,606, yielding 27.56 pounds per ton of rock = 18.96 pounds ingot. There was an average of the work of three stamps (Balls). The cost of stamping, washing, etc., was 67.09 cents per ton of rock, and the total force employed was 333 men. It was found, in working the mine, that the condition of the hanging wall required for safety that large pillars should be left frequently.

During 1877 a larger amount of work was done at the mine than in any preceding year of its history, and at the same time there was a corresponding diminution in cost, giving a net profit for the year's work of \$42,880.55, and a surplus of \$137,043.02. Several masses were obtained, the largest of which weighed 4,495 pounds. A skip road was fitted in No. 3 shaft, and the pumps put down to the ninth level. Six new dwellings were built. The total amount of rock carried one mile during the year was 330,562 tons, at a cost of 3.89 cents per ton per mile, including the cost of 102.5 tons of new rail. In place of the chutes at the mill, used to convey the rock from the end of the railroad to the mill, was substituted a double inclined-gravity railroad, with wire ropes and drums. At the top of the incline a rock house of 1,000 tons capacity was built. These changes, in addition to other advantages, saved the services of six men.

The total number of tons of rock stamped in the year 1877 was 105,780, which yielded 27.23 pounds of mineral per ton = 19.42 pounds of ingot per ton of rock. The total cost for stamping, washing, etc., including all expenses at the mill, was 57.79 cents per ton of rock. The expenses per cubic fathom of ground stoped was: For the year 1874, \$62.62; 1875, \$55.48; 1876, \$52.27; 1877, \$45.62, and the total cost of smelting and marketing per ton of rock was, for the same years respectively, \$4.09, \$3.90, \$3.54, \$3.07.

The product for the year was 1,440 378-2000 tons of mineral, yielding 71.32 per cent = 2,054,304 pounds ingot, which sold for an average price of 18.54 cents per pound, giving a surplus from which a dividend of fifty cents per share was paid. The company purchased 462 acres of adjacent lands. This land was obtained for the purpose of securing to the company the control of the stream of water and launder, which supplied the stamps, and for timber.

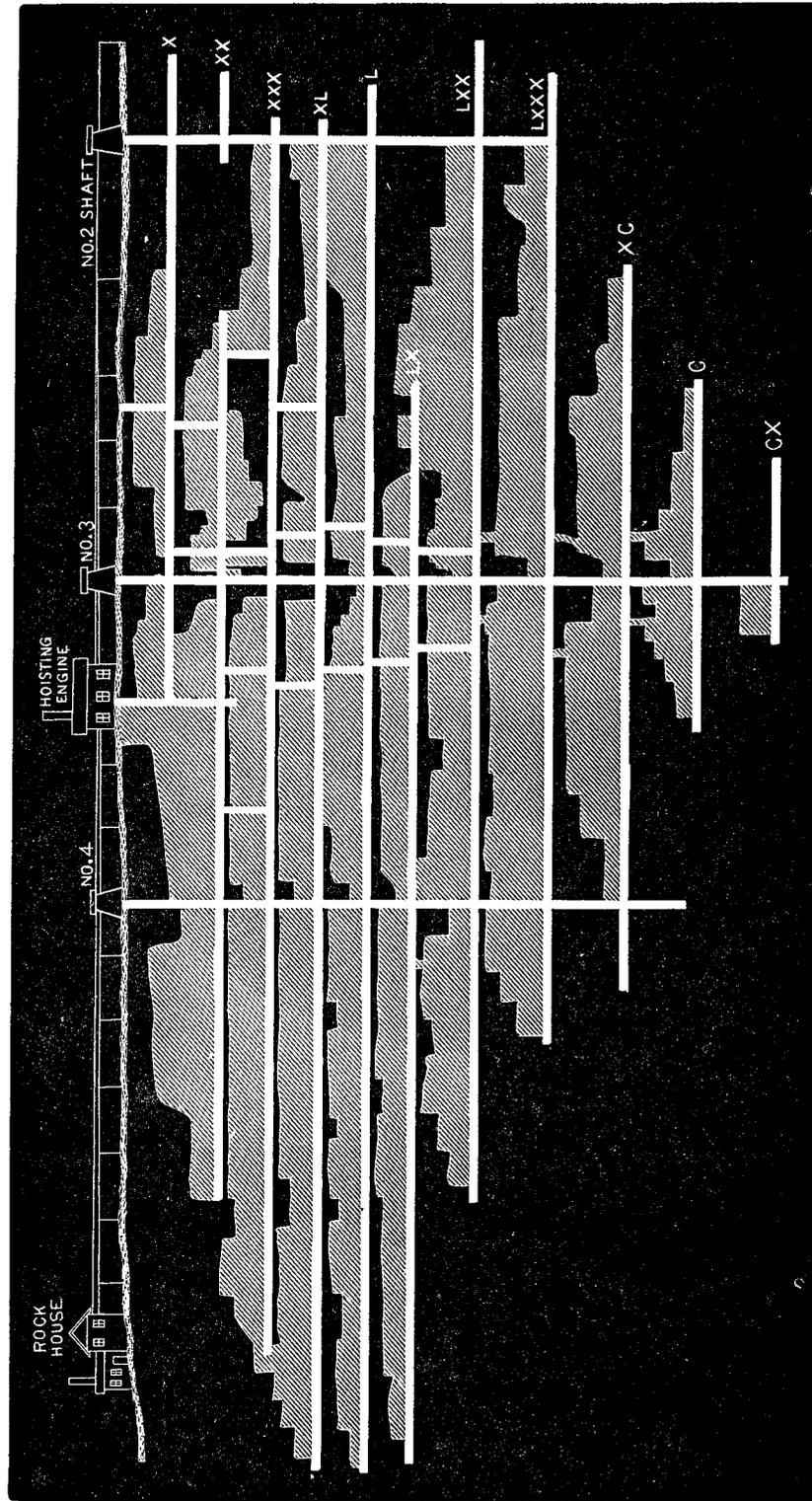
The product for 1878 was 1,423 1894-2000 tons, which yielded 70.44 per cent, or 2,006,075 pounds of ingot, and at an average price of 16.15 cents per pound, for which it sold, gave, for the year's work, a net profit of \$11,325.06. After paying a dividend of \$20,000, there remained in the company's treasury a surplus of \$147,286.09. The low price of copper left but a small margin of profit.

Some changes in the management of the mine became necessary to secure harmony among the officers, and Capt. Wm. Tonkin, the mining captain, was chosen agent. The cost per fathom for stoping was \$14.46; per foot for drifting, \$10.06. The number of tons of rock stamped was 111,709, which, including the other expenses at the stamp mill, cost \$54,579.38 = 48.85 cents per ton. The yield of mineral per ton of rock stamped was 26.54 pounds = 18.5 pounds of ingot.

Considerable improvements were made; two additions were built to the stamp mill, 110x25 feet, and 80x25 feet; the washing apparatus was increased by the addition of three Evan's slime tables, and 14 Collum's washers; a new engine house was built, and the arrangements perfected for bringing the supplies and materials from the dock by railroad, instead of hauling with teams, as had

LONGITUDINAL SECTION OF THE ATLANTIC MINE, JAN., 1881.

Scale, 300 ft. to one inch.



been heretofore done; a shop, three houses, a truss bridge, 180 feet long, over Coles creek, were built; also a new rock house and engine house at the mine were built, and a new 24-inch cylinder engine, with boilers and other necessary machinery for driving the crushers were procured.

The product of mineral in 1879 was 3,257,085 pounds, which yielded 71.81 per cent = 2,339,073 pounds of ingot, and sold at an average price of 16.3 cents per pound; a dividend of \$1 per share was declared. The two shafts, Nos. 3 and 4, being worked at their full capacity, it was determined to fit up No. 2, which is 790 feet north from No. 3, into a working shaft.

The general expenditures up to the close of 1879 amounted to \$3,294,337.40; total receipts from the sales of copper were \$2,304,548.68; total assessments, \$280,000; number of tons of rock stamped, 122,668 tons, yielding 26.55 pounds per ton = 19 pounds of ingot. The total cost of stamping, washing, etc., including all expenses at the mill, was 42.44 cents per ton.

During the past year there has been done 188 feet of sinking, at a cost of \$18.04 per foot; 2,118 feet of drifting, at a cost of \$12.90 per foot; 9,521 cubic fathoms of stoping, at an average cost of \$14.35 per fathom; 169,825 tons of rock have been treated at the stamp mill, at a cost of 38.13 cents per ton, yielding 19.74 pounds of mineral per ton = 3,352,190 pounds, yielding 72.28 per cent ingot = 2,423,225 pounds refined copper. The net value of the product for 1880 is \$467,426.43; the operating expenses were \$384,083.76; profit for the year, \$84,391.01; cost for construction, \$23,849.66, leaving the net gain, \$60,541.35; net surplus January 1, 1881, \$263,320.02; total assets, \$372,555.30; total sales of copper to date amount to \$2,761,372.01; dividends paid in 1880, \$60,000; total expenditures to January 1, 1881, \$3,853,201.99.

One side of a Rand duplex compressor and engine were put in, and 1,000 feet of 7-inch pipe, and 2,000 feet of 3-inch pipe, to convey the air to the power drills, were laid in the mine.

The Adams location was the S. $\frac{1}{2}$ Sec. 4, and the South Pewabic the N. $\frac{1}{2}$ Sec. 9, T. 54, R. 34. The latter went into bankruptcy and the property was bought from the bankrupt court. The same parties bought both mines. In the Adams mine but little stoping had been done, and but two levels had been sunk. The purchasers organized the Atlantic, and have since bought the land between the location and the lake. The mine is on the South Pewabic lode, which carries a width of from 10 feet to 21 feet, and possesses a good degree of uniformity. It is a dark colored, friable amygdaloid, somewhat similar to the ash bed in Keweenaw county. The dip is 45° to the northwest, and bears about N. 35° E. There are three working shafts connected by an elevated railway, on which the cars are drawn to the rock house south of the south shaft, where after being crushed it drops into the bins, and is drawn out into the cars that convey it to the stamps, over a railroad three miles long, four feet, one inch gauge. The railroad is operated by locomotives, of which there are four. The cars dump into a chute that conveys the rock into a large bin of 2,000 tons capacity, whence it is drawn out into cars that operate on automatic tracks, connecting the large bin with smaller ones, one for each stamp, of 200 tons capacity, from which the rock is drawn out under the stamps. The railroad and dock are connected with an incline operated by a stationary engine, which hauls up the supplies.

The copper is sent down to the dock on a gravity incline, which connects it with the stamp mill. In the mill are 4 Ball's stamps, 56 Collum's washers, and 9 Evans' slime tables, and they are now treating 480 tons of rock per day. The water for the stamps is brought by launder two miles from a dam in Cole's

creek. The launder has a fall of but one-eighth of an inch in 16 feet; the size is 16x16 inches. It was originally tried, by the former company (South Pewabic), to pump up the water from the lake, but the trial was not successful, and the launder was substituted. It is carried over ravines, in one instance on a trestle 150 feet high.

The mine has now attained a depth of 1,000 feet. The underground workings are shown in the accompanying longitudinal section.

The percentage of copper in the mineral got out at the stamp mill is less than it would be, but for an appreciable amount of iron ore that having a nearly equal specific gravity cannot be separated from it. The iron ore comes mainly from the trap which is taken from the walls of the vein. Owing to imperfect cleavage, more or less trap at the margin is mixed with the vein matter, and goes to the stamp.

The cars running on the elevated track from the shafts to the rock house carry two skip loads to a car, obtained at two shafts. The cars dump on an inclined screen, which allows the smaller portions to pass through into small breakers, from which it drops into the bins. The large pieces slide down the bars on to the floor and are sorted. There are two large breakers, and two of medium size. Through these the rock passes into the bins. In these are a row of shutes on each side for loading cars on the two tracks that enter the building.

There is a locomotive shop for repairs. The company have a fine pumping engine, erected in 1876,—one of the finest on the lake, 18 inch cylinder, 8 foot stroke; and two hoisting engines with friction gear and winding drums, and a hoisting engine at the south shaft with geared hoisting apparatus. A good store is conducted by the company, well stocked, and made a separate affair.

A year ago an air compressor was put in, and five drills have since been at work in the mine, and Captain Tonkin finds, by carefully kept estimates of the expenses attending their use, that there is a saving of \$1,000 per month, the matter of saving in time not being taken into account. Each drill, with six men, will stope 60 fathoms per month. By barrel-work the same number of men will stope from 25 to 27 fathoms per month. The cost per fathom with the drill is about \$10, and by hand labor it is \$17, a saving of \$7 per fathom. The drainage is run into sumps at the shafts and thence pumped to the surface. The rock house is 80x40 feet, and the engine house of the same size.

There are 113 dwelling houses in the location, and a population of about 1,200 persons. The number of employes is 400, of whom 240 are miners. The average contract wages underground are \$50 per month, surface \$45.

President, Jos. E. Gray; Secretary and Treasurer, J. M. Stanton, Jr.; Agent at the mine, Captain William Tonkin; office, No. 76, Wall st., New York.

THE QUINCY MINING COMPANY.

This great mine, second only to the more celebrated Calumet and Hecla, of the copper mines of Lake Superior, was early incorporated by a special charter, granted by the legislature of the State of Michigan, in March, 1848, with a capital stock of \$200,000 in 20,000 shares. The lands owned by the company comprised 627 acres of mineral land, on Secs. 26, 34 and 35, T. 55, R. 34, and 227.5 acres of timber lands situated in townships 33 and 54, ranges 33 and 32, three or four miles distant from the mine and on the borders of Portage lake.

Previous to 1856 no satisfactory progress was made, but at that time the discovery of the so-called Pewabic lode on the company's property caused the out-

look for the future to become cheering, and the work which had nearly ceased, was henceforth prosecuted with vigor, in the direction of opening and developing the newly discovered vein. But not until the close of 1860 did the company begin to receive any remuneration for the previous expenditures. That year the mine returned a profit of upwards of \$44,000. The total expenditures up to 1856, amounted to \$42,097.98, and from the time of organization to August 1, 1861, the total expenditures were \$916,670, of which amount \$200,000 had been derived from assessments, making it fully paid up; \$600,000 were obtained from the sales of copper produced. The company had in operation 64 heads of Wayne's stamps and was employing a force of 185 miners. The mine adjoins the Pewabic on the west, and comprises the whole of Sec. 26, except the southwest quarter, and has an extension on the Pewabic vein on the property, of 5,800 feet. In the following year, 1862, the company began the payment of dividends. In 1863, the product was 1,472 1472-2000 tons, yielding 82.17 per cent of ingot copper, nearly all of which was stamp work. This sold for \$824,504.66. The company also purchased two sections of wood lands and paid in dividends \$240,000, leaving a working capital of \$120,000, and also purchased a steam tug for hauling wood and timber from the shores of Portage lake to the location. The total number of tons of rock stamped for that year was 50,670, at a cost of \$1.27½ per ton. The average price paid for sinking shafts was \$23 per foot, winzes \$14, drifting \$12.17, per fathom for stoping \$19.20.

In 1864 the shipment was 3,102,532 pounds of mineral, yielding 82.5 per cent = 2,498,574 pounds of ingot, which yielded a gross sum of \$1,120,482.52, and the total expenses were \$667,512.57, leaving a profit of \$452,969.95 on the gross work, from which dividends to the amount of \$320,000 were declared.

Further explorations for determining the value of the mineral veins on the company's property were undertaken. An adit across the formation from the Pewabic vein to the Albany and Boston conglomerate was begun. The number of tons of rock stamped was 47,445 at a cost of \$1.90 per ton. Cost per foot for sinking shafts, winzes, and for drifting, were respectively \$40.72, \$21.91, \$17.92. Average price paid per fathom for stoping was \$23.89. Number of men employed was 646, of whom 242 were miners, who received on contract an average price of \$65.50 per month. The average yield of mineral per cubic fathom was 697 pounds = 562 pounds ingot. The product of the mine for 1865 was, 1,360 1980-2000 tons, yielding 81.36 per cent ingot. A portion of the product wrecked in a vessel on Lake Huron occasioned a loss to the company of \$20,000. The total dividends paid up to February, 1865, were \$699,000.

The total amount of rock treated in the stamp mill was 48,557 tons, at a cost of \$1.85 per ton. Average price per fathom for stoping was \$24.40; cost per foot for sinking shafts, winzes, and for drifting were \$33.73, \$20.82, \$18.25; yield of mineral per fathom of ground broken, 618.5 pounds = 501 pounds of ingot; number of men employed, 654; number of miners, 212; wages of miners, \$57.53.

In 1866 the shipments of mineral were 2,529,572 pounds, yielding 83 per cent = 2,114,220 pounds of ingot, which sold for \$661,107.11, and the total expenses were \$610,833.25, leaving a profit on the year's business of \$50,273.86. A man engine, working down to the 90-fathom level, was built at a cost of \$17,448.39. The exploring, with the exception of driving the adit, was given up. The stoping per fathom, sinking shafts and winzes per foot, and driftings cost respectively, \$22.40, \$27.39, \$19.64, \$15.74. The number of tons of

rock treated in the stamp mill was 49,903, and cost for treating, \$1.667 per ton. The yield of mineral per fathom was 541 pounds = 451 pounds of ingot. The average force employed was 598 men, of whom 227 were miners, receiving \$53.16 per month.

The shipments for 1867 were \$2,358,639 pounds, yielding 81.46 per cent = 1,921,620 pounds ingot, from the sale of which was realized the gross sum of \$437,482.75. The total expenses amounted to \$363,572.02, leaving a profit for the year's work of \$73,910.73, from which a dividend of \$60,000 was declared. The land under cultivation was found to yield an abundance of hay, oats, potatoes, etc.

The number of tons of rock stamped was 37,774, yielding 2,068,885 pounds of mineral, at a cost of \$63,595.89. Cost of treating per ton, \$1.68; average cost for sinking shafts, winzes, drifting per foot, \$28.36, \$17.64, \$14.46; per fathom for stoping, \$19.74; average sales, 24 cents per pound; average yield of mineral per fathom, 646 pounds = 526 pounds ingot; number of men employed, 370—miners, 167; wages, \$50.83 per month; cost of mineral ready for smelting, 13.63 cents per pound; cost, including smelting, sale, etc., 20 cents per pound; price received, 24 cents per pound.

In 1868 the number of barrels shipped was 1,713,248, mineral, yielding 82.34 per cent = 1,410,759, and 7,182 pounds washed from the tailings, making the total of ingot, 1,417,941 pounds, which sold for \$357,078.39. The expenses for the year were \$327,094.81, leaving for profit \$29,983.58. A dividend of \$2 per share was paid. There was a large falling off in the yield of the mine below that of the previous year. It was discovered that the vein had separated into two parts, the larger and more productive portion dipping nearly vertically, while the openings in the course of the work had been made in the branch vein. The main vein was recovered by a cross-cut, and thence a system of cross-cutting and new openings had to be resorted to at a loss of time and of product.

The cost per foot for shafts, winzes, and drifts was respectively, \$24.94, \$14.92, \$12.93; per fathom for stoping, \$19.43; yield of mineral per fathom, 519 pounds = 427 pounds of ingot. The number of tons of rock stamped was 36,557, at a cost for treating in the mill of \$1.28 per ton. Average number of men employed, 346; of miners, 157; average miners' wages, \$50.44; the average cost per pound for producing the mineral ready for smelting, 15.87 cents; total cost per pound, including smelting, sales, etc., 22.5 cents; average price per pound, sold for, 24 5-8 cents. Capt. George Hardie, who had been in the employ of the company since its organization, resigned, and was succeeded in the agency by J. N. Wright.

In 1869 the product showed that the previous falling off in yield had been but temporary, and that the vigorous work that had been undertaken had its effect in bringing the mine back to its former production. The shipments for the year were 2,878,128 pounds, which yielded 82 per cent = 2,417,365 pounds of ingot copper, and sold for \$529,081.87; the total expenditures were \$403,573.38, leaving a margin of profits of \$125,508.49 from the earnings; a dividend of \$6 per share = \$120,000 was declared. The man engine was extended down to the 130-fathom level. Number of tons treated in the stamp mill, 56,767, at a cost per ton of \$1.06½. The cost of the mineral ready for smelting was 11.7 cents per pound; cost, including all expenses, 16½ cents per pound; price received per pound = 21.85 cents; cost per foot for shafts, winzes, and drifts, was respectively, \$25.04, \$15.98, \$13.24; average price per fathom for stoping, \$18.91; yield of mineral per cubic fathom, 531 pounds

=446 pounds of ingot; average force employed, 429 men, of whom 210 were miners, who received \$51.10 per month.

The shipments for 1870 were \$2,952,742 pounds of mineral, which yielded 84 per cent = 2,496,774 pounds of ingot, which yielded a gross sum of \$538,170.23; the total expenditures were \$383,709.67. A dividend of \$4 per share was declared. Each year a special sum of \$50,000 had been set aside for insurance and contingencies. The work of the stamp mill was 55,027 tons of rock treated, at a cost of \$1.15 per ton. Cost of the mineral ready for smelting was 10.5 cents per pound; total cost of ingot, including sale, etc., 14.9 cents per pound; average price received, 21 cents per pound; the average cost per foot for shafts, winzes, and drifts was, respectively, \$31.99, \$16.42, \$13.48; cost per fathom for stoping, \$17.96; yield of mineral per fathom, 624 pounds = 528 pounds of ingot; average number of men employed, 422; of miners, 181, who received \$46.09 per month.

In 1871 the company shipped 3,011,074 pounds of mineral, which yielded 80½ per cent = 2,409,501 pounds of ingot, and sold for \$549,729.74. The total expenses were \$365,513.50. During the year the sum of \$340,000 was paid in dividends. More ground was broken in 1871 than in the previous year, and with less yield of mineral, and a smaller percentage of ingot—due to a decrease in the richness of the vein. The machinery was procured for the introduction of steam power drills into the mine, and a rock house at the head of the railway incline was built and connected by railway with the shafts, and was furnished with Blake's crushers.

The number of tons of rock treated at the stamp mill was 59,757, at a cost per ton of \$1; total cost of mineral ready for stamping, 10.6 cents per pound; cost of ingot per pound, including sale, etc., 15 3-5 cents per pound; average price received, 23.5 cents per pound. The cost per foot for sinking shafts, winzes, and for drifts was \$28.22, \$16.43, \$13; average price paid per fathom for stoping, \$18.44; the yield of mineral per fathom, 551 pounds = 441 pounds ingot; number of men employed was 440, of whom 104 were miners, who received \$47.08 per month.

In 1872 the shipment of mineral was 2,795,949 pounds, yielding 81.12 per cent = 2,269,104 pounds ingot, which sold for \$725,096.72. The total expenses were \$522,107; total net earnings for the year, \$213,543.67. The dividends paid during the year amounted to \$350,000. The business office, which, up to 1872, had been in New York, was removed to Boston, with a new board of directors and Horatio Bigelow as President, and W. R. Todd, Secretary and Treasurer. Up to this date the president had been Thomas F. Mason. Mr. A. J. Corey, former clerk of the mine, was appointed the agent.

The number of tons of rock stamped, etc., was 60,828, at a cost per ton of \$1.065. The cost of mineral per pound was 16.44 cents; the cost of the ingot per pound, 22.93 cents; amount received per pound, 32.5 cents; the cost per foot for shafts, winzes, and drifts was \$36.62, \$19.32, \$17.36, and the cost of stoping per fathom, \$20.81; yield per fathom, 482 pounds = 391 pounds of ingot; average number of men, 487, of whom 233 were miners, who received average contract wages of \$60.62 per month. It will be seen that there was a less amount of copper obtained, while a greater amount of rock was stamped, and that there was a falling off in the yield per fathom. This was due to the "pockety" character of the vein, which is rich in places, with stretches of barren ground, and in the 170th and 180-fathom levels, which were worked at this time, a less amount of productive ground was found, the lode in these levels proving comparatively lean in copper, making it necessary to break a

larger quantity of ground to a given amount of mineral. The steam drills which had been on trial during the year proved too unwieldy for general mining work, and their use was abandoned, except for special purposes.

In 1873 the company shipped 3,200,180 pounds of mineral, which yielded 81.9 per cent = 2,621,087 pounds of ingot; to obtain which, 63,272 tons of rock were stamped at a cost of \$1.209 per ton; the cost per pound of mineral was 13.31 cents; of ingot, including cost of sale, etc., 18.57 cents per pound; average price received was 26.5 cents, which sold for a gross sum of \$722,408.47. The total expenses were \$519,902.67 from the net earnings; a dividend of \$8 per share was declared. During several years the company had sold lots in Hancock, that village having been laid out in the Quincy estate. Some excellent results were obtained in 1873, which speak well for the local management. A cross-cut was started in the 180-fathom level, north of No. 1 shaft, for the purpose of testing the ground to the eastward, and was driven 60 feet, striking a soft healthy vein well charged with copper. Drifting to the south developed rich ground. Another cross cut was started 130 feet south from No. 1 shaft, which also cut the lode, and the two cross cuts were connected in the new lode. Here a wide, rich vein was opened that yielded a large amount of stamp and barrel-work. The vein to the north of No. 2 shaft in the lower levels having narrowed to two feet width and become hard and compact, a cross cut was started in the 210-fathom level to the east, at a point 24 feet north of No. 2 shaft, which, after being driven 60 feet through hard compact trap, cut a promising vein that, being opened south from the cross cut, developed to 9 feet in width.

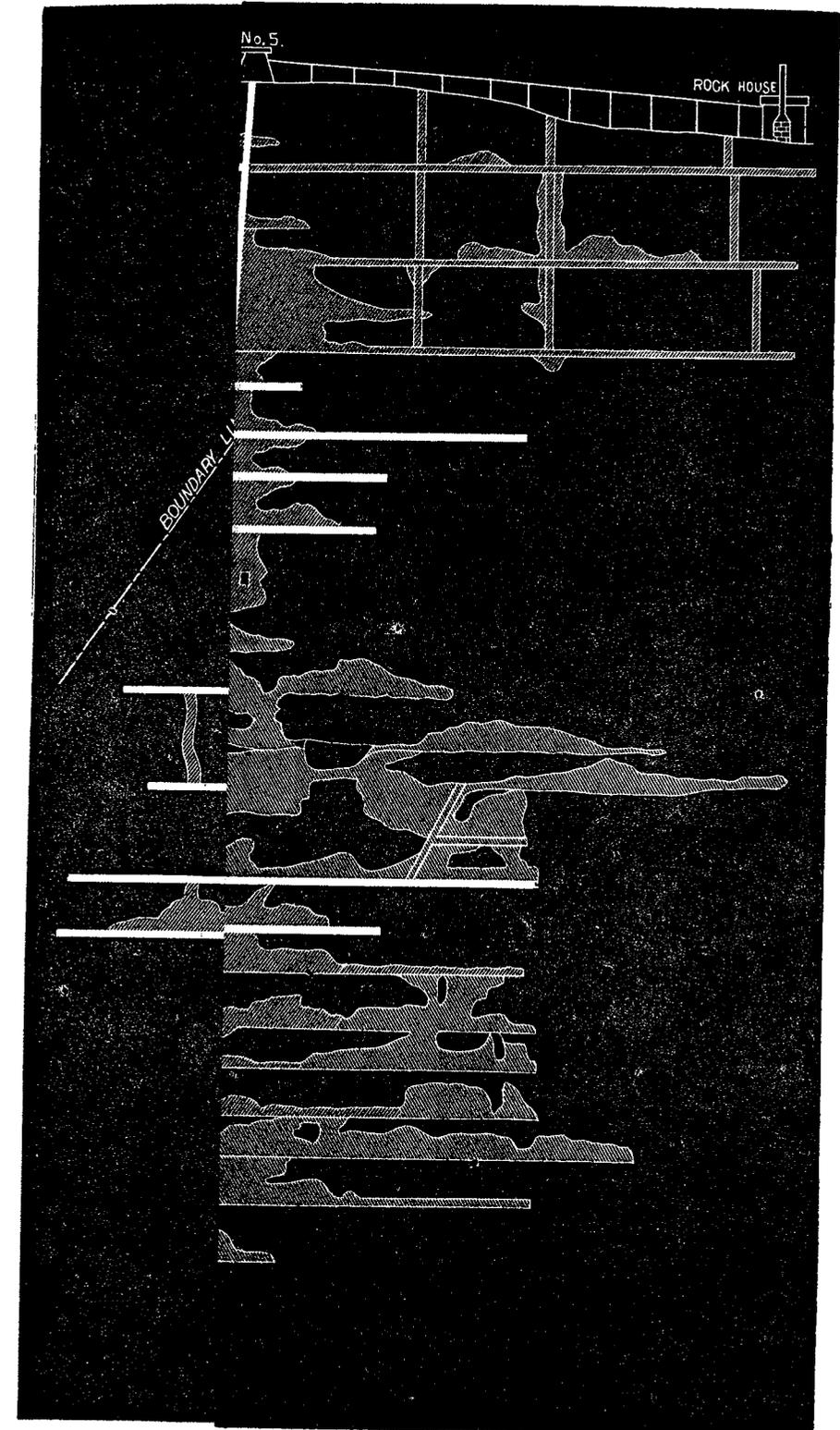
The average price paid for shafts, winzes and drifts per foot was \$34, \$19.03, \$16.16; average price paid per fathom for stoping was \$21.26; yield of mineral per fathom of ground, 600 pounds = 491 pounds ingot; average number of men employed, 489, of whom 223 were miners, who received per contract wages \$62.42.

The shipments of mineral in 1874 amounted to 3,626,350 pounds, which yielded 84.125 per cent = 3,050,154 pounds ingot. This product was obtained from 67,112 tons of rock stamped (being 80 per cent of the rock hoisted) at a cost per ton for stamping, working, etc., \$1.085. Cost of mineral per pound, including all expenses, 12.87 cents; cost of ingot per pound, including all expenses and sale, 15.13 cents; average sale of shipments per pound, 21.88 cents; making the gross earnings, with silver sold, \$656,083.16; the total expenses were \$461,088.54. A dividend of \$8 per share was declared. The cost per fathom for sinking shaft was \$30.27; winzes, \$16.73; drifting, \$14.67; price per fathom for stoping, \$20.15; yield of mineral per fathom, 685 pounds = 577 pounds ingot; average force employed, 468 men, of whom 234 were miners, who received \$48.38 contract wages.

The largely increased yield for the year is seen to be in a great measure due to the increase of copper per fathom, showing an improvement in the character of the vein, as depth was obtained, but chiefly the advantage came from the east branch, which had been opened the year previously. This new ground proved to be of increased width and richness, giving a greater amount of stoping ground and a greater facility for working as well as increased yield for amount of ground broken.

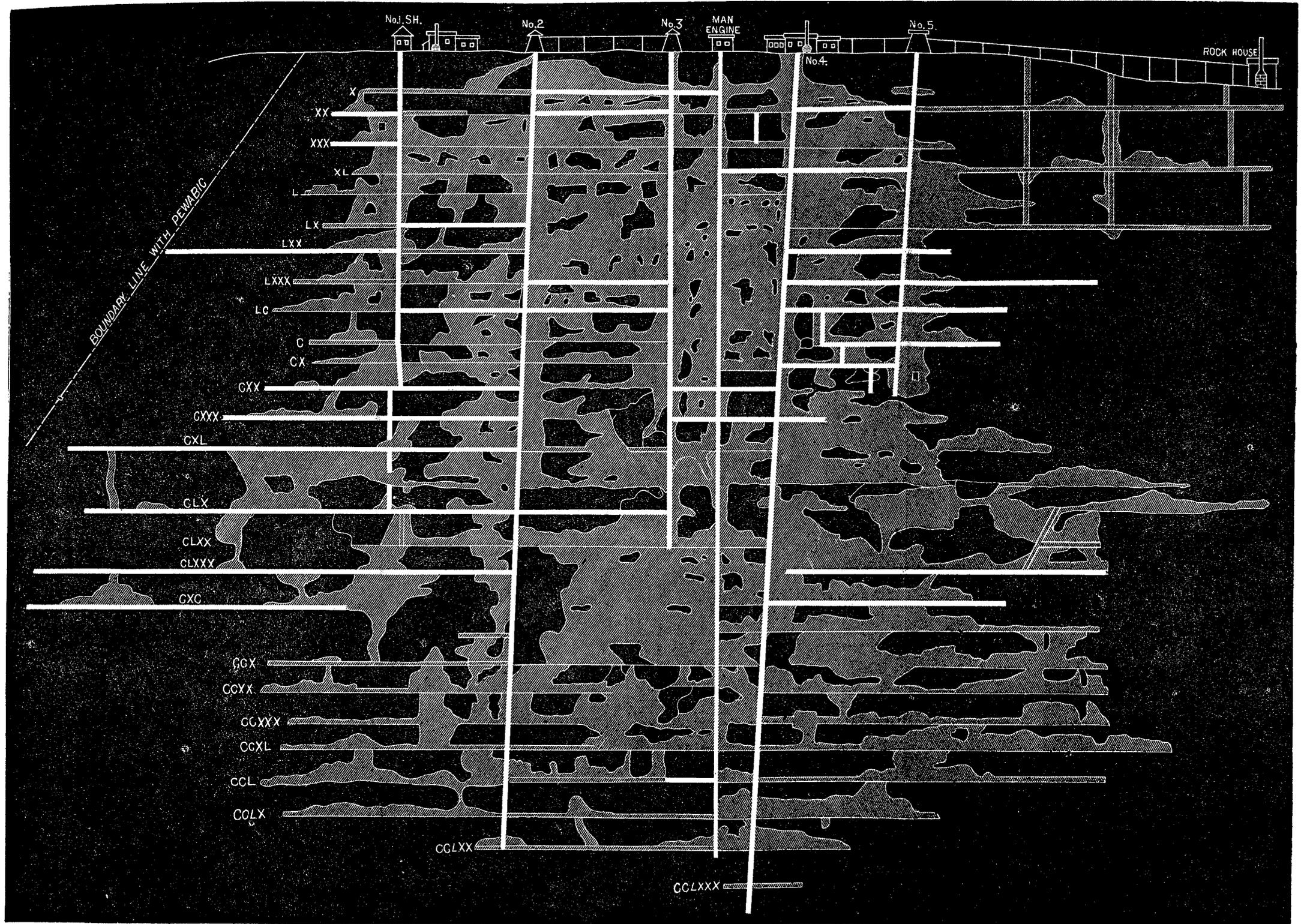
In 1875 the office of the company was returned to New York and the former officials reelected: Thomas F. Maston, President; W. R. Todd, Secretary and Treasurer.

The shipments for that season were 3,401,345 pounds of mineral, which



LONGITUDINAL SECTION OF THE QUINCY MINE, JAN., 1881.

Scale, 600 ft. to one inch.



yielded 82 per cent = 2,798,281 pounds ingot, from sales of which, with the silver obtained, the gross sum of \$653,168.08 was realized; the expenses aggregated \$456,816.66; this balance, with other assets, constituted a sum of \$485,004.14, from which two dividends, making \$160,000, were paid. The mining operations of the year developed some of the peculiar changes that have ever characterized the working of the Quincy lode, which, however unfavorable it may sometimes appear, always has been found to recover its productiveness as the work has been pushed, so that the confidence in the lode has become so well established that though there may be occasional cause for anxiety, there is never discouragement. There was a falling off of 92 pounds of mineral per fathom in the yield, and a reduction in the percentage of mineral, and it was early in the season discovered that the lode at the points which had been relied upon for the year's product was much narrower than was expected, and it became necessary to push forward with increased vigor to open new ground. Full 50 per cent more drifting and 6,000 fathoms more stoping were done than were done the year previous.

The ground to the north, towards the Pewabic, having been neglected for several years, the 180-fathom level was started in that direction, and after passing through 80 feet of contracted, non-paying ground, opened into a wide, rich lode, which proved especially favorable. Other explorations were made that kept the openings well ahead of the needs of mining work.

There were 10,401 tons of rock stamped, at a cost of 96.5 cents per ton. Dividing the total expense by the number of pounds ingot, gives the cost per pound, ingot, 16.32 cents. The gross sales were 19 cents per pound; price paid for sinking per foot: Shafts, \$35.12; winzes, \$15.51; drifting, \$14.01; average price per fathom for stoping, \$19.73. The yield per fathom broken was 591 pounds = 485 pounds ingot; about 15 per cent of the rock hoisted was rejected. Average number of men employed, 504, of which 217 were miners, who received an average contract price of \$46.74. The year 1876 showed a larger product than had been obtained any previous year, while the sales were unprecedentedly low. The larger portion of the product came from the new ground opened to the north of No. 1 shaft, and from the east branch deposit, north of No. 2 shaft, and the resources of the lode at these points gave no indications of being exhausted.

The year's shipments aggregated 3,815,850 pounds mineral, which yielded 80.53 per cent ingot = 3,073,171 pounds ingot. The cost per foot for sinking shafts was \$36; winzes, \$14.64; drifting, \$12.92; average price paid per fathom for stoping, \$18.83; the average yield per fathom was 629 pounds mineral = 507 pounds ingot; the number of tons of rock treated at stamp mill was 44,177; the number of tons poor rock rejected was 10,026; the cost per ton for treating the rock was 91 cents; the total gross receipts for copper and silver were \$591,226.66, and the total expenses \$461,032.48, which latter amount divided by the number pounds ingot, gives 15 cents the cost per pound; the average price received was 16 cents; the average number of men employed, 510, of whom 227 were miners, who received average contract wages of \$47.13; dividends amounting to \$160,000 were paid.

During the year 1877 the copper interests continued depressed, but a greater economy in the company's expenses resulted in a saving of \$5,000 in the running expenses for about the same amount of work as had been done the year previous. No additional sinking was done in the main shafts, the underground work being mainly done in the way of pushing the levels to the north

and south. The shipments for the year were 3,450,150 pounds of mineral, yielding 82.23 per cent = 2,837,014 pounds ingot, which sold for, including silver, \$506,057.90. The expenses were \$399,407.20; a dividend of \$5 per share was declared. The number of tons of rock stamped was 75,307, at a cost of 94.9 cents per ton. The expenditures divided by the number of pounds of refined copper, show a cost per pound of 13.5 cents; the average price received was 15 cents; cost per foot for sinking in shafts was ———; winzes, \$13.44; drifting, \$17.29. Average price paid per fathom for stoping was \$17.29; average yield of mineral per fathom, 568 pounds = 467 pounds ingot; average number of men employed, 474, of whom 249 were miners, who received \$43.79 for contract wages.

The original charter of the company having expired in March, 1878, a new company was formed, retaining the same title, under the general mining laws of the State of Michigan, with a capital stock of \$1,000,000, divided into 40,000 shares of \$25 each. The year's product continued to be obtained chiefly from the new openings in the north and south ends of the mine, but a low percentage in yield of the rock stamped compelled the stoping of upwards of 1,000 fathoms additional ground to make up the deficiency in mineral. The pockety character of the lode was unusually manifest, affording an increased amount of mass and barrel-work, being 48 per cent of the whole product. Many of the new openings were in unproductive ground, and a good deal of care and energy was requisite to keep up the product. In the progress of the underground explorations constant use has been made of the diamond drill, and it has been found that by no other available means could so much have been accomplished.

The average assays for the year of the waste sands show a loss of only 185-1000 of one per cent. The shipments for the year were 3,554,210 pounds of mineral, yielding 84.18 per cent = 2,991,050 pounds of ingot; receipts, \$447,510.50; expenses, \$401,849.17. In 1879 the shipments were 3,161,175 pounds, which yielded 83.5 per cent = 2,639,958 pounds of refined copper. The total sales were \$445,506.44; the total expenses, \$382,064.75; the total profits were \$75,541.70; assets January 1, 1880, \$455,567.93; dividend, \$3 per share. A saving of \$18,000 in expenses was made as compared to the previous year. The openings were in poor ground, and a large extent of hard, narrow lode was encountered; 3,000 tons less of rock were stamped than the year before.

The diamond drill explorations were continued through the year, but the only discovery made of importance was that north of the man engine winze, in the 230-fathom level; cross-cuts were started to reach this ground. The air compressing machinery was increased, it having become established that in mining work the power drill is one of the chief elements of success. The increase of facility enabled the use of five additional Rand's drills. The man engine was carried down to the 240-fathom level.

On the last day of the year 1879, the rock house was burned to the ground; a serious matter in the light of expense, and still more, as occasioning delay in the production of mineral. Preparations were immediately made for the building of a new rock house, and it was completed in March, 1880. It is situated at the top of the bluff, and is connected with the stamp mill, on the bank of the lake, by a double track, gravity-incline, 2,200 feet in length. The track connecting the shafts with the rock house is 1,465 feet in length, and the cars conveying the rock, which run over this track, are drawn by wire rope and stationary engine.

The underground workings of the mine are shown in the accompanying longitudinal section. The mine is now down to the 28th level, a distance, on the lay of 56°, of 2,000 feet.

The largest mass ever found in the mine is now being cut up in the 170th level, about 50 feet N. from No. 2 shaft, and will weigh about 20 tons. The masses usually found are not to exceed five tons in weight. The product is about 40 per cent mass and barrel-work, and 60 per cent stamp. Two loaded cars go down at a time on the incline, and two empty ones ascend the track. The cars have a capacity of two tons each. The mill has 80 Wagner's stamps. In October, the yield of mineral from the stamp rock was 4.5 per cent; for the year 1880, it is 2.5 per cent. The following table shows the percentage of mineral from the rock, for the entire period, since the mill started:

Year.	Per Cent.	Year.	Per Cent.
1861	2.55	1871	2.29
1862	2.03	1872	2.17
1863	2.75	1873	2.60
1864	2.96	1874	2.61
1865	2.60	1875	2.44
1866	2.63	1876	2.38
1867	2.74	1877	2.11
1868	2.25	1878	1.76
1869	2.48	1879	1.80
1870	2.61	1880	2.50

From the above it will be seen that in 1878 and 1879 the percentage of yield ran the lowest of any period, but in 1880 the mine again resumes its normal condition of productiveness.

The product for 1880 is 2,201 tons, 140 pounds, yielding 82 per cent of ingot copper. Total dividends paid, \$2,390,000.

Thomas F. Mason, President; Wm. R. Todd, Secretary and Treasurer, No. 4 Exchange street, New York; A. J. Corey, Agent; John Cliff, Mining Captain, Hancock, Michigan.

THE PEWABIC MINING COMPANY.

The Pewabic mine has ever been a favorite among the mining men on Portage lake, and a great deal of satisfaction is felt over the more recent active policy of the company, and the nearly certain prospect of the mine renewing again its old-time, prosperous career. The company was organized in 1853, owning 1,205 acres of land in Secs. 9, 10, and 25, T. 55 N., R. 34. The mine was opened on the Pewabic lode, in the northwest corner of section 25. The lode crosses the corner of the section at an angle of N. 33° E., and dipping to the northwest 56° to the horizon. The portion of section 25 owned by the company is 485 acres, extending to Portage lake. Up to 1855 the company had realized from the product of the mine the sum of \$26,363, and there had been paid in from assessments the sum of \$75,000. But in October, of that year, mining work on a much increased scale, and under the supervision of Mr. Charles H. Palmer, was begun, resulting, for succeeding years, as follows:

YEAR.	Total Expenditure.	Mining Expenditure.	Mineral Product in Tons and Pounds.	Mining Cost Per Ton.	Per Cent of Copper.	Tons and Pounds of Ingot.	Assessments.	Total Per Ton Expenditure.	Net Value of Product.
1855	\$26,357 75	\$19,362 04	19 344-2000 t's	\$1,008 07	60	11 174-2000 t's			
1856	40,820 54	34,674 31	36 1548-2000 t's	358 27	68	65 1646-2000 t's	\$15,000	\$2,378 48	\$1,080 14
1857	59,484 96	37,820 50	204 684-2000 t's	185 08	58	118 254-2000 t's		627 75	31,482 23
1858	109,152 95	55,212 13	379 1136-2000 t's	145 46	54.5	208 603-2000 t's	20,000	500 68	44,058 29
1859			1,437,458 lbs		69½	1,029,949 lbs	20,000	526 46	76,548 02
1860			1,943,837 lbs		69¼	1,917,426 lbs			197,597 02
1861			2,225,268 lbs		79	1,849,192 lbs			322,317 32
1862			2,051,789 lbs		76.7	1,571,281 lbs			295,951 57
									303,901 84

The whole number of superficial fathoms of vein surface opened at this date (1862) was 15,615, and during the preceding year the yield of copper per fathom was 966½ pounds of ingot. Average price paid per fathom for stoping, was \$21.75; for drifting, and for sinking shafts and winzes, the price per foot depth of 2,047 feet, the lowest, No. 4, being down 552 feet. The average cost per ton for stamping, washing, etc., 91 cents. The mill had a capacity of 150 tons per day; it was provided with two Ball's stamps; 7.15 tons of rock were stamped per cord of wood consumed. The amount of copper lost, from the mill, was found to be 1 1-55 pounds per ton of rock treated in the mill. The tailings were washed by tributers, the company receiving two-fifths of the product thus obtained. Some farming was done in 1861; 2,000 bushels of potatoes, 30 tons of hay, etc., were raised on the location. In the same year, also, was added to the mining plant a powerful hoisting engine, the services of which had become indispensable to the advantageous working of the mine. During the year 1862 the directors were enabled to pay to the stockholders \$100,000 in dividends, \$25,000 more than the capital stock which had been paid in. The total expenditures, \$363,000, had thus all been met by the earnings of the mine, and a surplus of \$60,000 over and above all liabilities remained for a working capital. No. 4 shaft had attained a depth of 637 feet, and the vein was apparently increasing in capacity and in richness and facility of working.

In the year 1862 the company paid \$10,200 to the Portage River Improvement, and also loaned \$6,359 to the Portage Lake Manufacturing Company, an enterprise, as heretofore stated, which had just started, and whose success it was in the interest of the mining companies to promote. The success attending the Albany and Boston Company in the conglomerate belt which it was working induced the agent of the Pewabic, Mr. J. H. Forster, to drive a cross-cut to intersect the same lode on the Pewabic property, which work was consummated in September, 1864. Encouraged by the promising appearance of the vein thus intersected, he ordered an additional set of Ball's stamps and washers for the stamp mill; the whole bulk, 160 tons weight, was brought from Cleveland by steamer, and safely landed at the company's dock in November. By the advice of the agent, one-half of this new machinery was sold to the Franklin Mining Company. Up to this time the Pewabic lode was the only one which had been worked. The lateral extent of the openings on this vein by the Quincy, Pewabic, and Franklin Companies, was about one mile, and the extreme depth was 900 feet, averaging 600 feet. The yield of copper since the vein was fairly opened, in 1855, had been 19,915 tons, which had been sold for \$8,258,793.54, and the vein seemed to possess undiminished richness as greater depth was attained. The sum of the depths attained by the shafts in

1864 was 2,981 feet, the deepest, No. 5, being 900 feet. Many improvements were made, among which were the erection of 40 dwelling houses for the accommodation of the men, a new engine house on the conglomerate lode, an addition to the stamp mill for the new machinery, and the tram road laid with new ties and rails, a new saw mill, with engine, boilers, etc.

The two new stamp heads were found to do double the work of the old ones, and the same was true of the washers, the difference, seemingly, being due to the greater degree of readiness with which the sand was carried from beneath the heads. A shaft was sunk (The Heywood) in the Albany and Boston conglomerate lode, to intersect the cross-cut that had been driven through it, and the new shaft house was provided with an engine for hoisting and pumping.

Up to the close of 1866 there had been paid in dividends the amount of \$380,000. The Franklin Company was working on the same vein, directly north of the Pewabic boundary, and the Quincy, on the same vein, on the western boundary, so that the mine on the Pewabic property was rapidly converging, between the section lines, towards the northwest corner of the section, which limit it was constantly approaching, and beneath which corner it must ultimately terminate. Consequently the directors were naturally anxious to discover profitable ground on some of the other veins which crossed the property, and explorations and cross-cuts were made with this vein; but all such effort proved of no avail, and the explorations were finally abandoned.

In 1867 there was an accumulated indebtedness of \$136,466.58, and the market price of the copper was less than it cost the company to produce it, so that the directors decided to suspend operations, and to levy an assessment of \$3 per share to pay off the debts. But a rise in the price of copper occurring, the determination to stop work was not carried out. A reduction of 25 per cent in the price of labor was made, and an additional assessment of \$2.50 per share was made in December of that year. The stockholders received a stock dividend of 61 shares on the Portage Lake and River Improvement Company, and a cash dividend of \$18 per share was also declared by the Improvement Company.

In 1869 the yield per fathom was 312 pounds of refined copper, there being 3,079 fathoms of ground broken in the mine. The number of tons of rock treated, with two Ball's stamps, was 43,199, at a cost of 90.95 cents per ton, against a cost of \$1.23 the previous year, which was equivalent to a saving of \$13,219.20. The average amount stamped with the four Ball's stamps during the first three years, when the heads were new, *i. e.*, from 1860 to 1863, was 37,852 tons per year, at an average cost of 94.7 cents per ton.

In 1868 the Pewabic and the Concord were consolidated. The product of the years, not given in the previous tables, down to 1869, was:

YEARS.	Pounds of Mineral.	Average Per Cent.	Pounds of Ingot.	Average Price Received.	Net Receipts.
1863	2,167,006	78.07	169,724	33.1½	\$459,971 17
1864	1,864,712	76.68	1,429,857	46.41	621,624 54
1865	2,387,932	72.50	1,731,415	32.56	382,314 35
1866	1,791,181	75.15	1,346,140	30.54	290,132 75
1867		70.88	1,660,208	25.82	313,745 59
1868	1,367,790	76.30	1,043,523	24.	171,704 29
1869	123,779	78.03	111,333	23.	15,121 19

The Pewabic and Franklin were worked much on the same plan. The majority of the stock in both companies was held by the same persons, and the same agent controlled the affairs of both. Capt. Richard Uren was the agent from 1864 to 1868, and during this period he introduced the skip dump in the mines, and also first brought into use the power drill in mining work.

The product ran down from the year 1868; the assets only exceeded the liabilities by \$33,000, and it was voted to suspend work on company account in 1870. The Pewabic leased the Franklin mine, and both mines were let to Capt. Uren on tribute for four years, he paying the company a royalty of one-seventh of the copper produced; but when copper sold for more than 25 cents per pound, the company was to have one-half the excess above 25 cents.

In 1871 the company paid a dividend of \$1 per share, and at the close of the year 1872, there had been paid in dividends \$460,000, and in assessments, \$225,000.

The mine was becoming rapidly exhausted, having reached the limit of the extension of the bed on the property, and soon the company found itself involved in litigation with the owners of the southeast quarter of section 23, for mining on their land. An annual product continued to be obtained, mainly produced from the upper levels, and the efforts of the company were exerted, also, in the direction of endeavoring to develop the Concord property in case of being obliged to abandon the Pewabic.

It was finally determined by the directors to put a quietus to the vexatious litigation in which they were engaged, and to obtain a new lease of life for the mine by purchasing the quarter section regarding the boundary between which and their own property the dispute had arisen. This property, the southeast quarter of section 23, was owned by Messrs. Edwards and the Brothers Uren, and the purchase was made in October, 1879, the consideration being \$275,000. These gentlemen had bought it a few years previous of the Canal Company, for \$25,000.

The work of extending the mine into the new ground began in November thereafter, and has since been prosecuted with all vigor and an abundant success. The mining plant has also been enlarged, and made to conform to the increase of underground work. A new trestle work, from the bottom of the incline to the stamp mill, has been built. Previous to the new purchase in November, the underground work for the year had been confined to the bottom of the 24th level, between the Edwards land and the Franklin boundary. The lode on the new purchase has opened from 10 to 30 feet wide, and is gaining rapidly in length with the increase of depth. The mine is now 1,700 feet down in the lode.

The product for 1879 was 415,565 pounds, yielding 80.99 per cent = 336,475 pounds of ingot. There was an average force of 64 men employed. The total receipts were \$243,901.21, and the assets were \$3,639.19. The number of tons of rock stamped during the year was 7,299, with an average percentage of 2.84.

In the reorganization the number of shares were increased to 40,000, and an assessment of \$10,000 per share was made. The Concord was set off as a separate organization, and some work is now being done by the company at that mine. The product is trammed from the rock house in cars drawn by mules, to the head of the incline, four-fifths of a mile, and thence the cars descend the automatic incline to the stamp mill on the shore of the lake. The mill is provided with four Ball's stamps, Collum's washers, and Evans' slime tables. During the past season a new compressor and engine have been procured and erected at the mine. The accompanying longitudinal section will

OF THE

much on the same plan. The
held by the same persons, and the
Capt. Richard Uren was the agent
e introduced the skip dump in the
wer drill in mining work.
38; the assets only exceeded the
pend work on company account in
ine, and both mines were let to
ing the company a royalty of one-
opper sold for more than 25 cents
f the excess above 25 cents.
1 per share, and at the close of
nds \$460,000, and in assessments,

, having reached the limit of the
on the company found itself in-
theast quarter of section 23, for
continued to be obtained, mainly
cts of the company were exerted,
op the Concord property in case

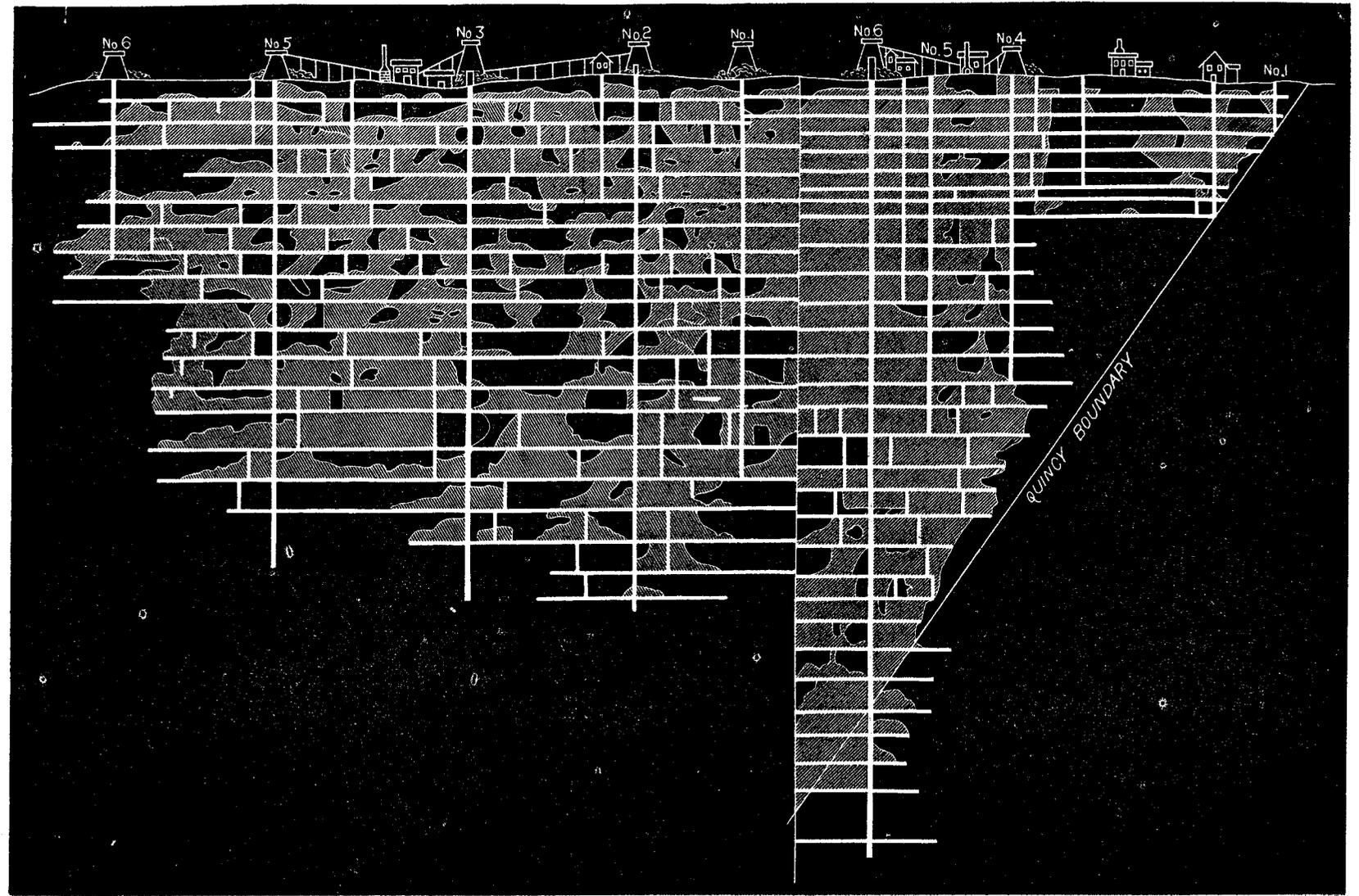
o put a quietus to the vexatious
o obtain a new lease of life for the
ding the boundary between which
n. This property, the southeast
. Edwards and the Brothers Uren,
the consideration being \$275,000.
previous of the Canal Company,

e new ground began in November
h all vigor and an abundant suc-
ed, and made to conform to the
le work, from the bottom of the
Previous to the new purchase in
r had been confined to the bottom
and the Franklin boundary. The
to 30 feet wide, and is gaining
t. The mine is now 1,700 feet

yielding 80.99 per cent = 336,475
e of 64 men employed. The total
e \$3,639.19. The number of tons
ith an average percentage of 2.84.
were increased to 40,000, and an
The Concord was set off as a
being done by the company at
e rock house in cars drawn by
of a mile, and thence the cars
ill on the shore of the lake. The
um's washers, and Evans' slime
essor and engine have been pro-
panying longitudinal section will

LONGITUDINAL SECTION OF THE FRANKLIN AND PEWABIC MINES, JAN. 1, 1881.

Scale, 420 ft. to one inch.



show the underground workings, and the tables at the end of the volume, the annual product.

The officers are: D. L. Demmon, Secretary and Treasurer, No. 19 Congress street, Boston; Capt. J. Vivian, Superintendent; J. Hay, Mining Captain.

THE FRANKLIN MINING COMPANY.

This near neighbor and intimate associate of the Pewabic was organized April 23, 1857, and commenced active mining operations upon its location, the S. W. $\frac{1}{4}$ of Sec. 24, T. 55, R. 34, adjoining the Pewabic on the north, in July of the same year. The Pewabic vein, upon which the company began work, was so far developed as to give every encouragement of success. Indeed, the directors were so confident of receiving immediate returns, that they deemed it to be only necessary to levy an assessment of fifty cents per share—\$10,000—with which to open the mine, secure the necessary plant, erect the buildings, etc.; and they were so far justified in their estimate, that for the first two years no further calls were made on the stock. During this period 99 $\frac{3}{4}$ tons of mineral were produced, yielding 60 per cent = 119,803 pounds of ingot, which netted the sum of \$23,522.48; but an indebtedness was incurred amounting to \$17,000. Accordingly, an assessment of \$2 per share was made to liquidate the debts, and to secure the funds for mining operations on an enlarged scale. Additional lands were purchased, consisting of 53 acres off the west side of the S. E. $\frac{1}{4}$ Sec. 25, giving access to the lake for stamp mill, adjacent to the Pewabic mill; also the quarter sections in Sec. 11, and the S. E. $\frac{1}{4}$ Sec. 19, thus making the company's estate 850 acres, all in T. 55, R. 34.

A stamp mill was erected and furnished with two heads of Ball's stamps, with washing apparatus, etc., which was completed in 1860; also a double track, inclined-gravity railroad was built from the stamp mill to the top of the bluff, and thence the track was extended to the mine, a distance of 7,000 feet, which, together with the subsequent kiln and other branches, made up a total length of track of 10,000 feet. The ascending cars, which were drawn up by the descending ones loaded with rock, were made to carry up the supplies, etc., from the dock on the lake—a convenience and saving in transportation. The whole length of vein of the property was 3,000 feet, in which, up to December 31, 1861, there had been opened a total number of fathoms of vein of 7,034, and the yield of copper per fathom had been 571 pounds. Six shafts had been sunk, only two of which extended below the third level. The company were employing, at this time, 220 men. The copper produced during each year for the period to 1861 was:

YEARS.	Pounds— Gross.	Per Cent of Copper.	Pounds Re. fined Copper.	Price Sold for.
1857.....	10,002	67	6,699	\$0 24 $\frac{1}{2}$
1858.....	189,885	59	113,104	0 24
1859.....	409,347	57	234,211	0 22 $\frac{1}{2}$
1860.....	738,163	64 $\frac{7}{8}$	484,196	0 21
1861.....	1,736,401	80 $\frac{3}{4}$	1,462,078	0 19 $\frac{1}{2}$

The whole average cost for smelting, commission, insurance, State tax, etc., was 14 per cent of the amount received for the copper. During the three years

from June 1857 to 1860, the total expenditures aggregated upwards of \$517,000, of which \$125,000 had been derived from the sales of copper. The mine, in 1861, showed an increased yield, but the low price for copper, which prevailed, did not make the financial result as favorable as was anticipated; still the company's indebtedness was decreased \$69,000.

The engines having become inadequate from want of power to do the work of hoisting and pumping, it was found necessary to support them by a large stationary engine, of sufficient capacity to suffice for some years to come. The company had thus far invested in improvements and in personal property the sum of \$330,000.

The breaking out of the war took from the region many skillful men that could be illy spared, occasioning an increase of wages, combined with a low price of copper, tended to the embarrassment of the Franklin as of other mining companies, which could only be met by the exercise of the strictest economy, and all work that could be dispensed with was necessarily deferred, and the labor turned in the direction which seemed to promise the most immediate results. But little stoping had been done below the third level, and the appearance of the lode at the extreme depth which had been attained was deemed to be as favorable as at any point which had been mined.

The product for 1862 was greater than that of the preceding year, being 156,580 pounds of ingot; but in 1863 there was a diminution in the yield, arising from a pinch in the vein, similar to what had been before observed in the Quincy and in the Pewabic mines. But still, the high price which the copper brought in the market, enabled the company to accumulate a surplus out of which to pay its first dividend of \$3 per share, which was declared in August, 1863. The product for that year was 1,680,189 pounds, yielding 76 per cent = 1,278,684 pounds ingot. It was decided by the company to set off the S. E. $\frac{1}{4}$ Sec. 19, which had been sufficiently explored to determine the occurrence of metalliferous veins crossing it, and to organize a company to work it. The Concord Mining Company was thus formed, and the stock distributed *pro rata* among the stockholders of the Franklin; but subsequently the stock of the Concord passed into the hands of the owners of the Pewabic. The cost of the real estate and the improvements amounted to \$381,000. The product for 1864 was 1,563,869 pounds, yielding 77.5 per cent = 1,211,335 pounds of ingot copper, which sold at an average price of 47 $\frac{1}{4}$ cents per pound, affording a sufficient surplus from which to pay the second dividend—\$5 per share—which was declared in August, 1864, and a third dividend was declared in April of the same year, of \$3 per share.

In the winter of 1863-64 an association of the mining companies was formed to secure immigration from Northern Europe. Participation in this scheme cost the Franklin Company \$9,000, but the result was not so encouraging as to warrant further effort in that direction. About 400 men were thus brought into the country. Their arrival had a tendency to prevent apprehended strikes, and many of them were got to enlist in the army and thus helped fill the quota and prevented miners from fleeing to Canada to escape the draft which they so much dreaded.

Mr. J. H. Foster, who had been the agent for six years, resigned in 1864, and his place was filled by the promotion of the mining captain, John P. Hodgson, to the agency.

Two of the Ball's mortars were purchased of the Pewabic; this became necessary from the insufficiency of those that were in use to work up the stamp rock produced. The company also purchased 919 acres of woodland available to

its use, at a cost of a little over \$5,000. A locomotive had been previously put on the railroad to run from the mine to the head of the incline.

The product for 1865 was 2,125,589 pounds, yielding 73.37 per cent = 1,559,481 pounds of ingot copper. During this, and the following year, the railroad to the head of the incline was rebuilt, and the directors purchased from the Pewabic company all their interest property which had heretofore been held in common.

The copper produced in 1866 was 2,144,174 pounds, yielding 76.1 per cent = 1,638,994 pounds ingot, which sold for an average price of 29.9 cents per pound, giving a net profit above the cost of production of \$5,730.97. But the liabilities at the end of the year were \$48,625.45. The number of tons of rock stamped, etc., was 57,196, averaging 227 tons per day of running time, which was done at an average cost of \$1.25 per ton of rock. In 1865 the average cost of treating the rock was \$1.69 per ton. The number of acres of land under cultivation was 115. The total expenditures for the year were \$268,914.99. The average number of miners for the year was 192; average wages paid \$50.94 per month. Number of other employes 95; their average wages \$49.75. The average yield of the rock stamped 1.17 per cent of mineral. In 1867 a change in the management was effected, and it was found that there had been an over-issue of stock by the former officers of 3,874 shares. The stock was all replaced and a judgment obtained against the former president of the company, John Leighton, for \$10,168.08. The prospects of the mine were unfavorable. There was a constant falling off in the yield. The average product was only 15 pounds to the ton of rock stamped in 1867, and the stamped rock was 57 per cent of the rock taken from the mine. At this time the cost of production was excessive and the market value of the product less than ever before. The agent at this time, 1863, was Richard Uren. But at the close of the year the vein recovered its former productiveness, and all apprehensions of the permanent failure of the mine were dispelled.

The total product of the year was 1,942,123 pounds of mineral, yielding 72.57 per cent = 1,402,455 pounds of ingot, which sold at an average of 23 $\frac{1}{2}$ cents per pound. Some improvements were made; new boilers were added to the stamp mill, and Ball's washers were thrown out and Collum's substituted.

Number of tons of rock raised from the mine, 90,300; number of tons stamped, 51,356; number of tons of rock stamped per day, 180; average cost for treating per ton, \$1.24 $\frac{3}{4}$; cost per foot for sinking, \$17.79; drifting, \$13.60; stoping per fathom, \$21.22. It was announced at the close of 1867 that the mine had never been in such excellent condition for profitable working as at that time.

This promising outlook was verified in the succeeding year of 1868, the yield being 337 $\frac{1}{2}$ pounds of ingot per fathom of ground, against 279 $\frac{1}{2}$ pounds for the previous year, making a cash difference on the amount of ground stoped, of \$50,460. There was 24,000 pounds less of mineral obtained, but the higher percentage which it yielded gave 65,000 pounds of refined copper in excess of previous year. The total product for the year was, 1,463,580 pounds of ingot, which sold for 23.7 cents per pound. A committee was appointed to thoroughly examine and report upon the property. The profits of the year were \$32,000, the most of which sum was expended on the stamp mill.

The total amount of rock treated, up to and including 1868, was 299,088 tons, an average of 42,727 tons per year. The number of tons treated in 1868 was 43,028; number of tons raised from the mine was 79,880; number of pounds of mineral produced, 594 1915-2000 tons; average number of tons

stamped per day, 167; cost per ton for treating, \$1.31; number of men employed, 338. The liabilities of the company were reduced from the sum of \$107,628.40 to \$67,514.74, and an excess of assets over liabilities was claimed of \$58,085.79. Failing in their efforts to borrow money on mining security, an assessment was laid of \$2.50 per share. There had now been made assessments amounting to \$320,000.

In 1870 the mine was leased to the agents of the Pewabic, on tribute, and during the next four years dividends, in all, of \$3 per share, were declared from the receipts from the royalty. The total receipts up to the close of 1874 were \$3,600,000, and the total dividends paid were \$280,000; assessments, \$320,000.

The lease having expired in 1874, the company again resumed work. The affairs of the company had reached a crisis where something must be done. The mine had been practically exhausted in the upper levels, which had been opened. The houses and mining plant were in somewhat of a dilapidated condition. The new management determined to rescue the property from the absolute ruin that seemed impending. A rigorous policy was decided upon, and pursued with such effect that in one year the market value of the stock was enhanced six fold, and the location was changed into a scene of thrift and activity. The mine had been leased when it should have been systematically worked, and only when the stockholders took the matter determinedly in hand was the mine brought back to renewed life.

The product in 1875 was 749 tons, 120 pounds, yielding 1,167,633 pounds of ingot. The receipts were \$263,288.66, and the cash in hand was \$10,000.

In 1876 the product was 1,206 tons, 487 pounds of mineral. A new dock was built on the lake, 175 feet long, and 20 feet wide. \$150,000 were expended up to the close of the year in improvements.

The mine produced in 1877 1,436 tons, 162 pounds of mineral. In 1878 the product was 3,162,040 pounds, yielding 82.181 per cent = 2,599,073 pounds of ingot. The number of tons of rock mined was 133,163; number of tons hoisted was 121,357. The number of tons treated in the mill was 96,358; number of tons rejected was 24,999. The average cost of breaking and delivering, etc., to the stamp mill, to ton of rock, was 16.13 cents; average cost of stamping and washing per ton was 68 cents; average number of tons stamped per cord of wood, 10.58.

Up to January 1, 1880, there had been expended during the preceding five years, in repairs, machinery, etc., over \$200,000, all of which had been paid by the earnings of the mine, and no assessment had been called for. They had started with an empty treasury and everything out of repair, and the earnings of the mine had been made to meet all the demands for expenditure, so that on the beginning of 1880 the company was out of debt, and a small balance in the treasury—\$1,655.76.

During the year 110,209 tons of rock were treated in the stamp mill, at a cost of 52 cents per ton, which includes every item of expense connected therewith. Two new locomotive boilers were put in the stamp mill, and their operation was found to effect a saving in fuel of 15 per cent; 350 feet of shafts were sunk, 574 feet of winzes, and 2,410 feet of drifting done; total amount of ground broken was 8,550 fathoms; number of tons of rock hoisted to the surface was 141,714, 20 per cent of which was rejected. The total cost of manipulating a ton of rock was \$2.37, a saving of 34 cents over the previous year. Capt. Thomas Dennis was appointed mining captain. The average cost of breaking rock is shown in the following table:

YEARS.	Cost of Selecting and Breaking Rock.		Cost of Stamp- ing Per Ton.	Total Expense of Manipulating Per Ton.
1876	\$0 20		\$0 81	\$3 45
1877	0 17		0 71	3 03
1878	0 13		0 68	2 71
1879	0 12		0 52	2 34

Making a difference of \$1.08 per ton in favor of 1879, as compared to 1876, or a total saving of \$53,051.12, in manipulating the year's product—141,714 tons.

The mine lacks a good deal of having reached the depth attained by the Pewabic. The surface improvements are good, lacking mainly in a rock house. The breaking is now done in No. 5 shaft house, in which are a screen and two Blake's crushers. The distance to incline—length of locomotive haul—is 4,300 feet. Product of 1880, up to December 1, is 2,876,519 pounds of mineral, yielding 82.76 per cent.

THE ALBANY AND BOSTON MINING COMPANY.

This company was organized under the general mining laws of the State in June, 1860. The company held the greater portions of Secs. 7 and 8, T. 55, R. 33, and began work in the same year of its organization on an amygdaloid belt, in which several shafts were sunk to the first level, and 800 feet of galleries made, but the vein not proving of sufficient promise, operations in it were abandoned, and in 1864 resumed in the belt known as the Albany and Boston Conglomerate. The amygdaloid lies between two parallel belts which cross the property, at a distance apart of about 625 feet. These belts have a bearing of about N. 40° E., and a northwesterly dip of 52° to 56° with the horizon. The Conglomerate is a wide belt, attaining to 32 feet in width; in character it is hard and compact, made up of boulders and pebbles of reddish feldspathic rock, cemented together with a matrix composed of the same materials in which the copper is disseminated in particles and small masses. The lode has a length on the property of nearly one mile, and is underlaid by a belt of sandstone of about six feet in thickness, which rests on a bed of amygdaloid trap. The mining shafts and galleries were made in the sandstone having the copper bearing vein above for stoping. Some 50 tons of this vein rock were treated at the Huron mill, and gave a yield of 4 per cent, which extraordinary result greatly excited the hopes of the stockholders, and induced the agent of the Pewabic to cross-cut to intersect the lode on that property. The main shaft was carried down 250 feet to the third level, and a total drifting done on the three levels of 1,200 feet before stoping of any amount was begun. Thirty-three dwellings, a warehouse, store, engine house, boiler house, saw-mill, etc., were built. A hoisting engine, pumping engine, winding machinery, stamp mill, with 24 heads of Gates' stamps, were erected in 1865. The mill was placed on a small stream which crosses the property.

But the high expectation that the lode would average three or four per cent of ingot copper was not realized; on the contrary, the result for the year 1866 was only 1.3 per cent. The 50 tons smelted at the Huron mill the year before, yielding 4 per cent of ingot, and some experiments reported by the agent in smelting the rock without stamping, producing 8 to 13 per cent of ingot, when

contrasted with the actual result of the subsequent work was greatly disappointing, and showed that the vein was only rich in places. The expenses for the year 1866 were \$254,022.54, and the receipts from the sales of copper—271,200 pounds of ingot—were \$75,445.85. The total expenditures to August, 1866, were \$978,002.44, of which sum \$840,000 had been met by assessments on the capital stock.

The company launched out far too largely in surface improvements and mining plant before thoroughly proving the mine. Great expenditure was incurred in advance that should have been avoided until it was certainly determined that there was plenty of copper, and in waiting for that fact to appear, the money would probably have been saved. The heavy disbursements were made on the assumption that they had a paying vein, and were made on a scale for producing and marketing a large product. The company continued to work until 1869, when operations were suspended, and only a small amount of tribute work has since been done. The total product of the mine is about 440 tons of refined copper. Until recently the company derived a small income from the rent of its stamp mill. The mill, however, was, about three years ago, destroyed by fire.

THE MESNARD MINING COMPANY.

This company was organized in 1862, immediately upon the discovery of a mass of copper, of 18 tons weight, upon the property. The mass had been moved a distance of 48 feet from its original bed by the ancient miners, the evidences of whose work were plentifully apparent in the multitude of stone hammers, etc., that were found surrounding the mass, and in the place where it had apparently been taken. The bed from which the mass was derived had become filled up with dirt and decayed bones, and the mass itself was buried beneath the earth that had accumulated over it. Trees corresponding in size with those of the surrounding forest were growing over it.

The mine was opened in the epidote vein, from which this mass had come, and great hopes were entertained of results, which several years of mining work failed to realize. Less than 50 tons, all told, were obtained, and unable to find copper in paying quantity, work was suspended.

The location consists of 160 acres, being the N. E. $\frac{1}{4}$ of Sec. 24, T. 55, R. 33. Some tribute work was done on the property after the company ceased operations, and in 1876 it passed into the possession of the owners of the Pewabic, etc., with D. L. Demmon, Secretary and Treasurer; office, Boston, Mass.

THE PONTIAC MINE,

lying adjacent on the north, being the S. E. $\frac{1}{4}$ Sec. 13, was worked at the same time as the above, but with no noticeable result. The property is owned by the same parties.

THE DOUGLASS MINING COMPANY.

Dougllass Mining Company, owning the N. E. $\frac{1}{4}$ Sec. 30, and N. W. $\frac{1}{4}$ Sec. 29, T. 55, R. 33, is situated about one mile north from Portage lake. The company was organized in 1863, and began work in the same year by sinking four shafts to the first level in the Isle Royal lode. The work was under the superintendence of J. H. Forster, and was continued until 1868, resulting in obtaining a total product of about 85 tons of refined copper.

THE HIGHLAND MINING COMPANY.

This location adjoins the Douglass on the south and west, and a small amount of work was done at the same period, as indicated in the preceding notice. Next to the Douglass is situated the Concord, of which mention has been made in the history of the Pewabic and Franklin Companies, and in succession also are the locations called the Arcadian, and the Edwards Companies, which were organized to work the northerly extension of the Isle Royal and the Grand Portage lodes. But with the exception of the Concord, all are now idle, and none have heretofore done very much work.

THE DORCHESTER MINING

locations, consisting of the N. W. $\frac{1}{4}$ of the S. E. $\frac{1}{4}$, and the S. $\frac{1}{2}$ of the S. W. $\frac{1}{4}$ of Sec. 18, T. 55, R. 33, was explored in 1863, and a little mining work done on the Mesnard or Epidote lode, which has a length on the property of 1,600 feet, and showed a width of three feet. Several other amygdaloid or conglomerate belts cross the property.

ST. MARY'S COPPER MINING COMPANY.

This company was also organized in 1863, and owned the N. $\frac{1}{2}$ of Sec. 18, T. 55, R. 33, being about three miles north of Hancock. The great success which attended the Quincy, Pewabic, and Franklin mines, led to the organization of several companies, for the purpose of working the extension of the Pewabic lode on the lands which it crossed to the north. Among them was the St. Mary's, which began work in 1863 by sinking three shafts to the depth, respectively, of 50 feet, 75 feet, and 100 feet, in the Mesnard epidote vein, which lode also crosses the property, and was thought, then, to be a very promising one. A small amount of copper was taken out, in value about \$1,400, and an assessment was made of \$50,000, which was expended on surface improvements and mining work. The corporators were Boston gentlemen. Fred. Beck, Secretary and Treasurer, Boston, Mass.

HANCOCK MINING COMPANY.

This company was organized in 1859 under the general mining laws of the State, with a capital stock of \$500,000. The location comprises the S. W. $\frac{1}{4}$ of Sec. 26, T. 55, R. 34. The mine was opened in the side of the high bluff which rises from the side of Portage lake, and is but a short distance northwest from the village of Hancock. The mine was opened by an adit driven into the bluff from the south, at a point 218 feet above Portage lake to intersect a shaft lowered from the surface of the hill 100 feet above. A second adit was subsequently driven on a level 70 feet below the first, and from the intersection with the surface an incline was constructed to the stamp mill, which was built on the lake, a distance from the mine of 1,400 feet, the product coming out at the adit, which also afforded the requisite drainage. The stamp mill built in 1860 was intended for 32 heads, but was only furnished with 16 heads, similar to the Quincy stamps.

The office of the company, originally in New York, was, in 1861, removed to Boston on a change of the board of directors, and Horatio Bigelow became secretary and treasurer.

During the succeeding three or four years the operations of the company

were considerably enlarged. The main shaft was fitted for hoisting and pumping, and provided with hoisting engine, pumping engine, boilers placed in suitable buildings, also engine house and shaft house built at Dupeer's shaft. The stamp mill was overhauled, a new boiler house and new engine house built, and 40 heads of stamps provided. Many other buildings were constructed, incurring, all told, an expenditure of \$122,625. The total expenditures up to this date, January 1, 1865, had been \$350,059.55; \$248,395 had been paid in in assessments, and \$104,120.98 had been received from the sales of copper. The product for the year 1864 was 100,182 pounds, yielding 61,044 pounds of refined copper. The ground yielded 446 pounds per fathom.

The company continued to work with poor success until the capital stock had been exhausted; the mine was leased on tribute until about 1872, when it was sold to Captain Snell and W. H. Streeter, who, in 1873, changed the name to the Sumner Mining Company; but little, however, was done until the winter of 1879-80, when the property was bought by Mr. Ed. Ryan, of Hancock, Mich., who reorganized the concern under the general mining laws of the State, as the Hancock Copper Mining Company, with a capital stock of \$100,000, divided into 40,000 shares, and work was begun in the month of June last by the new company. The stamp mill has been rebuilt and supplied with two heads Ball's stamps, and with Collum's washers, and thus has an estimated capacity of 160 tons in 24 hours. The incline from the mine to the mill has been repaired and put in working order; the mine has been unwatered, and mining work is regularly progressing. The belt is an amygdaloid, having a width of about four feet, and bearing N. 36° E., and dipping to the northwest at an angle of 56°. The product, at present, comes out at the adit, and is sent in cars down the incline to the mill, 1,400 feet distant. The adit is about 240 feet in depth below the surface at the north end, and is 1,400 feet in length. The mine is down to the 80th level, and has an extreme depth of 640 feet, and the new company has already sunk 100 feet below the former bottom level, and has expended, in improvements, repairs, etc., \$100,000. The rock yields about two per cent of copper. The diamond drill is being used in the work of exploration in the mine. The sinking is costing about \$23 per foot, and the stoping from \$6 to \$12 per fathom. The stamp mill was started up the 13th of December, 1880. The rock house, with breakers, etc., is connected with the stamp mill. The company employs 100 miners—has 140 men in all. The wages of the miners are \$47 per month, and of other laborers the average is \$38.50. The stock is held in Hancock, Chicago, Milwaukee, and Cleveland.

The officers are: Ed. Ryan, President; August Mette, Secretary and Treasurer; office, Hancock, Mich.

TECUMSEH MINING COMPANY.

The Tecumseh Mining Company was organized in March, 1880, and owns 480 acres of land, lying southwest from the Osceola and adjoining it. The property comprises the S. E. $\frac{1}{4}$ of S. E. $\frac{1}{4}$ of Sec. 27, the N. $\frac{1}{2}$ of the N. E. $\frac{1}{4}$ and the E. $\frac{1}{2}$ of the N. W. $\frac{1}{4}$ and the S. W. $\frac{1}{4}$ of the N. W. $\frac{1}{4}$ of Sec. 34, and the S. $\frac{1}{2}$ of the N. $\frac{1}{2}$ of Sec. 33, and the S. $\frac{1}{2}$ of the N. E. $\frac{1}{4}$ of Sec. 32, all in T. 56, R. 33. The location extends one and one-half miles east and west, and is crossed in the east part by the Calumet conglomerate and the Osceola amygdaloid, and also by the track of the Mineral Range railroad. Other important lodes undoubtedly cross the property, but the great depth of drift materials

with which the rock is covered, renders it difficult to locate the copper bearing belts. Two shafts have been started; one to reach the Calumet conglomerate, and the other the Osceola amygdaloid. These bear N. 39° E., and dip northwesterly 40°. The conglomerate shaft, it is calculated, will be at the point of entering the rock, 550 feet from the boundary line and will have a downward extent within the limits of the property on the course of the vein, of 720 feet. It was sunk vertically 70 feet through the drift to the surface of the trap, and thence drifting east a distance of 50 feet, disclosed the vein. The vertical shaft is now being carried down 40 feet through the rock, when it is calculated the vein will be intersected. No. 4, the amygdaloid shaft, is 1,600 feet to the south of the one above described, and was sunk 64 feet through the drift and 9 feet through the rock to the lode, and thence the sinking was extended in the lode 35 feet, and a horizontal cross-cut of 12 feet through it. The hanging wall is a fine hard trap; the foot wall a coarse trap. The improvements, thus far, consist of a few dwelling houses, and a 40-horse power engine has recently been procured to pump and hoist with. Mr. Charles H. Palmer, Jr., a mining engineer of much experience, has recently assumed charge of the mining operations, and it is safe to assume that in future whatever work it may be decided to do will be efficiently performed.

THE OSCEOLA CONSOLIDATED MINING COMPANY.

The Osceola was organized in 1873. Its advent into existence was heralded far and wide, and the stock was eagerly sought for on the basis of the statement that Mr. E. H. Hurlburt, who had been credited with the discovery of the Calumet & Hecla lode, had found another conglomerate belt of surpassing richness. The mine was opened by Mr. Hurlburt, through whose influence and reputation the organization was made and the capital secured. It was supposed that the company was formed to work a conglomerate lode other than the southerly extension of the Calumet & Hecla, which was no new discovery. But the borings and explorations, which were made to find the original resting place of the conglomerate boulders which had been found on the surface, failed of success. It was quite well known that certain erratic masses of conglomerate, rich in copper, had been found in this locality, of a character, it was thought, somewhat different from the Calumet & Hecla conglomerate; and also the position in which they occurred did not correspond with the drift from the Calumet lode, so that it was assumed they were derived from an independent lode. The conjectured mineral belt, it was rumored, had been discovered, and was thus the basis of the new organization, a belief which enabled the projectors to readily place the shares at unusually favorable rates for new stock. When it became known that the mine was being opened on the Calumet vein, there was among those interested, whose expectations had been a good deal raised, a feeling of disappointment. Public anticipation did not, however, wholly subside until it became certain that there had been no previous discovery, and that the exploration carried contemporaneously with the mining work failed to develop anything of value. But money enough was obtained to equip the mine fully at the start. A large amount of surface improvement was made. All the houses necessary up to the present time were built.

The mine opened in the Calumet & Hecla vein proved to be so favorable, at first, that whatever else might have been expected, there seemed to be, after all, every reason for congratulation, until further development denoted its ultimate