

ANNUAL REPORT OF THE COMMISSIONER OF  
MINERAL STATISTICS OF THE STATE OF  
MICHIGAN, FOR 1882.



BY AUTHORITY.

LANSING:

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1883.

**SLATE.**

**QUARRIES AND DOCKS ON HURON BAY,  
LAKE SUPERIOR, MICH.**

Very many men who are quite familiar with the State industries have examined the quarries at Huron Bay, and pronounce the quality of the slate and the extent of the deposits equal to any to be found in the country. The product has been submitted to leading architects in Chicago, New York, and elsewhere, and the testimony has been, unanimously, strongly in its favor.

The present company, organized to work these deposits and furnish slate for the market, was formed in 1881 by Messrs. W. D. Thompson, Jackson, Mich., C. R. Knickerbocker, do; Edwards, Townsend & Co., Cleveland, and S. L. Smith, S. F. Seager, and James Turner, of Lansing, Mich.; the capital stock fully paid up is \$500,000. The company acquired the title of the lands, etc., formerly owned by the Huron Bay Slate and Iron Co., the Superior Slate and Mining Co., and the Clinton Slate and Iron Co., with other lands esteemed of value to the interests of the company.

In the commissioner's report for 1878, a description of the deposits is given, together with a history of each of the companies that had been formed and a statement of the work done, etc. There was nothing further to add, up to the time of the formation of the present company; since the time of the writing alluded to, to the period of the resumption of operations by the present company, all work had been suspended.

The owners have exemplified their faith in the value of the property by extensive improvements, which they have made and are still making, and the opening of new quarries.

Work was begun in July, 1881, and from that time until March thereafter the time was occupied in rebuilding the railroad five miles, from the location to the bay, repairing the docks, clearing land, building a stone engine house and supplying it with machinery, building a blacksmith's shop, carpenter shop, 14 new dwelling houses, a barn 100x40 feet, wagon shop 60x30 feet, a boarding house and hotel, 153 feet in length, 2 stories high, which latter building cost with an attached refrigerator \$10,000.

Having performed this preliminary work, the company, on the first of March, began to open a new quarry; having decided to abandon the old pits, they commenced at a distance of 100 feet south from the Clinton quarry to uncover the ledge, sink a pit, and to drift from it to the north to connect with the Clinton. This work is still in progress, and when accomplished the company will have an opening 200 feet in length across the slate formation, and in depth to the bottom of the shaft, which is already sunk, sixty-five feet.

All the developments which have been made tend to confirm the statements made in the report of 1878, regarding the geological formations of the slate deposits. The facts as to cleavage, dip, bedding, etc., are still shown to be therein indicated; by reference to the diagram and text of that report the rock structure will be clearly understood. "The slate formation in these quarries forms a wide belt and extends over a portion of the Huron Mountains." "It consists of several strata, or narrow beds of good slate rock; the cleavage or splitting planes of the slate dip very uniformly to the south, but the natural bedding is in broad anticlinal and synclinal waves, which have a trend nearly east and west, and a consequent dip to the south or to the north as the case may be; the bedding planes are very plain and can be readily determined by the experienced observer; nevertheless an expensive error was made at one of the quarries when it was opened, by mistaking the cleavage for the bedding."

One hundred and fifty rods to the west of the Clinton opening, another, called the Bismark, was started in the latter part of the summer of 1882, and the work in it was continued until the winter set in. Mr. Litchfield, the superintendent, states that the result of this development was of the most promising character. To use a mining phrase, he says they struck the mother belt of the slate formation. In quality the slate they have here obtained is the best; it splits freely, is a shade lighter than the Clinton product, and from present indications there is a large quantity of it. They have explored the belt to the north and to the east for 200 feet from its first opening by sinking in it, and find it to be at each of these points the same. The depth to which it has been proved is 15 feet, and there have been no indications of poor rock. Some other openings have been started, but in none of them has much progress been made.

From the commencement of work to the present time the company has employed an average force of 95 men, and have paid average wages of \$2.00 per day. The purpose has been to get ready for a large annual output in the future. Thus far the present company have not made any effort to manufacture slate, but it is expected that the coming season they will turn out 40 or 50 squares per day, and thus be prepared to meet all demands for purchase. In quality the slate is of the best, fully equal to any eastern slate for roofing purposes, and can also be used for any of the purposes for which the slates of Vermont and Pennsylvania are noted. The company has expended thus far in the work a quarter of a million of dollars, exclusive of the cost of the property. The greater portion of this expenditure has been for surface plant; especially for the railroad, which has been laid with steel rails, and will be operated with a locomotive at the opening of spring—1883. The quarries are in T. 51 N., R. 31 W., in S. W.  $\frac{1}{4}$  of S. E.  $\frac{1}{4}$  of Sec. 28, and the Old Clinton quarry is in the N. W.  $\frac{1}{4}$  of Sec. 33. The elevation is 500 feet above Huron Bay, and the distance from it about five miles, and it is 16 miles from L'Anse, to which place a highway has been made. The company have ample docks at the terminus of the railroad at the bay, in sufficiently deep water for the largest vessels to enter. It would seem that the slate interest of Huron Bay was now upon a secure basis, and that it should thenceforward be one of the permanent and prosperous mineral industries of the State. The superintendent, Mr. E. A. Litchfield, is a gentleman of large experience in the slate quarrying business, and expresses full confidence in the future of the quarries which he is now engaged in developing.

The following regarding the slate industries is clipped from the Portage Lake Mining Gazette:

#### LAKE SUPERIOR'S SLATE DEPOSITS IGNORED.

The value of the slate beds of this region for roofing and other purposes is no longer a matter of doubt, but so far the development of the material which exists in abundance in Baraga county, within a short distance of shipment by lake, has not been carried on with the business enterprise which its commercial worth suggests. The day is coming, however, when the slate deposits down there will command the attention they deserve, and furnish an important line of prosperous industries.

To show how little is known outside concerning the slate beds of Lake Superior, we give below an interesting article on slate from the Boston Commercial Bulletin, which ignores this section as the possessor of this mineral:

The better class dwelling-houses in large cities and the immediate suburbs have, for a long time past, been roofed with slates, and in the country their use is constantly growing larger. The first cost of slates is more than that of shingles, but they are cheaper in the end, as they will last as long as the nails will hold them,

and will always afford a better protection to the roof. Some country people who use rain water also prefer them because the water when it comes from them is perfectly clean. Slates are particularly adapted for use on the Queen Anne style of houses on which shingles have been almost entirely used. The shingles have to be painted, and the paint will wear off and the shingles become discolored and warped, while different colored slates may be used, and will form a permanently handsome covering, and one which will last for an indefinite period. On city warehouses slates are not now very much used, as the roofs are generally flat, but they are used ornamentally in many ways on city buildings, and their use is almost universal on public buildings, churches, railroad depots, and such structures. Slates are also used generally on founderies and furnaces, where they are valuable as a protection against sparks, and their use on manufacturing buildings generally is growing.

#### AMERICAN SLATE QUARRIES.

The great slate producing section of this country is Pennsylvania, which, by reason of the extensive deposits and ability to manufacture cheaply, as well as accessibility to the western markets, is enabled to control the slate trade. The Pennsylvania slate is black and unfading. In and around Fairhaven, Poultney and Castleton, Vermont, and Hampton, Middle Granville, Salem and Pawlet, New York, are produced the fancy colored slates used for ornamental purposes, such as the unfading green and red, and thereabouts also, particularly in Vermont, are produced the sea green, purple, and black slates, which are not unfading. There are also mines at Monson and Brownville and in Kennebec county, Maine, which yield black slate. These Maine slates combine unfading color with all the desirable qualities of slate, and are regarded by the trade as one of the best slates in the market. These slates are all about the same price in the Boston market, as the difference in freight generally almost equalizes the price.

#### THE TRADE.

The slate trade is extremely sensitive to the financial condition of the country, and is one of the first industries to feel the effects of any business depression, met one of the last to recover from it. During the "panic" years the trade was prostrated, but since 1879 it has shown a steady and marked improvement. The amount manufactured in the United States during the last four years, square being equal to 100 square feet, was as follows:

	Squares.
1879 .....	367,000
1880 .....	332,000
1881 .....	554,000
1882 .....	501,000

The amount produced in the various sections during 1882 was as follows:

	Squares.
Pennsylvania .....	328,000
Maine.....	43,000
Vermont.....	120,000
Virginia.....	10,000

**FOREIGN SLATE.**

Wales may be regarded, for all practicable purposes, as the great slate producing country, outside of the United States, though there are some quarries in Cornwall, Scotland, Ireland, and on the Continent of Europe. Welsh slate was formerly imported in considerable quantities, but the Americans now not only control their own markets but also export heavily to South Africa, New Zealand, and Australia, as well as the various European countries.

The exports for the past four years have been as follows:

	Pieces.
1879 .....	1,100,000
1880 .....	1,900,000
1881 .....	4,400,000
1882 .....	5,800,000

The slate exported has been principally low class slate, and since the beginning of this year the exports have been light. This has been due to unfavorable local causes in the various countries and the competition of Welsh slate.

**PRICES.**

There is generally very little doing in slate during the winter, and the trade opens in March and closes in December. As may be judged by our figures, they'll trade last year was a good one, and prices in the Boston market advanced about 50 cents per square. The trade this season is entirely dependent upon the general condition of the country. At present all slates are cut and prepared by machinery by which better slates are made than by hand. An interesting fact in connection with the trade is that nearly all the quarries are worked by Welshmen, who seem to believe that they have a heaven-given faculty for working slate.

**GYPSUM.**

I do not find much of general importance to add to what is very fully given in the commissioners' report for 1881, regarding the plaster business at Grand Rapids. The past year has been a prosperous one and shows an increased output.

The rivalry which formerly existed among the several companies resulting in the cutting of prices below living rates, has been done away with. The entire plaster and stucco manufacturing interests of the State are now pooled, and each company is allowed its share of the business. This arrangement was consummated early in the year 1882, and the sales of the past year now made

on this basis through a central office, and the same plan will be continued. The only exception to it is the Alabastine company, of Grand Rapids, which is opening a quarry on some leased lands lying south from Godfrey & Bro.'s mills, being near the east line of the city limits, on the line of the Chicago & West Michigan railroad. This company has built a new mill for the manufacture of stucco, furnished with one 8-foot kettle, six tons capacity, that is one that will turn out six tons at each boiling. A second kettle will be added, and it is estimated that the mill will turn out 40 tons per day of calcined plaster.

The quarry is opened and they have 5,000 tons of rock in stock. Twelve feet of dirt were removed, which is succeeded by 12 feet of plaster rock; a boring which was made revealed a second underlying stratum of the same material. This is the only company whose product is not pooled; they have contracted with the State Grange to furnish 8,000 tons, at \$21/2 per ton delivered on the cars. The agency price of land plaster is placed at \$3 per ton. The stucco made will be for the company's own use in the manufacture of alabastine; 1,500 tons were used last year for this purpose, and about 2,000 the present year, 1883, will be required.

Messrs. Godfrey & Bro. are improving their water power, by raising the dam to the height of 181/2 feet, making it flow 25 acres. It is expected that this will give sufficient power for their entire business.

The product of the different companies for the year 1882 has been as follows:

NAME OF COMPANY.	Land Plaster Net tons.	Stucco, barrels 300 lbs to a bbl.
Grand Rapids Co.....	7,512	32,854
Godfrey & Bro.....	6,080	30,274
Noble & Co.....	6,037	27,993
Union Mills Plaster Co.....	8,298	23,074
Loren Day.....	6,901	9,643
B. F. Smith.....	2,993	11,817
Total.....	37,821	135,655

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

YEARS.	Land Plaster. Tons.	Stucco—Barrels, 300 lbs. each.
For years previous to 1866.....	†100,000	* 80,000
1866.....	14,604	
1867.....	17,439	
1868.....	28,837	34,966
1869.....	29,996	41,187
1870.....	31,437	46,179
1871.....	41,126	48,685
1872.....	43,536	59,707
1873.....	44,972	82,453
1874.....	39,126	82,449
1875.....	27,019	61,120
1876.....	39,131	64,386
1877.....	†40,000	†55,000
1878.....	†40,000	†48,346
1879.....	43,658	50,800
1880.....	49,570	106,004
1881.....	33,178	112,813
1882.....	37,821	135,655
Total.....	701,450	1,033,810

†Partly estimated.

\*Stucco for years previous to 1868.

TABLE Showing the Amount of Land and Calcined Plaster produced by the several Plaster Companies in Michigan for the years given.

NAME OF COMPANY.	Tons of Land Plaster.				Barrels of Stucco.			
	1878.	1880.	1881.	1882.	1879.	1880.	1881.	1882.
<sup>1</sup> Godfrey & Bro.....	9,117	9,000	6,422	6,080	.....	23,000	27,500	30,274
<sup>1</sup> Grand Rapids Plaster Co.....	8,970	12,000	6,375	7,512	.....	23,500	20,400	32,854
<sup>1</sup> Geo. H. White & Co.....	1,900	.....	.....	.....	.....	.....	.....	.....
<sup>2</sup> Wyoming Mills Co.....	7,000	10,000	6,093	6,801	.....	.....	.....	9,643
<sup>2</sup> Union Mills Co.....	4,500	7,500	6,716	8,298	.....	35,000	34,913	23,074
<sup>1</sup> Taylor & McRingolds*.....	10,585	9,570	6,572	6,037	.....	24,504	30,000	27,893
<sup>3</sup> Smith, Bullard & Co.....	1,586	1,500	1,000	2,993	.....	.....	.....	11,817
Total.....	43,658	49,570	33,178	37,721	.....	106,004	112,813	135,555

<sup>1</sup> Quarry, etc., at Grand Rapids. <sup>2</sup> Quarry, etc., at Grandville. <sup>3</sup> Quarry at Alabaster \* Now D. Noble & Co.

## COAL MINES.

The coal mines of Michigan were fully written up in the last report, and on visiting the mines I am able to find but little, beyond that which has already been stated, to give regarding this mineral interest. During the summer of 1882 the mines were all idle through an extensive strike by the workmen. This strike continued from July to September, and as a matter of course greatly reduced the product of the mines. Miners at Corunna now receive \$1.15 per ton for mining, and at the Jackson mines 90 cents per ton, in addition to \$3 per foot paid for driving the openings, 6x5 feet. One man can mine from 1 1/2 to 2 1/2 tons per day. The reason that a higher price is paid at Corunna for mining is due to the fact that the work is more difficult, the coal is harder, or claimed to be.

The Corunna Coal company abandoned the old bank in May last, and the work is now all confined to the new mine, which at the date of the last report had just been opened. They have not experienced the best of luck; were of course idle during the strike; the men at that time were receiving \$1.10 per ton, and claimed an advance which the company refused to allow; ultimately the company got an advance of five cents per ton on the price of coal and gave the men the benefit of it. After the strike was adjusted and work was resumed, the water broke in and flooded the mine, and then a fire consumed the "dry" in December. They have difficulty in keeping the men; the company has imported seventy from Ohio, the past year, paying all their expenses, but they have only ten of these men now. It is hard work and requires experience to mine coal in these banks; the coal has to be blasted (at Jackson blasts are not necessary), and each man must be his own boss, in a measure have his own "room." He must know just how strong a blast to put in to throw out a full amount; if the blast is too light or not well placed, it will only shake the ground, and then it must be all picked out, as a second blast in the same hole would only dissipate itself in the seams. The man looks after himself and receives \$1.15 per ton. It takes some experience and skill on the part of the workman. They use a sledge of 8 pounds weight.

The shaft is vertical, 8x16, and 67 feet in depth, and divided. The main entrance, drift from the bottom, is

driven east 529 feet from the shaft; the "butt entries" turn from this at right angles, and from these latter the "rooms" fire cut out. The "butt entries" are driven at each 100 yards, or would be if the ground were horizontal, but as the shaft is sunk in the lowest point and the vein descends toward it from the east, these lateral drifts are cut at 40 yards apart and from these the ground is worked only in the up-hill direction, so that the product, as does the water, runs down hill; the latter collects into the at the shaft.

To the west of the shaft the work has been abandoned, the ground is unsettled and broken, but east the roof is firm; it is a fine grained, black, silicious slate; when brought to the surface and exposed to the air it disintegrates.

The coal sells readily at nearly the same price as does the Ohio coal at Detroit. The only difference in price being the transportation from Detroit. Owing to the strike, etc., and the considerable outlay in opening the new mine, the expenditures have exceeded the income by \$25,000.

The prospects are very good for the coming year. The vein is 3 to 4 feet thick and very uniform, but the price is low. The thicker coal veins in Ohio can be mined at a much less relative cost per ton, enough less to cover the cost of transportation, so that the Ohio coal is shipped in and sold in Detroit for less than the Michigan mines can afford to sell it.

The product for the year 1882 of the Corunna mine is monthly as follows:

	Pounds.		Pounds.
January.....	.....	July.....	2,658,400
February.....	255,300	August.....	1,082,400
March.....	250,506	September.....	639,700
April.....	822,200	October.....	2,156,400
May.....	1,138,000	November.....	2,643,200
June.....	2,351,000	December.....	2,750,000
Total.....	.....		8,623 1/4 net tons.

	Tons.
1878.....	22,537
1879.....	26,215
1880.....	12,252
1881.....	7,000
1882.....	8,623

George Tod, President, Youngstown, Ohio. Tod Kincaid, Agent, Corunna, Michigan.

## JACKSON COAL MINES.

The coal mines about Jackson constitute an important part of the business interests of that city, and with the exception of the Corunna mines, a very little which is done at Grand Ledge, at Flushing, and at Williamston, comprises all the coal mining done in the State. These mines were described in the last report, and although I have again visited them, I do not deem it worth while to undertake a new description, and will merely give such statistics as I have obtained that are of any particular public interest.

## THE MICHIGAN COAL COMPANY.

Office in Jackson, Mich. Z. C. Allard, Treasurer, Thomas A. Willard, Secretary, J. C. Eldred, Agent, Donald McGorry, President, Cleveland, Ohio.

The company employs 105 men altogether, 85 of whom are miners. The miners work on contract, and receive 33 cents per car load equal to \$1 per ton, an increase above the price paid. The men furnish their own tools and lights, and push the cars to the main track. It is claimed that there is some improvement in the width of the vein, giving it an average thickness of 4 feet. The prices at which the coal sells are for slack coal \$1.25 per ton, unscreened \$2, other varieties at the shaft \$2.50 to \$4.25 per ton, retail. The product for the year 1882 was 25,000 net tons. The shaft is vertical, 80 feet deep. The location is on the north side of the Michigan Central railroad, about four miles east from the city. The company hold the mineral right to 500 acres, and the fee simple of a small parcel of land in which the shaft is sunk.

In 1880 the company mined 20,021 tons, in 1881 23,987 tons, and in 1882 25,000 tons, total 70,008 tons.

## THE SLOPE MINE.

Owned and worked by the Jackson Coal Company, is the largest producing coal mine in the State; its product for the year 1882 was 60,103 net tons. One hundred and fifty men are employed in and about the mine. The shaft is 300 feet long and reaches to a point 100 feet below the surface. The average thickness of the coal seam is 31/2 feet.

R. H. Emerson & Co., Agents, C. H. Bennet, Treasurer, Jackson, Mich.

## EUREKA COAL COMPANY.

M. S. Hitchcock, Treasurer, Jackson, Mich.

This mine is about one mile northwest from the Slope mine. It is opened by a vertical shaft 53 feet deep, and the company holds the mineral right to one hundred and five acres of land. The coal seam in which the company is mining is about 31/2 feet thick, and the underground workings extend over an area of 30 acres. The product has been, 1880 30,000 tons, 1881 37,477 tons (net), 1882 , total . The royalty paid is 15 cents per ton screened coal.

## THE PORTER COAL COMPANY.

This company is now operating the old Woodville mine, which was unwatered a little over a year ago, and mining work in it resumed, resulting in a product for the year 1882 of 8,158 net tons. Office, Jackson, Mich. Benj. Porter, Secretary, Isaac Hurd, Treasurer and General Manager.

## THE SOUTH MINE

Is the name given to an exploration which has recently been made, resulting so favorably that the organization of a company to work the shaft is contemplated. They sunk 34 feet, cutting a 4-foot vein of coal, in which they drifted 250 feet. The roof is black slate, apparently firm and sufficient for a support. W. A. Hammond, Secretary, Jackson, Mich.

## WILLIAMSTON COAL COMPANY.

Coal has been mined in a limited way at Williamston for many years. R. H. Emerson & Co. unwatered an old shaft at that place a year ago, and have kept a force of about 20 men at work there during the year, resulting in raising 10,454 net tons of coal. The vein averages about 3 feet thick, but the water is so troublesome, with the unfavorable circumstances, the company talks of shutting down. C. H. Bennet, Treasurer, Jackson, Mich.

## GRAND LEDGE.

Two or three miners have worked getting out coal at this point for consumption. A small amount of coal has been mined here off and years, but no extended work has ever been undertaken.

TABLE Showing the Amount of Coal Produced in Michigan for 1877-78-79-80-81-82, Total for Previous Years Partly Estimated.

	Yr's previous to 1877.	1877.	1878.	1879.	1880.	1881.	1882.
Williamston Coal Co. ....	.....	.....	.....	.....	.....	.....	10,454
Jackson mines. ....	.....	67,697	61,785	65,000	.....	.....	.....
Corunna mines. ....	.....	.....	22,537	16,215	.....	.....	.....
Other mines. ....	.....	1,500	1,000	800	.....	.....	.....
Slope Mine (Jackson Coal Co.)	.....	.....	.....	.....	66,780	61,666	60,103
Eureka Mine (Jackson). ....	.....	.....	.....	.....	30,000	37,477	.....
Michigan Coal Co. (Jackson). ....	.....	.....	.....	.....	20,021	23,987	25,000
Corunna Coal Co. (Corunna) . .	.....	.....	.....	.....	12,252	7,000	8,624
Other localities. ....	.....	.....	.....	.....	1,000	2,000	.....
Porter Coal Co. (Jackson)....	.....	.....	.....	.....	.....	.....	6,158
Total net tons. ....	350,000	69,197	77,715	82,015	130,053	132,130	.....

## SALT.

It is well known that Michigan has become a large salt producer, and from the excellent report of the late salt inspector I am mainly indebted for the following facts regarding the business:

The first practical attempt at salt well boring was made in Grand Rapids in 1859; the depth attained was 276 feet; an analysis of the brine seems to have shown but a small percentage of salt. The first well at East Saginaw was made in 1860, and an analysis of the brine gave 19 parts to the hundred of salt.

Experience has shown that the best quality of salt can be made from Michigan brines, and that the great preponderance of the salt sold in the market has been found as pure and as efficient an antiseptic as any mined or manufactured elsewhere, within this or in foreign countries. To preserve the reputation of our salt and to protect honest manufacturers the legislature, by

statute, established the office of State Salt Inspector, and provided for a

## SYSTEM OF INSPECTION.

The irregularities that crept into the manufacture of salt, deteriorating its quality and value, soon made it evident that some system of inspection would have to be adopted to protect the careful manufacturer against the ignorance and carelessness of others.

As early as the year 1865 a system of local inspection was adopted by a number of salt manufacturers which had a tendency to improve a portion of the salt product. The inspection, however, not being a general one, and there being no State law by which offenders could be punished, the effectiveness of the inspection was greatly diminished, and it soon became evident that some more stringent system, backed by a State law, would be the only way to secure uniformity of manufacture.

To meet this point a committee of the then existing Saginaw and Bay Salt Association was appointed in 1868 to draft a law meeting the wants of the salt manufacturers. The law as perfected by the Association was presented at the next session of the State Legislature and passed by them—approved March 6th, 1869, and amended by an act approved April 16th, 1875. Dr. Samuel S. Garrigues received, at the hand of Gov. H. P. Baldwin, the appointment of State Salt Inspector on the 17th of March, 1869, was re-appointed by Gov. Bagley in 1875, and has just completed his second term of office, having filled for twelve years with much wisdom and fidelity a position which has enabled him greatly to advance improved methods of manufacture and to place Michigan salt on a firm footing in the market. Dr. Garrigues will in the future act as chemist to the Salt Association, and Geo. W. Hill has been recently appointed by Gov. D. H. Jerome to act as State Salt Inspector.

### AN ACT TO REGULATE THE MANUFACTURE AND PROVIDE FOR THE INSPECTION OF SALT.

SECTION 1. *The People of the State of Michigan enact,* That no salt manufactured in this State after this act takes effect shall be sold within the State, nor exported therefrom, until the same shall first be duly inspected, as provided in this act. Any person who shall violate the provisions of this section 1 shall pay for the use of the people of this State, as a fine, the sum of twenty cents for each bushel of salt sold or exported, contrary to the provisions of this act. In case any manufacturer of salt shall knowingly sell, or export, or permit to be sold or exported, salt, contrary to the provisions of this act, he shall, on conviction thereof, be liable to a fine not exceeding one thousand dollars, or imprisonment in the county jail not exceeding ninety days: *Provided,* That nothing in this act shall apply to any salt packed and in the hands of dealers when this act takes effect.

This section is followed by 42 others, covering the whole business of the manufacture and sale of salt and the duties of the inspector.

Michigan is now the largest salt producing region in the United States, its only competitor to any extent is Onondaga, which latter it largely leads in production.

There are 260 salt wells in the State, 226 of which are in the counties of Saginaw and Bay, the remainder, 34, are in Huron, Iosco, Manistee, Midland, Gratiot, St. Clair, and Jackson counties. The average depth of the wells in the Saginaw valley is 950 feet, in Manistee to 1,900 feet. The average Salometer strength is 90° at 56° Fahrenheit.

The following table shows the amount of the various grades of salt inspected in Michigan since 1869, the first year of the establishment of the State Salt Inspection:

Years.	GRADES OF SALT IN BARRELS.				Total for each year in Barrels.
	Fine.	Packers.	Solar.	Second quality.	
1869	513,989	12,918	15,264	19,117	560,818
1870	568,326	17,869	15,507	19,650	621,350
1871	655,923	14,677	37,645	19,930	728,175
1872	672,034	11,110	21,461	19,876	724,481
1873	746,702	23,671	32,267	20,706	823,346
1874	960,757	20,090	29,391	16,741	1,028,979
1875	1,027,886	10,233	24,336	19,410	1,081,865
1876	1,402,410	14,233	24,418	21,668	1,462,729
1877	1,590,841	20,389	22,949	26,818	1,960,997
1878	1,770,361	19,367	33,541	32,615	1,855,884
1879	1,997,350	15,441	18,020	27,029	2,058,040
1880	2,598,037	16,691	22,237	48,623	2,676,588
1881	2,673,910	13,885	9,683	52,821	2,750,299
1882	2,928,652	17,208	31,335	60,222	3,037,417

Previously to 1869 the salt production of the State was as follows:

Years.	No. of Bbls.	Years.	No of Bbls.
1860	4,000	1865	477,200
1861	125,000	1866	407,077
1862	243,000	1867	474,721
1863	466,356	1868	555,690
1864	529,073		

The average price which Michigan salt sold for per barrel in different years is as follows:

Year.	Price.	Year.	Price.
1866	\$1 80	1875	\$1 10
1867	1 77	1876	1 05
1868	1 85	1877	85
1869	1 58	1878	85
1870	1 32	1879	1 02
1871	1 46	1880	75
1872	1 46	1881	85
1873	1 37	1882	75
1874	1 19		

## GRINDSTONES.

WHERE THEY COME FROM AND WHERE THEY ARE MADE.

Up on the shores of Lake Huron, at the extreme end of the "thumb" of Michigan's lower peninsula, and 90 miles north of Port Huron, is located Grindstone City. It is an enterprising town of 1,500 inhabitants, and takes its name from the fact of its location on the most extensive

grindstone quarries known in America. These strata stretch away in a most limitless extent, containing stone sufficient to supply the world with this important article for centuries. The Lake Huron quarries, as they are called, were first worked in 1838, and have been under the present management since 1840. About 3,000 tons are annually taken out, and yet it is estimated that less than one per cent of the whole amount has been removed. The stone extends from near the surface to a depth of about 16 feet, and lies in nearly horizontal strata which vary from a few inches to two feet in thickness. That nearest the surface is a trifle softer than the rest. The features of this stone are a hard, fine grit, and the absence of all foreign substances, which specially adapt it for cutlery and sharp edge tools. It is quarried by having the strata broken up with bars to the required sizes, no blasting whatever being done. When first taken from the ground the stone is soft and easily broken, but a few days exposure to the sun evaporates the "sap" and fits the stone for use.

Grindstones are made by first chipping the block as nearly as possible to the size of the intended stone, after which it is "hung" and turned to the requisite thickness and diameter. This work is done in mills near the quarries, and from which the stones are sent by water to the company's agencies at Detroit, Chicago, and New York. The company employs about 100 men eight months in the year, work being suspended during cold weather. The company ships its goods to all parts of the United States, to European countries, and to Australia. In 1871 James Wallace, one of the members of the firm, built one of the finest residences to be found in Detroit, at 990 Woodward avenue, entirely of grindstone material.

The only other sandstone quarries in America which produce an article suitable for grindstones are in Nova Scotia and at Berea and Marietta, Ohio. Those at the latter place, also owned by the Lake Huron company, produce a soft inferior stone, in demand only for purposes of dry grinding. The grit is very coarse and the stone soft, and therefore suitable only for heavy work. The fine Lake Huron stones are usually made small, while most of the coarse Ohio stones are cut large. The largest are 12 inches thick, 7 1/2 feet in diameter, and weigh from 4,000 to 4,500 pounds. They are used alone in Detroit by W. C. Bennett & Co., at their knife works on Brush street, near Woodbridge. Bennett & Co. keep four of them in motion in their extensive works, and notwithstanding the immense size of the stones, they are each ground entirely away in from 30 to 40 days. All grindstones are sold outright by the manufacturers, no commission agents being employed, and the price per pound is uniform, whether the stones are large or small.—*From Detroit Daily News.*

## THE IRON MINES.

### MARQUETTE RANGE.

#### CLEVELAND IRON MINING COMPANY.-(APRIL, 1883.)

The early history of this mine, as a part of the discovery and settlement in the iron region, is briefly given in that connection in the historical sketch, at the beginning of this volume. It is one of the most favorably known as well as one of the oldest of the mines in the State. Its affairs have always been consistently and ably managed, and the business of the company has ever been constantly and uniformly successful. The history of the Cleveland mine is not characterized by the ups and downs, to the extent so frequently found in the record of many important mining companies. The company's estate comprising upwards of 2,000 acres of land is in one body, in a compact form; the western portion is covered in part by the city of Ishpeming, and it extends east to the Jackson company's property, or nearly to the city of Negaunee.

The principal mines of the company are within the limits of Ishpeming, and the fine new stone buildings recently erected by the company and the great activity prevailing about the location are among the attractive features of the busy little city. In the past year the company has made some important improvements, which being upon the surface are very noticeable. These are new machine and carpenter shops, built of stone with iron roof, and located on the north margin of the street leading in the direction of Negaunee, the enlargement of the main engine house situated opposite the former, the grading down of the road that runs by it, the enlargement of the office, the removal of several old buildings and superfluous ore docks, and many other minor changes that have added materially to the attractiveness of the location and hence to this portion of the city. The front of the new machine shop, along the street, is 147 feet in length, east and west, by 44 feet in depth, north and south, and the wing of the same length, which extends from the center of the main part north is 62 feet in length by 44 feet wide. It is very substantial and when fully completed and provided with the machinery that will be placed in it, it will be adequate to all future needs of the mine. The machinery will be run by a Westinhouse engine which has already been erected within the building. In the easterly extension of the main engine house, which is also of stone with iron roof, built in the most durable manner, and in entire architectural conformity with the rest of the building, have been placed the new hoisting machinery, for the holding of which the enlargement was made. This comprises four Lane winding drums, each eight feet in diameter, and a second double compressor to duplicate the one already in use in the same building.

There are now upon the location three of these stone buildings, the two already mentioned and the pumping

engine house, built the previous year. The result is not only an agreeable one to the eye, but the business of the mine will be concentrated and cheapened thereby.

For several years past the Cleveland company have conducted systematic and extended explorations with the diamond drill, and the result has been, in the aggregate, a very valuable one; it has developed the existence of bodies of ore yet untouched, of sufficient magnitude to be a surety for a long future of prosperity.

One of these bodies of ore, which was discovered by the diamond drill, has just been reached by two vertical shafts, known as "K" and "J" shafts, situated at some distance from the old mine, and on the south side of the main line of the Marquette, Houghton and Ontonagon Railroad. The latter of these is now 260 feet in depth, of sufficient size for a double cage. The diamond drill passed through 52 feet of ore in this shaft, but in what direction the deposit may lay remains to be determined. From the bottom, a drift 12 feet in length to the north came to the rock, and a boring from the end of it in the same direction 90 feet, was all the distance in dioritic schist, but to the south they have a hundred feet of ore. "K" shaft is vertical 80 feet in depth, to the ore, and thence the working follows the ore, inclining downwards towards the bottom of "J" shaft. The connection of the two is sought for the purpose of ventilation, and will be accomplished in about six or eight months further. In the meantime these shafts are furnishing a daily product, at the present time, of 60 tons of ore.

In No. 3 pit next to the New York line—the north part of the mine—the stopes are reduced to one; the line cuts off the mine on the north, and to the west the hanging wall has come down and cut off the ore in that direction; but this, while a matter of temporary inconvenience, is no cause for alarm, since it is known from the borings that have been made that the body of ore again recurs beyond this wall of rock, to the west. The necessity is made of pushing through it in the direction of what is known as "B" shaft, where 60 feet of ore was passed through by the diamond drill. Also the workings of the New York mine along this line, further to the west, show that ore there extends into the Cleveland property; they have mined to it along the line on the New York side.

This ore will perhaps be reached from the further extension of No. 2 pit, which adjoins No. 3 on the south and opens into it, but does not reach so far west. No. 2 skip has for the past year been pushing downward and westerly through rock, and will soon be in ore, as is known by a boring which has been made from the end of the pit. So that the future of this part of the mine is well assured. While under a temporary cloud it is certain to be again as productive as ever, and probably so even in a greater degree than at any period heretofore.

As formerly, the well known Incline pit, still continues to be the main productive part of the mine. By far the largest portion of the product comes from this pit, and there is no indication of an abatement in its yield; the stopes are large and in sufficient number, and the

sinking, which is in progress for further openings, is equally promising. The daily product of this pit is now 400 tons. It has been extended west during the past year in the north part of the pit 200 feet, and the south part 140 feet, measured horizontally,—the average westerly dip being, perhaps, 17° from the horizontal. The west end of the pit is 190 feet below datum. In this portion, embraced in the past year's work, four large ore pillars have been left to support the roof. A large ore pocket has recently been built in this pit in the line of No. 4 double skip road, to which the ore is trammed from the upper stopes. The skips are filled from the shutes in this pocket. The extension of No. 3 pit west during the year past has been 150 feet.

A few men are working in the Sawmill pit, and the product is about 1,500 tons per month. Diamond drill borings made from this pit showed large bodies of ore in advance of the openings, which it has not yet been sought to reach.

The Hematite mine, situated a mile to the north, is looking extremely well. It is now worked entirely underground from two shafts. No. 4, the easterly one, is 237 feet deep, and No. 3, which is 375 feet to the southwest from it, is 201 feet deep. Both are vertical, and are worked with bucket and derrick. The shafts are connected by the open chambers and long drifts. Both are designedly sunk in rock a short distance from the ore. They are working only in No. 4 just at this writing, No. 3 being stopped by a temporary influx of water, which must first be got rid of before work can be resumed. From No. 4 they are hoisting 100 tons per day. In the level in which they are now working they have drifted west 120 feet, and are in a body of ore 30 feet wide, and are sinking to prove the depth of it. The sinking has progressed to a depth of 30 feet, and will continue. The ore lense at No. 4 runs east and west; at No. 3 it runs north and south, and was in the level 40 feet above the bottom 156 feet long. In the bottom level they had drifted 80 feet when the water broke in; it is 20 to 30 feet wide. The drifts are timbered, but the ore deposits being under the open pits are allowed to fill with dirt as fast as worked out,—the ore is worked out and the dirt drops down from above.

A new engine house has been built, situated 150 feet south of No. 4 shaft, and a new plant of hoisting machinery will be placed in it. The mine yielded in 1882, 24,000 tons of ore, and the estimated product for 1883 is 30,000 tons, 8,000 tons of which are now in stock. This mine is in what is known as the Teal Lake range, being in the line of the Cambria, Bessemer, Detroit, etc.,—all lying west from Teal Lake.

The product of the Cleveland is as follows:

Years.	Tons.	Years.	Tons.
1854.....	3,000	1869.....	106,133
1855.....	1,444	1870.....	132,884
1856.....	6,343	1871.....	142,658
1857.....	13,201	1872.....	151,724
1858.....	7,909	1873.....	133,265
1859.....	15,787	1874.....	105,855
1860.....	40,091	1875.....	129,881
1861.....	11,795	1876.....	145,661
1862.....	40,364	1877.....	151,554
1863.....	46,842	1878.....	143,320
1864.....	44,954	1879.....	113,108
1865.....	33,355	1880.....	187,234
1866.....	42,680	1881.....	197,843
1867.....	75,864	1882.....	204,341
1868.....	102,112		
Total gross tons.....			2,531,308

The present force employed is 400 men.

The officers are S. G. Mather, President, Cleveland, Ohio; Jay C. Agent, Cleveland, Ohio; D. H. Bacon, Superintendent, Ishpeming, Mich.

#### LAKE SUPERIOR MINING COMPANY.—(APRIL 24.)

The Lake Superior iron mine makes the largest out-put of ore of any mine in the State, and the quality is of the best. The ore sells readily in the market and at the highest price, and is suitable for making all the kinds of iron for which Lake Superior ores are adapted. The mine was never in so good condition as now, never in shape to afford so great an amount of ore as could be mined if the demand were such as to justify the mining of it. The annual out-put of nearly 300,000 tons has, apparently, made little advance toward exhausting the mine; there is a world of ore in sight, and the exploration made with the diamond drill have shown that beneath the present bottom of the mine the ore still continues to a depth that will suffice for many years to come.

A detailed description of the underground workings of the Lake Superior mine was given in the report for 1881, and as that includes also the methods of mining and all essential facts that would be of general interest, a similar description will not be attempted at this time. It suffices that the enormous shipment tells its own story,—it is a wonderful deposit. There is a world of ore in sight, and every year of future working is sure to reveal an equal show of treasure.

The quality of the ore is shown by some recent analyses that were made by Mr. C. E. Wright of samples of the present stock pile. The samples were taken by the officers of the company from every part of the stock piles, and were intended to represent the average. The results of the analysis gave an average of exactly 68% in metallic iron, and the amount of this ore now in stock is 150,000 tons, which including 15,000 tons of hematite, makes the total of ore on hand ready to ship 165,000 tons.

Owing to the fact that no contracts have been made for sale of ore, and the generally unfavorable out-look in the iron market, the Lake Superior company, in common with all others, has greatly reduced its working force; thirty-three per cent of the number of men have been

discharged, leaving the total number of employes at the present time five hundred. No effort is making to get out a large amount of ore. In fact more of the men would be discharged and the work still further circumscribed if it could be done with economy and safety. With too small a force the relative cost of the ore would be increased, and later in the season when the shipping season really arrives a considerable force will necessarily be required, which it then might be difficult to secure.

The product now, as heretofore, comes mainly from pits No. 2 and No. 3, in which they are now stoping in the 440-foot level, and are sinking to the 480-foot level. The levels are 40 feet apart, and 20 to 25 feet of the ground taken out, the rest being left for a floor. About forty per cent of the ore is thus left in the mine for perfect security. When the end is reached, and there is to be no further extension of the pit, these floors will be also removed. Mr. Hall's plan for accomplishing this is to fill the mine from the bottom, sending down rock and dirt from the surface, and thus rising up and removing in succession, towards the top, the pillars and floors. In No. 2 pit, on the south side against the south foot-wall, they made a vertical boring, which was 180 feet in ore. This shows the vertical dip of the foot-wall and the continuance of the ore.

At 180 feet the foot-wall was struck, but the ore undoubtedly continues to follow. These pits are connected with No. 6, further to the southwest, in the 180-foot and in the 280-foot levels. No. 6 and No. 7 pits are gradually driving towards each other. The latter is the most westerly pit, and there is still 350 feet of solid ground between the extremity of its easterly drift and the westerly drift from No. 6. These drifts are undoubtedly in the same deposit of ore, as they tend exactly towards one another.

In No. 6 they are stoping in the 5th level, and have sunk to and are opening out in the 6th level. The pit has a length of about 400 feet, somewhat increasing as greater depth is attained.

The Hematite mine is looking extremely well, and is in excellent condition for systematic working. A product of 50,000 tons could be raised from this mine the present season if the ore market were such as to demand it. The quality of the ore is the best. A recent analysis made by Mr. Wright of an average of samples collected by the company from all parts of the lower level of the mine gave as a result 64% in metallic iron. They have recently struck in the bottom a deposit of soft blue ore, that is now using at the Deer Lake furnace with excellent result. The mine is down to the 340-foot level, and in this they are now drifting, and all the indications in the bottom are as favorable for a continuance of the ore in all its magnitude as were afforded in any of the levels above. The ore thus far taken from the two lower levels has been wholly derived from the drifts. The great body remains intact ready for stoping. It is certainly an extraordinary deposit; one of the largest bodies of first class hematite ore that is known in the whole iron region.

The mine is wholly underground, and great care is taken to render it safe. Capt. Hall states that in the past nine years only one man has lost his life in this mine.

The machinery has been for some time esteemed inadequate, and a new hoisting plant is now placing in the main engine house for operating the shaft in this mine. This additional hoisting machinery will comprise 4 Lane drums each 8 feet diameter. The hoisting machinery at the Lake Superior mine is excelled by none in the iron region. The four new Lane drums that were put up when the engine house was completed upwards of one year ago are each 12 feet diameter. Twenty-four air drills are used at the present time in the mine. "A" shaft, the most easterly one in the mine, is simply sinking, no ore is at present mining in this pit. The shaft is extending to reach the body of ore that was discovered by the diamond drill, 200 feet below the surface. The boring was made in the "base ball ground" near the Catholic church, and 50 feet of first-class specular ore was found. The inclination of the skip to reach it is at an angle of 31°-56° with the horizon, inclining to the north. The distance which the shaft must yet be extended to reach the ore is 200 feet, that is if to the drill hole, though it is probable that the ore will sooner be cut. This body of ore that it is sought to reach is probably first-class. That which the pit has thus far afforded, while high enough in metallic iron, is also too high in phosphorus for bessemer steel, and it is for this reason that no ore is now mining in the pit. In reducing the mining force "A" shaft was of the part of the mine that the men were first withdrawn from.

The number of surface men employed is 106, the rest are underground laborers. The company keep a "boss" in every pit, and the mining work is done partly on company account and partly on contract; but whatever the arrangement the work is all done under direction of a company boss. Mr. Hall states that one-half the total expense is chargeable to surface account, and this is true for each year; the underground mining cost and the surface expenditure have been found to equal each other.

The Lowthian, which is the only outlying mine worked by the Lake Superior company, is also in excellent shape; its product in 1882 was 35,000 tons, and there will be no difficulty in duplicating it in the present year if the company so desire; but at this mine also the working force has been reduced, so that at present only 60 men are employed. The Lake Superior mine is situated in the south part of the city of Ishpeming, and joins both the Cleveland and the Barnum. The Lowthian mine is about three miles to the south. The capital stock of the company is now 60,000 shares of a par value of \$25.

The local officers are C. H. Hall, Agent, Ishpeming; W. H. Johnston, Superintendent; John McEncore, Mining Captain.

Product of the mine for each year is as follows:

Years.	Tons.	Years.	Tons.
1858.....	4,658	1871.....	158,074
1859.....	24,668	1872.....	145,070
1860.....	33,015	1873.....	158,428
1861.....	25,145	1874.....	104,311
1862.....	37,704	1875.....	119,365
1863.....	78,976	1876.....	110,570
1864.....	86,773	1877.....	127,349
1865.....	50,201	1878.....	104,674
1866.....	68,002	1879.....	174,747
1867.....	114,935	1880.....	204,094
1868.....	105,745	1881.....	262,235
1869.....	125,560	1882.....	296,504
1870.....	166,582		
Total gross tons.....			2,937,418

#### THE JACKSON IRON COMPANY.

No mine in Marquette county has done more to establish the reputation of the district than the Jackson; its ores have always been a standard in quality. To know that it was Jackson ore, or as good as the Jackson ore, has ever been a sufficient recommendation; and while it is not the largest producer, its product remains very uniform in quantity and quality.

In going through the mine one finds very little change either for the better or the worse; the average outlook is about the same as has been observable for years past. New openings or new discoveries are annually made to supply those which are partially depleted or exhausted. It would be impossible to render a description that should convey to the reader an accurate idea of the mine without he himself having seen it, and having made himself somewhat familiar with it. The formation is so broken up, contorted, and twisted that an attempt to describe it fully would be likely to appear as confused as the mine would seem to a novice who should visit it for the first time.

The Jackson mine is a geological enigma; it is full of surprises. They expect to find ore because they always have found it, but there are very few positive indications to direct them in the search. The circumstances under which the ore sometimes occurs are greatly at variance with the assumed conditions.

If a person, examining the mine were to construct some, seemingly to himself, very satisfactory theories regarding the formation, and should find after a few years that subsequent developments had completely shattered his hypothesis, he could readily console himself with the reflection that he had fared in this matter precisely as others had done many times before him. Still Capt. Merry's conjectures are usually correct, at least his attempts to find ore generally result favorably, and thus occasion no great amount of dead work in the way of worthless exploration.

No 6. is still the main pit in the mine, from it comes the greater portion of the hard ore. It has reached a depth of 300 feet from the level of the railroad track, vertically down, and in the bottom has a length of stoping ground of 275 feet, and an average width of 16 feet. The general dip is to the south at an angle of about 56°.

No. 5 is divided by a wall of jasper, the north part is worked out, but south No. 5 is looking well. They have here a vein of ore 80 feet long and 25 feet wide; it extends in the direction of No. 2, and is probably connected with the deposit mined in that pit. They are sinking in No. 2 with the hope of finding the ore again, underlying the bottom, which seems to be extending there from No. 5. The product of these pits is the best quality of hard specular ore.

To the north, west of the main track of the M., H. & O. railroad, between it and the Northwestern road, has been opened what is called the Merry pit. The direction is northeast and southwest, and the dip is to the northwest with a quartzite hanging wall, the latter an unusual occurrence in this mine. It is fine hard ore, the deposit having a width of 30 feet at 60 feet below the surface, in the widest place, but narrowing at the northeast. At a distance of several hundred feet to the northwest, in the direction of the dip, a diamond drill boring was made, which at 200 feet vertical depth passed through 12 feet of the same ore now mined in the Merry pit. It is the intention to bore a second hole further to the southwest. This new "find" seems likely to prove an important adjunct to the mine.

In No. 7, the east pit of the old mine, they have gone down 200 feet below the railroad track, and are at the bottom of the ore, but Capt. Merry thinks, that they have by no means worked it all out yet. The further sinking develops only a mixed ore, and looks similar to that found in the Pendill mine further east. For the present at least, they will not sink from the bottom. There are several levels opened, in each of which is ample stoping ground. The bottom level extends 150 feet southwest from the shaft, and the west drifts find the same ore that is contained above. They are driving south in a narrow vein of fine unmixed ore, which analyses 68% in metallic iron. The drift is in 400 feet, with this ore the whole distance, but only a few feet wide. Wherever it has seemed to widen out or afford any indications of leading laterally into pockets, it has been followed, but no success of this sort has been met with. They are now rising in the drift, hoping to find a pocket nearer the surface, and in any event if much further work is done in this direction they will rise and sink for an air shaft. The matter of getting a sufficiency of air into the drift is a question that must be settled in the affirmative without much further delay. Several methods are suggested but none has been decided upon. This pit yielded last year 14,000 tons, and they have here now in stock 6,000 tons. Quite a "cave in" occurred in this pit on the south side, underground, under the M., H. & O. railroad. It was filled up with dirt and rock from the surface.

In the South Jackson, in the south east corner of section 1, not much is now doing, they are only working a small force in each of the two largest pits, the S west and middle pits. The ore in these requires picking over carefully as there it is some rock mixed with it; near by was a narrow, shallow vein of ore recently worked out; the ore gives on analysis, 20% of manganese. The

ground is full of pockets that have been worked out, everywhere. They have at the South Jackson 7,000 tons of ore in stock, it is of course of the best quality.

The large rectangular pit in the corner that is divided with the Iron Cliff, is nearly exhausted. The body of ore which had a width of more than 50 feet for a length of 50 feet, has narrowed at both ends abruptly, to but a few feet in width. Further west, near the line of the McCumber, a shaft has been sunk inclining downward to the south, and it is in a nice body of ore from which a small stock pile has been made. The South Jackson does not strike one as affording at the present time as good an outlook as it has sometimes heretofore but if the market were active and the demand for ore such as to require it the output this season from the mine would be as great as ever, and the work would probably uncover other deposits, so that the future is likely to take care of itself.

The total amount of ore in stock at the Jackson mine is now about 27,000 tons. The total force employed is 200 men.

Product of the Jackson mine for each year has been as follows:

Years.	Tons.	Years.	Tons.
Previous to 1854.....	25,000	1869.....	125,908
1856.....	417	1870.....	127,642
1857.....	12,443	1871.....	132,297
1858.....	10,304	1872.....	114,910
1859.....	28,377	1873.....	130,131
1860.....	41,295	1874.....	94,708
1861.....	12,919	1875.....	87,283
1862.....	46,096	1876.....	98,480
1863.....	77,237	1877.....	80,340
1864.....	83,905	1878.....	83,121
1865.....	65,505	1879.....	112,921
1866.....	92,287	1880.....	120,622
1867.....	127,491	1881.....	118,939
1868.....	130,534	1882.....	93,670
Total.....			2,279,806

General Manager, Capt. Henry Merry, Negaunee, Mich.

#### BARNUM MINE.—(APRIL 25.)

Great things have been expected of the Barnum since the work of opening the new mine began. The ground had been well explored, as fully explained in previous reports, with the diamond drill, and the existence of a body of fine specular ore underlying a great extent of surface had been determined. It was well known that the old mine next to the Lake Superior was worked down to the line and nearly exhausted, so that all interest has centered in the new mine, with entire faith that when opened it would greatly eclipse all that had been accomplished in the old mine in years gone by. One shaft has been opened, and the work that has thus far been done in the ore in this shaft verifies all that had been conjectured. The westerly shaft—designated by the letter "B" as the easterly one is by "A"—where so much difficulty has been met with in the work of sinking, has finally been mastered; that is they are down to the ledge, and well into it, through the 80 feet of intervening quick sand, that for a time seemed an almost insuperable barrier to further progress; but now that this

great obstacle is overcome no other extraordinary difficulty is anticipated, and the work is expected to go steadily forward to its final consummation, which is to reach the ore at a depth of about 450 feet from the surface. One hundred and four and a half feet of this distance have now been sunk, and as soon as some preliminary work is completed to dispose of the water, it is estimated that the further sinking will progress at the rate of one foot per day. The cause of the trouble heretofore experienced will be understood when it is stated that the amount of water now constantly pumped from this shaft is between 800 and 900 gallons per minute. One can easily comprehend that so great an influx of water, holding in suspension the sand, would be no trifling matter to sink through. The shaft is timbered down from the surface, and is 24 feet into the ledge. The water pouring down from the surface of the ledge renders it nearly impossible to work; the men, though protected by a canvass roof and clothed with oilcloth, become wet to the skin. To obviate this trouble a drift will be made from the bottom for a sump, and the water will be run down outside of the timbering to the bottom, where it will be caught in conveyors and conducted into the sump, from which it will be pumped to the surface. Thus far it has not been found possible to stop the pumps for a moment, even to blast. An experiment of this kind, when the pumps ceased working for a space of 25 minutes, resulted in raising the water in the shaft to a depth of 17 feet. They work two air drills in the shaft and twenty-one men. By the time it is sunk it will be connected with "A" shaft at the bottom by a drift which is extending west from "A" shaft, the latter being 750 feet east from "B."

In "A" shaft they are mining now an average of 200 tons of ore per day; the shaft is 495 feet in depth—vertical—is double, although as yet only one cage is used. In the bottom they have opened west 300 feet, with a tunnel 20 feet wide and of an equal height, and to the east the drift extends 150 feet. At points 50 feet each way from the shaft, east and west, lateral drifts have been started north and south; to the north rising on the foot-wall at an angle of 45°, and to the south sinking in the ore at a like angle. The shaft does not reach the lowest horizon of the ore, though further to the south the ore is known to rise again, since a drill hole, sunk at a point 300 feet further in this direction from the surface, struck the ore at 100 feet nearer the surface than it is at the shaft, so that somewhere between this point and the shaft the ore changes the direction of its dip.

They will leave a continuous pillar of ore 20 feet wide on each side of the main drift for safety. The only avenues of egress from the mine will be these two shafts, and in case of accident it is intended that whatever befalls, the main tunnel, which will be easily accessible from all parts of the mine, shall be always safe and free from any possible accident. The lateral drifts, above mentioned, west of the shaft, have been extended 80 feet, and those east of it a distance of 60 feet from the main drift; the stopes are at the ends of these drifts.

In going east from the shaft they encountered at a distance of 92 feet a wall of soap rock, along which they drifted north a hundred feet and then turned east again, going 30 feet. From the end of this latter drift a diamond drill hole was bored to the south, which passed through 70 feet of fine ore. The main drift was then continued, and the intervening rock speedily cut through, the drift thenceforward continuing in good ore.

A force of 76 men is employed in "A" shaft, and 12 air drills. The width of the ore averages 20 to 25 feet, and is all first-class. The shaft house is as near fire-proof as they could conveniently make it, being covered with iron roofing material, and is otherwise made as safe as may be against any possible accident. They have a Sturtevant exhaust fan 12 feet diameter in the mine to assist in creating a draft after blasting, and also to insure sufficient air for the workmen in hot weather; it is run by a Corliss engine 14 inches by 43 inches. The mine is a wet one, and seems likely to continue to be so; the water is constantly dripping everywhere from the hanging wall.

The new stone engine house is very conveniently placed between the two shafts, and almost on a level with Lake Bancroft, from which the water is pumped to supply the boilers. The two condensing engines will hardly suffice for the mine when "B" shaft is completed, and it becomes necessary to work two cages in each shaft. There are two duplex compressors, each 10 inches by 30 inches. The shaft to the pumping engine is 18 inches, diameter 14 feet in length.

They are laying pipe to convey the compressed air to the old mine, 1,150 feet to the south. The old mine is now yielding an average of 100 tons per day, and has an apparent lease of life for two or three years to come. In the west shaft they have yet 80 feet in which they can sink for ore. At this mine are 6,000 tons in stock, and at "A" shaft there are 20,000 tons, all first-class ore, and evidently picked over with great care. The total force employed is 250 men.

The Barnum belongs to the Iron Cliff company, and the officers are Wm. H. Barnum, Lime Rock, Conn., President of Iron Cliff company; A. W. Maitland, of Negaunee, Mich., General Manager for the Iron Cliff company; Wm. Sedgwick, Superintendent of the Barnum mine.

The following table shows the product of the Barnum mine for each of the preceding years that it has been worked:

Years.	Tons.	Years.	Tons.
1868.....	14,386	1876.....	37,750
1869.....	37,503	1877.....	38,314
1870.....	44,793	1878.....	26,680
1871.....	45,939	1879.....	24,911
1872.....	38,381	1880.....	24,921
1873.....	44,388	1881.....	27,281
1874.....	40,255	1882.....	41,424
1875.....	40,914		
Total gross tons.....			527,865

A mile northwest they have opened a hematite deposit the past year, from which were taken a few thousand tons of ore of first quality. They are still working in the

pit, but just now it looks as if the deposit were limited in extent.

THE NEW YORK MINE.—(APRIL 26.)

This mine has been very fully described in previous reports, and the peculiarities of the formation somewhat minutely indicated. To enter again into their discussion would necessitate a somewhat superfluous repetition of what has before been written. The mine is in the same ore deposit as No. 3 pit of the Cleveland mine, and is worked along the north side of the Cleveland line. The ore deposit on the New York was embraced in a fold inclining to the south and to the west and in more recent years the mine was preserved from immediate exhaustion by the fact that at greater depth the ore deposit assumes a steeper downward inclination. Were it not for this fact the mine would have been worked out some years ago. But in addition to the difficulties heretofore contended with, the doom, which has impended over the future of the mine, seems now to be greatly accelerated by a further serious fact, which, if continued, will prove fatal to the already limited prospects of the mine.

Latterly a large percentage of the ore contains pyrites to so great an amount as to render it valueless. All the ore, so far as it is reached, east of No. 3 shaft is for this cause worthless; so that they are at present reduced to a single run of ore 80 feet long and 25 feet wide, lying west of No. 3 and between No. 2 and No. 4. These—No. 2 and No. 3—are the only skip roads now worked in the mine. Nos. 5 and 6, which extend towards the southwest corner of the property, have been worked out and abandoned. They have 13,000 tons of ore in stock, and may increase it 10,000 more during the season; but unless other discoveries are made the future working at this mine will be confined to mining out the limited body of ore still remaining against the Cleveland line. The appearance of the sulphur in the ore, to the extent which it now occurs, is a new feature, and another peculiar fact is that before reaching the line the sulphur entirely disappears from the ore, so that the bar of standing ground that is left along the line is good ore, free from this destructive impurity.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1864.....	8,000	1874.....	77,017
1865.....	12,214	1875.....	70,103
1866.....	33,761	1876.....	58,863
1867.....	43,302	1877.....	55,581
1868.....	45,655	1878.....	21,903
1869.....	71,456	1879.....	57,367
1870.....	94,809	1880.....	58,522
1871.....	76,381	1881.....	49,342
1872.....	68,950	1882.....	56,970
1873.....	70,882		
Total product gross tons.....		1,031,078	

The mine is in the northeast part of the city of Ishpeming and the property comprises 40 acres of land owned by Mr. A. R. Harlow, of Marquette.

The officers are as heretofore, Samuel J. Tilden, President; J. H. McCloskey, Agent; August Beering, Mining Captain; J. C. Cutter, Cashier.

THE CAMBRIA MINE.—(APRIL, 1883.)

The Cambria mine is the most easterly of the mines that constitute what is known as the Teal Lake Range. Its location is about a mile northwest from the city of Negaunee, and but a short distance from the margin of Teal Lake.

The ore is mostly a brown umber colored hematite of excellent quality, all of it suitable for the making of bessemer steel, and for this reason the ore has always found a ready sale at the highest market price.

The company have now 18,000 tons of ore in stock, of a quality equal to any that the mine has ever produced, and the body of ore, particularly at the west end of the mine, is as large as has been seen in the mine at this season of the year, at any previous period. The chief part of the mining has been done at the west end, adjoining the Bessemer, and it is here that the greater portion of the ore now in stock is found, 14,000 tons.

The pit next to the west line is worked out, and they are sinking and building a new skip road a short distance to the east in which direction the ore lens is found to pitch. They have opened it sufficiently to prove the large extent of the ore deposit by drifts east and west and across the formation. These are at a depth of 150 feet below the surface, and were reached by sinking in the bottom of the open pit and drifting east. The ore in this part of the mine is run up in skips, which dump into pockets that stand over the railroad track. The east end of the mine is also looking well, but the company is working a reduced force, 65 men, on account of the general dullness in the iron market.

The product of the mine has been as follows:

Years.	Tons.	Years.	Tons.
1876.....	6,329	1880.....	7,232
1877.....	10,082	1881.....	18,837
1878.....	3,754	1882.....	47,545
1879.....	6,860		
Total.....		1,0689	

It will be seen that the product of the mine in 1882 was nearly equal to the aggregate of the previous years' production.

The company have completed their new engine house, and it is supplied with 4 hoisting drums, 4 feet in diameter.

The agent is A. W. Maitland, General Manager of the Iron Cliff Company, Negaunee, Mich.; Gordon Murry, Mining Captain.

THE BESSEMER.—(APRIL, 1883.)

The Bessemer mine, which joins the Cambria on the west, has been idle since the close of navigation until recently, when the work of unwatering and further sinking the shafts in the two west pits was begun. These pits were filled to a considerable depth with dirt caved in

from the sides in February, 1882, and the ore in the bottom was reached by sinking through the overlying debris. When the preparations now in progress are completed, the work of mining ore in these pits will be resumed. The hoisting machinery at the east pit, adjoining the Cambria, is removed to be used at the west pits. The ore next to the Cambria has been mainly worked out. They are now mining out what little remains, and hoisting it with a bucket. The ore is of the best quality and sells at the highest market price for hematite. The mine is owned and operated by C. M. Wheeler, of Marquette, though the fee of the land is in the Teal Lake Iron Company.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1875.....	144	1879.....	21,681
1876.....	6,801	1880.....	18,347
1877.....	10,127	1881.....	16,718
1878.....	8,506	1882.....	28,221
Total.....			110,545

West from the Bessemer is the

#### FOREST CITY

At which no work has been done in the past year. The engine house, however, which was erected and provided with machinery, a short time before the mine shut down in 1881, has been destroyed by fire. Next west from the Forest City is the

#### CLEVELAND HEMATITE,

Which has already been described in connection with the Cleveland Company's other mines, and adjoining this latter is the Detroit, formerly the Norwich Mine, but now the property of the

#### DETROIT IRON MINING COMPANY (APRIL 27TH, 1883,)

By whom it is operated. The location is the northeast quarter of the southeast quarter of section 2, and is situated one mile north from Ishpeming. The transfer of the mine to the present company was made in October last, and the ore which is pronounced excellent for foundry iron has been sold to the Deer Lake Iron Company, and smelted in their furnace. The ore affords by analysis 58% of metallic iron, and in the furnace yields 53.77%. Worked alone it makes a soft No. 1 foundry iron.

Previously to February 1st last, the mine had been worked in an open pit, but at that time the pit caved in from the south side, and when the dirt was sufficiently removed to get at the ore, it was found to have been nearly exhausted. Since then the work has been mostly in the way of underground exploration. A drift has been run from the west end of the pit to the west, heading to the north. In this drift ore was found at 90 feet from the pit and they passed through 60 feet of it, mixed ore and rock. At 120 feet west a shaft was sunk 50 feet deep, 30 feet of which was through ore, through which they have

drifted north 80 feet. The ore is mixed somewhat, but so far that taken from the drift and the shaft has gone to the furnace and given satisfaction. They seem to have a large body of this ore such as it is, and are nearly in readiness to mine it. A new engine house will be built, and the engine which they already have placed in it, together with other suitable hoisting machinery. A few buildings consisting of a large boarding house for the men, office, warehouse, shop, barn, etc., have been erected. Thirty men are employed. It is probable that they have not gone deep enough yet to fully test the mine.

The company own the fee of the land. The officers are John F. Newbury, President; James McMillan, Treasurer; W. K. Andrews, Secretary; Detroit, Mich.

The product of the mine in 1882 was 5,402 gross tons.

#### NEGAUNEE CONCENTRATING COMPANY.—(APRIL, 1883.)

The works of this company, which are built on the Jackson company's property, a short distance north of the mine, have been partially in operation during a portion of the past year, but more or less difficulty has been met with, necessitating changes and additions in the machinery, etc.; so that they are yet not fully completed. One of the troubles, which they have lately was in the rollers; they were made in Chicago, and speedily wore concave that they would not properly crush the rock; the company having built; foundry for doing their own work, have succeeded in making a chilled face their rollers, which shows no signs of wear; the castings are composed of mixture of Lake Superior, Salisbury ores and steel.

Up to this time the average analyses of the ore that they have obtained from the rock give a percentage of iron of 62 30-100%. They think of making two grades, grinding over the refuse and getting a 57% ore from it. They get from the rock so far 33 1/3% of ore. It will be remembered that these works were made to work up the jasper walls and waste piles of the Jackson mine. The buildings and machinery are extensive and of the most substantial character. The present capacity of the mill is estimated at 600 tons of rock per day, making 200 tons of merchantable ore. It is expected that the ore thus prepared will sell somewhat higher than ore of the same quality direct from the mine, the fact of its being crushed being to its advantage. The product certainly looks well.

The rock is drawn up an incline on the west side of the mill to the top where the cars discharge into the rock bins; of these there are five. The inclination of the track is 28°. The capacity of the bins is 1,000 tons. Below each bin is a large Blake crusher, into which the rock is drawn out, thence below it drops into a roller, and again in succession through a second series of smaller crushers and rollers. The latter are 3 feet in diameter, and 18-inch lace. Two 30-inch belts, each 278 feet in length, connect the engines with the mill machinery. The incline track is operated with a small engine and a Lane

drum. The two main engines are respectively 24 inches by 48 inches and 24 inches by 40 inches, cylinders.

It is expected that the mill will soon be in complete working order. Mr. W. A. Allen, the gentlemanly superintendent of the works, expresses entire confidence in the ultimate success of the undertaking. He tells me that these are the most extensive concentrating works in the United States.

## THE NEGAUNEE HEMATITES. MAY 1ST, 1883.

### McCUMBER MINE.

The McCumber, as are all the Negaunee south-side hematites, is idle. It is not from lack of ore, however, for the mine is in condition to produce as great a quantity as it ever did. In point of fact it is evidently in better shape than it has been for some years, but the company continued work until they had 12,000 tons of ore in stock, and then decided to stop mining until it should be determined whether the ore could be sold, at least if it could be disposed of at a price that should pay the cost of mining. The pumps are still at work and the mine kept free of water. Some surface work is in progress, and they are ready to start in again if it shall seem advisable.

The greater part of the mining work is now wholly underground in No. 3 and No. 9 shafts. No. 3 is opened in three levels, the first is 1541/2 feet below the collar of the shaft, the second is 1781/2 feet down, and the third 2061/2 feet, and there is stoping ground in all of them. The first level extends west to the line of the property, widens out in places into large chambers, and is opened to the east 400 feet, besides there are large openings to the south of the shaft, and a drift to the northeast 250 feet long which ends in a pocket of ore. The second level is not quite as extensively opened as the first, and in the third they have drifted in a horseshoe shape, with the toe at the shaft and the ends to the southwest, thus following the hanging wall and have not cross-cutted to the foot, but have ore between these branches. The ore is nearly as good in the bottom as it was in the upper levels; it looks as well but is said not to analyse as well.

No. 9 is a fine vertical shaft well timbered up, 12x12 inside the timbers, and divided into 4 compartments for double skip hoist, the ladder-way and pump-pipes. It will finally be used to drain the whole mine. No. 3 shaft will drain to it as soon as they are connected, as they soon may be, and No. 5 pit which. yet has a large amount of ore in sight will find its outlet both for product and the waste through an underground drift to No. 9 shaft. The shaft is now 180 feet deep, and will be sunk 50 feet more to bring it to the same horizon as the bottom of No. 3, it being in higher ground.

They are erecting a high trestle from this shaft, 300 feet in length, to a branch of the M., H. & O. railroad that has lately been extended to the mine from the Manganese

property. This elevated track is placed high enough to give space for an ore pocket to be built above the railroad, into which the ore may be dumped and thence "chuted" into the cars.

The C. & N. W. Co. are also to build a track to No. 3 shaft coming in the west through the South Jackson and Section 12 mines. This will be the carting, which has heretofore been a considerable of an item, as the ore to be drawn quite a distance from the shaft and pits down to the pockets and docks by the branch railroad.

Capt. J. C. Foley took charge of the affairs of the mine in August and the results of his energy and skill are manifest in the appearance of location. Capt. Charles Cox still remains in charge of the mining, work, etc.

The property is upon the side hill south of Negaunee, and overlooks the whole city.

The description is the N. W. ¼ of the N. W. ¼ of section 7, and the south part of the S. W. ¼ of the S. W. ¼ of section 6, T. 47, R. 26.

The product of the mine in years past has been as follows:

Years.	Tons.	Years.	Tons.
1870.....	4,866	1877.....	19,691
1871.....	15,442	1878.....	30,180
1872.....	25,030	1879.....	28,962
1873.....	38,332	1880.....	31,028
1874.....	2,642	1881.....	28,230
1875.....	10,357	1882.....	40,390
1876.....	17,282		
Total number of gross tons.....			292,932

### THE MILWAUKEE MINE.—(APRIL 29TH.)

This mine was carefully examined and fully written up last June, and the description published in the report for 1881, and there is not much to add, especially as the mine is mostly filled with water. I went to the mine and experienced the sensation which the unpleasant contrast affords between the present idleness and the activity which formerly prevailed.

Mining work was discontinued in February last, and since then the only work done is to keep the water out of No. 7 and No. 8 pits, in the hope that the ore market might sufficiently revive to induce the resumption of work, if only to a moderate extent. Previous to stopping 10,000 tons of ore were mined, and are now held in stock. One difficulty which the section 7 mines contend with is the excessive royalty which they have to pay on the ore; 75 cents per ton is at least one-third too high.

The only pits that are now deemed of value in the Milwaukee mine are Nos. 7, 8, 9, and 10. The two former are together, and really form one and the same pit. They are worked underground, dipping to the south, and extend east and west, giving a stope 200 feet long and 6 feet to 25 feet wide. The ore deposit in these pits is widening out apparently, and so far there is a good body of ore here. No. 9 pit is further to the north; it is worked underground and entered by two shafts 300 feet apart, which follow down the foot-wall to the south. Its

product is a beautiful umber colored hematite, that Captain Foley says is well liked by furnace men.

No. 10 pit is close to the west line; in fact the line crosses the open pit dividing it between the Milwaukee and the Wheeling iron company. The pit has a good body of ore, which analyses the best of any in the mine, being above 60% in iron and below 1-100% in phosphorus.

Captain J. C. Foley remains agent of the company, and Captain Gilbert Carmichael is still in charge of the location. The estate comprises 40 acres of land in the center of section 7 south of Negaunee; it is held by the company on a lease from the Negaunee iron company.

The product for each year has been as follows:

Years.	Tons.	Years.	Tons.
1879.....	941	1881.....	31,254
1880.....	13,142	1882.....	41,200
Total gross tons.....			86,537

#### THE WHEELING IRON COMPANY.—(MAY 1ST.)

This is a new organization, formed to mine in the land which joins the Milwaukee on the west. The only discovery of ore which has been made is the westerly extension of No. 10 pit of the Milwaukee mine. This has been stripped of the drift down to the ore for a distance west of 70 feet, and it shows a width of ore of 60 feet, measured horizontally north and south. South from this opening, 300 feet, is the diorite, which rises abruptly to a considerable highth. The ore analyses well; samples gave 62 1/2% in metallic iron and .084% in phosphorus. The estate comprises 80 acres in section 7, joining the Milwaukee and the McComber mines. It is held on a lease from the Negaunee iron company.

The officers are Daniel McGarry, President, Cleveland, Ohio; J. C. Foley, General Manager, Negaunee, Mich.

No ore has yet been mined. It was intended to proceed with mining if the iron market had warranted it.

#### THE ETNA IRON AND EXPLORING COMPANY (MAY 1ST)

is also a new organization, which has resulted from the success of the exploration prosecuted last summer on the Manganese property, being the N. E. ¼ of the N. W. ¼ of Sec. 7-47-26, and joins the McComber on the east. They have uncovered a deposit of ore 145 feet long, east and west, and 22 feet wide; the opening is 50 feet long. The company are now working a force of 15 men, and have contracted 5,000 tons of ore, but hope to get out this season 8,000 or 10,000 tons. They have a good showing, and if the ore holds out, as there is no reason to doubt but it will, the company will accomplish their intention.

The officers are J. C. Lewis, President, Marinette, Wis.; J. P. Lombard, Treasurer, Marinette, Wis.; J. M. Gannon, Secretary, Negaunee, Mich.; Capt. Wall, Superintendent.

A branch of the M., H. & O. R. R. runs along near the pit. The land is held on a sub-lease from M. Shaad, who holds from the Negaunee iron company. On the adjoining 40 to the east a good "find" of ore has recently been made by the Miller brothers of Negaunee.

#### THE NEW YORK HEMATITE MINE

has been idle since the close of navigation, and there is no ore in stock. Some negotiations were pending for the sale of the mine in the fall, and the owners expected that the sale would be consummated, and the suspension of the work was primarily due to this cause. Since, however, the ore market has been so uncertain that it has not been deemed advisable to start up. The explorations which were made last summer on the property with a drill, and which were one time thought to be looking very favorable, resulted finally in a nothing really of value was discovered.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1870.....	1,809	1877.....	3,307
1871.....	2,921	1878.....	4,674
1872.....	9,925	1879.....	2,737
1873.....	6,629	1880.....	2,063
1874.....	750	1881.....	1,970
1875.....	450		
1876.....			
Total gross tons.....			37,241

The mine is on section 6, south of the city of Negaunee but a short distance.

J. C. Foley, Agent, Negaunee, Mich.

#### THE ROLLING MILL MINE

Has continued idle, except some explorations which were made last year, which resulted in failing to find anything of value. The mine has yielded in the past 215,865 gross tons.

#### THE STAR MINE,

On section 8, was described last year, and while considerable subsequent work was done, they have not yet succeeded in developing a very promising mine.

The work has been suspended.

#### THE CHICAGO MINE,

In the southeast corner of section 7, has been idle for a year past. The ore that was in stock in the spring of 1882 yet remains unsold. The mine has yielded 8,895 tons of ore.

#### THE BAY STATE MINE

Got out 1,593 tons of ore last year, but no work has been done since October last. Its prospects are not extremely flattering, though they have a small deposit of ore which might develop into greater magnitude on further working. The total number of tons shipped in

past years is 16,768 gross tons. The location is on section 8, southeast from Negaunee one mile.

#### THE VALLEY CITY IRON COMPANY

Have been exploring east from the Pioneer furnaces in Negaunee, having bored three drill holes, in two of which a moderate thickness of ore was found, covered, however, with 40 feet of quicksand, succeeded by rock. The company began the work of sinking a caisson through the quicksand to reach the ledge, but operations have been suspended. The land held by the company comprises 80 acres, held on a lease.

Mr. G. F. Case, Agent, Negaunee, Mich.

#### THE PENDILL MINE,

Situated just south of the Union depot in Negaunee, has been practically abandoned; the pumps have been taken out, and the mine is filled with water. Borings were made in various parts of the mine last summer with the hope of discovering other deposits of ore, but without avail, and there is nothing left to mine but the pillars, some of which still remain; however, it is doubtful if it would pay to pump out the water to obtain the ore in them. There is about 1,700 tons of ore at the mine in stock. The mine has yielded 25,088 gross tons.

H. A. Burt, Agent, Marquette, Mich.

#### THE SECTION TWELVE MINE,

Belonging to the Iron Cliff company, is located in the northeast corner of section 12-47-27, and joins the South Jackson mine on the north and the McComber mine on the east. The mine was very fully described in the last report, and there is nothing to add. The ground is limited by the diorite bluff on the south and the sections lines north and east, so that in this locality the mine cannot become a large producer. The quality of the ore is excellent. All work at this mine was suspended in the fall, and there is no ore in stock. The mine yielded in 1882, 5,176 tons. Its total product to date, 23,734 gross tons.

A. W. Maitland, General Manager of the Iron Cliff Company.

#### THE FOSTER MINE

Is the oldest of the Iron Cliff company's mines, having been opened in 1865, and furnished one of the earliest hematite ores shipped from the district. The ore requires careful sorting, but is good in quality. The mine is situated on Sections 22 and 23, T. 47, R. 27, and previously to December, 1881, had been for some years idle. During the past year, 1882, 10,593 tons were mined, 2,037 tons of which were smelted at the Pioneer furnaces at Negaunee, the rest was shipped below. The company are now working 30 men at the mine, and are mining in two open pits, No. 1 and No. 3; No. 2 pit has been abandoned. No new pits have been opened, and

the work has not been pushed underground. The mine looks very much as heretofore. No. 1 pit is below the hill, and they are stoping the ore in the bottom of it, when there is a good showing of it in No. 3, on the hill, they are stoping back along the whole face of the pit, and have not sunk any, while in No. 1 they are going deeper. They have at the mine 7,000 tons of ore in stock. It is expected to use the product at the Pioneer furnaces. The total product of the mine to close of the year 1882 has been 119,549 gross tons.

#### THE SALISBURY MINE (MAY, 1883.)

Is second only in importance to the Iron Cliff company's mines; it affords annually a large product of excellent, soft hematite ore, that yields a high percentage in metallic iron, and is low in phosphorus. The product of the mine for the year 1882 was 42,019 tons; 41,603 tons of which were smelted at the Pioneer furnaces in Negaunee. The mine is in shape to furnish an equally large output the present year, but it is not probable that it will be done, since the mining force has been considerably abridged, owing to the stagnation which prevails in the iron market. The usual number of men employed, when the mine is worked to its full capacity, is 85; at present only 32 men are engaged. The mining work is mainly confined at the present time to the west open pit, where they are stoping in the bottom.

In the east part of the mine, which is extensively worked underground, there have lately sunk for another level, and are well opened for mining, which will be resumed when the market warrants it. The underground work reaches 300 feet east from the shaft, and at the extremity they have been rising for another shaft. The mine is well timbered and rendered secure, and shows an abundance of ore; its depth from the surface is 200 feet. There are now in stock at the mine 16,240 tons of ore.

Captain Bartle still remains in charge of the mining work. The several years previous experience which he has had in the western mines has familiarized him with the system of timbering practiced in that region, and the application of the knowledge which he has thus obtained is of great value in the Salisbury, where, notwithstanding the precarious nature of the ground, he has succeeded in thus far avoiding all serious accidents.

The Salisbury has yielded as follows:

Years.	Tons.	Years.	Tons.
1872.....	545	1878.....	52,155
1873.....	11,023	1879.....	39,770
1874.....	6,730	1880.....	22,387
1875.....	4,571	1881.....	41,888
1876.....	20,510	1882.....	42,019
1877.....	37,868		
Total gross tons.....			279,466

The location of the mine is on the south side of the high diorite bluff, which separates it from Lake Angelina, being about a mile and a half south from the city of Ishpeming.

## LAKE ANGELINE MINE,

Situated at the west end of Lake Angeline and a half of a mile south of the Lake Superior mine, in the city of Ishpeming, has been working for many years in the open pits between the lake and the high greenstone bluff that rises very abruptly on the south, until the pits have reached a great depth, and the ore in the bottoms is nearly exhausted. The only ore that is now taken from these open pits is at the west end of the west pit, where a few men are now stopping,—April 25th.

Some years ago a shaft was sunk to the northwest, 200 feet from the pit, and came into good ore, but the shaft was so small that no great amount of exploration could be carried on in it. Within the past year the work of enlarging this shaft and sinking it deeper, etc., has been undertaken and carried forward. The shaft is a large one, sufficient in size for a double cage, pump shaft, and ladder way. It is well lined up and sunk to a depth of 200 feet, 100 feet of which is in good ore, and they have drifted in this ore, south across the formation, 240 feet. Samples of the ore have been taken every ten feet of distance in this drift and analyzed. These analyses show the ore to be about 64% in metallic iron—2% in silicon and .025% in phosphorus. It is thus an immense deposit of excellent hematite ore. The mine will thus soon be wholly underground. A trestle is building from the shaft to the railroad, sufficiently elevated for ore pockets at the end, and for stock pile.

The officers are John Outhwaite, President; L. E. Holden, Secretary and Treasurer; A. Kidder, Agent, Marquette; Harvey Diamond, Superintendent, Ishpeming.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1864.....	19,500	1874.....	30,499
1865.....	20,151	1875.....	30,282
1866.....	24,073	1876.....	22,539
1867.....	46,607	1877.....	19,113
1868.....	26,651	1878.....	28,161
1869.....	39,644	1879.....	25,420
1870.....	53,467	1880.....	14,794
1871.....	33,645	1881.....	18,000
1872.....	35,221	1882.....	14,518
1873.....	43,933		
Total gross tons.....		546,328	

## THE NATIONAL MINE

Is about two miles south west from Ishpeming, in the inner side of the semicircular diorite range that opens to the northwest. The west mine, near the "Old Parsons," in section 16, was abandoned last fall; the pumps have been taken out, and there is no present intention of resuming mining work at this point. The diamond drill borings which were made across the formation below the mine workings failed to discover anything of value, and it was decided that the outlook was too unfavorable for further endeavor. But the east mine, on the hill, is looking as well as it ever has. The mine is wholly underground from the bottom of the open pit, 250 feet from the surface, and is reached by a skip road that descends to the west from the east side of the pit,

whence the product is taken in the tram car, into which the skip is emptied, around to the ore pockets and stock pile by the side of the railroad. The stock pile has assumed pretty large dimensions, and necessitates the extending of the dock to deposit the ore.

The product is a very peculiar looking ore; much of it is a hard, bluish colored, porous ore, that has much the appearance of furnace slag; it is, however, a good ore, and from a large number of analyses shown to me by Capt. Mitchell I can realize that it should give good satisfaction. One made in Cleveland of the ore in stock there last season gave

Metallic iron.....	65.625
Silicon.....	3.866
Alumina.....	.550
Sulphur.....	.028
Lime.....	.130
Magnesia.....	.018
Phosphorus.....	.070

Another made by Mr. Wright of samples sent him by Capt. Mitchell gave:

Metallic iron.....	66.34
Phosphorus.....	.153
Lime.....	1.850
Silicon.....	1.780

Samples also collected by Capt. Mitchell from same pit as the above gave:

Metallic iron.....	65.170
Phosphorus.....	.118
Silicon.....	2.800

Average samples of a reddish colored fragmentary ore, regarding the value of which some doubt was felt, were collected by Capt. Mitchell, and the analysis gave:

Metallic iron.....	62.85
Phosphorus.....	.086
Silicon.....	5.200

They have now 12,000 tons of ore in stock at the mine. The ore is harder than formerly, and altered in appearance, but the change is not for the worse; it sells for hard ore. They are mining in three levels and are sinking for the fourth. The work is all north of the shaft, and extends 200 feet, showing a width of ore of from 6 feet to 20 feet, with indications that it is widening out and increasing in volume as greater depth is attained. The total force employed at the present time (May 3d) is 45 men; they are working only day shift. A diamond drill hole was bored across the formation below the mine to the north, but no ore was found. They are now boring in a similar way to cross the formation to the south.

Capt. Williams, as heretofore, has charge of the mining work, but the affairs of the company are directed by Capt. Samuel Mitchell, who is also one of the principal owners of the mine. The company hold 240 acres, embraced in the E. ½ of Sec. 16, T. 47, R. 27.

The yield of the mine for previous years has been as follows:

Years.	Tons.	Years.	Tons.
1878.....	4,191	1881.....	24,699
1879.....	33,769	1882.....	23,366
1880.....	29,043		
Total gross tons.....		115,068	

### THE WINTHROP MINE (MAY 3D)

Is unfortunate. A year ago, when ore was in good demand at a fair price, the mine caved in on one side of the deep open pit, and a great expense and loss of time was incurred in hoisting all this rock and dirt to the surface to the obstruction of mining; and this season, when they are all ready to mine, they are wholly estopped, as a result of a suit which is pending in the United States court. However, they have plenty of ore ready to stope. The mine is in good shape, the ore is of the best quality of soft hematite, and will readily sell at any time, even now if they had it out; so that when the present embarrassment is tided over, the company ought to meet with reasonable success.

They have about 9,000 tons of ore in stock, but just now are not mining at all. The vertical shaft, which was begun something over a year ago, is down 200 feet. It is expected that it will have to go down 400 feet to strike the main body of the ore. It is expected that the suit will be so adjusted that mining work may proceed before long. The property is the S. W. ¼ of Sec. 21, T. 47, R. 27, and the mine is near the center of the section joining the Mitchell mine.

The officers are J. O. St. Clair, President; E. G. St. Clair, Secretary and Treasurer; and Geo. A. St. Clair, Superintendent, office Ishpeming, Mich.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1870.....	2,469	1877.....	12,549
1871.....	7,319	1878.....	23,740
1872.....	14,239	1879.....	27,050
1873.....	31,150	1880.....	45,247
1874.....	8,248	1881.....	43,900
1875.....	8,642	1882.....	23,259
1876.....	27,236		
Total gross tons.....			276,028

The company have lately leased the Mitchell mine, and will hereafter work that in connection with the Winthrop.

### THE MITCHELL MINE (MAY 17TH)

Has been recently sold to the Winthrop Hematite company, by whom it is now controlled and worked. The two mines are close together on opposite sides of the line which divides the properties. The mine is now wholly underground, and its workings are quite extensive; they are reached by three shafts, designated as "A," "B," and "C," and a fourth one, "D," will be sunk further to the east. The levels are as sinuous in their direction as the course of a brook in the meadow where it meets with frequent obstructions. The second level has a length of 900 feet, very irregular, and widening out into chambers, in places.

The present owners have done no sinking, but have confined all their mining work to the levels already opened—3d, 3d, and 4th levels,—mainly in the vicinity of "C" shaft. Before the end of the present month it is expected to be working also "A" shaft. The latter is 188 feet deep, "B" is 160 feet deep, and "C" one level below "A." They are mining now 3,500 tons per month, but

intend to increase this to 5,000 tons when a product from "A" shaft is added. In the 2d level some cross cuts showed a large amount of ore. This ore in the Mitchell is probably south of that found in the Winthrop, except in "A" shaft, which is near the Winthrop, and to the south, and probably reaches the Winthrop run of ore. The ore is of fine quality of soft hematite, and presents three distinct varieties, which are mined and stocked separately. They are designated as the white ore, blue ore, and the run of the mine. Several analyses of these ores were shown me made by different chemists.

Blue ore from "A" shaft:

Metallic iron.....	64.67
Phosphorus.....	.151
Silicon.....	4.04

Blue ore:

Metallic iron.....	66.80
Phosphorus.....	.129
Silicon.....	1.30
Alumina.....	1.010
Lime.....	1.100

An analysis of an average of the mine, of samples collected by Capt. Mitchell, made by Mr. Wright gave:

Metallic iron.....	65.170
Phosphorus.....	.118
Silicon.....	2.800

The white ore is Bessemer; an analysis of average samples gave:

Metallic iron.....	62.85
Phosphorus.....	.086
Silicon.....	5.200

They have 14,000 tons in stock; 3,000 tons of which are the blue ore. They have had to rebuild the engine house, which was burned down. To work this mine will require great care, as the support to the ground must be almost wholly artificial; the ore is very soft, and on exposure becomes like dirt; the rock has little tenacity. On the evening of the day I visited the mine a man was killed in the mine by being buried in a fall of ground, and without much care and foresight such an accident might involve the loss of life of a large number of men. The force employed is 100 men.

The annual product has been as follows:

Years.	Tons.	Years.	Tons.
1872.....	197	1878.....	4,259
1873.....	8,552	1879.....	11,450
1874.....	7,699	1880.....	12,753
1875.....		1881.....	20,965
1876.....	5,596	1882.....	33,396
1877.....	3,897		
Total gross tons.....			108,764

The officers are the same as those of the Winthrop. The mine is about 3 miles southwest from Ishpeming, being in the S. E. ¼ of Sec. 21-47-27, near the center of the section.

## THE SAGINAW MINE

Has permanently closed down. The present company have decided that they will make no further effort to work it. There are about 3,000 tons of second-class ore at the mine that will be shipped to the owners. The product in 1882 was 11,259 tons, and the mine has produced in the aggregate 429,274 gross tons.

Capt. Samuel Mitchell, Agent, Stoneville, Mich.

## THE GOODRICH MINE,

Which adjoins the Saginaw, has also shut down, but not finally. The suspension is due to the condition of the ore market, rendering it probable that the ore could not be sold. The ore is scarcely first-class, and it seems likely that there will be sufficient difficulty in disposing of first-class ore at a profit. The mine is in the W. ½ of the N. W. ¼ Sec. 19, T. 47, R. 27, southwest of Ishpeming. Work suspended on March 1st, last.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1873.....	3,258	1878.....	7,547
1874.....	3,048	1879.....	3,992
1875.....	1,718	1880.....	11,181
1876.....	.....	1881.....	10,245
1877.....	503	1882.....	9,987
Total gross tons.....		51,479	

## THE CASCADE RANGE. MAY, 1883.

Exploration in this range, of which so much was done in the past two years, has all been abandoned. A number of companies were organized—The Grand Rapids, Laxey, Wick, Clancy, Mexican, etc.,—which were described in the last report, and little has since been done at any of the locations which were made, and nothing of much value was found. A little ore is obtained, just enough to excite the hopes of the operators and stimulate to further effort, but never enough to make a paying mine.

They have all been abandoned, and probably permanently so. The only ones working are the only ones that have been shown to be worth working; these are the Palmer and the Wheat mines. The former, owned by

## THE PITTSBURGH AND LAKE SUPERIOR IRON COMPANY— (PALMER MINE.)

Is the only considerable mine in this range, and this one on the whole shows some improvement. The work is now confined to the old mine. No. 5 pit, to the south, which was begun a year ago to mine a deposit of ore that had been reached with the diamond drill, is worked out; the deposit proved to be a small one; and No. 6, near the location, had a similar result. In the latter they sunk 130 feet, following a drill hole, but the deposit did not prove to be large enough to pay to work. Further

exploration will be made with the drill to prove the formation at greater depth at this point, and also near No. 5 pit.

The lenses are generally small detached deposits. No. 1 pit is the only large deposit that has been found in the mine; the others shorten up at the ends, and do not hold in depth. No. 1 is the farthest to the north and west, and holds good; they now have a run of ore in the bottom 200 feet in length and 10 feet to 12 feet in width, at a depth of 375 feet from the surface on the lay. They are working two stopes, and are sinking another lift. In the bottom of this sink the ore is 12 feet wide. The ore is good quality of hard slate ore, 65% in iron, but too high in phosphorus for Bessemer pig. In the hanging wall of the mine, 75 feet north of the main deposit, is another lense 6 feet wide, which has been reached by cross cuts from the main vein; but this appears to be coming into the large vein; in fact it connects with it at the south end, so that they run a track into it by branching from the main track, using a Y instead of cross cuts, as heretofore has been necessary in the levels above. They are now mining 125 tons per day.

Nos. 2 and 3 pits are small; the former is not working, but the latter is improving, and at the present depth, 300 feet, is 6 feet wide. No. 1 lengthens every year, and will perhaps eventually absorb the whole mine; it is already in front of No. 3, and they think of cross-cutting from No. 3 into it. The several pits are in separate parallel lenses, lying partially one behind the other, and may come together and from one body at greater depth.

The company employ 150 men, and have in stock 17,000 tons of ore—all first-class. The drill holes that were made, and described in the last report were too shallow. It is the intention to start the drill again and to bore deeper. In addition to the mining work the company have at the saw-mill 2,500,000 feet of logs.

Capt. W. H. Whiteside is still in charge of the mining work; Mr. Kirkpatrick, Agent.

The annual output has been as follows:

Years.	Tons.	Years.	Tons.
1871.....	4,171	1877.....	20,211
1872.....	39,495	1878.....	4,704
1873.....	41,204	1879.....	24,141
1874.....	16,106	1880.....	38,597
1875.....	4,070	1881.....	39,273
1876.....	15,324	1882.....	40,590
Total number of gross tons.....		287,887	

## THE WHEAT MINE

Is doing very little; are working only in one pit, and employ a force of 18 men, and have about 3,000 tons in stock of hard ore, and at the hematite mine about 1,000 tons. They have sold 1,800 tons to the Bellair nail works, Wheeling, Va. They are taking out about 60 tons per week. The hematite mine is not working, though it is looking tolerably well; but the company were afraid that the ore could not be sold this season, and so shut down.

The hard ore mine is not looking very favorably; the ore deposit in No. 1 shaft, the one they are working, is

contracted, and it looks like a sharp contest between the rock and the ore which shall hold the day. A good deal of rock is mined to get what little ore is obtained. They are underground about 100 feet from the bottom of the open pit. No. 3 shaft is 130 feet deep, and they have an ore deposit at the bottom of it 5 feet wide.

The Agent is J. T. Haze, Negaunee, Mich.; Mining Captain, Thomas Prout.

The annual output has been as follows:

Years.	Tons.	Years.	Tons.
1879.....	850	1881.....	9,040
1880.....	3,324	1882.....	9,554
Total number of gross tons.....			25,989

### THE NORTH RANGE. MAY, 1883.

With, the exception of the Beaufort and the Titan all the mines in the north range, in the vicinity of Michigamme lake, are idle. These mines are, commencing at the most easterly one and naming them in the order in which they occur, the Mesnard, Jim Pascoe, Daliba, North Hampton, Marine Farm, Webster, Beaufort, and Titan. The two latter are now working, all the others are idle, and have been so since the close of navigation last fall. Some of these that are idle are important mines, and the sole reason that they are not working is the fact that there is no market for the ore. There is little market at present for even the best ores, and it is to be expected that such ores as are produced by the mines in this range in this vicinity must, under a depressed condition of the iron market, be the first to go to the wall. The Beaufort and Titan have made sale of quite a large amount of ore, but it is to furnacemen who are also interested in the mines, and probably it is sold at a low price; but as they have, apparently, an enormous body of the ore, and it can be very cheaply mined, no doubt the companies can even then realize a profit; besides, it is understood that the conditions of the lease of the Beaufort require the corporation to pay royalty on at least 10,000 tons each year, so that they must pay the stipulated price on that amount whether they mine it or not, and thus this requirement may be a strong reason in determining the company to work the mine.

At this mine they have stripped the earth from the ore for a space of 150 feet east and west, and 50 feet north and south, and have sunk 15 feet in the ore, and are stoping on the south, east, and west sides. The ore is reasonably free of rock, and requires but little picking over; the derricks on the north side of the pit, working the buckets, can hoist the ore and empty it directly into the cars standing on the railroad track. They are in condition to mine several hundred tons per day. The quality of the ore is low grade, a hematite 55% in metallic iron and high in phosphorus. Five thousand five hundred and forty-three tons of ore were sent from the mine last season. The openings of the

### TITAN

Are but a few rods to the west of the Beaufort; the ore is identical, and they have an equally large body of it. No drifting or cross-cutting has been done on either property to determine how wide the deposit is. They have a foot wall of jasper, mixed with ore, which may not be the limit of the ore to the south, and to the north they have not yet reached the hanging wall. The arrangements for mining are of the same simple character as at the Beaufort. The mines have a branch from the main line of the M., H. & O. R. R., which starts a short distance west from the Spurr. The Titan is the most westerly of this range of mines. One thousand seven hundred and seventy-eight tons were shipped late last year.

### THE WEBSTER

Is the next mine east from the Beaufort. Preliminary work was prosecuted here vigorously last summer, and the mine put into excellent shape for mining a large amount of ore. There is sufficient evidence that the mine will afford an abundant supply; 4,413 tons were shipped from the mine last year. The management devolves upon Dr. Northrop, of Marquette.

### THE WETMORE.

The Titan, Beaufort, Webster, and Farm lie west from Lake Michigamme and southwest of the Spurr mine. The latter is the most easterly one, and is at least fully as promising as any of them. If the ore were sufficiently low in phosphorus it would be a mine of extraordinary value; but, like the others of this range, it is an ore for which there is no present demand.

Mr. Ed. Wetmore, one of the parties chiefly interested, and who has from the beginning directed all the operations at the mine, kept a force of men at work throughout last season, until the winter set in, chiefly stripping, and he has now a large extent of the ore uncovered, and is fully in readiness to mine whatever amount can be sold. There is in any event but little gain, under the present condition of the mine, in mining the ore and placing it in stock, since it can be taken from the mine and put into cars or into ore pockets nearly as cheaply and readily as it can be taken from the stock pile and put into cars; certainly there is not enough difference in the time gained to pay the additional cost for rehandling. The property comprises the N. W. ¼ of Sec. 26, T. 48, R. 31; and the explorations that have been made were described in the last report. The developments so far show an extraordinary amount of ore that can be very rapidly and cheaply mined. East of Lake Michigamme and north of the M., H., & O. R. R., a mile or so from the station at Champion, are located the other mines of this range, of which mention has been made. Of these the Daliba and Jim Pascoe have an abundance of ore, the others are still doubtful; at least the showing is not such as to warrant the assumption that they certainly have a sufficient body of ore, even of

the quality that these mines afford, to be made successful.

### THE DALIBA IRON MINING COMPANY

Hold the S. 1/2 of the N. W. 1/4 and N. 1/2 of the S. W. 1/4 of Sec. 29, T. 48, R. 29 W. The general features of the mine have been described in previous reports, and there is nothing further to add beyond the fact that the openings have enlarged to the extent necessary to the production of the large output of last year. The Daliba is the oldest of the mines of this range in this locality. It has made large annual shipments, so that its ore has been on trial in the furnaces. The mine is still, apparently, in condition to afford as large an annual product as heretofore whenever buyers can be found for it. The mine was shut down at the beginning of winter, and there is no probability that work will be at present resumed.

There have been shipped from the mine as follows:

Years.	Tons.	Years.	Tons.
1881 .....	10,986	1882.....	44,836
Total gross tons.....			55,822

The officers are James H. Daliba, President, Cleveland, Ohio; W. S. Pollock, Treasurer; Walter Fitch, Agent.

East of the Daliba is

### THE JIM PASCOE,

Which in 1881 made a great stir in iron mining circles; the stock ran up to \$15 per share, and it was heralded by some enthusiastic, or not over scrupulous parties, as the most extensive iron ore deposit ever discovered on Lake Superior, and the prediction made that in a short period it would eclipse all other mines in the country. In point of fact it proves to be about on a par with the others that have been mentioned. It has, unquestionably, a large amount of this low grade, high phosphorus hematite ore, for which there is no market in any depressed condition of the iron trade; nor can be until some available process comes into general use in iron manufacture for cheaply eliminating the phosphorus. Eighteen thousand eight hundred and eighty tons of ore were shipped from the mine in 1882. There is no prospects of any shipments being made or of any mining work being done during the present year.

Thus far the Boston is the only hard ore vein that has been discovered in this range.

### THE BOSTON (APRIL 30TH)

Still sustains its reputation for the quality of its ore, which is lowest in phosphorus of any hard ore in the State, and equally high in iron with the best. Some noticeable improvements have been made at the mine within the year past; among these are the addition to the mining plant of a new Norwalk compressor and several air drills. Three large frame houses have been built, which, in addition to those which they previously had, make ample

accommodation for the men and families. All of the buildings have been painted, and thus improved in appearance. In the mine the buckets and derricks in the west end of the mine have been dispensed with, and now instead of three shafts, as heretofore, operated in this way, they have but one shaft, formerly the No. 3, and this is provided with a skip road, and the single skip does the hoisting with far greater facility and convenience than it was formerly done with the three. This new skip road works very nicely, and is just what was needed. The shaft house built over it is of dimensions calculated to suffice for a double skip road; but one is amply sufficient for present purposes; it is 215 feet in depth. Jasper shaft, which is 387 feet east from the west line of the property, is also now used for hoisting; it is at about the same depth as No. 3. The pit at the bottom of the jasper shaft is 75 feet in length, with a heading of jasper at each end.

The run of ore is lengthening in the pit since it is cutting under the jasper at the west, and the pitch of the ore in the bottom is to the east; at least all the "slips" are sharply in that direction. It is thus possible that it may lead to the ore cutting out the jasper to the east also. It is nearly certain that the ore must soon connect under this jasper pillar, which now separates the two pits, as No. 1 drill hole, bored two years ago, passed directly beneath this pillar 225 feet below the surface, and cut 101/2 feet of first-class hard ore, measured at right angles to the walls, and thence, after passing through a belt of jasper, cut 12 feet in thickness of good hematite ore, that gave, on analysis, 59% of metallic iron, and a trace, only, of phosphorus. The drill core of the hard ore in this hole gave of phosphorus .006 of one per cent, and metallic iron, 67.12%; silicon, 1.62%.

If this jasper wall does cut out, as above indicated it probably will, the Boston will have a fine run of ore from the west line of the property to a distance of 50 feet east of jasper shaft; a length of stoping ground of 440 feet, which will enable them to get out 5,000 tons of ore each month very easily. The vein was proved for a length of 1,140 feet, by boring through the formation at four different points. In these holes a width of the hard ore vein was found of from 101/2 feet to 14 feet in thickness. The entire length of the ore vein on the property is upwards of half of a mile. They have a fine stock pile of ore at the mine of 10,000 tons, and are mining 2,700 tons per month—the April product.

A cross cut has just been started in the mine to the north to reach the hematite deposit, with the view to proving it and mining it, tramping the ore out through the cross cut to the shaft.

Mr. Fred. A. Wright remains agent of the company, and under his intelligent supervision, assisted by Mr. Joe. Sellwood, as superintendent, the affairs of the mine are sure to be ably managed.

The Boston has produced as follows:

Years.	Tons.	Years.	Tons.
1880.....	6,478	1882.....	18,077
1881.....	14,824		
Gross tons.....			39,379

### THE STERLING MINE

is only separated from the Boston by the line which divides the properties. They are in the same vein and contiguous, so that in several places the workmen have broken through the partition and opened from one mine into the other. The ore is identical, though the stock pile of the Sterling shows a greater proportion of second-class ore than does that of the Boston. This second-class ore has a small mixture of jasper; it comes mainly from, along the foot-wall. The best ore, that which is free from rock, is near the hanging wall. The mine is deeper than the Boston, being 240 feet deep. They are working two stopes, and have drifted west from the line a distance of about 250 feet. The ore in the west end, however, is a good deal mixed with rock, and the vein is narrow. Next to the Boston it holds a good width, and is free from rock. They are restricted in their work to one small bucket shaft near the east line. No recent change has been made in the surface arrangements.

The product of the mine was:

Years.	Tons.	Year.	Tons.
1880.....	1,197	1882.....	7,235
1881.....	4,702		
Total gross tons.....			12,134

The Boston and Sterling lie two and a half miles northeast from Clarksburgh station; the latter property being the W. ½ of the S. W. ¼ Sec. 38, T. 48, R. 28.

G. W. Reed, Agent.

### THE DEXTER AND THE DEY MINES (MAY 1ST)

Are situated about two miles east of the Boston and Sterling, and like them, are opened on adjoining properties and near the line which divides them—the Dey on the east and the Dexter on the west. Each has one shaft; they are sunk from the surface from the north slope of the hill at an elevation of about 40 feet above the level ground below to the north. The ore deposit, running east and west, lies under this lower ground covered with a depth of 60 feet of drift. An attempt was made by the Dexter company to sink through this overlying drift to the ore, but the quicksand was met with to so great an extent that the work was abandoned, and the shaft was sunk in the rock to the south, following the dip to the north. The inclination starts at 75°, but becomes flatter as depth is attained. The shafts are 150 feet deep, and from the bottom cross cuts are made to the ore to the north. In the Dexter this cross cut is completed; is 60 feet in length from the shaft to the ore, and they have also drifted west above the ore 50 feet, and to the east in it 150 feet, as far as the line, but they will continue drifting east beyond the line in the Dey, as it is the intention to connect the two mines underground, in order to secure ventilation. They have taken out about

500 tons, and that which they are now hoisting has the appearance of being good ore—a clean, uniform, brown hematite. They are mining about 400 tons per month. The deposit is 16 feet wide, and free of rock. It certainly has a very promising look, and there is thus far every assurance of having a good mine. The shaft is worked with a small engine and winding drum. A good boarding house has been built, and some other minor improvements made.

At the Dey the cross cut drift from the bottom of the shaft to the ore is in 30 feet, and they estimate that there is 50 feet more to drive to reach the ore. The hoisting is done with a horse-whim, though something more expediting will soon be procured. The shafts are advantageously situated for handling the ore, since the descent to the north gives sufficient elevation for ore pockets and stock piles, etc.

There is no swamp land in the vicinity, and the location will be a dry one. A branch from the M., H. & O. R. R. will soon be built to the mines.

Mr. F. A. Wright, the same gentleman who has heretofore been mentioned as agent of the Argyle and Boston mines, is also agent of the Dexter and the Dey.

### THE ST. LAWRENCE MINE (MAY 1ST)

Is a promising hard hematite deposit, which has been opened during the past year. It is situated about three miles northwest from the city of Ishpeming in Sec. 5, T. 47, R. 27; the company holding on a lease 80 acres in the northwest quarter. A branch from the C. & N. W. R. R. has been extended to the mine. The ore deposit extends east and west, and dips to the south at an angle of about 70°. It has an apparent width of about 15 feet it is covered with about 15 feet of sand and gravel, which has been removed for a length of about 200 feet. They are mining in two open pits, that are separated by a pillar of ore, and are stripping to the east for a stope. The pits are 30 feet deep, and in the bottom of the east pit they are sinking for a stope. The west pit is but a short distance from the west line of the property. Work for the season has but recently begun, and about 500 tons of ore have been mined and placed in stock pile. They have sold 10,000 tons, and design to mine all the ore they can this season. It will be very cheaply mined, and be dumped directly into the cargo the railroad track, which runs along on the south side of the mine. The ore is low grade, 53 to 57% metallic iron and .086 to .104% in phosphorus, with quite a percentage of magnesia. The sale of the ore is to one of the owners who uses it in his furnace. The present force employed is 25 men. The walls of of the ore deposit are jasper, foot and hanging apparently the same, which at the surface are much broken up, and show little tenacity, but deeper they appear to be firmer. The hoisting is done with two derricks and buckets worked with an engine and drums.

The superintendent is J. R. Wood, formerly of the Cornell mine, assisted by his brother, J. S. Wood, who is at present directing the work.

The St. Lawrence is the most easterly of the mines in the so called north range. The mine shipped last fall 9,993 tons of ore.

### THE HUMBOLDT MINE (MAY 3D)

Shows very little change, either for the better or worse. The mine is deeper, of course, and in the main pit there is an improvement in length. The work is now all confined to two shafts, No. 2 and No. 3; No. 1 has been abandoned, and also the small pit in the south slope of the ridge further to the east from the mine. No. 2 and No. 3 shafts are 280' feet deep, dipping to the northwest. The hanging wall is a very singular conglomerate, mainly a talcose schist, impregnated with quartz, pebbles, and pieces of ore. At this mine it forms a wide belt, and upon the surface are seen immense boulders or fragments of the same rock to the north of the mine. It seems to be of limited extent east and west, since it cannot be traced to any great distance in either direction. There are facts, particularly the magnetic attraction, that indicate that the ore formation at this mine makes a sharp bend at the west end of the mine to the north, so that the dip of the ore, if it exists, in the opposite bluff may be to the east and south. However, nothing of this kind has been certainly determined, beyond the fact that in the west end of the mine the upper drift in the bottom level which follows the ore curves sharply to the north.

The shafts are both in the same pit and not far apart. The whole length of the ore in the bottom is about 300 feet. A favorable feature is the fact that it has lengthened 90 feet in the last year. Between the shafts the deposit is wide, narrowing up at the ends until it is merged into jasper. The ore is of good quality, hard slate and magnetic, high in metallic iron, but averaging at slightly too great a percentage in phosphorus for Bessemer pig.

Mr. Maas, the agent, has a diamond drill at work in the hollow between the railroad and the highway, at a considerable distance east of the mine, to further prosecute some explorations previously made at this point. They designate the present mine as the Barren in distinction from the old mine, now abandoned, which is about a mile east from where they are now working. The company have 16,000 tons in stock, and work 160 men.

The product for past years is as follows:

Years.	Tons.	Years.	Tons.
1865.....	4,782	1874.....	27,890
1866.....	15,150	1875.....	9,642
1867.....	25,440	1876.....	3,333
1868.....	35,757	1877.....	16,546
1869.....	58,462	1878.....	23,921
1870.....	79,712	1879.....	18,204
1871.....	48,725	1880.....	14,727
1872.....	38,841	1881.....	26,302
1873.....	38,014	1882.....	43,436
Total gross tons.....			528,933

John B. Maas, General Manager; John Hosking, Mining Captain, Humboldt, Mich.

### THE ARGYLE MINE (MAY 3D, 1883)

Is situated about half of a mile east from the Humboldt. It is an old mine, and the location is a pleasant one. Until two years ago it was known as the Edwards, when it passed under the control of the corporation that now owns it. The present mine cannot certainly be a very profitable one, the ore deposits which they are working are too small either for working to advantage or to afford a large product. But it is a good mine to explore, a good property to explore with the diamond drill, and it is stated by the local officers of the company that it is the intention to bore with the drill in the bottom of the mine to the south in the foot-wall without delay, and also from the surface north of the mine.

A small amount of drill work has been done in the mine heretofore, and 14 feet of ore penetrated after going 60 feet into the foot-wall. A cross cut has just been driven to this ore, but it has not yet been opened out. The mine is so small that it requires constant sinking in order to have any stopes, and the result is a rapid increase in depth. No. 3 shaft is 600 feet down, on the lay, and No. 2 is 500 feet deep. They are only connected by drifts in the upper levels, below a bar of rock separates them. The mine is a succession of small lenses or pockets of ore, lapping each other and separated by bars of rock, that have also to be mined out; thus necessitating a too large proportion of dead work in mining and hoisting rock. They now work about 40 men, and are mining 400 tons per week. The stockpile contains about 10,000 tons, which is now shipping. It requires careful picking to make it first-class. The ore is slate and magnetic, averaging 65% in metallic iron, and slightly too high in phosphorus for Bessemer pig. A recent sale of some of the ore has been made to the Vulcan furnace company.

A change has lately been made in the local management of the affairs of the mine, and the company are fortunate in securing the services of Mr. Fred. A. Wright, as agent, and Joe. Sellwood for mining superintendent. Mr. Wright is a very reliable, clear headed business man, and the latter has had a long and successful experience at the Cleveland mines and elsewhere in directing mining work. If given an opportunity these gentlemen are sure to do some practical exploring work, and to do it intelligently and economically. Such efforts will go far towards determining the value of the property.

The mine has produced in past years as follows:

Years.	Tons.	Years.	Tons.
1866.....	2,843	1875.....	12,804
1867.....	4,928	1876.....	19,420
1868.....	17,360	1877.....	10,591
1869.....	21,450	1878.....	10,303
1870.....	24,232	1879.....	5,455
1871.....	26,437	1880.....	-----
1872.....	26,026	1881.....	4,584
1873.....	39,281	1882.....	12,461
1874.....	2,844		
Total number of gross tons.....			241,074

The officers are Don M. Dickinson, President; Sigmund Rothschild, Vice President; A. H. Dey, Treasurer; D. E. Shaw, Secretary; Fred. A. Wright, Agent, Humboldt,

Mich.; Joe. Sellwood, Superintendent, Humboldt, Mich.; James Tundy, Mining Captain.

#### THE REPUBLIC MINE (MAY 17<sup>TH</sup>, 1883)

Has been very fully described in the previous reports, and in the last one the description written as late as June, 1882, describes the mine in detail, going through each of the shafts and pits in succession. Too few changes have been made within the year that has since transpired to render it necessary to repeat this description. It is almost superfluous to remark that the mine is as great as ever, and in condition to make its usual enormous product. In fact, it probably never looked better than now, or had a larger amount of ground opened for stoping. All of the 16 shafts or pits are working except No. 3, which has been merged into No. 5. They have all been sunk an additional lift and the three southwesterly pits, Perkins, Pascoe, and Morgan, have also been connected during the year, formerly they were separated by bars of ground. The Morgan has a double skip road, the Pascoe a single track, and the Perkins is operated with a bucket hoist.

The larger portion of the product is taken from No. 5 pit, which is the finest deposit of hard ore to be seen in the State. The shaft is nearly vertical to 530 feet in depth, and operated with a double cage going down through an ore deposit that has a width near the shaft of 150 feet from foot to hanging wall. Half the ore is required to be left in the pillars to support the roof. At some future time, if the bottom is ever reached, these pillars may also be mined out, rising up from the bottom and filling the mine with rock obtained from the surface. The product is fine specular slate and black magnetic ores, but they occur in the pit in entirely distinct deposits, resting one against the other without mixture or separated by a partition of soap stone—talcose schist. They are mined and hoisted separately, and run to distinct pockets and stock piles. This pit, as well as the others in the mine, is as nearly as may be the exact counterpart of what it appeared a year ago, except that we go down an additional level to witness the main work of stoping.

The company met with a misfortune not long ago in the burning of the compressor house at the dam on the Michigamme river; a new one on the same site is now, however, nearly completed, and greater precaution has been taken in its construction to avoid the liability of fire. The new building is furnished with an iron roof, and the side next to the boiler house is covered with corrugated iron; on the inside the rafters are left naked, as in the one burned the fire ran between the ceiling and the roof and could not be reached with the hose to extinguish it; such a recurrence they propose to avoid. The loss of the compressor house afforded the company an opportunity of realizing the great value of power drills in mining work; they were able to nearly keep up the product, but at a greatly increased cost.

The most important improvement made during the year is the new engine house and the hoisting plant, electric

engine and boilers contained therein; it, altogether, is one of the best to be found in the iron region, and is an addition that the mine very much needs. The location of the building is east of No. 5 shaft above it on the solid ledge; it is built of stone with iron roof, and is very substantial and a fine looking building for the purpose intended. Its size is 78 feet by 98 feet. The main room contains the four large hoisting drums and two engines. The drums are each 12 feet diameter and 6 feet face, internal friction gear, made at the Marquette iron works. They are set with great care on the most solid foundation, and when started for trial worked perfectly. They will be used to work Nos. 5, 6, and 7 shafts. They are now at work changing the east half of No. 5 shaft; will take out the cage and put in a double skip road for hoisting ore. The west part of the shaft will be used with the cage, as heretofore, for the men and for timber.

Electric lights have not previously been used at the Republic, but they now operate eighteen, all on the surface; none are in use in the mine. They have but recently gone into use, and they find them a great convenience in facilitating the night work. The new boilers are three in number, are each 78 inches diameter, 62 feet long, and contain 82 four-inch flues. They proved a great help in the recent emergency, when the compressor house burned, as within 24 hours thereafter steam pipes were attached to the underground pumps and connected with the new boilers, which were in readiness to start, and the pumps were thus run by steam power instead of air, which had been cut off. Without these boilers they would have been in an embarrassing situation, as there would have been no available power on the location to run the pumps. They are laying the foundation for a new office near the old one, which, when built, will be much more commodious and adequate to the wants of the company than is the present one.

They operate 22 power drills; employ an average force of 700 men, about 500 of whom are miners and underground workmen. The product is now 800 tons per day, and on the first of May there were in stock 105,000 tons of ore. Several train loads per day are now sent to Marquette from the mine. Mr. W. D. Rees, the assistant general manager, severed his connection with the management of the mine the first of May instant, and Mr. David Morgan, who has for some years had the chief direction of affairs, retains now the sole charge. Capt. Peter Pascoe, who antedated them all in service of the company, having done the first work and originally opened the mine, still continues in his position as mining superintendent. He takes the same pardonable pride in showing the mine to an appreciative person that a prosperous country gentleman does in showing his well improved estate.

The annual product of the Republic mine has been as follows:

Years.	Tons	Years.	Tons
1872.....	11,025	1878.....	176,221
1873.....	105,453	1879.....	135,131
1874.....	122,639	1880.....	235,387
1875.....	119,726	1881.....	233,651
1876.....	120,095	1882.....	235,108
1877.....	165,836		
Total number of gross tons.....		1,660,292	

A remarkable fact connected with the mine is that up to the present time. (May 17) not a ton of the ore has been sold, the first instance in the history of the mine where the entire season's product has not been contracted before the earliest shipments began. It is generally thought that when Republic ore wont sell there is no use for any other mines to try to sell.

### THE WEST REPUBLIC MINE

Is no doubt somewhat of a disappointment to the more sanguine shareholders who two years ago invested in its stock at pretty large figures, anticipating that ere long it would rival its formidable neighbor, the great Republic. Still the West Republic has proved to be about what its surface exploration showed, and has grown neither better nor worse. They built up too much on anticipation and possibly were given, when looking at the comparatively limited showing to glance over to the stock piles that loomed up on the opposite side of the bay. It is not easy to see into the earth, particularly when the rock formation is so broken up and contorted as it is in this locality; but it is the simplest thing in the world to conjecture and to anticipate a result that runs with our wishes. The ore being a fine, specular slate, identical with that at the Republic, and contiguous to it, it was but natural to project the other parallel, and assume that there was a like quantity of it. So far, however, such has not proved to be the case. The ore lense is shorthand they have of necessity gone down pretty rapidly. Last year the depth increased 100 feet, and the mine is now wholly under the river. They really have two lenses, which near the shaft are not far apart, but radiate from each other as they extend west. The south lense is wholly west of the shaft, and is the longer, but it is narrow, not above 6 feet wide, and terminates in jasper. A drift from the west end is extending under the river to the west side, where a shaft has been begun to sink to meet it. The shaft is only to the ledge. The end of the drift is 230 feet from the shaft, and is all in rock with occasional seams of ore. The north lense has a good width but is short, not above 70 feet in length. The lower level where they are now stoping is 335 feet below the surface, the dip is slightly to the northwest. To keep up the stopes requires constant sinking, and last year's product of 27,865 tons carried the mine down, as before stated, 100 feet.

The surface arrangements are excellent; the ore pockets and stock piles could not be more conveniently placed with reference to the shaft and for loading into cars. They have a good hoisting plant, engine house, shop, office, and a number of good houses. A number of deep

borings have been made with the diamond drill, mainly on the opposite side of the river, but no ore was found, after passing through quartzite, instead of ore, they came to granite. The same result was met with by the Republic company boring further west. East of, the mine, next to the Republic, a boring was made and some ore was found, and this locality may be further investigated. The mine is in Lot 4, Sec, 7, T. 46, R. 29.

Capt. Mitchell still directs the mining work under the Superintendent, James O. St. Clair. General office Cleveland, Ohio. Mark Hanna, Secretary and Treasurer.

The company now have 10,000 tons in stuck (May 17th,) which they have begun to ship. The present force employed is 100 men. None of the ore has been sold.

The mine has been worked two years, and the annual product has been:

Year.	Tons.	Year.	Tons.
1881.....	7,378	1882.....	27,865
Total gross tons.....		35,243	

### THE COLUMBIA MINE,

Lying north of the Republic on the opposite side of the river, has been idle since the opening of winter, and it is stated as uncertain when work will be resumed, perhaps not at all. The company has met with little to encourage them to prosecute work further at this mine. The ore lenses are small and contracted, and the ore is mainly second-class, hard slate ore. The mine affords very little, if any, strictly first-class ore. It has been very fully described in previous reports.

Mr. C. M. Wicker, Republic, Mich., is still general manager for the company.

The mine has produced as follows:

Years.	Tons.	Years.	Tons.
1873.....	21,271	1878.....	-----
1874.....	34,348	1879.....	-----
1875.....	8,059	1880.....	6,636
1876.....	-----	1881.....	11,158
1877.....	-----	1882.....	12,066
Total gross tons.....		93,535	

### THE ERIE MINE

Is situated about five miles to the northwest in the same range with the Columbia in the N. E. ¼ of the N. W. ¼ of Sec. 28, T. 47, R. 30. During the last season a branch of the M., H. & O. R. R. was extended to the mine, and ore to the amount of 2,730 tons was shipped.

The company continue to work in the same deposit from which this was gotten out, and now have in addition about 5,000 tons in stock ready for shipment. The workings have reached a depth of about 100 feet vertically down, and the ore has been all taken out. The deposit has a length of 50 feet, which, at the northeast end, has a width of about 34 feet of mixed ore and rock. In the southwest end it is equally mixed, but the rock varies in character, as does also the ore, throughout the deposit. In the bottom there is a small shoot of soft, fine slate ore, similar to the best Champion, but the

predominating variety is a specular slate, similar to the Republic ore, but with numerous concretions of birds-eye quartz, that renders the ore second-class. There is not enough of first-class ore in the mine to indicate that the company can establish a grade of that degree. The deposit is small and mixed, and is all worked out from the surface down to the present bottom.

E. H. Wright, Agent, Republic, Mich.

#### THE SPURR MINE.

No doubt but the owners of the Spurr mine would be glad to find a good body of ore in addition to the limited deposit in which they are now working but they fail to take the steps which have generally been found necessary to make such a desire a reality. There are several important mines in the country which could have made no better showing than the Spurr makes if they had made no more of an effort in the way of exploration than is made at the Spurr.

The owners might, one would think, consider with advantage the example of their neighbor, the Michigamme Company, and observe the important success which has attended their efforts in boring with the diamond drill. It is very possible that at the Spurr also, in the foot-wall, or in the hanging-wall, or in both may be inclosed lenses of ore far greater than the meagre one which they are now mining. A few borings with a diamond drill would go far toward determining the matter, and a little judicious exploration for this purpose would certainly be true economy; it is a matter of surprise to every one acquainted with the mine that it is not done. Until something of this kind is done that shall lead to the discovery of more ore than they now have, the mine cannot amount to much. The work is confined to a short pit that has been constantly becoming abridged, being cut off at both ends by rock which on the west side has gradually approached the shaft until now in the bottom it has cut across it so that the bottom of the shaft is in rock, leaving but a small triangular prism of ore to take out to complete the stoping west of the shaft.

East of the shaft in the lower level, they are now drifting in ore under the rock that has heretofore cut off the vein in this direction, and are at present 79 feet east of the point that constituted the limit in the levels above. This fact is a very favorable one for the mine, since otherwise it would be nearly air the limit of its working. The breast of this east drift is still in ore and the vein holds in width, having an average of about 10 feet. If it continues they will have to sink No. 2 shaft, which is further to the east and is down a short distance below the surface. No. 1 shaft being now in rock and altogether west of the ore, it would be hardly desirable to sink that further at present; its depth is about 400 feet. The company have sold 10,000 tons of ore and have 7,500 tons in stock. They can mine about 2,000 tons per month. The force employed is now 40 men. The location of the Spurr mine is a pleasant one, a good deal of surface improvement has been made, there are a number of

good dwellings for miners, and the machinery is also ample for a much larger mine than they now have.

The description of the land owned by the company is the N. ½ of the S. W. ¼ and the S. ½ of the N. W. ¼ of section 24, T. 48, R. 20. The officers are H. C. Pulling, President; W. D. Wisson, Secretary and Treasurer. Office, Detroit, Mich. W. D. Davis, Agent, Spurr Mine.

The product of the mine in gross tons is as follows:

Years.	Tons.	Years.	Tons.
1873.....	31,933	1878.....	2,225
1874.....	41,765	1879.....	1,409
1875.....	23,095	1880.....	-----
1876.....	20,276	1881.....	2,746
1877.....	22,801	1882.....	8,872
Total gross tons.....			155,122

#### MICHIGAMME MINE.—(MAY 12TH, 1883.)

Few mines in Marquette county show greater recent improvement in their prospect for the present and the future than does the Michigamme, and the important developments which have been made illustrate the value of explorations in a hard ore mine, which may be made with a diamond drill when intelligently used. The discoveries of ore which have lately been made in this mine are due to the application of the drill.

About a year ago Capt. Christopher began boring to the north through the foot-wall, in the west end of the sixth level, 324 feet vertically below the collar of No. 4 shaft, and at 120 feet a body of ore was found to which a cross-cut was driven, following a drill hole. In this ore an opening has been made 220 feet in length, with several stopes each way from the drift; measured horizontally, from foot-wall to hanging, the new vein is 27 feet wide, in the center of the opening; the dip is about 62 degrees. The product is of same quality as heretofore found in No. 4 pit—hard specular ore—and Magnetic. In the level above but further to the east, a second drift has been made to this body of ore, and here, too, considerable progress has been made in mining it; the deposit proving to be equal in dimension as found below. The great want felt is a shaft from the surface into the newly-opened deposit, for ventilation and for hoisting—a necessity that it is the intention to meet as speedily as possible. At present the ore is trammed out through the drifts to No. 4 shaft, which is thus greatly overburdened, since the regular work of No. 4 pit, in the old vein, is fully sufficient for the capacity of the shaft. Ventilation is secured to a degree sufficient to render the situation tolerable in the new mine, through a winze from the upper to the lower opening. The diamond drill is now working in the seventh level, in the east end, where the rock had cut out the ore. A series of holes has already been made at this point, extending to the east and to the south, one row of holes reaching out into a horizontal plane and another below at an angle downward of about twenty-five degrees. In all of these borings, after passing through about 26 feet of "green rock," ore has been found varying in extent, as shown by the holes, from 20 to 51 feet. The ore is of the best quality ever found in the mine. The discovery is a very fortunate one,

as the east end was looking very dubious, but now they are assured of having ore in a greater quantity than would have resulted from a continuance east of the old deposit. Several levels above this point east from the bottom of No. 3 shaft, the foot-wall had apparently come in and cut out the ore, but by working south into the hanging-wall, the ore is found in a large body, and they have drifted through and are now sinking a winze in it, and the outlook at this point is very favorable, where but recently the ore appeared to have become exhausted. The plan is to sink No. 3 shaft to the bottom, and to use it in working the east end of No. 4 pit.

No. 1 and No. 2 shafts remain about the same as heretofore; they are both small pits and afford but limited stoping ground, but from each a few thousand tons of ore is annually obtained. In the bottom of No. 1 they are just now mining a red martite ore, into which they have recently come, and the indications are favorable for an enlargement of the deposit.

No. 1 shaft is 500 feet from the lake, and from it to the west end of the mine it is 28,000 feet. The west shafts—Nos. 5, 6, and 7—are 400 feet apart and are idle; the water, however is kept out of No. 5 with the view of working it in connection with the new north mine now reached by the cross-cuts from No. 4. No. 4 shaft is about midway between the extreme east and west ends of the mine, and has for years been the main productive portion of the mine. It is about 530 feet in depth on the lay of the deposit; dipping, average 61 degrees 40 minutes, to the south. The length of the ore deposit in this pit is about 400 feet, and the average width about 10 feet—much wider in some places and narrower in others. Below the level in which they are now mainly stoping, the shaft has been sunk another lift and the side winzes also sunk ready for stoping, when the level above is sufficiently exhausted to require it.

No. 3 shaft is 196 feet east of No. 4, measured on the surface, though the two shafts approached each other in their descent, being only 171 feet apart at the bottom of No. 5—160 feet, vertically down. Attempt has heretofore been made to lower this shaft below its present bottom, but they failed to find the workings beneath, into which it was desired that the shaft should extend, with the drill, owing to the probable fact that the foot wall changes and makes off very flat to the south; they have followed the hanging. If the shaft were opened to the bottom of the mine and in working order it would be of great advantage, since now everything—ore, rock, timber, drills, etc., must be passed through No. 4 shaft, which has only a single skip road, and is far from straight. A good deal of delay and inconvenience naturally results from being thus restricted. A survey has been made to determine the direction that must be given to No. 3 to insure its reaching the point desired, and the work of continuing it will be speedily prosecuted. The ore from the winze now sinking to the east of the shaft is hoisted in a bucket through the shaft.

No. 2 shaft is 575 feet east of No. 3. The intervening ground has not been worked with the exception of a

shaft 80 feet deep, 160 feet west from No. 2. This was started to reach a body of ore that had been discovered with the diamond drill; at present it is expected to reach the ore thus found from No. 2, working west. No. 2 pit is somewhat of a singular, contracted affair, presenting many perplexities: the bottom extends west from the shaft 100 feet, and is still pushing on; further up in the pit it has been opened to a distance of 160 feet west of the shaft. At this point, a short distance west of the shaft, occurs an island of jasper in the vein, connected lower down with the foot-wall, but at the top the ore has been beaten away on all sides of it. Standing on it one sees a chasm all around him. At the bottom, east of the shaft, the length of the ore is about 40 feet. The ore holds good in the bottom but does not increase in length. Further up in this pit, to the east, the ground has all been beaten away, leaving only pillars, for 150 feet to old No. 1 shaft. Into this latter abandoned shaft the waste rock is dumped and it is already pretty well filled up. One hope of No. 2 is to reach a body of ore to the west, that as before stated was penetrated with the diamond drill. The shaft is 225 feet deep, inclining south 61 degrees 30 minutes. No. 1 shaft, formerly called the Barnum, is 278 feet east from No. 2. It has frequently presented features that excited hopes of good results, but has on the whole been a disappointment; the length of the bottom is about 90 feet and the ore occurs mainly to the east of the shaft. The shaft is 220 feet deep on the lay. With the exception of No. 3 the shafts are all provided with skip-roads and are worked from the main engine house. No. 3 has a small separate hoisting plant. All but No. 1 are furnished with air pipes and power drills.

The main engine house is a substantial stone structure, one of the best in the iron region, situated 150 feet west of No. 4 shaft between Nos. 5 and 6. It contains the hoisting machinery, compressor, etc. The latter is the National, capable of operating 27 power drills; 13 are now in use. It also works several pumps and small hoisting engines, used underground. In fact it is just at present overburdened. The drills are Rand No. 3; formerly they used the No. 2, and a few National drills, but they were exchanged for the present drills, the makers allowing \$100 each for the old ones. The company will immediately begin to sink a new shaft between No. 4 and 5 to reach the new deposit north of No. 4. The extent of the sinking will be 254 feet at an angle of 62 degrees and 30 minutes, south from the horizon. The present force is 300 men and there are about 25,000 tons now in stock, the shipping of which has just begun. Mr. J. C. Fowle, the superintendent of the mine, to whose intelligent management the present favorable outlook is largely due, is to be congratulated upon the success of his efforts.

The Michigamme mine has shipped as follows:

Years.	Tons.	Years.	Tons.
1872.....	141	1878.....	58,622
1873.....	28,966	1879.....	56,935
1874.....	45,218	1880.....	52,944
1875.....	44,756	1881.....	57,115
1876.....	70,074	1882.....	43,712
1877.....	28,238		
Total gross tons.....			486,721

The officers are Wm. H. Barnum, President, Lyme Rock, Conn.; James Rood, Secretary and Treasurer, Chicago, Ill.; I. C. Fowle, Superintendent, and J. P. Christopher, Mining Captain, Michigamme, Mich.

#### THE CHAMPION MINE (MAY 14TH, 1883)

Has great advantages, and in every particular it is one of the best iron mines in the State. It is one of the largest producers, and its ores are among the richest, hard specular slate and magnetic that are found in the region; they command the highest market price, and are among the most eagerly sought for. The extent and situation of the ore deposits, the firmness and stability of the walls, the excellence of the management, and the skillful direction of the mining work, have reduced the production of the ore to the minimum of cost, and to the maximum of safety.

The gain in the length of the ore deposits in the last year are precisely what was anticipated would occur, at least the favorable result is a matter of no surprise. It is naturally a gratification to have so fortunate a verification of what had been previously determined should occur; a contrary result would have been a disappointment.

It will be remembered by those who are familiar with the mine that the ore deposits are in two distinct lenses, lying east and west, parallel with each other and separated by about seventy feet of rock, and known as the north and the south deposits. The shafts go down in the north lense, and the south one is reached by cross cuts through which the ore is trammed out to the shafts. These ore deposits are limited to the east by the rock, which has extended downward from the surface with an inclination to the west, but they underlay to the west indefinitely; so that with each successive level there is a great gain in length. In the last year the 7th level has been stoped west to the end, and the gain in length beyond the length of the 6th level is 112 feet. The length of the ore in this level in the north deposit is 570 feet, and its length in the south deposit is 500 feet.

The 8th level has been extended west beyond No. 4 shaft 50 feet. Thus far No. 4 shaft has not been sunk, they have stoped west from No. 3, leaving only pillars, and put in the skip road for No. 4 through the openings. Hereafter No. 4 will be sunk, and will have side pillars, and will be the main shaft of the mine, taking the bulk of the ore. No. 3 shaft is down to the 10th level and in the rock that finally crosses it, and it will not be sunk any further.

In the 9th level they have opened 200 feet in length, 60 feet to the east and 140 feet west of No. 3 shaft. In the south deposit in this level the openings extend 44 feet west and 90 feet east from the shaft, and in the 8th level in the south deposit they have stoped to within 60 feet of the east end, which is all that is left in this level in this deposit.

In the 9th level, in the south deposit, a winze has been sunk to the 10th level, and a cross cut made north to the

shaft. This gives a very large amount of ground opened for stoping—two deposits, each 500 feet in length and upwards, and 16 feet in width, with firm walls and separated by a partition of 70 feet of self-sustaining rock.

No. 4 will soon take the bulk of the mine, and after many years of continuous work, it will in like manner be transferred to No. 5. Realizing this fact, No. 5 shaft has been pushed down from year to year, while, otherwise than for this ultimate use, there has been but little inducement for so doing; much of the way there has not been ore enough found to any more than pay the cost of obtaining it. What ore was found in the north deposit was entirely exhausted in the 4th level, so that thence downward the only product came out from the south lense. Very recently, however, there is an important change for the better. The shaft is sunk to the 7th level, and in ore, and in the south lense a winze has also been sunk from the 6th to the 7th, and a cross cut made from the bottom of it to the shaft; in making this cross cut they found the ore to be 20 feet wide. Thus they have a good body of ore in the shaft, which has been, heretofore, wholly in rock.

In the 6th level, in the south deposit, at No. 5 shaft, they have opened 90 feet in length. The ore has a width of 12 feet. Also, as will be seen, they have at this shaft a large amount of ground opened for stoping—the entire body from the 6th to the 7th level in both lenses.

It is the intention, if the ore market does not improve, to stope only in the newly opened ground in this shaft and at No. 3, leaving the ore in the upper levels for the present. To get out a large product generally requires that as many stopes as possible may be worked, and for this reason, if the ore does not sell, they will avoid exhausting any of their stopes, reserving them for a time when there shall be a demand for ore.

No. 6 has not been worked for a long time, but, ultimately, it will be again started and pushed, on the same principle that No. 5 has been.

No. 7 has a body of ore underlying it, as shown by the drill, which passed through 14 feet of it. This ore is 80 feet below the bottom of the pit—220 feet below the surface. No attempt has been made to sink for it yet.

No. 3, which is the deepest shaft, is 600 feet below the surface, vertically down. The mine is increasing in magnitude, but as before stated, no more so than was anticipated, since the pitch of the lenses to the west has been pretty well determined with the diamond drill, and the developments from year to year are likely to be such as are mainly expected to occur.

The new compressor building has been completed, and like the main engine and boiler house, is of stone, and of the most durable character. The new compressor is a duplex Delameter; cylinders, each 20 inches by 40 inches, and works perfectly. To secure the requisite additional steam, two new boilers have been added to the four previously in use.

The total force employed is 400 men, and they are mining 6,000 tons per month. The stock piles contain about 50,000 tons of ore.

Mr. Alfred Kidder, who for many years has been agent of the company, unites with his thorough business qualifications an interest in mining work and an entire familiarity with the Champion mine, of which he is justly proud.

Capt. Jim. Pascoe, the superintendent, is again on deck, greatly restored by his winter's sojourn in the south. He is now able to take to the ladders and go through the whole mine, a task that exacts no small degree of endurance.

The Champion mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1868.....	6,225	1876.....	66,002
1869.....	21,535	1877.....	70,883
1870.....	73,161	1878.....	73,764
1871.....	67,588	1879.....	93,203
1872.....	68,404	1881.....	112,410
1873.....	72,782	1881.....	144,025
1874.....	47,097	1882.....	157,516
1875.....	56,877		
Total number of gross tons.....		1,131,202	

#### THE EAST CHAMPION (MAY 13TH, 1883)

Is still working in a small way. There have been no new discoveries of importance, and the mine has no large deposits of ore, so far as known. They are working in No. 2 and No. 3 shafts, in the latter the work has only been in the way of exploration. The shaft is 300 feet deep, and in the bottom of the pit they have bored with a diamond drill—horizontally into the foot wall—200 feet. A short distance from the pit they intersected a deposit of ore, to which they are preparing to cross-cut, but it is not known whether it is merely a small pocket or one of some size. Small lenses or bunches of ore have not been of unfrequent occurrence, but they are soon worked out.

They have also drilled to the south across the formation under this pit, 100 feet below the bottom, and found the ore, but not in great magnitude. Another hole has been started to cut the formation further to the east and higher, up. The object is to catch the ore that was found in No. 1 pit, if possible.

No. 2 pit has improved somewhat; it is 150 deep, and the lense is about 150 in length, with a width at the west end of 8 feet, and at the east end of about 5 feet; it is increasing in length.

No. 3 pit has in the bottom about 6 feet of width of ore which added to the lense they are cross-cutting to will make the pit of some value, possibly of considerable value.

There are about 2,000 tons of ore in stock, and about 20 men are now employed at the mine.

A new Ingersoll compressor has been added during the last year, and three power drills are worked, a fourth one will soon be added to run the cross-cut in No. 3. The

compressor has necessitated the addition of another boiler which is also in use.

The president of the company is F. B. Spear, Marquette; C. T. Hampton Agent; Wm. Edwards, Mining Captain.

The mine joins the Champion on the east, and has yielded as follows:

Years.	Tons.	Years.	Tons.
1873.....	12,701	1878.....	5,401
1874.....	4,880	1879.....	4,029
1875.....	3,348	1880.....	10,221
1876.....	7,715	1881.....	3,408
1877.....	14,496	1882.....	3,713
Total product.....			69,912

The mine is the S. E. ¼ of the S. W. ¼, of section 32, T. 48, R. 29, being about a half of a mile from the railroad station at Champion.

#### THE TAYLOR MINE

Has closed down after working out all the ore in the mine. As it now stands the mine is exhausted, but it is very probable that further exploration may develop other deposits that are not known. The indications are favorable for it. They have 5,000 tons of ore ready for shipment from the mine. The location is the N. E. ¼ of the N. W. ¼ of Sec. 9, T. 49, R. 33, being seven miles west from the village of L'Anse. The shipments have been as follows

Years.	Tons.	Year.	Tons.
1880.....	1,110	1882.....	15,031
1881.....	9,488		
Total.....			25,629

#### THE SWANZY MINE,

Being, as will be remembered, an offshoot from the Cheshire mine, has been worked for the past two years with good results. The old Cheshire workings have been abandoned, and the only mining now done is at the Swanzy. The latter is in the S. W. ¼ N. E. ¼ of Sec. 18, T. 45, R. 25. They have worked out an open pit to a depth of 60 feet, and in the bottom have sunk a shaft 60 feet below it in the ore, which in the bottom of the pit has a width of 30 feet. The shaft is sunk for a stope, and to the depth to which it extends the ore will be mined out, leaving an open pit. The ore at the bottom of the shaft has been shown to be, by cross cuts, of an equal width as when worked out. The indications are all favorable for the continuance of the prosperity which the mine has thus far held. The mine is reached by a branch railroad, connecting at Cheshire Junction with the Peninsula division of the C. & N. W.

The officers are J. J. Pierce, President, J. F. Stevens, Agent; A. P. Wood, Superintendent.

The shipments of ore from the mine, including that also obtained from the Cheshire, which is held by the same parties and lies adjacent:

Years.	Tons.	Years.	Tons.
1872.....	13,415	1878.....	16,924
1873.....	9,329	1879.....	17,831
1874.....	-----	1880.....	13,201
1875.....	188	1881.....	5,674
1876.....	225	1882.....	-----
1877.....	8,423		
Total product.....			85,250

Swanzy product:

Year.	Tons.	Year.	Tons.
1881.....	9,337	1882.....	31,498
Total gross tons.....			40,835

## THE MENOMINEE RANGE MINES.

### THE VULCAN MINES (JUNE 1ST)

Have undergone some improvements in the past year. No. 1 shaft, at the East Vulcan, has been sunk an additional distance of 120 feet, and lined up from the surface to the bottom, 150 feet, and provided with a cage, shaft-house, etc. The expenses incurred at this mine have been greatly in excess of the value of the ore obtained, but the mine has been put into good shape for future working, and should the company be fortunate enough to find sufficient ore, the mine is now in condition to be worked to advantage.

In the bottom of No. 1 shaft they have a lens of ore about 50 feet in length, and have run an exploration drift to the east, 360 feet, from the extremity of which they have driven to the north and south without any important results. They have also driven to the west of the shaft upwards of 200 feet in rock, and cross-cutted from the end to the south, coming into ore. They are obtaining, altogether, from this shaft, about 600 tons of ore per month. The officers at the mine regard the indications as favorable, and think that the new deposit which they have struck at the west and south will prove a valuable one, and in the end the East Vulcan will return to the company all that it has cost them.

At the West Vulcan the trestle work, 370 feet in length, mentioned in the last report as among the plans for the future, has been built, so that now all the ore from the several shafts is run out on this elevated track over the ore dock and to the pocket at the extremity over the railroad; these pockets have a capacity of about 300 tons. The long drift from No. 2 to No. 3 shaft has been completed, 450 feet in length, so that now one can go through the whole mine without ascending to the surface after going down one of the shafts to the level of the drift. A stone house has been built, and in it placed a new pumping engine, which takes the water from the north mine. The water is drawn from the bottom to the level of the cross-cut by a 12-inch plunger pump and thence to the surface with a 10-inch plunger, and what the latter pump does not take goes over and runs through the

cross-cut to No. 2 shaft where it is taken to the surface, in addition to the water made in the south mine, with a 10-inch plunger pump.

It will be remembered that the mine is in two distinct deposits extending east and west in the hill side sloping to the south, the one lying 450 feet north of the other. In the north mine are four shafts and in the south one two. The greater portion of the product is obtained in this south deposit in No. 1 shaft; the output for May was 5,000, of which 4,000 were from No. 1. It was formerly an immense deposit, 90 feet in width, but has now narrowed downhill about 18 feet. This narrowing was occasioned by the foot-wall setting off to the south into the ore; now, however, the walls are going straight down, and the ore is widening in direction of No. 2. No. 1 shaft is the deposit in the mine; it has been sunk three lifts in the past year, two of them 65 feet each and one 75 feet. They are now working mainly between the third and fourth levels in the direction of No. 2 shaft. The ore is from 16 feet to 30 feet wide. They are working out the ground in rooms, leaving pillars of ore, but between the fourth and fifth levels it is the intention to take out all the ore and support the ground with timbers, on the system that has been adopted in the Vulcan mines, having been inaugurated at the East Vulcan.

It is a very simple and complete arrangement, and is claimed to be the true Nevada system. At the bottom it commences with sills, into which the lower ends of the posts are dovetailed; the posts are 18 inches square and 7 feet in length. In the center of the top end is a tenon 6 inches square. The posts are set on the sills along the pillars and walls, and in rows between the pillars, at equal distances apart, caps are laid on the tops from post to post each way at right angles, the ends of the caps being separated from each other by the width of the tenon; these caps thus make a floor over the whole room, by being covered with logging, on which to stand to stoop out the back to a sufficient light for another similar set of timbers. The next set of posts have a tenon on each end, and are set directly over the first, the lower tenon fitting into the hole between the ends of the caps, and on the upper ends caps are laid as before, and a floor made for another rise. It will thus be seen that they are stayed equally well vertically and horizontally, and in all directions the timbers are in line. The length of the ore west of No. 1 to No. 2 is 160 feet. They have drifted east 70 feet, but find but little ore. The shaft in the 5th level is south of the ore, which is reached by a cross cut 40 feet in length. The shaft is down to the 6th level.

In No. 2 shaft they are mining in the 3d level near the shaft, where the ore has a width of 40 feet and a run of about 100 feet, not wholly free of rock, however. It will all be taken out coming up from below at the 6th level and the space timbered. The cross cut from the shaft to the ore at No. 2 in the 3d level is 130 feet long. The winze at the shaft is down to within 80 feet of being at the same depth as No. 1 shaft. They have drifted west at the bottom from No. 1 shaft beyond No. 2, and know

that the ore west of No. 2 continues down so that they will have a body of ground to stope out from the 3d level to the 6th 100 feet in length and of a width of 10 feet and upwards that will give them a large amount of ore. This stretch of ore in No. 1 and 2 is the best part of the mines. The north mine is higher up on the hill, so that the 5th level in it corresponds to the 3d in the south deposit.

In No. 3 shaft in the 4th level they are mining a little ore in a small vein three feet wide, and are driving a tunnel in the 5th level east of the shaft into the foot wall—are in 30 feet. The shaft is now in rock.

At No. 4 shaft they are sinking to the 7th level, and are 400 feet below the collar of the shaft. They have sunk two lifts the past year. In the 6th level, in this shaft, they have drifted east 100 feet. The first 50 feet was in ore, but, have since been in rock. The drift will be continued with the view to strike some ore 40 feet further on, that was passed through by the diamond drill, which showed 15 feet of ore. In sinking the shaft they have had 20 feet of ore, but now, at the bottom, there is considerable rock, they will cross cut to prove it. Above the 6th level the ore is worked out, and they are only stopping at the east end of the drift. Where the deposit has been worked in this shaft, it proved pockety, varying from 3 feet 40 feet in width. They think that they will find a good body of ore east of No. 4, basing the hope on the boring previously alluded to.

No. 5 shaft fell in from the top, but the lower levels were not disturbed. By stripping the top they have uncovered a large pillar of ore that had been left, and which is not now needed for a support, and is thus being mined out. It is fine ore, and will afford about 5,000 tons.

No. 6 shaft is the most westerly one. They are sinking it now below the 3d level, to get at a small vein of ore that is at the bottom. The ore preserves its excellent quality, a recent analysis of the average of the stock pile gave, metallic iron 59.5%; phosphorus .05%. But at the present market price of ore, there can hardly be much profit in mining it at the Vulcan.

The force employed at the west Vulcan is 350 men, 300 of whom are Austro-Italians, and the officers spoke highly of them as laborers, commending them as the most peaceable men they have ever employed, and showing an aptitude for mining work equal to that evinced by men of other nationalities. The Vulcan mines are among those belonging the Perm Iron Mining Company. The officers are Powell Stackhouse, President; Wm. S. Robinson, Secretary and Treasurer; Wm. R. Babcock, General Manager.

The work at the East Vulcan is in charge of Capt. John U. Curnow, and at the West Vulcan Capt. E. S. Roberts continues to direct the operations. Mr. A. C. Davis, the former agent, severed his connection with the company in May last. The Vulcan mines are the most easterly of the Monominee range mines that are now worked. The mines have yielded as follows:

Years.	Tons.	Years.	Tons.
1877.....	4,593	1880.....	72,405
1878.....	31,239	1881.....	85,671
1879.....	57,350	1882.....	94,042
Total gross tons.....			353,190

### THE CURRY MINE

Lies just west from the West Vulcan a short distance. There is very little to record regarding it in addition to what was said in last year's report. They are working in the same lense of ore now as then, only that they have got so far west of the shaft and have sunk for another stope, that it was decided to sink another shaft to work the deposit. And they are now engaged in this work, sinking and rising at the same time. They have sunk and drifted in the ore to a sufficient extent to warrant the belief that they will at least get out ore enough to justify the sinking of the new shaft.

It is the property of the Curry Iron Company, the stock of which is now mainly held by J. H. Outhwaite, Esq., of Cleveland, Ohio. The mine was opened in 1879, and has since yielded as follows:

Years.	Tons.	Years.	Tons.
1879.....	13,010	1881.....	17,504
1880.....	21,741	1882.....	13,374
Total gross tons.....			65,659

The Curry is in the N. E. ¼, N. E. ¼, Sec. 9, T. 34, R. 29.

### THE BRIAR HILL MINE

Adjoins the Curry on the west, being situated in the southeast quarter of the northwest quarter of section 9, T. 34, R. 29, and like the Curry it is in a single lense of ore pitching to the west. The mine has a single shaft, which is about 270 feet deep, and the ore has been followed down the foot wall that cuts under the lense to the west about 150 feet from the shaft. At the extremity they have a breast of ore 18 feet wide, 30 feet high, and they have drifted in west 30 feet. At the end they are sinking a winze for another stope and so far, in this winze, have not struck the rock which they entertained some apprehensions of doing. In these mines they can only be sure of what they see. These pockets of blue ore have shown a great liability to exhaustion, and it is a matter of uncertainty how soon the bottom may be reached. The Briar Hill Company are endeavoring to prove the ground a little further to the west and deeper, to find if this deposit holds out. They are boring with the diamond drill. If it is found that the ore holds out, it will be necessary to sink a shaft, as they have already about reached the limit at which they can work on account of the air.

It is the property of the Briar Hill Company, of Youngstown, Ohio, the same parties who own the mines at Crystal Falls, and at Iron River, H. C. Davidson, Supt. Product for 1882, 10,594 gross tons.

### THE PERKINS MINE

Is a short distance west from the Briar Hill, and it has been a very productive and profitable mine; but as has been foreseen for a year or two past it is approaching the end of its career. This termination has been accelerated recently, since it is found that the limestone in the foot wall and the rock in the hanging, have come together in the bottom and to all appearances have cut out the ore entirely, so that all there is left to stope is what lies above the bottom level. While the formation dips to the south the ore deposits pitch down to the west, so that the ore in the east shafts—3, 4, and 5, has already been exhausted and they are only working No. 1 and No. 2 shafts adjacent to the Norway. Between these two shafts they have a body of ore standing, 100 feet long, 40 feet high and of an average width of 25 feet, and this deposit, with the same lateral dimensions, reaches 40 feet; east of No. 2 shaft, west from No. 1, to the Norway line, there is a run of ore 75 feet long and 30 feet wide, and 30 or 40 feet high. The bottoms of both shafts are in rock and the drifts, which extend from them have failed to reach any ore. At the east end of the mine they bored with a drill 350 feet, finding a succession of sandstone, jasper, limestone, etc., but no ore. A similar trial will be made in the west end of the mine.

On the 1st of May the company had 41,000 tons of ore at the mine in stock, and they are adding to it at the rate of 5,000 tons per month; are working 120 men; employed last year 200. The ore is used by the Cleveland Boiling Mill Co., who control the mine. There is some ore left in the pillars, which will be attacked when the ore in the bottom is exhausted.

Capt. John Perkins, now as heretofore, directs the operations at the mine. The mine began work in 1879, and has since afforded annually ore as follows, to wit:

Years.	Tons.	Years.	Tons.
1879.....	13,492	1881.....	60,706
1880.....	49,433	1882.....	73,648
Total gross tons,.....			197,279

The Perkins comprises the S. W. ¼ S. W. ¼ Sec. 4, T. 39 R. 29, and corners to the west with the Norway and the Stephenson mine and is thus within the limits of the village of Norway.

### THE STEPHENSON MINE,

As is known, was worked down to the Perkins line. Some explorations have been conducted during the past year to the north of the limestone formation, which resulted in finding some ore but not in sufficient quantity to make a mine. It would seem to be well for the company to explore still further, as the indications are favorable for ore north of the limestone. The mine yielded 34,995 gross tons. All the ore was so completely

removed that the mine has mainly fallen in, occasioning a sink from the surface, making a large hole and extending into the Perkins also. Cornering on these two mines and lying west from them is the

### NORWAY MINE,

Which was formerly the largest producing mine on the "range," and with the exception of the Chapin still continues to be such. The Norway has been a valuable mine but it has probably passed the meridian of its prosperity, and possibly is already on the decline. At any rate the limestone in the foot-wall in the bottom in the east end of the mine next to the Perkins has assumed a nearly horizontal direction, and seems likely to cut out the ore as it has done in the Perkins mine. They have had very large pockets of ore in the Norway, as is shown now by the rooms which have been made by working it out, that have been cut out by jumps in the foot-wall. The foot-wall has suddenly flattened out in these places to the south, cutting out the ore entirely. Still the Norway is a good mine yet, and has a large amount of ore in sight, and will produce this year 125,000 tons. The mine was written up in considerable detail last year and also has been for the previous reports, and there is nothing found of interest beyond what has already been said heretofore.

There has been very little change during the past year, except as to the threatening position which it is found the limestone in the foot-wall assumes in the east end of the mine. In other respects and at all other parts the mine is looking as favorably as it was at this season one year ago. There are good stopes of ore in all the shafts, of which there are seven that are now operated, there being ten in all, numbered from the east to the west. The largest deposit of ore is found in No. 5, but it is a phosphorus ore, too high in phosphorus for Bessemer pig. The company, however, use it at their own works in Pennsylvania.

At the time of my visit to the mine, June 15, a serious fall of ground occurred in the east end of the mine, extending from the 3d level to the surface, where it made a depression of 50 feet deep and of an equal diameter. It was thought, however, that as it did not reach to the lower levels it would not greatly interfere with the mine. The Norway mine is very fortunate in the matter of its walls; they are in a remarkable degree self supporting. No mine on the "range," and indeed, very few in Marquette county, have such large chambers worked out and left without artificial support to the walls. There has thus been but very little timbering required in the mine, notwithstanding the immense deposits of ore that have been worked out, and there has also been but comparatively little ore left for pillars. The great stretches of roof stand without other support than the natural firmness and tenacity of the rock which composes it.

The Norway is the property of the Perm Iron Mining Company, until one year ago owned by the Menominee

Mining Company. It is situated in the N. E. ¼, S. E. ¼ of Sec. 5, T. 39, R. 29. As formerly, the mining work is in charge of Capt. John Oliver, assisted by Capt. James Hoskins; W. R. Babcock, General Manager; Wm. S. Robinson, Secretary and Treasurer, Johnstown, Pa.

The mine was opened in 1877, and has since yielded as follows:

Years.	Tons.	Years.	Tons.
1878.....	7,533	1881.....	137,558
1879.....	73,590	1882.....	165,084
1880.....	198,165		
Total gross tons.....		581,930	

The force now employed is about 500 men.

### THE CYCLOPS

Mine adjoins the Norway on the west, and belongs to the same company. The mine has improved greatly in the last year, and from a mine that had the appearance of being exhausted, it has become a large producer of the finest of ore, and has an amount in sight that insures its existence for the ensuing year at least. The deposit that had just been discovered in the Curren pit, as described in the last report, has proved to be all that could be reasonably hoped for. They mined from it last year 18,287 tons, and now have a breast of ore above the bottom of the open pit, of 80 feet wide and 25 feet high, and into which they have drifted some distance, finding it to hold. It is calculated to yield a product the present year of 25,000 tons. The chief expense in obtaining it, is in stripping the heavy body of sandstone which overlies it. Capt. John Oliver, of the Norway, superintends also the Cyclops. The mine has yielded, since it was first opened, annually as follows:

Years.	Tons.	Years.	Tons.
1878.....	6,275	1881.....	12,214
1879.....	46,472	1882.....	18,287
1880.....	14,368		
Total gross tons.....		97,616	

### THE QUINNESEC MINE

Is also one of the mines purchased of the Menominee Mining Co., and now owned by the Penn Iron Mining Co. It is found within the beautiful little village of Quinnesec, and has been a valuable property. Unfortunately, however, the end of its career is, apparently, soon to be reached. There does not seem to be any more ore below the present bottom of the mine, at least none has been found, so that as it now stands when the present stopes are exhausted, they will have come to the end of the rope and the mine will be finished. The mine was very fully described in the last report and there is nothing to add.

The mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1878.....	26,467	1881.....	43,606
1879.....	42,127	1882.....	44,240
1880.....	52,357		
Total gross tons.....		208,797	

The officers are: W. R. Babcock, General Manager, Powell Stackhouse, President, W. S. Robinson,

Secretary and Treasurer, Hon. Elisha Morcom, Superintendent.

### THE INDIANA MINE

Is situated about three miles from Quinnesec. The mine affords a very fine grade of soft, blue ore, and the favorable developments which have been made during the year indicate that the owners may be fortunate enough to possess a valuable mine. The description is the N. E. ¼ Sec. 27, T. 40, R. 30 W. A branch of the C. & N. W. R. R. has been built to the mine, and over it shipments were made in 1882 to the amount of 4,280 tons.

The mine is now working under the direction of Mr. John Traverse, of the firm of Kruse & Traverse, Chicago.

The explorations which were going forward at this time last year at

### THE ILLINOIS MINE,

Which adjoins the Indiana, resulted in nothing of value; no ore was found, nor has any good ore yet been discovered on the property. There is nothing doing at present on this location.

### THE CHAPIN MINE (JUNE 16TH)

Affords the largest product of any mine on the "range," in fact it is perhaps the largest deposit of ore that is known in the State. From No. 10 shaft, the west end of the mine, to No. 8, a distance of 420 feet, the ore will average 90 feet in width; the maximum width is 128 feet. Thence east to No. 7 shaft its average width is 70 feet, and from this point on the width of the ore runs from 50 feet to 630 feet. It is a uniform soft, blue, specular ore, yielding about 64% in metallic iron, and low enough in phosphorus to be used for Bessemer pig iron. The entire season's out-put has been contracted.

The mine is wholly underground and reached from the surface by ten shafts, which are numbered from the east to the west. No. 1 shaft is only to the first level, and is of no value. No. 2 is a new shaft which was begun about a year ago but is now down to the third level. It is a mixed deposit of ore and rock, and will not probably reach settled ground until another level is attained. No. 3 is also to the third level, as far as it will be sunk, as it inclines toward No. 2 and the bottom is only 150 feet from it. No. 4 is only used as a timber shaft. All the other shafts are to the fifth level, which is the bottom of the mine, and they are rapidly being connected. The bottom level is graded down to the east one half foot to the hundred. The respective depths of the shafts below the collar of each are, No. 10, 371.16 feet, No. 7, 383.47 feet, No. 6, 388.7 feet, No. 5, 391 feet. The stoping now doing is all between the third and fourth levels, rising up from the fourth, in the rooms into which the ground is blocked out. Of these rooms there are 40 in number, each 20 feet wide and reaching from the main drift along the foot-wall across the deposit to the hanging. They are

separated by pillars of ore 18 feet wide. These pillars are covered with lagging as fast as the rooms are made. In starting the rooms, as soon as the first under-cut is made to the bight for the first bent, sills are laid on the bottom eight feet apart across the room from pillar to pillar, on the ends of these are laid the stringers, which are pressed against the lagging of the pillars and held there by timbers that are laid between them on top of the sills on which the stringers themselves rest. The posts are set along the pillars over the ends of the sills and the lower ends dovetailed into the stringers; the upper ends are tenoned to receive the cap, which is morticed to correspond. Under the middle of each cap a post is set. Lagging placed over these caps makes a floor from which to take out the back of the room for another set of timbers identical with those below and set directly above them, and thus they continue to ascend in the room taking out the ore in successive stages until the bottom of the next level above is reached.

An important change has been made recently in handling the ore underground. Formerly it was allowed to fall on the bottom of the level, where it was shoveled into the tram cars. Recently, however, this has been changed, so that now the ore drops upon the floor over the bottom, and along one side against one of the pillars shutes are made from which the ore is drawn out into the cars. These shutes are along the main drift and in the rooms along one side. An ingenious arrangement for turning the cars from the main track into the rooms is made by having one short piece of loose rail—that is fastened at one end and moveable at the other. No frogs are necessary. There is a good deal of sameness in the mine; the working level is made up of a succession of rooms, the one precisely like the others. The lower level has not been touched, beyond sinking the shafts and driving the connecting tunnels. It is 80 feet deep at No. 10, and increases to the east, becoming 100 feet at No. 5, so that there is all this immense body of ore to be taken, while the 4th level still has enough ore for the year's product. No. 7 shaft has a double skip hoist, all the rest are single skip shafts. The daily product is 1,000 to 1,200 tons.

They had a "cave" in the mine last fall, occasioned by the foot wall sliding, but no serious damage was done.

The ore is run out on long elevated tramways extending from the shafts to the ore docks. These tramways are worked automatically as at the copper mines, and they extend from Nos. 5, 6, 7, 9, and 10 shafts; No. 5 tramway is 800 feet long and takes also the ore from No. 3. They terminate at the railroad in ore pockets, which take all the ore in the shipping season. Some of the ore docks are on a level with the railroad, and to load the cars from these the ore has to be run up an incline of a height equal to the height of the car. To do this they operate a small hoisting plant, set on the dock, and by means of it the loaded tram cars are run up the incline. The timbers are prepared at the company's mill down by the railroad, and are drawn up to the mine on the long incline, on cars attached to a wire rope.

During the past year a fine large pumping engine and boiler house has been built at the upper end of the mine; the walls are of red sandstone and it has a substantial look. The new pumping engine is a duplex with cylinders 24 inches by 48 inches, with balance wheel 20 feet in diameter. It works a 12-inch suction pump that takes the water from 1, 2, 3, and 5 shafts and probably will take all the water in the mine when another level is opened.

The shaft in the swamp next to the Ludington was abandoned; they found too much water and quick sand to get it down. No doubt but the ore extends through this ground that has not been opened.

The mine has shipped as follows:

Years.	Tons.	Years.	Tons.
1880.....	34,556	1882.....	247,505
1881.....	134,717		
Total number of gross tons.....			416,878

It is probable that the present year the mine will send out more ore than any other mine will ship, in the State. The mine is worked on a lease by the Menominee Mining Company.

On the 1st of May last Mr. C. H. Cady, formerly an officer at the Cleveland and more recently agent of the Detroit Mining Co., assumed the agency of the Chapin. Capt. C. B. Rundle remains Superintendent, W. M. Oliver, Mining Captain, Per. Larsson, Mining Engineer.

The water-works which, as stated in the last report, the company contemplated constructing at the upper Quinnesec falls, on the Menominee river have been building during the past year, and probably by another season will be in readiness to go into operation. The purpose is to furnish all the power for this and other mines in this vicinity, that shall be required for pumping-hoisting, and working power drills, with compressed air. The water power will be used to compress the air, and it will be conveyed to the mines in pipes as is now done at the Republic.

#### THE HEWITT MINE,

Which was opened in the Chapin vein on the south side of the latter and worked down against the Chapin line and thus exhausted, found a new lense of ore by cross cut from the old mine, 350 feet south.

During the last year the company has sunk a shaft in the south deposit, 180 feet deep. In the bottom they have drifted east 140 feet and 50 feet to the west from the shaft. The drift is partly in ore and partly in rock, a mixed deposit. Eight hundred feet to the east is another shaft which is sinking, and is down 130 feet, and in this some ore is found. From the two about 30 tons per day are obtained.

The company has a diamond drill at work away to the west near the railroad, and here they bored through 27 feet of ore. The Iron Mountain Mining Company's property joins this on the west, and as the boring is near

the line the owners of the latter are considerably elated over the discovery.

The Hewitt mine has yielded as follows:

Year.	Tons.	Year.	Tons.
1881.....	4,352	1882.....	9,667
Total gross tons.....			14,019

H. Tucker, Esq., Superintendent; W. P. Bice, Mining Captain.

The ore is of the same quality as the Chapin.

### THE LUDINGTON MINE

Joins the Chapin mine on the west, being situated on the rising ground on the opposite side of the valley which separates them, and, while it does not rival its neighbor in magnitude, it is still a mine of considerable proportions. The mine is in the western continuation of the same ore deposit, and the ore is the same. Although the mine has been worked but a year, the promise given by the early openings have been borne out in the, subsequent developments. The trend of the ore is east and west, and the dip is to the north, at a very steep angle, in fact in the open pit it apparently goes vertically down, but in the underground workings it is said to underlay slightly to the west, as it naturally would do. The mine is about 800 feet long, and has three shafts, two of which only are worked.

No 1, the western shaft, is in a mixed, narrow deposit of ore, and is not pushed. Between the other two is an open pit, worked down to a depth of 80 feet, and in length 175 feet. In this pit they are mining in several stopes, hoisting with derricks and buckets.

The east shaft is down to a depth of 240 feet, to the 3d level, and on its way to the 4th. They have cross cutted the ore in the 3d level and find it to be 90 feet wide. North of the open pit they are sinking a vertical shaft, which ultimately will be continued down to the ore, but for the present will go only to the 3d level, when they will drift south to the ore, to connect with the workings under the open pit. This shaft is all in rock. No. 2 shaft is down to the 2d level. There is a bar of jasper extending longitudinally through the ore, separating the lense. The underground chambers are timbered after the Nevada system. They are mining 400 tons per day, and the gross product has all been contracted. The mine is changing so rapidly that it is scarcely worth while to enter into a detailed description of the underground workings. It suffices that they have ore in sight to afford a product the present season of from 75,000 to 100,000 tons, and there is every indication of its continuing, affording a first class mine, producing first class ore, for which there is sure to be always a market. A branch of the C. & N. W. R. R. comes to the mine in convenient shape for shipping, and the company has at the mine the usual facilities for handling, etc., with a reasonable degree of ease and economy. Between the two mines, the Chapin and Ludington, and a little to the south, lies the pleasant and thriving village of Iron Mountain. Mr.

Stockbridge, the agent of the Ludington, has built, on the hillside overlooking the town, an elegant residence, which, although pleasantly surrounded by foliage, is plainly visible from the village. The present mine was opened one year ago, and, as stated in the last report, the old mine of the company was abandoned.

The company began shipment in 1880, and has sent off as follows:

Years.	Tons.	Years.	Tons.
1880.....	8,876	1882.....	52,519
1881.....	3,365		
Total gross tons.....			64,760

Mr. Geo. E. Stockbridge gives his personal attention to the management of the mine, and it was through his presistent effort that the discovery of the ore was made. William Bice remains mining captain.

### THE KEEL RIDGE MINE

Was the scene of a terrible tragedy, in the month of April last, whereby eight men lost their lives, and their bodies still lie buried in the mine.

It was well known that the mine was exhausted, and the only mining work recently done in it has been the taking out of the pillars, etc., preparatory to abandoning the mine. It began to be noticed that the ground was settling a cracking, and giving warning of coming down, and the superintendent gave orders to do no more mining or hoisting of ore, but to take out the pumps and machinery and leave it to fill up. This work of removal of the property had been accomplished, and the men were all on the surface. A number of them standing near the shaft when they felt the ground giving way, and thinking that the shaft was about to collapse ran from it, and were standing over the mine in a place of supposed safety; only one of the men. Thompson, thinking possibly the fall might run to the surface, ran from the spot where they were standing and barely escaped going down with the rest. They were buried 200 feet below the surface.

It was not expected that when the fall should occur it would extend to the surface. It was supposed that the arch of rock standing above the bottom levels would hold up the surface, and the fall would only be below this. But the foot-wall had been cut away under, and it is probable that the pressure caused the sliding of the rock on the foot wall, when of course the arch broke away and let in the whole mine from the surface. An attempt was made to rescue the bodies of the men, but it was found to be impossible. It was only by chance that eight more men did not lose their lives, and the work was abandoned. The buildings, machinery, etc., will be removed from the mine.

The company is now exploring adjacent to the Chapin and Ludington, preparing to sink a shaft, with a diamond drill. They bored here last year 530 feet deep, and lost the drill. The purpose was to find the Ludington deposit and sink to it.

The Keel Ridge mine has yielded as follows:

Years.	Tons.	Years.	Tons.
1880.....	11,445	1882.....	23,171
1881.....	19,011		
Total gross tons.....			53,647

Mr. J. T. Jones superintends the work now as formerly.

The company is known as the Emmet Mining Company.

### THE FELCH MOUNTAIN RANGE (JUNE, 1883)

Has a length of perhaps 18 miles, extending from the east branch of the Sturgeon river in township 42 N., R. 27 W., to the Menominee river in township 42 N., R. 31 W. But in all this distance, while the occurrence of ore has been frequently observed and at several points a good deal of money has been expended in exploring, it is very doubtful if there has yet been found in this range a mine that has any permanent value. There are deposits of ore of an excellent quality as at the Metropolitan and the Northwestern mines, but they have proved to be of very limited extent. At the present time the outlook for the Felch Mountain district is a very dubious one. I regard it as the most unpromising mining field in the iron region.

The Chicago & Northwestern Railway Company has built a branch, connecting with the main line at Naretta, which is 28 miles in length, and reaches the Metropolitan, Northwestern, and Calumet mines. It looks very doubtful if these mines are likely to furnish ore enough for shipment to compensate the company for the cost of this road.

The ore shows well on the surface, but at no point has it been found to hold in depth. The deposits are shallow basins of ore, or short surface lenses that soon work out. In some instances, as at the Northwestern, "the show" is a mere wash or veneering of ore over the rock. At this mine the owners uncovered what appeared, at a mere surface view, to be a very large deposit of fine, soft blue ore. Men journeyed 30 miles through the woods over the rough road that connected the mine with the railroad to see it. Its fame spread far and wide, and the Northwestern was boomed up as one of the most extraordinary deposits that the country afforded, which indeed it was, but in a sense quite the opposite of that which was held. The stock was sold as high as \$22 per share, the par value being \$25, and the number of shares 20,000.

The owners may have purposely avoided to sink in this apparently promising deposit. Certain it is that a very limited investigation proved it to be valueless. It was simply a thin wash of ore lying upon the rock. If all of it were scraped up and saved there would not be ore enough to make a car load.

At a distance of several hundred feet from the "elephant," as this humbug of a deposit was called, the company are now working. They have a long, open cut about 15 feet wide in a poor quality of yellow hematite ore. Extending from this west is a drift 70 feet long, that

is now in fine blue ore. They are preparing to develop this new find, and entertain the expectation that it will prove valuable. They are doing a limited amount of exploring at another point a short distance away south of the jasper, but as yet have met with not particular success.

### THE METROPOLITAN MINE

Is east of the Northwestern, on the top of the jasper bluff which extends east and west and slopes to the south. The foot of the bluff is diorite that extends for a considerable distance south. The main mine is in the jasper; they have two shafts, one of them sunk in the bottom of an open pit below which it reaches a hundred feet. The other is 250 feet to the east and is 130 feet deep. Between these shafts is a stope of very good hematite ore, 10 to 15 feet wide and 20 to 50 feet deep, and narrowing to a mere seam at the bottom; between the shafts to the depth mentioned the whole bottom is rock and the drift is headed with rock at both ends. At the east shaft, however, they have a lateral deposit extending south across the formation, in which they are stoping and have not reached the end. They are also sinking the shaft for another level in this deposit It has a width of about 20 feet.

The company has a stock pile mined from the open pit which is about three-fourths rock and one-fourth ore. This they are sorting, and shipping the ore.

Further to the west and north is a long, open, canoe-shaped pit, in red ore. The walls dip towards each other and tend to cut out the ore—limestone on the west and jasper on the south. The ore is of poor quality, and they are not now working in this pit.

Southwest from the Northwestern, a short distance, the Metropolitan has another somewhat extensive opening. The product is mainly a soft, yellow ochreous ore, spread out over the limestone bottom and filling innumerable cavities in this rock. Found with this ocher in limited quantity, is some of the blue ore, and also in still less supply, some exceedingly fine, hard, bluish hematite ore. They were doing some mining at this point at the time of my visit, mainly to pick out the small pockets of blue ore. They have also accumulated a stock pile of the yellow ore of several hundred tons.

The company has done some exploring at other points, at one of which, adjoining the Calumet mine, it is proposed to prosecute work still further. The company holds leases of 520 acres. The mine is in the N. E. ¼ Sec 32, T. 42, R. 28. S. P. Bart, President, R. C. Hanna, Secretary and Treasurer, Jefferson Day, Superintendent.

Twenty-three thousand eight hundred and fifty-four tons of ore were shipped from the mine in the fall of 1882. At the main mine is a good engine house containing four Rochester drums, etc.

## THE CALUMET MINE (JUNE, 1883)

Is by far the most promising of the mines in the Felch Mountain district. It is about three miles south from the Metropolitan, the description being the S. W.  $\frac{1}{4}$  N. E.  $\frac{1}{4}$  and the S. E.  $\frac{1}{4}$ , N. W.  $\frac{1}{4}$  of Sec. 8, T. 41, R. 28. The mine is in about the center of the property. Between it and the Metropolitan are a succession of granite ranges, separated by marble, diorite, and schist. At the Calumet the formation seems to be more regular than it is at Felch Mountain; but still there is the same pockety character in the ore deposits; they show the same tendency to become quickly exhausted. The ore is of excellent quality, soft, blue ore; analyses range from 60.42% to 69.16% in metallic iron, and in silica from .54% to 9.15%, in phosphorus .014 to .038%.

"The new find," which has been recently opened, is certainly a very fine show of ore, and if it shall fortunately continue will make a valuable mine. This new opening is about 600 feet in length and 30 feet in width, though the length of the deposit has been proved for 800 feet and for a maximum width of 67 feet. The ore is covered with a depth of about 15 feet of earth with which it is in contact. It is very easily and cheaply mined, but it is a matter of uncertainty to what depth it may extend. One hundred feet west from the open pit a drill hole was made, dipping 45° to the north across the formation. The length of the hole was 372 feet, and it cut the ore at a depth, as Captain Wood, states, of 150 feet below the surface. He also says that a drift, south from the old mine, 150 feet below the surface cuts this ore, but that they did not cross it. However, at the time of my visit but a small amount of mining had been done in this deposit, and there was nothing to indicate to what depth it might extend; but if it holds down it will prove an exception to all the other deposits that have been opened in this district. The old mine, a short distance to the north of the new deposit, has been quite extensively opened, and formerly the prospect was a very encouraging one for a large and valuable mine, but the ore does not seem to hold.

They are mining and shipping about 25 cars of ore per day (June 15th), though 50 cars could be loaded as readily, and as soon as the cars and vessels can be had the amount of ore shipped daily from the mine will be double the present output. The railroad track comes in between the mines, and the engine house is north of the mine. The location is really a very pleasant one, and the miners' houses, etc., scattered among the trees make up a very neat, cosy little village.

Adjoining the east end of the property on the S. E.  $\frac{1}{4}$  of the N. E.  $\frac{1}{4}$  of Sec. 8 the Metropolitan has done some exploring with the diamond drill. The cores are mainly quartzose schist. On the line the two companies joined in sinking a shaft, which was put down to a depth of 70 feet. The refuse indicates that they sunk in mainly mixed ore and jasper. This jasper belt is overlaid with the quartzose schist.

Work was begun at this mine in 1881. The railroad was completed to the mine in the fall of 1882, and up to the close of navigation 5,847 tons of ore were shipped.

A. B. Cornell, President; Robert McCurdy, Treasurer; John R. Wood, Superintendent.

## THE HECLA MINE

Is a location by the side of the railroad track, northwest from the Calumet, that, so far as has been shown, has no value. A wash of blue ore was found along the trough of a small ravine, but not enough of it to pay to mine. Several borings with the diamond drill made across the formation one rod south of this deposit of ore, failed to discover any continuance of it. Exploring work has been abandoned.

## THE BRIAR HILL COAL COMPANY,

Of Youngstown, Ohio, has been exploring on several options in the vicinity of the Metropolitan and Northwestern mines, with a diamond drill, but becoming disgusted, has just concluded to abandon this work, and ship away their machinery. A hole bored at the south, at an angle of 45°, across the formation, between the South Metropolitan and the Northwestern, south of the jasper, on sec. 32, T. 42, R. 28, passed through 50 feet of lean ore, thence 200 feet of marble, when 34 feet in thickness of poor quality of ore was found, thence 50 feet of chloritic schist, succeeded by 40 feet of quartzose schist. A second hole produced a like unfavorable result.

## THE FELCH MOUNTAIN MINING COMPANY,

Which is really the Menominee mining company, has done a large amount of exploring work in this district, without succeeding in finding any valuable deposits of ore. They are now at work on Sec. 31, T. 42, R. 29, west from, the Metropolitan, where they have done a good deal of work, finding just enough ore to encourage them to keep on, but not enough to make a mine. They are running two drills, one at this point, and one west from the Calumet mine. Mr. Gould, who superintends the work, expresses a poor opinion of the country. The company has expended the sum of \$100,000 in this exploring work.

## THE CRYSTAL FALLS IRON COMPANY

Has recently stopped work entirely, discharging all their men. The shaft at the Falls was abandoned in the fall of 1882, and later or early in the present year the Fairbanks mine was also abandoned, the company removing all the machinery to another point on the property adjoining the Great Western mine on the west. Here they sunk two shafts, each to a depth of 50 feet, and have done a good deal of drifting, hoping to find the continuation of the Great Western deposit, but without success, and recently, in June, the work was discontinued.

The Fairbanks mine shipped last year 8,121 tons of ore. James H. Elmore, Superintendent, Crystal Falls, Mich. The Fairbanks mine is in the S. W. ¼ Sec. 21, T. 43, R. 32.

The Crystal Falls mine, owned by the same company, shipped 1,341 tons of ore. The location is Lot 3, Sec. 20; T. 43. R. 32.

#### THE PAINT RIVER MINE

Adjoining the Fairbanks mine on the west, in the S. E. ¼ of Sec. 20, T. 41 R. 32, is looking fairly well. The mine has been opened underground with three shafts, No. 1 of which is near the Fairbanks line, and is down to the second level, a depth of 70 feet from the surface, and is reached by cross-cuts to the south: the ore has been mined out above the 2d level to the west of the shaft, to half the distance to No. 2.

No. 2 shaft, 120 feet west of No. 1, is 150 feet deep, inclining slightly to the south. The shaft has been sunk regularly with side pillars and winzes to the 4th level, and in each of the levels—3d, 3d, and 4th, they have drifted west 50 feet, and in the 3d the ore has been mined down to a height of 20 feet and left lying in the mine, ready to hoist, when it can be sold and shipped.

No. 3 shaft is a new undertaking, 300 feet further to the west, and is only down to a depth of 24 feet; the bottom is in mixed ore and rock. The company is working about 18 men and has not sold any ore. Some samples of the ore recently taken from No. 2 shaft, gave an analysis 63% in metallic iron .95% in silica, and .46% in phosphorus. The width of the ore in No. 2 shaft is about 20 feet and is tolerably free of rock. It is dark brown hematite, containing also a percentage of lime and manganese.

The mine is provided with hoisting machinery, etc., and is in shape to take out considerable ore whenever there is market for it. Joseph Austrian, Secretary and Treasurer; C. T. Roberts, Superintendent, Crystal Falls, Michigan.

#### THE GREAT WESTERN MINE

Is claimed, by those interested in it, to be the leading mine in the Crystal Falls district. It has certainly developed into a far better mine than was anticipated by those who examined it when it was first opened years ago. It lies east of the Fairbanks, in Sec. 21, T. 43, R. 32. The mine is in a cedar swamp, and there are three shafts now working, with a fourth one just begun. No. 1 is near the west line, and is sunk to a depth of 100 feet from the surface. In the bottom, it is claimed that the ore deposit has a width of 30 feet, dipping slightly to the south. No. 2 shaft, 280 feet to the west, is sunk to a depth of 50 feet, and is connected by a drift with No. 1. No. 3, two hundred and eighty feet west from No. 2, is also 60 feet deep, and is the best part of the mine. They are extending a drift from the bottom west, to meet one driving east from No. 2, and the length of the two is

about 240 feet, only wanting 40 feet to connect. The ore deposit in No. 3 shaft is 45 feet wide, 13 feet of which along the north side is claimed to be Bessemer ore, since an analysis of it gave .045% phosphorus. They propose to mine the ore in rooms 20 feet wide, leaving pillars, and timbering between, after the Nevada system.

They are mining and shipping from these three shafts, daily (July 10th), about 25 car loads, sending it to the Florence furnace. It is said to work well. No 4 shaft is located still further to the east. Several attempts have been made to sink this shaft, but failed through inability to get through the water and quicksand. The present undertaking has been begun by inclosing the timbers in a caisson of 1/8 inch sheet iron, intending to push it down outside the timbers, adding to it from the top, and digging away under. The distance to the ledge is 35 feet. Opposite No. 4 shaft, to the south a short distance, a new engine house has been built, and in it will be placed the machinery for operating No. 3 and No. 4 shafts, and others which may be made still farther to the east. They employ at the present time a force of 120 men, many of them carpenters, etc. A branch from the C. & N. W. Railroad extends to the mine. Secretary. S. D. Hollister; Superintendent and Treasurer, George Rankle.

#### THE ACME MINING COMPANY

Is a new organization which has recently begun to explore in the S. E. corner of the N. E. ¼ of Sec. 20, T. 43, R. 32, in what is thought to be the westerly extension of the Great Western deposits. The point of present operations is just north of the railroad track, where they have a few men engaged sinking test pits, employing a small engine and boiler to pump the water from the pits. At the time of my visit (July 11th) they were sinking in the ledge at a depth of 15 feet from the surface. The ledge being a mixture of slaty jasper and ore, it was proposed to keep sinking, hoping to reach ore. The work is conducted under the direction of S. D. Hollister, Superintendent.

#### ON SECTION 14, T. 43, R. 32,

Some parties are exploring and have found a deposit of very good ore, which is said to analyse well in iron, and sufficiently low in phosphorus for Bessemer pig.

#### ON SECTION 29, T.43, R. 32,

Mr. S. D. Hollister has some men at work, and has done quite a little exploring, but has not found any good ore.

#### THE UNION MINE,

Formerly known as the Sheldon & Schaffer mine, but now held on a lease by the Chicago Union Iron and Steel Company, has been idle for some months, or since the failure of that company last winter. The mine consists of an open pit about 200 feet long, 80 feet deep, and 12 feet in width. Stalls have been placed from foot

to hanging to support the walls, and by covering with lagging to protect the men when working in the bottom. The ore is of very good quality, being somewhat lower in phosphorus than most of the ores found in the Crystal Falls district, but is badly mixed with rock, and requires a great deal of sorting.

Some legal contention exists between the owners of the fee and the leasees. The property comprises 320 acres, being the N. W.  $\frac{1}{4}$  of Sec. 31 and S. W.  $\frac{1}{4}$  of Sec. 30, T. 43, R. 32.

Geo. Lyon, Agent, Crystal Falls, Mich.

#### THE YOUNGSTOWN MINE

Is located in a cedar swamp that extends east and west between two ranges of moderately high bluffs that rise to the south and to the west. Banning east along the north margin of the swamp, is Bertha creek, which a little further on flows into the Paint river. Along the south side of the swamp is the mine, extending entirely across the N. E.  $\frac{1}{4}$  of the S. E.  $\frac{1}{4}$  of Sec. 19, T. 43, R. 32, and east into Sec. 20, where recently the largest body of the ore has been found giving the mine a length, thus far opened, of upwards of 1,400 feet. So far the ore that has been mined has been mainly taken from No. 2 shaft and from the open pit to the east of it. The shaft is about 100 feet in depth and the pit about 70 feet, and are situated west of the center of the forty. The ore is hoisted with derrick in baskets to the top of the high trestles which reach from the shafts to the ore dock that has been built along the foot of the south bluff on the south side of the railroad track. Eight thousand tons were mined during the winter before the mine shut down, and 6,000 tons still remain on the dock (July 10).

East of the open pit, about 120 feet, it was ascertained that there were two lenses of ore separated by rock, and it was decided to sink a main working shaft in the rock and reach the ore deposits by cross-cuts to the north and to the south, the former of which has a width of 40 feet, and the latter of 15 feet. This shaft was sunk during the winter, and at the time that work was suspended had reached a depth of 100 feet. It is vertical, well lined up and strongly made, 12 feet by 16 feet inside the timbers. It is calculated for two skip tracks, ladder-way and pump pipe. It will be the main working shaft for the central part of the mine.

But the chief discovery has been made at the Nelson shaft, just east of the section line in Sec. 20. This shaft was sunk not without much difficulty owing to the influx of water and quicksand, during the past winter, and is now found to be at a depth of 66 feet, in a large body of ore; how great has not yet been determined, but at 60 feet from the surface they have drifted north 90 feet from the center of the shaft, and south 52 feet, all in clean ore, and neither way has any rock been found. The ore is very uniform in appearance a dark brown hematite of medium hardness, averaging about 60% in metallic iron, .30% in silica, but too high in phosphorus for Bessemer pig.

The Youngstown ore contains an amount of alumina, magnesia, and lime in quantity that should render it suitable for working easily in the furnace, without additional flux.

The Nelson shaft, so called, was sunk as an exploring shaft, and is too small to be used for extensive hoisting. A large working shaft has been started to the east, and the sinking of this shaft is the only mining work now carried on at the mine. A large engine house has been built near the west end of the mine, furnished with four hoisting drums—Merritt's pattern—and two large boilers, etc. Other necessary buildings have also been erected and upon the top of the bluff, to the south, a large, commodious boarding house and about 20 good frame dwelling houses have been built during the past year.

The officers are: John Stambaugh, President, Youngstown, Ohio, J. G. Butler, General Manager, F. P. Mills, Agent and Superintendent.

#### THE QUINCY MINE

Is simply the result of a protracted effort, still continued, to discover ore just west of the west line of the Youngstown mine. The ground is very wet and there is a great depth of overlying drift, but the ledge has been reached in two places at a depth of about 40 feet, and some ore has been obtained mixed with rock. The ore found in the shaft that they are now engaged in sinking is, apparently, of excellent quality, a very hard, fine grained hematite, closely resembling hard specular ore. The work is delayed by reason of a fire that burned up their engine house (July 10). The location is the N. E.  $\frac{1}{4}$ , S. E.  $\frac{1}{4}$  Sec. 19, T. 48, R. 32.

#### THE CHICAGON LAKE MINE

Is about six miles east from Iron River, in the W.  $\frac{1}{2}$  of the N. E.  $\frac{1}{4}$  of section 26, T. 43 N, R. 34 W. A small force of men, under the direction of Capt. Henry Roberts, is working at the present time at this location. They have taken from a small open pit about 2,000 tons of ore, which is held in stock awaiting the advent of the railroad to this point. The ledge has been stripped for a length of a hundred feet. The ore deposit has a width of from 15 to 40 feet, is a brownish colored hematite averaging 58% in metallic iron. The mine has a plant for hoisting and pumping.

#### THE DELPHIC MINE

Is situated in the N. E.  $\frac{1}{4}$  of the S. W.  $\frac{1}{4}$  of Sec. 24, T. 42, R. 33. Considerable mining work has been done in advance of the building of the railroad to the mine. The branch to this location will be about a mile in length, extending from the Mastodon line, which latter connects with the Crystal Falls extension of the C. & N. W. R. R. At the Delphic they have sunk a shaft 50 feet deep, 30 feet of which is in ore, and at the bottom they have cross-cutted in fifty feet of ore. The ore is similar to that found in the mines in this vicinity. Some of it was

smelted in the Florence furnace with, it is said, good results. At other points in the line of the ore test pits have been sunk to the ore, and some drifting across it done, so that for a distance of several hundred feet in length they have proved the ground to a sufficient extent to afford the assurance that the ore exists in quantity for a large mine if they can find market for the ore.

The work is in charge of Capt. J. E. Western, Geo. W. Smith, President; John J. Cahill, Secretary; W. A. Whittlesey, Superintendent.

#### THE ALPHA MINE

Is situated in the S. W.  $\frac{1}{4}$  of Sec. 12, T. 42 N., R. 33 W., in Marquette county. The mining work done comprises a shaft sunk to a depth of 80 feet. A small amount of drifting which has been done has developed a deposit of ore 16 feet in width, according to the authority of Capt. Schwartz, who has charge of the work.

#### THE MASTODON MINE

Continues to work, employing a force of about 25 men and they have about 5,000 tons of ore in stock, the shipment of which has just begun. The branch railroad to the mine was completed last fall in time to enable the company to ship 3,477 tons.

The results of the year's work, though not very extensive, have shown very favorably for the mine and seem to place it on an assured basis. Both open cut and underground mining have been adopted, the ore showing a width of 10 to 20 feet. The company has a small engine and boiler and two derricks, the latter worked with horse. The ore is apparently a good quality of hard hematite and is said not to be excelled by any found in the Crystal Falls district to which this mine belongs.

The officers are Edward Breitung, President; Joseph Austrian, Secretary and Treasurer; J. F. Simmons, Supt.

#### THE MANHATTAN MINE,

Situated near the Mastodon, has been abandoned and the company is removing the machinery.

### **IRON RIVER DISTRICT.**

But brief mention was made of this locality in the last report, as at the time of the writing the railroad had not been completed, and scarcely enough mining work had been done to enable one to determine how extensive the ore deposit was. Within the year that has since elapsed, however, the railroad connecting the mines with the Menominee branch of the C. & N. W. railroad, has been completed, and the work of mining and shipping ore has since been carried forward with as much vigor as circumstances would allow, resulting in the development of two, apparently, among the most extensive and

valuable of the iron deposits that have been lately discovered. Of these

#### THE IRON RIVER MINE

Is one of the most interesting and, probably, one of the most valuable of the new mines that have been recently opened in the upper peninsula. The location is a very pleasant one, and very advantageously situated for rapid development of mining work. Until recently the Iron River district has been an inaccessible region, to be reached only by a journey of thirty miles on foot or by vehicle over a most execrable road from Florence; but now since the completion of the railroad connecting with the Crystal Falls extension of the Menominee branch of the Chicago and Northwestern railroad, the arrangement of trains is such that one may leave the Marquette district on the Chicago express train and arrive in Stambaugh the same evening. Back from the river, where the mines are situated, the country is sufficiently level and heavily covered with fine hardwood forests. Outcrops of rock are rarely seen, the surface being everywhere deeply covered with a strong, loamy soil, excellently well adapted to yield in abundance such products as the climate of the country will admit to be cultivated. There are two villages which have started on their career, each with the determination to outdo the other. Stambaugh, situated high upon the bluff to the east, looks down upon its rival, Iron River, built in the valley, scarcely half a mile away, upon the opposite side of the river. But it cannot be claimed with any degree of truth that the denizens of the newly-created hamlet in the valley of the sparkling river look upward with blessings upon the equally self-esteeming fortunate dwellers of the hill. The upward glance to their rival, if not accompanied with animadversions, must at least be only taken in a physical sense, and has in no wise a social or a moral application. Apparently, however, Iron River has the advantage; the village is the most accessible by railroad, and it has a large hotel, an institution yet wanting in Stambaugh, but one which steps are being taken to speedily remedy. Besides, Iron River will be at the intersection of two railroads, since the Ontonagon and Brulé River road has surveyed its line through that town and located its depot there. It is said that the contracts are already let for completing the road to the State line the present season, and that the Wisconsin and Northern, with which it is to be consolidated, is rapidly advancing to meet it. So that in the not distant future there will be a continuous line of railroad from Ontonagon harbor to Milwaukee. Stambaugh has the advantage, probably, in the matter of mosquitoes; its elevation should tend to lessen its suffering in this respect, and also it is greatly the superior in fine residences. The elegant dwelling of Mr. Porter, the superintendent, would be an ornament anywhere, and Dr. Carpenter has the pleasure of watching the building of the commodious, tasteful dwelling which he is constructing at Stambaugh and happily anticipating the rapidly accruing time when he may remove his family from Ishpeming, and, relinquishing the bachelor miseries

which he is now enduring, again gather together his household gods beneath this newly made roof tree. It may be pleasant to the many friends of the doctor to know that he is greatly esteemed at his new location. The people congratulate themselves on their good fortune in possessing in their midst so reputable a physician, who is so kind-hearted and high minded a gentleman. It is unfortunate that the name of the village and mine were not the same. It will be observed that Stambaugh was laid out by the Iron River company, while the village of Iron River is in the vicinity of the Nanaimo mine. It is at the Iron River mine that the greatest activity prevails, and this company holds the most promising deposits of ore, and has thus far made the greatest advance in opening its mines. The natural situation of the ground is such as to enable the company to open its mine and locate its ore docks and railroad tracks, etc., so as to secure the greatest facility and economy in the work of mining and handling the ore.

The company holds the west half of the west half of Sec. 36 and the east half of the east half of the N. E.  $\frac{1}{4}$  and the N. E.  $\frac{1}{4}$  of the S. E.  $\frac{1}{4}$  of Sec. 35, all in town 43 E., range 35 W. The line dividing the two sections runs along the west slope of the hill that extends down to the margin of the Iron River and rises to a height of 50 feet to 100 feet above it. The north section corner is situated in the west bank of the stream, and the corner on the south end of the line is also on the west side about a hundred feet distant from the river. Between these points the river has a general north and south direction west of the section line and distant from it from 50 to 300 feet. It is along this hill-side, and near the section line, that the ore has been discovered, the chief deposits, as far as is known, being on section 36, and near the north and south ends of the sections. Where they are now mining is midway between the quarter post and the section corner, in the north half of the section and just east of the section line. The forties are owned by different parties and are held on leases by this company which run 20 years, and for which the consideration is a certain sum per ton royalty to be paid for the ore mined. The ore has been stripped for a length of about 800 feet, and shows a width of clean ore of from 30 to 80 feet. The railroad track has been built between the river and the mine with a down grade, so that the cars left standing on the track to the north are run down as required, by the force of gravity, to the dock, and when filled with ore are, in the same manner, allowed to run down to the south to be hauled away, each morning, by the locomotives to Escanaba. The ore dock is so near the mine that it is but a brief run of 50 to 100 feet, with the tram ears and horse carts to convey the ore from the stopes to the cars. In this manner, at this point, they are now mining and loading, each day shift, 75 to 100 cars with ore, with a force of about 100 men. There is no machinery of any kind on the ground—no engine, no boiler, not even a derrick nor bucket. In lieu of a steam whistle the men are called to their work and notified when to leave off by the musical vibrations of a triangle hanging in front of the office. No mining could be

simpler or more intelligently planned; all the advantage due to the conformation of the ground and the situation of the ore has been taken, and it is probable that at no mine in the peninsula is the ore at the present time obtained at so small a cost per ton. Of course there has been considerable preliminary expenditure preparatory to mining, simply as it is now done; and by and by when it becomes necessary to sink below the level of the dock, to a depth greater than will admit of hauling out with horse carts or tram cars, the introduction of machinery will be in order and thus a further expenditure must be inevitably incurred when the time comes for meeting the same conditions that prevail in other mines, and the work must be proceeded with in the same manner here as elsewhere. But for the present season, to furnish a production of 100,000 tons, no machinery will be necessary. The ore at this mine is a moderately soft, brown hematite, of a rich umber color, yielding an average of 60 per cent and upwards in metallic iron, and about .175 in phosphorus.

At the southwest part of the section, in the southwest quarter of the southwest quarter of Sec. 36, the company has partially developed another, apparently, very large deposit of ore; both at this point and where they are working the ore slightly outcropped, and the fact is found noted in the U. S. survey. At this south mine the conformation of the ground will admit of the same arrangements being made for opening the mine and handling the ore as are adopted at the mine now working. A side-track has been surveyed from the main line along the foot of the hill in front of the mine, giving a grade of one foot in a hundred. A dock will be built along the side of this track, and the earth removed from the ledge, leaving the elevation of the outcrop of the ore above the level of the dock a sufficient degree to afford the opportunity for mining out a large amount of ore before the use of machinery will have to be resorted to. A drift commencing in the side hill at the end of an open cut extends east diagonally across the ore 150 feet to the foot wall, the graphite as it is called—a black, slaty rock, easily fractured, and disintegrating on long exposure to the atmosphere. Test pits and trenches have been made, showing the ore for a distance of 1,000 feet along the line of the formation. South of the section line on Sec. 1, some test pits have been made which are bottomed in ore. To the north near the quarter post of the section, a good showing of ore is made in a trench that has been dug. Also west of the line in Sec. 35, at several points, the ore has been uncovered in quantity sufficiently large to insure the existence of paying deposits.

The company operates a steam saw-mill, located at the southwest corner of Sec. 36, and have just added a planer, etc., for the convenience of those wishing to build. Upon the hill east of the mine is the village of Stambaugh, named after the president of the company. The town has been laid out and platted and the lots are sold to those wishing to buy; a number of good houses, stores, etc., have been built, and the town has a flourishing, promising look. The gentlemen who own

and operate the mine also control the Youngstown mine, at Crystal Falls, and have large mining and metallurgical interests elsewhere.

Mr. F. P. Mills, the manager of this and of the company's Crystal Falls mines, etc., is proving himself thoroughly qualified for the responsible duties that devolve upon him. He has the integrity, energy, education, intelligence, and practical training that will insure his position among the first mining men in the country. Mr. J. N. Porter, the local superintendent, is a gentleman of considerable practical experience in the Ohio coal mines and in the lead mines of Missouri; he has been on the ground for the year past, and endured the mosquitoes and sand flies in a shanty by the river through one season, while clearing the ground and directing the preliminary work of bringing order and civilization out of the roughest wilderness, until now he may enjoy the satisfaction of observing the change which he has aided in perfecting, and partake of the comforts of domestic life in the elegant domicile which he has erected, and into which he has recently removed.

The company began shipping last October and before the close of navigation sent out 29,115 gross tons.

About a mile northwest from the Iron River mine is the

#### NANIAMO MINE

Which is situated in the northwest quarter of the southwest quarter of section 26, T. 43, R. 35. In its course between these two mines the Iron river makes a bend so that at the Nanaimo its direction is east and west and the mine is near the river on the south side of it. Here, as at the mine just described, there is, apparently, a large amount of ore.

The mining work thus far comprises an open pit about 200 feet in length, east and west, and 90 feet in width in the widest place. In this pit they are stoping, the ore being hoisted and transported to the cars in buckets, which are raised with two derricks. The ore is of good quality, some of it somewhat harder than that found at the Iron River mine, and averages 60% to 62% in metallic iron and about .18% in phosphorus. Below the open pit they have opened underground, the shaft going down 120 feet, at an angle of 65°, westerly dip. These underground workings are not very extensive; they consist as yet, merely of several drifts about fifty feet or so in length, extending in different directions, in some of which they have begun stoping ore. Altogether they are mining and shipping about 25 cars of ore per day.

The shaft has a skip road and the ore, which is hoisted in it, is run out and dumped into ore pockets, which stand over the railroad track. There is a small engine house, supplied with a pumping and hoisting engine and two drums by which the water and the ore are raised from the mine. The mine shipped in 1882 2,250 tons of ore, which was done late in the fall after the railroad was completed.

About midway between this and the Iron River mine is the village of Iron River, which grew last summer very rapidly and contains many good dwellings, stores, and a large hotel. However, there is very little doing in the village now.

It is expected that, possibly, before long the Ontonagon and Brulé River R. R. will be built through this place and consolidate with the Wisconsin and Northern, which is also, it is said, rapidly building north, and has already crossed the State line with its preliminary work. Iron River being at the juncture of the roads, the fact may add somewhat to its business and its prospects.

The Naniamo mine is unquestionably a good one, as they have a depth of ore in sight of 92 feet, and a width at the bottom of 67 feet. They are now (July 15) rising from the underground workings to the bottom of the open cut excavations, and then the whole body of ore, 92 feet deep, will be stoped away, affording a great breast of ore each way.

Capt. Luxmore has an admirable plan for supplying air to his confined underground drifts. The water pumped from the mine is conducted in a launder a distance of about 50 feet north, where it discharges on a narrow overshot wheel, 12 feet diameter; to the wheel is attached a rope pulley which is connected with an intermediate pulley, and this in turn by a belt, with a blower set at the mouth of the shaft. The water affords ample power to give the blower a motion of 1,400 to 1,800 revolutions per minute, giving all the air that is necessary in the mine. As the flow of water from the mine is constant the blower can be kept in constant motion, and there is no cost. The officers of the company are, John S. McDonald, President; Thomas Luxmore, Superintendent.

The region, of country in which these mines are located is a very fine one. The surface is tolerably level, generally covered with a heavy growth of timber. Very little exploring is now being done here; not from any supposed lack of mineral, but from the uncertainty regarding the title to the lands. The Ontonagon and Brulé River Railroad grant covers this country, and the claim of the railroad company to these lands has not yet been confirmed. Not a little of it has been taken by "homesteaders," and also some of the even sections, that have been sold by the government, have been settled on by parties under the homestead law, so that there is likely to be considerable conflict of interests. Until there is a permanent settlement of this matter of titles, there will not be much exploring done, or any great improvement in the territory.

#### THE FLORENCE MINE (JUNE 10TH)

And the Commonwealth, among the important mines of the Menominee range, are, however, south of the Michigan line and in the State of Wisconsin. The former is situated a short distance southwest of the city of Florence, the county seat of the county of the same name, and is a mine which has every indication of holding a great amount of ore. The mine has a present

length of 1,200 feet, extending east and west, and is opened by four shafts numbered from the east to the west. Until recently the mine was worked in open cut. The bottom of these open pit workings now makes the 1st level for the entire mine. At No. 1 shaft this level is 130 feet below the surface, and in it, 170 feet east of the shaft, they are working a stope which is 30 feet wide and 65 feet deep, and is the only stope now working in the mine. At the shaft the ore is 70 feet wide but narrows gradually towards the east, making its width 30 feet at the point now worked. The shaft has been sunk to the 2d level, 70 feet below the first, and at 20 feet a drift has been run to the east to beneath where they are now stoping, and also the same drift extends west to No. 3 shaft. At the bottom they have cross-cutted to the hanging wall 70 feet, and have drifted east and west, distances corresponding with those mentioned above. The plan which they propose to adopt in the underground mining that they have just inaugurated is to work out the ore in chambers, 20 feet and upwards in width, as occasion may suggest, running across and with the deposit, leaving pillars of ore 20 feet square, which will be arranged to stand under each other in succeeding levels, and a floor 20 feet thick in each level for supports.

The shafts 1, 2, 3 in the old mine are in the foot wall, and at each a few feet of cross-cut is required to reach the ore. At the east end of the drifts above mentioned they are connected by a winze.

At No. 2 shaft the ore deposit has a width of 80 feet worked out above the 1st level, but the shaft is sunk to the 2d, and in the bottom a cross-cut extends to the north to the hanging wall, and from it drifts have been opened along the hanging east and west, under similar ones made above, 20 feet below the bottom of the 1st level. These drifts go east to No. 1 and west to No. 3.

Between No. 2 and No. 3 shaft, in the 1st level, a considerable stope of ore remains in the vicinity of the latter. The width of the ore at No. 3 is 90 feet, the widest place in the old mine. The shaft is sinking to the 2d level and a drift is extending east 20 feet, under the bottom corresponding with those from the other shafts. They cross-cut from the shaft to the hanging at 20 feet down and at 70 feet down with the view to work out this 50 feet, leaving only the pillars which with the bottom will take, it is estimated, one-third of the ore. At the same point—20 feet down—a drift is pushing west towards No. 4, which will meet one coming from No. 4 east.

No. 4 is in the lower level, 500 feet west from No. 3, and is indeed an extraordinary "find." The shaft is sunk to the 1st level, 107 feet below the surface, of a line for two skip tracks, and above it an elevated trestle has been reaching easterly to the new ore pockets at the railroad. At the bottom they are cross-cutting south through the ore to the foot-wall, the cross-cut showing in the first 20 feet from the shaft 2d class ore, succeeded by 40 feet of ore, then 12 feet of graphite, followed by 80 feet of ore, thence 35 feet of jasper rock which separates the former from another lense of ore 85 feet wide. Then again 10

feet in rock succeeded by ore in which they are now drifting. They thus have in this drift across the formation, 300 feet of ore, 200 feet of which is apparently clean and first class, averaging 60% in metallic iron, and .30% in phosphorus.

The Florence mine is owned by the Menominee Mining Co., and the work done for some months past has been mainly that which has been above described—sinking the shafts to the 2d level and driving the connecting drifts. A force of about 100 men is employed and they are now, in addition to the sinking and drifting, mining about 100 tons of ore per day. Certainly if there were a demand for the ore, the mine is in shape to furnish a very large amount of it. But unfortunately it is hardly possible to sell any ore, much less this grade of non-Bessemer ores, at the present time, at any price, and the company will simply put the mine in readiness to take out ore whenever it is wanted. A. C. Brown, Agent; J. H. Buddle, Mining Captain.

The railroad reached this point in 1880, and in that year the mine began shipping ore, sending to market 14,143 gross tons.

Year.	Tons.	Year.	Tons.
1881.....	100,501	1882.....	160,155
Total.....			274,299

#### THE COMMONWEALTH MINE

Was one of the earliest discovered mines in the "range;" it had all the appearance on the surface of being one of the largest deposits of ore ever found in the iron region; but subsequent working, while failing to realize all that had been anticipated, has, nevertheless, developed a mine of considerable proportions, and while the mine at the present moment is showing a less amount of ore than heretofore, there are, nevertheless, sufficient indications to render it nearly certain that other lenses will be found of equal magnitude with these which are, apparently, approaching exhaustion. If there was a demand for the ore it is probable that the mine would furnish an output nearly equal to that which it has any year afforded.

The mine has been worked in open cut and now shows a series of deep open pits, running with the formation east and west. Those at the west end have been abandoned, and the only work now doing is in the No. 4 pit, what was formerly called the Taylor pit, then, as now, the chief pit of the mine. On the surface the width of the ore was equal to its length, which is about 200 feet and it has been worked to a depth of 130 feet. In the bottom a winze has been sunk 60 feet in depth and from the bottom of it they have opened to the No. 2 shaft. The 60 foot lift made by this winze has been nearly mined out and at the shaft they have sunk 50 feet further and are still going down, and at the same time stoping away from it, hoisting from the skip and also in bucket up the winze. The width of the ore here is 26 feet and it has a length of 150 feet.

At the west end of No. 4 pit, 50 feet below its bottom, they are stoping south in a body of ore that seems to cut across the formation. The ore has a width of 20 feet and they are working a breast stope, taking it all down, but do not, of course, know how far it extends. At this point they have not sunk below the level of the stope. They are mining about 100 tons of ore per day, and employ about 100 men.

No. 5 pit, east of No. 4, is a narrow lense of ore 10 feet wide at the bottom. It has been worked down in open cut 130 feet deep. They have sunk an underground level, but are not working it now. The company has a new discovery on Sec. 32, two and a half miles west of the mine. They have sunk a shaft 80 feet deep, and drifted from the bottom north across the ore 80 feet and south 72 feet. The north drift is mixed ore for the first 12 feet, after which the ore is free of rock and first-class. In the south drift for 25 feet from the shaft the ore is mixed with rock, thence it is found to be clean. East and west at this point the ore is found to extend a great distance; it has been proved for a distance of a quarter of a mile.

The Commonwealth Iron Company holds an estate of 3,000 acres which the own in fee simple, situated in sections 31, 32, 33, 34, 35, all in T. 40 N., R. 18 E., in the State of Wisconsin. The mine is in the S. W. ¼ of Sec. 34. The shipments of ore began in 1880 on the completion of the railroad to the mine, and the output for each year has been as follows:

Years.	Tons.	Year.	Tons.
1880.....	9,643	1882.....	115,860
1881.....	97,410		
Total gross tons.....			222,915

The officers are H. A. Tuttle, General Manager, Cleveland, Ohio; Capt. W. E. Dickinson, Superintendent.

The company has made very many surface improvements, and altogether, the location; is a very healthful and pleasant one.