

1877.	Number of Men on Contract.	Number of Fathoms Stopped.	Average Price per Fathom for Stopping.	No. of Feet Sunk.—Winzes.	Average Price per Foot for Sinking Winzes.	No. of Feet Drifted.	Average Price per Foot for Drifting.	Amount Paid for Stopping.	Amount paid for Sinking Winzes.	Amount Paid for Drifting.	Amount Paid for Extra Work aside from Contract.	Mining Cost. Powder, Fuse, Candles, etc.	Amount.
January	228	403,301	\$8 18 31	47 4	\$13 54	402 7	\$12 00	\$ 7,463 32	\$ 641 60	\$ 4,829 50	\$ 440 51	\$ 3,016 93	\$ 13,574 83
February	210	317,963	18 87	144 0	13 54	373 4	12 14	5,999 24	1,950 00	5,348 40	442 77	2,633 44	12,927 41
March	216	246,381	18 25	124 4	13 55	424 4	12 60	4,495 99	1,672 52	4,348 50	421 17	2,436 74	12,927 26
April	187	215,275	17 53	124 3	13 48	449 3	11 00	3,773 70	1,384 00	4,244 90	368 47	2,255 88	11,978 26
May	218	373,473	16 97	104 9	13 19	414 4	11 07	5,421 71	1,780 50	4,641 90	597 85	2,255 88	10,510 92
June	228	373,687	16 73	133 3	13 35	357 8	10 99	6,241 16	1,532 20	4,708 65	515 89	2,712 24	11,010 96
July	222	454,486	17 08	47 0	13 89	381 9	10 75	7,309 35	1,091 80	6,217 65	479 95	2,712 24	12,360 81
August	232	381,449	17 04	83 7	13 68	384 6	9 95	6,501 16	1,145 00	5,356 65	641 99	2,712 24	12,360 80
September	222	443,482	18 65	88 4	12 63	288 8	10 11	8,315 31	1,061 80	7,253 50	249 95	2,712 24	12,421 71
October	226	504,397	17 30	76 2	12 27	227 6	10 61	8,295 88	994 50	7,301 30	403 36	2,712 24	12,579 36
November	226	644,378	15 39	68 5	14 17	159 8	10 67	9,917 81	992 50	8,925 30	598 68	2,712 24	12,466 74
December	212	423,056	17 75	98 0	14 20	252 2	10 67	7,305 79	1,363 70	6,042 00	598 90	2,886 91	12,165 39
	219	4,729,368	17 29	1,136 1	\$13 44	4,026 9	\$11 22	\$81,774 42	\$15,274 65	\$43,515 70	\$5,347 61	\$32,874 41	\$147,912 38

SUMMARY FOR THE YEAR.

Average force employed..... 474 men. Total rock hoisted..... 81,587 tons.
 Average number of miners..... 249 men. Total stamp rock treated at rock house..... 73,251 tons.
 Average wages of miners on contract per month..... \$43 79 Total poor rock rejected..... 8,336 tons.
 Yield of mineral per fathom of ground broken..... 568 lbs. Product mineral..... 3,304,580 lbs.
 Yield of refined copper per fathom of ground broken..... 467 lbs. Product refined copper..... 2,720,558 lbs.
 Total rock mined..... 98,916 tons.

RETURN OF MINING COST FOR THE YEAR ENDING DECEMBER, 1877.

Amount of contracts brought down...	\$147,912 38
Mining captains and timbermen.....	6,948 44
Miners on company account.....	14,230 41
Laboring hands, including landers....	21,750 89
Engineers and firemen at hoisting engines.....	4,512 47
Carpenters' work.....	1,576 87
Blacksmiths work.....	4,416 07
Attending change house, watchman and teaming.....	1,779 75
Machinist and mason work.....	3,729 29
Surveying and engineering.....	720 00
Supplies and materials used in mine...	21,596 07
	<u>\$229,172 55</u>

February 15, 1878, a dividend of \$100,000 declared from profits made in 1877.

QUINCY STAMP MILL—BATTERY STAMPS—WAYNE PATTERN.

RESULTS.

1877.	No. of Days Mill in Operation.	Average No. of Heads run per day.	Tons of Rock Stamped Per Month.	Tons of Rock Stamped per Cord of Wood.	Pounds of Copper Produced.	Percentage of Copper per Ton. of Rock.
January	25%	71	6,977	13.50	260,490	1.87
February	24%	70%	6,234	13.00	260,360	2.09
March	13%	69%	3,373	14.30	202,180	3.00
April						
May	22%	70%	5,651	11 77	229,140	2 08
June	26%	70	6,959	15.00	313,950	2 26
July	25%	70	7,130	16.58	264,990	1 88
August	27%	67%	8,318	16.74	269,920	1 62
September	24%	68	7,655	15.75	295,295	1 94
October	27%	67%	8,736	17.15	284,165	1 63
November	26%	67	7,446	13.76	497,635	3 34
December	25	65%	6,828	11.38	294,455	2 16
	266	69	75,307	14.76	3,173,630	2 11

Running expense.....\$49,237 77
 Or 65 4-10 cents per ton of rock.
 Cost of repairs..... 22,204 17
 Or 29 1/2 cents per ton of rock.
 Total expense..... 71,441 94
 Or 94 9-10 cents per ton of rock.

The Franklin mine for several years was in the hands of tributers, but the company has taken hold of it again with good prospects of success; it is yielding over 100 tons per month.

The Pewabic lode has been traced many miles, and it has been opened and mined at several points. Just north of the Franklin, the

MESNARD MINING COMPANY,

Organized in 1859, sank several shafts two levels deep on it; removed some barrel and stamp copper, but thus far the success of the company has not been satisfactory. It was upon this company's property that the famous 18 ton mass, almost pure copper, and showing marks of the ancient miner's hammer, was found. The discovery of this mass led to the finding of the so-called epidote vein, the source of the mass. Several shafts were sunk on this epidote vein; some mass copper was removed and then work was suspended on the whole property.

THE PONTIAC MINE

Was organized in 1860 to work on the Pewabic lode, but after a brief career and the finding of a little copper, work was discontinued. This was next on the north of Mesnard. These mines were worked during the speculative period of the war. At the Albany and Boston mines, four miles northeast from the lake, the Pewabic lode has been opened, but shows only a little stamp copper. At some other point, or points in its course, it may or may not again become worthy of attention. So little is really known of the lodes and belts of the country, where they have not been opened, that it is not safe to pronounce upon them dogmatically.

Between the Pontiac and the Albany and Boston the Sr. MARY'S, the DORCHESTER and the DUDLEY were worked in 1862-4 upon a conglomerate and the epidote belts; a little copper was found, but no thorough mining was prosecuted and the mines were closed.

THE ALBANY AND BOSTON

Was organized in 1860 to work the so-called Albany and Boston amygdaloid lode and the Albany and Boston conglomerate. A large amount of work was done on this property, and at one time the success of the venture seemed well assured. The amygdaloid lode carries a good deal of

copper but whether it would pay as a mine is problematical. Work on this lode was interrupted by the discovery of the supposed much more valuable conglomerate, and the company's attention was turned to that attractive belt. The surface show on the conglomerate was really very fine, and as the shafts were sunk three levels deep, and the drifts opened therefrom, the same encouraging indications of a valuable mine continued. By analysis, and by treatment under the stamps, the rock taken from the mine yielded four per cent. This was good enough. The management thereupon put up machinery, including a 24 head stamp mill, Gates' pattern, and worked with vigor. After a time, and after several thousand tons of rock had been stamped as it came from the mine, it was ascertained that the copper contained in the veinstone did not yield one per cent. This result was so unexpected and disappointing that the mine was shut up. It has been idle about ten years.

THE RHODE ISLAND COMPANY,

For a brief period, contemporaneously with the ALBANY AND BOSTON, operated on the same belt, just northeast of the Albany and Boston company's lands, but without satisfactory results. These two companies own property extending across the range, and it is quite probable that somewhere on this large territory valuable discoveries will be made in the future.

The Albany and Boston conglomerate is a wide belt, 30 to 40 feet, with very coarse boulders and much carbonate of lime in the cement, which is not very firm. This belt is not identical with the Calumet conglomerate.

On the north side of Portage Lake, opposite the village of Hancock, with their northern boundaries in the water, lie the MONTEZUMA, DACOTAH and SOUTH SIDE MINES. Little more than exploratory work was done on these properties, but much money was expended in the deep drift overlying the rocks of that section. The object, mainly, of all this work was to find the Pewabic lode. But that lode has not yet been found on the south side of the lake, though the writer believes it may be.

Three miles back from the lake, on the supposed course of the Pewabic lode, in the year 1864-5, a promising belt was discovered, carrying very handsome copper throughout the mass of veinstone, 15 feet wide and for several hundred feet long. The veinstone is a purple-brown soft rock very like that found in the Pewabic lode. The mine organized under the name of the SOUTH PEWABIC MINING COMPANY. But this was not the Pewabic lode, but the ash bed of Copper Falls; it contained no mass copper and very little barrel work. The copper existed in shape and size of rifle balls, duck shot and very finely comminuted grains very difficult to save in the washers. This lode has nearly the same course and dip as the Pewabic lode.

THE ADAMS MINE,

Under the same auspices, was organized on the same lode, and was conducted by the same management.

These mines, more particularly the South Pewabic, was regularly opened, sufficient mine plant provided, and four heads of Ball's stamps with Collum's washers were set up on the lake shore.

Crossing the lode, near the dividing line of the Adams and South Pewabic, a true fissure vein was found, about four feet wide, filled with quartz or dolomite, carrying small, pure masses of copper. This vein, it was found, had been mined for several hundred feet on its course and to a depth of ten or fifteen feet. Nothing on the surface pointed out these ancient works. Maple forests had covered the even ground with a thick mat of leaves. It is curious to note how this discovery, like so many others in the districts, was the result of accident. Mr. Chas. H. Palmer, a gentleman of observing mind, while leisurley sauntering in the usual way through the woods, noticed that the hoofs of some stray cattle made deep impressions in the ground. He cut a sapling and probed the foot marks, and to his surprise found no bottom. An excavation was ordered, and an old mine was uncovered; the fallen timber and leaves, the accumulation of centuries, had completely bridged over the chasm. The workings were very interesting and undoubted.

Stone hammers were found, and the vein rock, after the separation of the masses had taken place, was piled up across the vein in a regular wall. At one point, on a projection or shelf of rock, reposed a handsome specimen of copper, which the miner had placed there and forgotten.

The South Pewabic Mining Company, after an active but brief career, and the expenditure of more than its capital stock of \$500,000, shut down. The bondholders *absorbed* the concern, and the honest shareholders are still whistling for their money, for it should be remarked, assessments in the sum of \$500,000 had been levied and collected.

A few years ago, in 1872, the company was re-organized, consolidating with the Adams, and named the ATLANTIC, with 40,000 shares. The Atlantic is now working at a profit, and producing over 100 tons of mineral per month. There is little, if any, waste rock in this mine; all the veinstone is sent to the stamps; the percentage of copper is about 1. The company, with locomotive and cars on its own railroad, $3\frac{1}{2}$ miles long, transports its rock to the mill. This mine, (as the South Pewabic,) was the first to use Frue's automatic railway between its shafts and rock-breaking house.

THE HANCOCK MINE,

NOW SUMNER, located just west of the village of Hancock, is one of the older mines of the district, organized in 1859. The belt upon which the mine is based is a mixed-up conglomerate; it carries stamp copper and small masses. It has never reached a high position, except in the hands of stock speculators, and is idle to-day.

Commencing at a point on the trap range five miles southwest of Portage Lake, and traveling thence a distance of some twenty miles, and embracing the entire width of the range, there is a large area of mineral land but little known. On the head waters of the Salmon Trout, Misery and other streams, some exploring and mining was done in early days. As a rule, the rocks are covered very deeply with sand drift, with few outcrops, which renders the work of exploration difficult and costly. There is no reason why this great

territory is not as rich in mineral resources as any other portion of the range, with the same mileage. Good float copper, with rock attached, has been observed in this section and some fine, promising veins uncovered. This is a legitimate and encouraging field for the coming miner. A railroad along the range, through this unsettled tract, is a desideratum.

In the year 1866 a discovery was made out in the woods, near the old Eagle river trail, ten miles from Hancock, out of which has grown the greatest copper mine in the world. The locality was as obscure as the tract we have just been describing. There was no road leading to it—the surface was heavily wooded and the drift deep. Reference is here made to the Calumet lode. And just here, if the legend be true, is another curious fact of discovery. On this Eagle river trail, so often wearily threaded by pioneer explorers, in a rude cabin called the half-way house, where a “drop of whisky” was procurable, resided a solitary individual, whose only constant companions were some barnyard fowls and two pigs kept in a pen. Now these pigs disliked confinement, and preferred to roam. Being knowing animals, they nosed out of their pen and wandered into the woods. The master's efforts to capture them were in vain. Indignant at the vagrant habits of his pets, so obstinately persisted in, one day, after a hot, ineffectual chase, he came in swearing like a woods pirate and begged a French gentleman resting at his inn to shoot them. The gentleman did as he desired, fired at and wounded one of them with his revolver. The injured porcine ran squealing away, followed by the master. The pig, tracked by blood on the leaves, was found hidden in a nest on the side of a knoll. With the quick eye of an explorer, the man noticed green carbonate of copper plentifully mixed with the earth which the pigs had worked up. He dug into the mound and found further evidences of copper. He reported the circumstances to Mr. John Hulbert, who was exploring there at the time, who in turn communicated the fact to his principal, Mr. Ed. J. Hulbert. Without delay the mound was

examined, a pit sunk some fifteen feet through the sand down to the firm rock, when lo and behold, there lay the great Calumet conglomerate. This mound was the veritable work of the “ancient miner.” The cackling of a goose saved Rome, so an obstinate pig discovered the Calumet. Of course this legend does not detract from the merits of such skilled explorers and engineers as the Messrs. Hulbert. To them the honor of the discovery belongs.

It is said that the celebrated Cliff' mine was discovered by a miner who had been out rabbit hunting on the bluffs, and coming down the steep declivity his foot tripped on a wet moss-covered rock, and down he came on his *a post parte*. Looking around to see what had hurt him, he saw a shining mass of copper, “a smiling at him.” This might be termed a *donkey* discovery.

THE CALUMET AND HECLA CONSOLIDATED MINING COMPANY,

80,000 shares, capital stock \$2,000,000, is working on the Calumet conglomerate. This belt is of an average width of ten feet; it dips to the northwest $39\frac{1}{4}$ degrees and has the same strike, or trend, as the formation of which it is a constituent part. The average percentage of the copper of the whole lode mined is now five per centum. Mineral yields 88 per cent. ingot; all of the stamp rock is sent to the mill, without assorting or rejection. The workings vary from 900 to 1,700 feet down on the dip—1,300 feet is the average depth for a whole mile. Length of workings three-fourths of a mile. The conglomerate of the belt is mostly made up of pebbles firmly cemented together; the mass has a lively flesh-colored appearance occasioned by the presence of feldspar; minute black specks of mineral are seen in it, and the whole is of porphyritic texture. The cementing material is very hard and is the same as the pebbles in a finely comminuted form; it is in this cement that the metallic copper is found, and often copper alone is the cementing substance. This veinstone, or matrix, is so hard and jaspery, and contains such a large amount of copper, that the work of boring it with hand drills is excessively slow and expensive. The best steel is soon dulled,

and the expense of mining the rock, as compared with that in amygdaloid belts, is double, if not more.

Mining is done here on a grand scale; two thousand men are employed, and the industry indirectly supports twice that number of people. The machinery used in mining, hoisting, pumping and stamping, is all of the most improved pattern and very powerful and effective. What with the engine houses, shaft houses, rock breaking houses, offices, dwellings for officers and men, supply stores, hospital, school house, hotel and churches, a large and populous village is built over the mine. The Red Jacket village, situate just off the mine limits, is a large, flourishing mining town. The population of the two villages is more than 5,000, for many of the miners have brought their families from the old country. The number of children that attend the schools is something incredible. The Calumet school is graded, and is one of the largest and best conducted in the state of Michigan. Being absolutely free to the poorest child, it is an inestimable boon to miners' children.

On the Calumet belt we find next south

THE OSCEOLA CONSOLIDATED MINING COMPANY,

A comparatively new mine organized in 1873, working a large force, and producing about 150 tons of copper per month. It possesses a Ball's stamp mill of two heads, located on Portage Lake, near Hancock, whence the stamp rock has to be transported a distance of nine miles, on the Mineral Range Railroad, which passes through the property. The Osceola company is also working on an amygdaloid of promise. Mining profits for the year 1877—\$140,000.

On the north side of the Calumet and Hecla mine, on the same belt, the

SCHOOLCRAFT MINING COMPANY,

Organized in 1865-6 has made quite extensive openings, and erected a stamp mill and other machinery, with the customary surface improvements for the accommodation of mine employes.

At points, this mine has yielded a fair amount of copper, but the metal is not equally distributed, and there is much

barren ground. The conglomerate is fine grained, but of brighter color than that found in the Calumet, showing more spar and epidote. Owing to financial difficulty the mine is closed.

Still further north, on the KEARSARGE, the Calumet conglomerate has been opened, but it is found, on the surface, almost destitute of copper. The Kearsarge Mining Co. also opened on their property a fine looking amygdaloid lode carrying small mass and stamp copper, but no regular mining has been done on the location.

There are several other mining associations that own lands, or have done business in the Portage Lake district, namely, the St. Louis, the Dover, the Hungarian, the Portage Lake, the Florida, and the Ossipee. All that can now be said of them is that their lands are well situated on the trap range in the vicinity of good mines, and are well chosen estates.

It is believed by many good explorers that there is a conglomerate belt lying somewhere to the eastward of the Calumet, that is very rich. A large amount of time and money has been expended in the fruitless effort to unearth it. If it exist, the deep drift and cedar swamps hide it from mortal eye; yet it will be found. A large quantity of float copper in the conglomerate, of exceeding richness, has been found on the surface and it suggests strongly the existence of the mother vein, *in situ*, somewhere to the eastward, whence the drift came.

The writer now proposes to take some one mine as characteristic of all stamp lodes in the district, and describe the *modus operandi* of mining, the hoisting machinery, stamp mills, &c. He will choose the Calumet and Hecla mine, for example.

In this new country, as before stated, preliminary to mining, the forests have to be cleared and the surface, if wet, drained. Houses to shelter the mine employes have to be made as well as roads and other absolutely necessary conveniences.

The lode having been satisfactorily tested by surface

examination. shafts are started at well chosen points, at convenient distances apart, say four or six hundred feet. These shafts vary in dimensions, but 10 by 14 feet is a good working shaft. In the Lake Superior copper mines, more particularly on stamp lodes, the shafts are always sunk on the dip of the lode, whatever angle it may be. Hence these shafts are inclined planes, and generally they keep to the foot wall. These shafts are sunk to a depth of 75 or 100 feet, at which point the first level is started and is run from shaft to shaft until the whole number of shafts are connected by a continuous gallery, or drift. These drifts are 6 feet by 4, or wider if necessary to accommodate rail tracks. The shafts, while the drifts are opening, are sunk away to the second level; the second level, in due time is opened like the first, and so on down. Between the shafts, for the purpose of ventilation and convenience in stoping, minor shafts are sunk, called winzes. The mine thus opened is like the rectangular blocks on a city map tilted up; the shafts and drifts are main streets crossing each other, and the winzes are alleys. The solid blocks of veinstone bounded by the streets are, if the whole lode is workable, taken out excepting pillars of rock left to support the hanging wall and keep the mine from coming together. This work is technically called stoping. The shafts are cribbed from the surface down to solid rock with square timber and plank, and is divided into two or more compartments, in one of which is laid the rail track, in another the pumps, and in the third a ladder-way. But in large mines, like the Calumet, one shaft is used as a pump shaft, while another shaft, or intermediate opening, is fitted for the man-engine, the duty of which machine is to take the men in and out of the mine. The top of the shaft is carried from 20 to 30 feet above the ground for convenience in the handling of rock. The iron cars or skips, holding several tons, are held by large wire ropes, which pass over pulleys to the drum of the engine. The movement of these skips is regulated with great precision by bell signals, from under ground; and to the brakeman at the drum

the position of the skip, at any depth, is told by an ingenious little indicator. The skip comes up out of the mine, dumps itself, and returns whence it came. At the Calumet the skip dumps its load into a car resting on a horizontal tram-road, which car, moved by an endless rope, apparently without human agency, moves off at a considerable speed to the rock-breaking house, perhaps a thousand feet away, where it dumps itself and immediately returns to its proper position. This economical railroad, set on trestles, more or less elevated above the ground, is called Frue's automatic road. The rock from each shaft has the same common destination, the great receiving rock house. Here the large blocks of copper-tied conglomerate are first crushed under a ponderous steam hammer, which resembles a section of the main shaft of an engine; it operates vertically in slides, and has the lower end beveled off. To compare great things with small, it is like the stub of the pencil which the writer is using. The motive power is a steam cylinder on top. Broken by this great hammer, the pieces of rock fall into a number of large and small Blake rock-breakers, whose corrugated iron jaws crunch them up remorselessly. From these breakers the comminuted conglomerate falls into shutes, and from thence it is, at will, drawn into cars. A train of cars, each holding four to eight tons, drawn by a locomotive engine, moves off to the stamp mill, five miles distant, where the copper rock is dumped into large bins placed at the top of the mill. The stamps now begin their work of further reduction; the rock is thrown into the hoppers of the great steam stamp, which strikes a blow of many tons eighty times a minute, smashing the rock into minute pebbles, fine sand and slime, which is washed from under the head by a stream of water, and carried by the same agent to the washers set on an inclined floor, when by a process of jiggging, in fresh supplies of water, the gravel and sand are separated from the freed copper, which, owing to its greater specific gravity, settles at the bottom on the sieves, while the sand is carried over the apron to the waste launder and is washed out into

the lake, or spoil bank. There is a large number of washers in this stamp mill, and the copper rock is subjected to repeated washings, and even the fine slimes are carefully treated upon slime tables. Yet quite a percentage of fine copper goes to waste in spite of the most ingenious contrivances used to save it. The mineral, or washed copper, having been graded, is packed into barrels and sent to the smelting works, where, passing through fire, it is purified from all rock remaining and cast into ingots, bolts, bars and cakes. All of this work,—processes which we have not pretended to describe in detail—is accomplished by that potent agent steam. These stamp mills are an interesting study for any one interested in such works.

Returning to the mine, we go underground, and fathoms deep, where no ray of sunlight ever pierces, we find a populous community of busy workers; the atmosphere of the place is damp and murky, with a strong odor of sulphur, the remains of exploded powder. The only light is that of tallow candles stuck on the hats of the men with clay, or upon the walls, or as head-lights on the rock cars. Each level is provided with tram roads; the cars are pushed along by men to and from the shafts, where the loaded rock is dumped into the skips. The visitor will not fail to observe, all along the drifts, immense round timbers, set near together and reaching diagonally from one wall to the other. These timbers are called stalls or stulls, and serve the purpose of keeping the walls from coming together and closing the mine. With lagging thrown upon them, a platform is made for the rock falling from the stopes above, which platform also protects the workmen in the level and on the tram-ways. Most of the mining is done with the hand drill; one man holds the drill while two strike. Black, very coarse powder is used as an explosive. Steam drills and air compressors are used to some extent. The mine, as a rule, is not very wet; the ventilation is good, as there is no foul air or poisonous gasses liberated in mining. The miners are a healthy, robust class of men. The work of mining proceeds night and day, summer and

winter, with great regularity. The men work ten hours, and are divided into day shifts and night shifts, and change from day to night once in seven days. But it frequently happens, in different places, or when greater expedition is required, certain of the miners are divided into three gangs, each gang working eight hours, and all fully occupying the twenty-four hours. Much of the mining is done upon contract, and the average wages are from \$45 to \$50 per month, out of which the man has to pay his board and other necessary expenses. Every mine has one physician and surgeon, or more, and a good hospital. The men are charged for the support of the surgeon and for medicines; a married man, including family, \$1 per month; a single man, fifty cents.

The Calumet and Hecla mining company has been very successful. It is making with great regularity, and pays quarterly, dividends of \$5 per share on its capital stock of 80,000 shares. To date, February 15th, 1878, it has divided twelve millions, four hundred thousand dollars, and the mine shows no abatement in the yield of copper or in productive ground. \$800,000 in assessments were paid to open and equip the mine. The mine is always kept well opened in advance of the stoping parties.

Yet this great mine had its period of doubt and uncertainty, and at one time, owing to bad management and financial trouble, it came near failing.

Successful mining upon conglomerates was an anomaly; many had no faith in the permanent value of conglomerate belts; but the Calumet and Hecla has dispelled all doubts on that subject.

First in the history of the copper country of Lake Superior, fissure veins, charged with enormous masses of metallic copper, had to gain favor; next, stamp lodes had to fight their way into popular estimation, and lastly, the conglomerate belts astonished the scientific world. What next?

KEWEENAW DISTRICT.

THE ALLOUEZ MINING COMPANY,

Whose property lies just north of the northern line of

Houghton county, is working on a conglomerate belt which is supposed to be the Albany and Boston conglomerate. This belt is 50 (?) feet wide, and the boulders of the conglomerate are coarse; some portions of the cementing material are well charged with copper, but the deposits of that metal are very irregular and uncertain. The belt being so wide, the cost of stoping so much barren veinstone, lessens the profits of mining. Were the copper, which is unequally distributed in the lode, concentrated upon the foot wall, for example, in a zone from ten to fifteen feet wide the length of the mine, the mine could be worked much more economically, and doubtless with very satisfactory results. Not even the Calumet can produce car loads of rock richer than those we see sent to the Allouez stamps, but there is so much low grade rock intermixed, say in 1,000 tons, that the average percentage of copper is greatly reduced. This company was organized prior to 1860, and some exploring, by shallow shafts, was done, but active work was begun only about five years ago; 188 tons of copper was sent to the smelting works in 1875. This mine has an extensive mine plant; a stamp mill with two heads of Ball's stamps, and a railroad connecting the mine and mill; the trains are hauled by a locomotive engine. The mine has shipped a good deal of copper, but at present, owing to financial difficulties, it is in the hands of tributers. Although the directors have expended more than the capital stock—\$500,000—raised by assessments, yet the mine has not reached a paying point.

THE SENECA MINE

Is a new concern, though the organization of the company was effected some twelve years ago; the lands belonging to the company were set off from the old Fulton, which occupied under a nine mile permit. Two shafts have been sunk to the first levels, on what is known as the Kearsarge conglomerate, which lies 1,600 feet east of the Calumet conglomerate. The site of the mine is some five miles northeast of the Calumet mine, or one mile in the same direction from the Allouez. The Kearsarge conglomerate,

as opened here, very much resembles the Calumet rock, the pebbles being fine and firmly cemented, but the color of the veinstone is a shade darker. The belt is, however, 50 feet wide, but is not rich in copper the whole thickness. Under the hanging wall there is a longitudinal section from four to six feet wide, which carries from one to three percentum of stamp copper. The dip and course of this belt correspond with that of the formation. All that can now be said of this mine is, that it is an undeveloped concern of much promise. The company is working only a few men, and proceeding cautiously. The lands owned by this organization embrace several thousand acres, and are most favorably situated on the Trap Range.

THE "CLIFF,"

Next in order of working mines, has been described.

A few years ago this company changed hands—the mine was sold. It was left to fill with water. At great cost and labor, agent Farwell removed the water and resumed mining operations. He is working a moderate force of miners. As the mine is very deep, the cost of mining is great. Besides working from the perpendicular hoisting shaft, and being under the necessity of drifting back from the shaft to the vein, at every level, the loss of time and cost are very serious draw-backs to successful working. It is not admitted that the mine is worked out, but doubtless it has seen its best days. Unlike agriculture, when the soil, by proper cultivation can be forever renewed, a mine, however good, will in time become impoverished to such a degree as not to pay, or become too deep to be mined profitably.

THE PHOENIX MINING COMPANY,

Working in a true fissure vein, is one of the prominent mines of this district, and is producing much mass copper; of late the annual product of mineral has averaged 700 tons. The Bay State Mine, absorbed by the Phoenix, adds greatly to its productive territory. The mine is well situated, about two miles from Lake Superior, on Eagle River, just south of the Greenstone. It has a small stamp mill, good machinery,

and comfortable habitations for its people. The surrounding country is cleared and cultivated, and the roads are excellent.

THE CENTRAL MINING COMPANY,

Is operating upon a splendid fissure vein. The mine is under the greenstone, the cuprifirous deposits on the north being limited by the slide; it is situated about midway between Eagle River and Eagle Harbor. The mine was organized in 1854, made its first shipments of copper two years thereafter, and has always been distinguished as an eminently, trust-worthy and successful concern;—the annual dividends coming with great regularity and paying good profits. The capital stock is 20,000 shares—\$500,000. The assessments levied and collected with which to open the mine were comparatively light, \$100,000, the money derived from the sale of copper going far towards equipping the mine. The mine is well fitted with machinery, offices and dwellings and the underground department is ably managed. The mine is worked through a great main shaft which enters the mine under the greenstone slide and runs parallel thereto,—a heavy car, running upon T rail laid in the shaft is used in the mine traffic. The vein, which has nearly a north and south course, dips to the east. The principal product is mass copper of 65 per cent. purity; the deposits of this metal are found in calc spar, sugar spar, laumontite, chlorite and other minerals, often occurring in form of beautiful crystals. The masses are often enormous, irregular slabs—isolated bodies of copper—and weigh in gross from four to eight hundred tons. They are mined by working on each side and removing the vein rock, and are blasted down so as to expose one face, by sand blasts in which several kegs of powder are used. They are cut, by means of chisels, into convenient blocks for handling, of from four to eight tons each. Some of these blocks are of great purity; when hoisted from the mine they are sent to the smelting works without further dressing. At first, smelting furnaces had to be constructed on purpose to receive and smelt these great solid masses. They were a novelty

not only to miners, but to smelters. But all difficulties in treatment have been overcome by American genius.

But a small percentage of the vein rock is stamp stuff, therefore the Central company operates only a small stamp mill of the Gate's pattern.

It is estimated that the total dividends made by this mine, at date, 1878, amount to \$1,320,000—assessments paid in \$100,000.

To all appearances the mine will not be exhausted for many years to come.

THE COPPER FALLS MINING COMPANY,

Already described, is not at present operating in the mine proper, but is engaged in bringing up a deep adit to tap the mine at a low level. When this work shall be finished, it is hoped, with ample drainage, that the company will be able to resume active mining in the lower sections of the mine when it is expected good paying ground will be opened in the fissure vein.

THE DELAWARE MINING COMPANY

Is working on a fissure vein, on their location, which lies a few miles southeast of Eagle Harbor. The vein is rather small, but carries a fair percentage of copper; a small force is at present employed in opening the mine.

The Amygdaloid Mine, situate near the Delaware, is on a fissure vein and is working in a small way.

The Clark Mine, an old organization, is situated near Copper Harbor. It is owned by Monsieur Estevant, who resides in Paris, France. The vein carries small mass and stamp copper, but the production thus far has not been satisfactory. Only a few men are at work in the mine.

This completes the record of the working mines of to-day in the Keweenaw county district.

The entire ground from the Houghton county line to the extreme eastern end of point Keweenaw is occupied by mining companies, but a large majority of these companies have been idle, from ten to twenty-five years. Some of them will doubtless again resume work and upon veins or belts partially mined, or upon new beds, meet with that success which thus far they have failed to reach.

The conglomerate belts, especially, offer a fine field for exploratory observation.

The reader, who has had the patience to follow these sketches thus far, has doubtless been surprised at the number of mining associations in the copper mines, as a whole, that have suspended operations, and may pertinently inquire why this is so? In this respect it is presumed that our mines do not present an exceptionable case. The same causes that have produced these effects exist in other mining regions on this continent; and the same stagnation and dilapidation of mining settlements, is apparent; especially is this so, in all the new territories.

It does not come within the scope of this paper to present a full statement of all the facts as they are found in our copper mines.

We repeat what has been already said that many so-called mines have merit which, in the course of time, will become manifest; while on the other hand many of these concerns have no value at all and never had any. They were the offspring of speculation and did not deserve to succeed. Others were blunders, the only excuse for which was a pardonable want of knowledge of the vein phenomena of the district. Still others failed from lack of sufficient capital and perseverance in the face of obstacles and discouragements, such as a general financial crisis, a fall in the price of copper, high price and scarcity of labor and a want of sound judgment as to the necessary outlay requisite, under the most favorable circumstances, to open and equip a mine. The remoteness of residence of the majority owners of these mines, (the board of directors generally having their offices in sea-board cities,) and a want on their part, of familiarity with mining, or its general business details, have often operated detrimentally to the best interests of the mines.

Then, it must not be forgotten that the copper region of Lake Superior was, and is, to a great extent, a wilderness, that the native forests had to be cleared—all supplies brought from long distances at great cost; that the only means of

communication with the settled portions of the union, was by the lakes which, for one-half of the year, were fast bound in ice; and that the climate of winter in this high latitude was dreary and remorseless, and the deep snows overwhelming.

Many of these depressing draw-backs have ceased to exist. The copper mine settlements are no longer entirely dependent upon the natural water ways for intercommunication, but find an outlet by several railroads. Good turnpike and macadamized roads have been built from Copper Harbor to Ontonagon, and good lateral roads are found where there is a necessity for them. The population of the country has become more stable, and the cost of living has materially decreased, while more comfortable habitations, and all those appliances of civilization which man knows how to invent and use, have robbed winter of much of its terror.

Hereafter it is not likely that gross blunders will be repeated. The managers, with the acquired experience of years, should make no grave mistakes in opening and equipping a mine. Examples of machinery, stamp mills, tram roads, &c. are numerous, and should serve as guides in the future.

As a rule the local managers of our copper mines, from first to last, have been men of character and ability. Instances are rare, if any exist, where the chief officers intrusted with so much power and responsibility have proven defaulters, or have been willfully unfaithful to their high trusts. They have, doubtless, from want of experience in a new field, committed mistakes, but they have been governed by an honest purpose. A large majority of the copper mines are controlled by boards of directors, resident in Boston or New York. The board chooses a president, treasurer and secretary, who reside in those cities. The local affairs of the mine are managed by a corps of officers, the chief of whom is the agent, or superintendent; his associates are the mine captains, surface captains, engineers, civil and mechanical, chemist or assayer, clerks and surgeon. There is also quite a staff of sub-officers to direct the

multitudinous details of a great mine. A good working mine expends from \$20,000 to \$100,000 per month. From 500 to 2,000 men, of all classes, are employed regularly, by each mine. Reference is here had to mines working full capacity.

ISLE ROYALE DISTRICT.

Mines were opened in a small way on the island twenty five years ago, at Rock Harbor, where a small stamp mill and a small smelting furnace were erected. The enterprises were short lived. About 1872-3, mining was resumed on the island by the ISLAND MINING COMPANY, on a tract of land lying two miles north of the head of Siscowit bay, south side of the island. The basis of the mine was an immensely thick bed of conglomerate. The course of this belt is about 35° northeast; the dip is very flat, so that the shaft forms an easy inclined plane. This dip is the reverse of that of the belts observed on the south shore, being southeasterly. This belt resembles the Albany and Boston conglomerate where it is mined at the Allouez. The vein-stone is often highly charged with metallic copper, but the copper is unevenly distributed, and there is much poor ground intermixed with the richer parts. Our remark made upon the mining operations at the Allouez are applicable to the mine under consideration.

At one time great hopes were entertained by the management that the Island mine would make a brilliant success. The mine was opened vigorously—money was freely expended, and two shafts were sunk to the third level, some drifting was done, but very little stoping attempted. Land about the mine was cleared; comfortable buildings for the miners' erected; a road was cut out and graded to the bay, and a substantial dock and warehouse were built on the shore. A space was also cleared for a large stamp mill which, however, was not erected. But for reasons not known to the writer mine work was suddenly suspended by the company, in 1875-6.

Tributers, who have erected a small stamp mill, on the

creek near the mine, are treating the rock hoisted from the mine during active operations by the company; they are also doing some stoping. What success they are meeting with is not known.

In 1876-7 the SAGINAW MINING COMPANY began work in some old shafts, in an epidote vein, found near the west end of Rock Harbor. Only a small force of miners have been employed there; however, the company's agent is very much encouraged by the show of copper found in two veins crossing each other on the property. One of the veins, at least, is said to be a true vein, carrying copper in small thin masses.

On the north side of the island, at McCargo's cove, the MINONG MINING COMPANY has been mining for about three years. The company was organized Dec. 16th, 1874, but did not get down to regular work until the next season. The mine is based upon a thick metalliferous, or cupriforous bed, and upon transverse veins. Attention was directed to this spot by surface evidences of most extensive ancient workings.

The cove is a perfectly land-locked harbor, two and one-half miles long, one thousand feet wide, and deep enough for large draught vessels to navigate. The mine is one hundred and fifty feet above the lake, and well situated for drainage, milling, &c. The bed upon which shafts are being sunk dips to the southeast, and is quite flat; as first exposed in the ancient mine, it was supposed to be several hundred feet thick, but recent mining disproves this theory and fixes the thickness of the belt at from 15 to 20 feet. Much small mass copper has been uncovered; from June to November of the first seasons work, thirty tons of 88 per cent. were shipped. The largest mass uncovered weighed 5,720 pounds, bearing marks of ancient stone hammers. The bed, or lode, has the same strike as the formation, is amygdaloidal-epidote, and carries a handsome percentage of stamp copper. The fissure veins are promising, but not enough is yet known of the vein phenomena of this section to enable us to decide conclusively upon their merits. The

display is truly wonderful, and everything points towards a profitable outcome of copper for the Minong. The company owns 1,455 acres of land traversed by these belts and veins.

Isle Royale is isolated. The storms of the great lake rage around it during the winter solstice, and when the season is severe and the lake filled with ice, communication with the main shores is entirely cut off. During the season of navigation, communication with Portage Lake is kept up by means of small daily steamers; large steamers also visit the island.

The estimated population of the copper mines of Lake Superior is 25,000. There is a large foreign element, chiefly found among the mining classes, namely, Cornishmen, Germans, Irish, Italians, Scandinavians and Canadian French. They are good workmen, and, as a general thing, they are an orderly, law-abiding people. Society at the mines and in the towns is cultivated and refined. Many of the leading people have immigrated from the larger eastern cities of the Union, and have brought with them all the tastes and refinements of an older civilization. Schools, churches and benevolent institutions abound. There are many beautiful homes to be seen, and a considerable display of wealth. The climate is salubrious, and the inhabitants enjoy a large immunity from disease. In fact, the Lake Superior country is visited in the summer season by a large number of invalids. The region is also a very inviting and favorite resort for those intent upon pleasure, or who wish to escape from the oppressive heat of more southern climes.

Agricultural pursuits have been followed only to a limited extent in the copper districts. The soil may be called second rate farming lands. The Trap Range is covered chiefly with hard maple, with a mixture of white cedar, white pine, birch, hemlock, spruce and balsam fir. The low lands support more trees of the evergreen class, and extensive pine forests are among the most valuable resources. The manufacture of lumber for the use of the mines, and for

exportation, is largely increasing every year. Heavy pine, hemlock and cedar timber is consumed by the mines in immense quantities, but the supply is ample for years to come. The maple and birch, cut up into cord wood, find ready sale at the stamp mills where there is a large yearly consumption of fuel.

The chief products of the soil are grass, hay, oats, potatoes, rutabagas and garden vegetables and small fruits. The raising of Indian corn is attempted only in gardens. That wheat can be grown has been satisfactorily proven in Ontonagon county, and elsewhere. Owing to the deep snows of winter, stock raising has received but little attention. But that the country is peculiarly well adapted to the raising of cattle, the writer knows by seeing how rapidly imported animals take on flesh grazing upon the native grasses of the country, which spring up as soon as the forests are cleared, and are fully equal, in every respect, to the celebrated Kentucky blue grass. This grass remains green, if it does not grow all winter, under the deep snows of that latitude; the ground does not freeze, and as soon as the snow disappears in spring the pasturage is good. Cattle raising, also sheep, could be made a profitable industry in the mining regions, we have no doubt; the period for foddering cattle, after all, would be no greater than that which rules in the vicinity of the State Capital. Butter, with the mines for a market, would be a most profitable product, also milk. All domestic cattle and beef, as well as oxen and horses, to supply the towns and mines, are drawn from Illinois, Wisconsin and Minnesota. Flour, mill feed, maize, pork, ham, poultry, &c., &c., are derived from those states mainly. It is estimated that at least \$2,000,000 are annually expended for supplies for the whole mining region—iron and copper—and that but a small proportion of the outlay goes to southern Michigan.

In favorable situations, in the vicinity of mines, upon the lake shores and river banks of the interior, many farms have been opened out. The forests are cleared and sold in

the shape of cord wood and timber to the mines and towns, so that the cost of making a farm in the woods, helped by the sale of timber, is comparatively light. The Canadian French are the chief agriculturists on Portage Lake. Elsewhere, American and German citizens are putting their hands to the plow in earnest.

The native forests are not the home of many kinds of wild animals good for food. The fur-bearing animals, once plenty, are being thinned out rapidly. Occasionally a deer, a black bear, or a wolf may be seen, but they are not permanent denizens; they are only summer visitors. The rabbit, porcupine and ruffed grouse are to the "manor born," and are still found in abundance.

The waters abound in fish. The yearly catch of whitefish and Mackinac trout amounts to many thousands of dollars. Americans, Norwegians, French and Indians engage in this profitable business. Thus a cheap and abundant supply of fish food is furnished to the people of the mines. The small streams and bays are full of brook trout, some of which grow to a great size—from one to seven pounds. Taken from the ice cold waters, they are very delicate food.

OTHER SOURCES OF COPPER SUPPLY.

In Canada, in the New England and several of the southern states are found mines which are, or have been, producing ores of the sulphuret of copper in limited quantity. In New Mexico, Arizona and in the Pacific slope states and territories have been discovered veins carrying ores and native copper. Many of these discoveries are reported to be rich, but the geographical situation of these mines is, for the most part, remote and in desert countries, without railroad facilities, or water communications. In such a country where mines of precious metal, of ordinary grade, do not meet with success, owing to the enormous cost of mining and transportation, it is not likely that mining for copper there will very soon become so prominent as to seriously affect, by competition, the prosperity of the Lake Superior

mines. And it remains to be proven whether those western veins are of such value and permanence as to be trustworthy. It will be remembered that about the year 1863 discoveries of exceedingly rich and productive mines of yellow sulphuret of copper were made at Copperopolis, near Stockton, California. These mines were very favorably situated in a settled country, near a point of ocean shipment, and were very wide deposits, which could be easily and cheaply worked. It was thought that they would speedily become dangerous rivals of the Lake Superior mines. But after having been worked for a period of a few years the deposits of ore were found to be superficial, and were soon mined out. In the year 1868, at which time the writer visited that section, these mining companies had suspended operations, and those millionaires who had reveled in a little brief prosperity, had failed and, with accustomed California courage, had once more taken up the hammer of the modest explorer and wended their way to the mountains in quest of treasures new.

The mines of Cornwall are so nearly exhausted as to have lost a preponderating influence in the copper market. The ore mines of Chili are still producing a good deal of copper, but there has been a marked falling off in production of late years. The new copper mines of Australia are producing some copper—how much we do not know. The mines of Continental Europe can, by no means, supply the home demand.

From this statement it would appear that at the present time the Lake Superior copper mines are without a rival. From the well known purity of the metallic copper of this region, and the high estimation put upon it by leading manufacturing and commercial nations of the earth, it is not probable that it will very soon lose favor, or cease to be in demand.

As to the origin of the metallic copper found in such abundance in the amygdaloidal rocks of the Trappean Range, different opinions are held. Prof. Winchell, late state geologist, thinks that these rocks are of igneous origin,

while others are of the opinion that these rocks, like the conglomerate belts, intercalating, are sedimentary and metamorphosed, and that the copper, which exists in solution in all of the rocks, including the sandstones, is deposited through the agency of electricity in the pre-existing cavities of the lodes and belts, and in the more recent fissures, which are true veins, carrying mass copper. The latter seems to be the general opinion among practical men at the mines.

GENERAL REMARKS.

It will be seen from the perusal of the foregoing pages that the copper districts have made great progress in settlement, improvement and production, during the last quarter of a century. All doubt and uncertainty as to the intrinsic value of the copper mines of Lake Superior have been dissipated. They are favorably known throughout the civilized world. The refined copper sent out from these mines is in high favor, and commands, for many uses, a premium above all other copper whatever.

Still, mining in the copper rocks of Lake Superior, must be regarded as in its infancy. Not one thousandth part of the Trappean, or Copper Range, is known, or has been minutely explored. The people of that country only stand upon the shore of the great ocean of discovery which lies before them. The mines of Cornwall have been worked for a thousand years, new discoveries having been made as old ones were exhausted. No one who has paid any attention to developments in this region can doubt for a moment that a great profitable future lies open, and that centuries hence the copper mines will be worked by a populous, intelligent and prosperous community, educated in our common schools, and mine colleges, and made happy by the perpetuated blessings of civil and religious liberty.

At this date—1878—in common with other great industries of the United States, copper mining is sharing in the general distress. The low price at which copper has ruled

for the last four years has made necessary the closest economy and the use of the best skill to prevent the mines from losing money. In this respect the depression has been salutary.

The general dullness has also had the effect to stop the tide of reckless speculation in mining stocks, or shares, and mine owners are now more than ever anxious to obtain profit from honest, legitimate mining.

Another effect of hard times is a lack of enterprise in exploring. At such periods men do not readily invest their money in undertakings that in their nature are uncertain and expensive; they wait for more prosperous times. Yet this is really the best time to engage in exploring and looking up abandoned properties, because labor and material are plenty and cheap.

But the present outlook is anything but discouraging. It is believed that the copper mining industry was never in a more healthy state. To-day there are more mines that are doing well than there ever was at any period in the history of the country. The future is full of hope, full of encouragement, and the people of the Upper Peninsula only ask of their brothers in the southern part of the state, fair and just recognition in the halls of the Legislature, in order that they may keep pace in progress and improvement, and in all high behests, with the rest of our great and advancing commonwealth—the Michigan of the two Peninsulas.

JOHN H. FORSTER.

List of mining companies that have reported copper product at Auditor General's office:

1 Adventure.....	Organized February, 1854
	Capital stock, 20,000 shares, \$500,000
2 Ætna.....	Organized January, 1864
	Capital stock, 20,000 shares, \$500,000
3 Albany & Boston.....	Organized June, 1860
	Capital stock, 20,000 shares, \$500,000
2 Allouez	Organized September, 1859
	Capital stock, 20,000 shares, \$500,000
2 Amygdaloid.....	Organized July, 1860
	Capital stock, 20,000 shares, \$500,000

3 Arcadian	Organized July, 1864
Capital stock, 20,000 shares,	\$500,000
3 Atlantic.....	Organized July, 1872
Capital stock, 40,000 shares,	\$1,000,000
1 Aztec.....	Organized August, 1863
Capital stock, 20,000 shares,	\$500,000
2 Bay state	Organized May, 1853
Capital stock, 20,000 shares,	\$500,000
1 Bohemian.....	Organized October, 1864
1 Caledonia (old Nebraska).....	Organized March, 1863
Capital stock, 20,000 shares,	\$500,000
3 Calumet & Hecla Consolidated.....	Organized December, 1864
Capital stock, 80,000 shares,	\$2,000,000
1 Carp Lake.....	Organized June, 1878
Capital stock, 20,000 shares,	\$500,000
2 Central.....	Organized November, 1854
Capital stock, 20,000 shares,	\$300,000
2 "Cliff" (Pittsburgh & Boston Co.)	Chartered at first, Organized
April, 1873.	
Capital stock, 20,000 shares,	\$500,000
3 Concord	Organized May, 1864
Capital stock, 20,000 shares,	\$500,000
2 Copper Falls	Organized November, 1855
Capital stock, 20,000 shares,	\$500,000
2 Dana.....	Organized April, 1853
Capital stock, 20,000 shares,	\$500,000
2 Delaware.....	Organized January, 1873
Capital stock, 200,000 shares,	\$500,000
1 Devon	Organized November, 1863
Capital stock, 20,000 shares,	\$500,000
3 Douglass.....	Organized January, 1863
Capital stock, 20,000 shares,	\$500,000
2 Eagle River.....	Organized February, 1853
Capital stock, 20,000 shares,	\$500,000
1 Evergreen Bluff.....	Organized September, 1853
Capital stock, 20,000 shares,	\$500,000
1 Flint Steel	
Capital stock, 20,000 shares,	\$500,000
1 Forest, (Victoria).....	Organized April, 1855
Capital stock, 20,000 shares,	\$500,000
3 Franklin.....	Organized April, 1857
Capital stock, 20,000 shares,	\$500,000
2 Garden City.....	Organized October, 1855
Capital stock, 20,000 shares,	\$500,000
1 Gogebic.....	Organized February, 1853
Capital stock, 20,000 shares,	\$500,000
3 Grand Portage, (old Portage).....	Organized May, 1860
Capital stock, 20,000 shares,	\$500,000
1 Great Western.....	Organized March, 1863
Capital stock, 20,000 shares,	\$500,000

3 Hancock, (now Sumner).....	Organized April, 1859
1 Hazard.....	Organized December, 1853
Capital stock, 20,000 shares,	\$500,000
1 Hilton.....	Organized May, 1863
Capital stock, 20,000 shares,	\$500,000
3 Huron (now Houghton).....	Organized December, 1853
1 Indiana.....	Organized March, 1854
Capital stock, 20,000 shares,	\$500,000
1 International (old Bohemian).....	
Capital stock, 20,000 shares,	\$500,000
3 Isle Royal.....	Organized June, 1857
Capital stock, 20,000 shares,	\$500,000
1 Knowlton.....	
Capital stock, 20,000 shares,	\$500,000
1 Lake Superior.....	Organized July, 1853
Capital stock, 20,000 shares,	\$500,000
2 Madison.....	Organized August, 1859
Capital stock, 20,000 shares,	\$500,000
1 Magnetic.....	
Capital stock, 20,000 shares,	\$500,000
2 Manhattan (Old Albion).....	Organized January, 1863
Capital stock, 20,000 shares,	\$500,000
1 Mass.....	Organized May, 1856
Capital stock, 20,000 shares,	\$500,000
3 Mesnard.....	Organized May, 1859
Capital stock, 20,000 shares,	\$500,000
1 Minesota (charter).....	(Organized laws of Mich.) 1855
Capital stock, 20,000 shares,	\$500,000
4 Minong.....	Organized December, 1874
Capital stock, 40,000 shares,	\$1,000,000
1 National (chartered).....	Organized 1848
Capital stock, 20,000 shares,	\$500,000
1 Native (chartered).....	Organized 1848
Capital stock, 20,000 shares,	\$500,000
1 Nonesuch.....	Organized June, 1867
Capital stock, 20,000 shares,	\$500,000
2 North American.....	
Capital stock, 20,000 shares,	\$500,000
2 North Cliff.....	
2 Northwestern.....	
2 Northwest (changed to Pennsylvania).....	
1 Norwich.....	Organized March, 1855
Capital stock, 20,000 shares,	\$500,000
1 Ogima.....	Organized December, 1860
Capital stock, 20,000 shares,	\$500,000
3 Osceola, consolidated.....	Organized 1873
Capital stock, 40,000 shares,	\$1,000,000
2 Pennsylvania.....	Organized June, 1860
Capital stock, 20,000 shares,	\$500,000

2 Petherick.....	Organized April, 1861
Capital stock, 20,000 shares, \$500,000	
3 Pewabic.....	Organized April, 1853
Capital stock, 20,000 shares, \$500,000	
2 Phoenix.....	Organized November, 1865
Capital stock, 20,000 shares, \$500,000	
3 Pontiac.....	Organized April, 1859
Capital stock, 20,000 shares, \$500,000	
3 Quincy (chartered).....	
Capital stock, 20,000 shares, \$500,000; now 40,000, \$1,000,000	
Organized under mining laws, 1878	
2 Resolute.....	Organized March, 1864
1 Ridge.....	Organized October, 1863
Capital stock, 20,000 shares, \$500,000	
1 Rockland.....	Organized October, 1853
Capital stock, 20,000 shares, \$500,000	
3 Shelden & Columbian.....	Organized June, 1864
Capital stock, 20,000 shares, \$500,000	
3 South Pewabic (now Atlantic).....	Organized November, 1864
Capital stock, 20,000 shares, \$1,000,000	
5 Star.....	Organized July, 1853
Capital stock, 20,000 shares, \$500,000	
2 St Clair.....	Organized March, 1864
Capital stock, 20,000 shares, \$500,000	
3 St Mary's.....	Organized March, 1863
Capital stock, 20,000 shares, \$500,000	
2 Summit.....	Organized November, 1862
Capital stock, 20,000 shares, \$500,000	
3 Summer (Old Hancock).....	Organized November, 1867
Capital stock, 20,000 shares, \$500,000	
1 Superior.....	Organized October, 1855
Capital stock, 20,000 shares, \$500,000	
1 Toltec (consolidated).....	Organized May, 1853
1 Union.....	Organized October, 1864
Capital stock, 20,000 shares, \$500,000	
1 Victoria.....	Organized April, 1858
Capital stock, 20,000 shares, \$500,000	
2 Vulcan.....	Organized March, 1864
Capital stock, 20,000 shares, \$500,000	
1 Windsor.....	Organized March, 1855
Capital stock, 20,000 shares, \$500,000	

1 Mine in Ontonagon county.

2 Mine in Keweenaw county.

3 Mine in Houghton county.

4 Mine in Isle Royale county.

5 Mine in Houghton and Keweenaw counties.

NOTE.—Some of the foregoing companies at first worked under a charter; afterwards they organized under the general laws (mining) of Michigan.

ITA

mineral Statistics.

Lbs.	Tons.	1876		1877		1878		TOTALS.		
		Lbs.	Tons.	Lbs.	Tons.	Lbs.	Tons.	Tons.	Lbs.	
.....	0470	20	784	32	609	27	115	566	1638
.....	70	881
.....	3	15	5	1998	.....	1746	440	36
124	1574	(a)780	1875	(a)650	279	493	796	3,133	1396
.....	770	1180
.....	5	409
.....	1036	917	1041	1,019	1226	1,021	1873	6,641	587
.....	252	13	1378	14	1934	11	1392	340	1240
1730	199	1115
.....	131	688
976	1954	10,845	737	11,284	468	12,537	782	97,497	760
1548	952	1,080	1400	997	1610	945	1013	15	1135
.....	1475	19	774	17	813	10	1520	93	1575
354	873	450	146	80	1319	207	415	18,622	1226
.....	440	.....	.....	.....	.....	.....	.....	327	1544
1348	1587	8	1488	5	1950	5	1790	6,750	1512
.....	1220	88	1701	16	1417	140	345	601	1050
.....	1	1258	.....	.....	84	1502
1257	24	1667
1000	35	1873	409	1833