STATE OF MICHIGAN

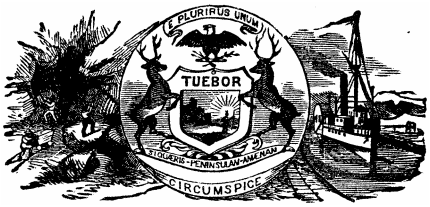
MINES AND MINERAL STATISTICS

BY

TOM A HANNA

COMMISSIONER OF MINERAL STATISTICS.

IRON MOUNTAIN, MICH.



BY AUTHORITY

1902-1903

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LETTER OF TRANSMITTAL.

STATE OF MICHIGAN
OFFICE OF THE
COMMISSIONER OF MINERAL STATISTICS,
Iron Mountain, Mich., Dec. 1, 1903.

HON. AARON T. BLISS,
Governor of the State of Michigan:

SIR:—In fulfillment of the duties of my office I have the honor to submit herewith the following report upon the mines and mineral interests of the State for the last half of 1902 and the first half of 1903.

Respectfully, your obedient servant,

TOM A. HANNA,
Commissioner of Mineral Statistics.

COMMISSIONERS OF MINERAL STATISTICS.

NAME	Date of Appointment.	Term Expired.
CHAS E. WRIGHT.....	Feb. 15, 1877.....	Jan. 12, 1883.
A. P. SWINEFORD.....	Jan. 12, 1883.....	April 29, 1885.
CHAS. D. LAWTON.....	April 29, 1885....	March 19, 1891.
JAMES P. EDWARDS.....	March 19, 1891...	Jan. 10, 1893.
JAMES B. KNIGHT.....	Jan. 10, 1893....	March 28, 1895
GEORGE A. NEWETT.....	March 28, 1895...	April, 1, 1899.
JAS. RUSSELL.....	June 18, 1899....	March 31, 1901.
TOM A. HANNA.....	April 1, 1901.....	March 31, 1905.

COPPER REVIEW.

The year covered by this report was an exceeding unfavorable one from the viewpoint of the stockholder, only three companies making returns, viz.: The Calumet & Hecla, $2,500,000; Quincy, $700,000; Wolverine, $240,000; total $3,440,000. This in comparison with six dividend payers in 1901 with a total of $7,496,900, a decrease of $4,000,000.

In his report of the United States Geological survey on the production of copper in 1902, Charles Kirchoff says that the copper mining industry of the United States suffered during 1902 from the reaction which followed the unsuccessful attempt during 1901 to maintain the value of the metal at an artificial level. The collapse left many producers committed to sales covering a long period at low prices, with the menace of heavy accumulations of metal constantly over the market. Yet production was heavier during 1902 than it had been in 1901, because some of the important mines were worked to full capacity and because some of the enlargements and improvements previously begun became effective during the year.

While 1902 was a bad year for the stockholders, it was an exceptionally good one for the wage-earner, more men being employed in the mines, and at a higher scale of wages, than ever before in the history of the district.

As a result, labor was content and no worthy of the name occurred during the year. Indeed, it be said that labor in the "copper country" has always been content. The copper miner is the best paid wage-earner in the world, is assured of steady work the year around, and the companies always zealous for his comfort and safety. Naturally the labor agitator has poor picking in the copper district. There is no room the labor union, and, as near as can be learned, there are none in the district.

The production of metal in 1902 was a record-breaking one. There were twenty producing mines with a total production of 170,644,055 pounds, as against 155,716,848 pounds in 1901. The largest producer was the Calumet & Hecla with 81,248,739 pounds to its credit, and the smallest was the Winona with an output of 101,000 pounds.

Out of the more than thirty Michigan copper companies whose stocks are listed on the Boston Stock Exchange, only the three named above were able to make dividend distributions to the holders.

The Tamarack mine which last year paid $20 per share, this year paid nothing, and the same may be said of the Osceola, which paid $6 per share in 1901.

However, there are better things in store for the stockholders in the Michigan mines and another year or two will add very materially to the lists of dividends distributors. Vast sums of money are now being expended in developing new mines, and in improvements of older ones, and that this is possible without additional assessments, in many cases, is in itself assurance that within a few years at least, half a dozen mines will be returning cash to the stockholder.

Developments on the Kearsarge lode have been the particularly bright feature of the year. These developments are such as to assure the addition of many millions to the wealth of our State. This section was recently reported upon by a Boston expert who says regarding the outlook for the future:

Adjoining the North Kearsarge on the north is the Allouez property, 600 acres of which underlies the Kearsage lode. This property has recently attracted considerable attention owing to its favorable location and the physical condition of the Kearsage lode on the properties adjoining.

The Allouez company owns in all about 3,600 acres, together with stamp mill (formerly leased by Wolverine) and railroad. This property is crossed by the Calumet Conglomerate, the Quincy Pewabic, the Allouez Conglomerate, upon which vein the old mine was developed, the Osceola Amydaloid, and carries the underlie of the Kearsarge vein.

The recent developments at the Ahmeek demonstrate the value of Allouez on the Kearsage lode, for probably no such showing has ever been seen on this wonderful formation as that already exposed by the work going on there. The lode dips into Allouez from the east and the new shaft now sinking should cut it about 1,000 feet from the surface.

Samples of copper rock taken from these openings bear the same characteristics of strength and color found in the best grades of rock produced by the Wolverine and Kearsarge properties. The mineral is in the form of strong, bright shot copper, quite uniformly distributed through the rock and in percentage will run high. For some past time many of the best geological students of the district have held the opinion that the lode underlying the lands of the south end of Mohawk, the Ahmeek, a large part of Allouez, as well as those of Wolverine and Kearsarge when opened up, would be found very rich, and developments in No. 4 shaft, Mohawk, with the discovery in Ahmeek, go to show that these impressions were well founded.

Developments in the south end of Mohawk and the north end of North Kearsarge all go to support the position of the men most experienced in the general characteristics of the Kearsarge belt with regard to the high values of the formation contained within the lands owned by the Ahmeek and Allouez companies. While it may be no great advantage to the Ahmeek that the discovery was made some 140 feet further west than expected, it will mean much for the Allouez company, as it brings the outcrop of the lode that much nearer the Allouez land and lessens the depth necessary for that company to sink its vertical shaft to reach the lode. The discovery is one of the most important made in the lake copper district for a long time, and proves beyond a shadow of a doubt that Ahmeek is one of the richest copper properties in the district, and that the new Allouez shaft will intersect a great rich lode and that the two properties will be developed into rich mines.

The Kearsage lode on the Allouez can be operated from two shafts located 1,700 feet apart, and these shafts can be extended to a depth to exceed 9,000 feet. Considering depth and area of the Allouez, it has at least three times as much underlie of the Kearsarge lode as the Wolverine.

The peculiar advantages of the Kearsarge lode are to be found the softness of the formation, which permits cheap mining and milling and the uniformity with which it is impregnated with stamp copper, as evidenced by the fact that the rock discarded is smaller than from any lode operated in Michigan. The importance of the latter statement can be better appreciated when it is considered that the discard of one of the large and successful Lake amygdaloid producers is fully 40 per cent of the ground mined. The average amygdaloid discard aside from the Kearsarge lode, is 20 per cent. The mineral yield from the upper levels of Wolverine was 27 pounds per ton of rock stamped; the most notable improvement at this mine began at the tenth level, and the present yield in minerals is 40 pounds to the ton of rock or thirty pounds of refined copper. As illustrating the local confidence in Wolverine, it may be stated that the latest official report of the shareholders and their respective holdings showed the majority of the stock to

be held in Michigan. The future of the Osceola lies in its holdings on he Kearsarge lode, especially at North Kearsarge, which seems destined to become its greatest producer. During the past six months, its fourteen drifts running north toward Allouez have been passing through ground which in the opinion of old miners is unsurpassed in the lake district.

Allouez has the advantage of owning a three-stamp mill with which to test and treat its rock during the first stages of development work and it can be used to earn the money to erect a new mill when required.

In conclusion it may safely be stated, and this opinion has appeared repeatedly without contradiction, that the Kearsarge lode has a brighter future than any copper belt now developed in the Lake Superior district. The Calumet and Hecla conglomerate is richer, but the mines operating it have passed the zenith of their careers.

President Fay, of the Centennial and other lake mines, confirms the above report as to the value of Kearsarge lode and says that on the Ahmeek the showing in No. 2 shaft, where the ledge has been uncovered, is wonderfully rich, quite as rich as in the south drift towards the Allouez property.

Mr. Fay told the directors of the Centennial that the twenty-seventh level in the No. 2 shaft of that property on the Kearsarge lode was very rich and fully justifies; the putting of the money raised on the last assessments into the sinking of that shaft.

It was primarily proposed to put the money into the building of a stamp mill, but the Centennial struck a bunch of poor ground at about the time the money came in and it was decided to be for the best interests of stockholders to abandon temporarily the building of the mill and push the shaft through to better ground. This was done and the rock found fully vindicates the action taken.

The Centennial has two shafts on the lode, one 1,300 feet deep, the other 2,800 feet.

The softness of the Kearsarge rock has been mentioned above. Mining men say that 525 tons of this rock can be stamped with one head against 480 tons of Trimountain rock.

At no time in the last few years has there been so much important work under way. The finding of the Kearsarge amygdaloid lode at the Ahmeek property, the next north of the Kearsarge mines, is worthy to be ranked among the most important strikes in the Lake Superior copper district in recent years. It may have greater results than ever expected. Opened twenty years ago at the Wolverine and condemned as of little value by one of the most successful mine superintendents this section has ever produced, the Kearsarge lode today is conceded to be one of the master copper-bearing formations of the Lake district. It is opened for a greater stretch than any other cupriferous measure and next year promises to make eighteen to twenty per cent of the entire production of the lake region.

Four new shafts have been started on the Kearsarge lode, two at the Ahmeek and two at the Calumet & Hecla. Developments at the Ahmeek are highly encouraging and lead to the opinion that the property will become an important producer within a reasonable length of time. Neither of the Calumet & Hecla shafts has entered the lode as et and it is problematical what they will reveal, but, judging from the showing at the Centennial, a short distance to the north, they should encounter good copper rock at depth.

From an insignificant amount twelve years ago the production of the mines on the Kearsarge lode has steadily grown, and next year they will make possibly 40,000,000 pounds of refined copper. At the present time no less than eighteen shafts are sinking on the Kearsarge amygdaloid and two diamond drills are searching for it. It is readily apparent to the best informed people that a large part of the Lake Superior copper production will in the future come from the Kearsarge lode mines. An output of 50,000,000 pounds per annum is expected by 1906 or 1907.

HISTORICAL.

The first record of copper mining by white men—if we can call it such—was made by Alexander Henry in 1757, on the Ontonagon river, near where was found the large mass of copper mentioned by Baron L'Honton in 1688, by Bishop Charlevoix in 1721, and by Henry in 1765.

Copper mining was initiated on Keweenaw Point in 1845 and one year later on Isle Royale. At this date it is confined to three counties—Houghton, Keweenaw and Ontonagon. No work has been done on Isle Royale since 1854-5. In his report for 1884, Commissioner Swineford maintained that "Isle Royale has never had a fair show," and there appears to be no immediate intention of giving that district a "fair show." Mr. Swineford states that the only approach to anything like an attempt at legitimate mining was at the Island mine, where the greatest depth reached was 200 feet, in a lode similar to the Calumet & Hecla.

Mr. Swineford declares it as his opinion that, with a judicious expenditure of a mere fraction of the capital employed in copper mining on the main shore, Isle Royale can be developed into one of the richest mining districts in the world. The prediction may come true.

In 1841, Dr. Houghton, who had made extended geological researches in the upper peninsula, drew public attention anew to this region. Since that date progress has been material, but in the past ten years development has been at a record breaking pace.

The fever of exploration culminated in 1848 at the time of the completion of the United States linear surveys.

The following historical facts relative to the copper smelting industry are extracted from a paper prepared by J. B. Cooper, and are worthy of preserving in the State records:

Of the first two attempts to smelt (not refine) copper in the Lake district, I have found no published record. These were both made in Keweenaw County, and John Senter has given me the following data regarding them.

In 1846, the year Senter came to Eagle River, a furnace was built on the Gratiot River, a short distance west of the present main road. Prof. Jas. T. Hodge built and ran this furnace two very short campaigns.

The selected rock, estimated to contain at least 20 per cent copper, was the material smelted and the net result of the second run of this furnace was 3.5 per cent copper. No further smelting was attempted after this disappointing result.

The second furnace was built (probably in 1847) by the Suffolk Mining Co., to smelt gray ore of copper. This furnace was located about seven miles southeast of Eagle River.

This ore was said to be so high in iron, and I surmise so low in copper, that it was impossible to smelt it in this furnace. Mr. Senter fixes the date of this furnace by is having attended its sale in November, 1848.

In 1849, the Ohio and Isle Royale Mining Co. built a furnace on Isle Royale, which was never put in blast.

John E. Grout, the originator of the Detroit works, had been in the Lake Copper district, as stated in Mr. Pope's paper, spending the winter of 1846-7 near the head of Torch Lake; he decided that Detroit was the proper location for a smelting works for lake copper.

Like the others he tried the experiment of smelting rich rock direct in a cupola. This trial was made in the small iron cupola of the Smith foundry at Birmingham, Oakland County, Mich., where the old inhabitants still remember the characteristic red color of the slag from amygdaloid rock.

In 1860 the Portage Lake Smelting Works was built directly opposite Houghton, under the supervision of the Messrs. Williams. At this works they began refining copper early in 1861. It was well patronized by the local mines. The product of the Calumet & Hecla mines was sent to this works.

They built one stack on the hillside back of the corks and four of the refining furnaces were connected to this by an underground flue.

In July, 1876, the Portage Lake Works, with its better central location in the mining district, and the Detroit Works, with its prestige as to brand of copper, were consolidated as the Detroit & Lake Superior Copper Co., with Mr. Grout as general manager. My father came to Houghton at this time as superintendent and remained one year, returning to the Houghton works as superintendent in October, 1873, and at the death of Mr. Grout in 1881, succeeded him as general manager.

Between 1860-67 two small works were built. One at Lac-La-Belle, Keweenaw County, by one of the Messrs. Williams. The exact dates of the building, starting, and closing down of these works I have not yet secured.

The second works of this period was built by a Major Pont Alba at Ontonagon, and from about 1863 to 1867 was in commission.

From 1867 to 1887 the Detroit & Lake Superior Copper Co., refined the entire product of the lake copper except a small amount smelted by the Houghton rolling mills (the Lake Superior Native Copper Works), whose one refining furnace and cupola were put in commission in 1882. The Mineral smelted at this works was almost entirely from small mines controlled by the owners of the rolling mills.

In 1886 the Calumet & Hecla Smelting Works at South Lake Linden, owned jointly by the Detroit & Lake Superior Copper Co., and the Calumet & Hecla Mining Co., was built, and smelting at this works began June 1, 1887. The Detroit works were closed finally in January, 1887.

In 1888, the Dollar Bay Smelting works were built by the Tamarack-Osceola Mfg. Co., and smelted copper of the Tamarack, Osceola, and other mines controlled by same management. These were consolidated with the Houghton works of the Detroit & Lake Superior Copper Co. in August, 1890, as the Lake Superior Smelting Co.

In 1891, the Calumet and Hecla Mining Co. built the Buffalo Smelting Works where, since early in 1892, a large part of the Calumet & Hecla product has been smelted.

In May, 1898, the Tamarack and Osceola Mining companies bought the Lake Superior Smelting Co.'s works, thus, like the Calumet & Hecla Mining Co., acquiring their own smelting works but continuing to do custom smelting for other mines of the district.

In this same month of May, 1898, the Quincy Mining Co. began the erection of their own smelting works on the stamp sands of the old Pewabic mill. J. R. Cooper supervised the construction of the Quincy works and continues in charge. Smelting was begun December 1, 1898.

[COPPER STATISTICS.]

CAPITALIZATION OF COPPER COMPANIES.

Adventure	$ 2,500,000
Allouez	2,500,000
Arcadian	3,750,000
Arnold	2,500,000
Atlantic	2,500,000
Ashbed	1,000,000
Calumet & Hecla	2,500,000
Centennial	2,500,000
Central	500,000
Copper Range	2,500,000
Copper Range Consolidated	28,500,000
Champion	2,500,000
Elm River	2,500,000
Franklin	2,500,000
Humboldt	1,000,000
Isle Royale	3,750,000
Mohawk	2,500,000
Mayflower	2,500,000
Mass Consolidated	2,500,000
Michigan	2,500,000
National	2,500,000
Old Colony	2,500,000
Osceola Consolidated	2,500,000
Phœnix	2,500,000
Quincy	2,500,000
Rhode Island	2,500,000
St. Mary's Mining Land Co.	5,000,000
Tamarack	1,500,000
Tecumseh	2,500,000
Trimountain	2,500,000
Union C. L. & M. C.	2,500,000
Victoria	2,500,000
Winona	2,500,000
Washington	2,500,000
Wolverine	1,500,000
Wyandotte	2,500,000

All of the above companies are organized under the laws of Michigan excepting the Arcadian, Copper Range Consolidated, Elm River, Isle Royale, and St. Mary's Mineral Land Co., which are incorporated under the New Jersey law. At the time the companies named were organized, the laws of Michigan prohibited the incorporation of companies with a larger capitalization then $2,500,000, but this condition was changed by the last legislature, and a synopsis of the new law will be found in another section of this report.

DIVIDEND COMPARISON.

The following is a ten-year comparison of dividends paid by Lake Superior copper mines, average price of Lake copper and number of companies paying dividends:

	Price.	No.	Paid.	Total.
1902	12.01	3	$36.00	$3,440,000
1901	15.00	6	86.00	7,496,000
1900	16.65	6	108.00	9,798,000
1899	16.76	5	129.00	12,318,000
1898	12.01	6	67.50	6,383,000
1897	11.33	6	62.00	5,431,000
1896	10.98	4	53.00	4,035,000
1895	10.73	6	53.50	3,280,000
1894	9.52	4	33.00	2,380,000
1893	10.75	6	47.00	3,520,000

LAKE COPPER PERCENTAGES.

In the table below are presented the figures a Lake Superior authority has furnished the Boston News Bureau, with respect to the rock now being stamped by the various mills in the district, the daily product in tons of refined copper, the pounds of refined copper per ton of rock stamped and the per cent of copper in each ton of rock.

Seventeen producing properties are now stamping daily 26,760 tons of rock. Of this total Calumet supplies 6,000 tons, or 22 per cent. The daily product of all the mines amounts to 350 tons, or 700,000 pounds of copper. This production, maintained throughout the year, would mean a total output in 1904 of 210,000,000 pounds, which compares with about 195,000,000 pounds for 1903.

A daily production of 350 tons of copper from 26,700 tons of rock indicates a refined copper percentage of 1.3 per cent or twenty-six pounds of copper per ton of rock stamped. Excluding Calumet & Hecla the remaining mines are producing 215 tons of copper from 20,760 tons of rock stamped daily—a refined copper percentage of exactly 1 per cent or twenty pounds of copper per ton of rock stamped.

The table referred to above follows herewith, the mines being arranged in the order of their copper percentage:

Mine—	Tons rock stamped daily.	Daily refined product in tons.	Pounds copper per ton of rock.	Per cent.
Calumet & Hecla	6,000	135	45	2.25
Mass	250	4.61	37	1.85
Champion	1,400	21.	30	1.50
Wolverine	1,050	15.5	29	1.45
Phœnix	250	3.5	27	1.35
Michigan	240	2.8	23	1.15
Mohawk	1,000	11.	22½	1.125
Baltic	1,800	20.	22	1.10
Tamarack	2,600	27.	21	1.05
Quincy	3,400	34.	20	1.00
Trimountain	1,650	16.	19½	.975
Osceola	3,600	33.	18½	.925
Adventure	320	2.8	17½	.875
Isle Royale	500	4.	16	.80
Winona	150	1.2	15½	.775
Franklin	1,150	8.5	15	.75
Atlantic	1,400	10.	14½	.725

COPPER MINES EXPENSES.

Number of mines	20
Salaried officials	419
Aggregate salaries above	$598,076
Number of wage-earners, average	13,887
Aggregate wages above	$8,744,892
Contract work	$11,725
Miscellaneous expenses	$473,501
Cost supplies and materials	$4,688,419
Product of copper, pounds	171,102,065
Value	$20,563,353
Value of product at mine	$18,247,417
Ore mine (short tons)	6,247,352
Ore shipped and milled (short tons)	5,971,650
Average price copper per lb	11.7
Average per cent. copper in ore	1.43
Royalties and rents	$2,842
Rent of offices, taxes, insurance, interest, etc.	$470,656
Cost of supplies and material	$18,247,207
Total horse-power	137,772

BULLION CONTENTS OF COPPER SOLD AND TREATED BY MICHIGAN MINES DURING 1902.

COPPER.

Pounds	171,102,065
Value	$20,100,425

SILVER.

Fine ounces	24,953
Value	$12,097

TAXATION MATTERS.

It is the claim of the copper companies that they are excessively taxed. Assessments were made during boom times and valuations seem to have been fixed at the selling price of stocks. It is not within the province of this report to discuss taxation matters, but as a matter of justice, we print the following table showing the shrinkage in the valuation of stock during the past year,

said table being compiled from Boston Stock Exchange reports:

	Shares.	High.	Low.	Close.	Loss.
Adventure	100,000	18	2	3	$1,500,000
Allouez	100,000	8½	3¼	4¼	425,000
Amalgamated	1,550,000	75⅝	33⅝	48⅝	41,850,000
Anaconda	1,200,000	31¼	15⅝	18⅞	7,425,000
Atlantic	100,000	14⅛	7	8	612,500
Bingham	100,000	39½	20	21¾	2,662,500
Calumet & Hecla	100,000	551	400	436	11,500,000
Centennial	100,000	31⅞	12	14¾	1,712,500
Copper Range	385,000	75	37	46⅞	10,870,000
Franklin	100,000	14	7	7½	650,000
Isle Royale	150,000	17½	5¼	6⅛	1,706,250
Mass	100,000	18	3	4	1,400,000
Michigan	100,000	11½	4¾	6½	500,000
Mohawk	100,000	58	31	36½	2,150,000
Old Dominion	150,000	23½	5	7¾	2,362,500
Osceola	100,000	79	43½	58	2,100,000
Parrott	229,850	34	16	22	689,556
Phœnix	100,000	7½	2⅞	3	450,000
Tamarack	60,000	190	75	90	6,000,000
Quincy	100,000	126½	80	90	3,650,000
Shannon	300,000	14⅞	7	8	2,062,000
United States Mining	435,000	27½	16¼	18⅛	4,075,000
Utah Consolidated	300,000	33⅝	22	30	1,087,500
Victoria	100,000	9	1½	1¾	725,000
Winona	100,000	14¾	5½	7	775,000
Wolverine	60,000	77	61	68½	510,000
Total					$109,360,306

MOTIVE POWER.

The aggregate steam engines and horse-power employed in the copper mines was 439 engines; average horse-power to the 20 mines, 6,876. In 1880 the average per mine was 669 and 1870, only 220. The preceding statement shows a remarkable growth. The average power employed in the production of one short ton of fine copper in 1880 was equal to fifty-five hundredths of one horse-power, and in 1902 to 1.61 horse-power, nearly three-fold. Electricity is now being introduced at some of the mines in some departments, notably at the Quincy and Calumet & Hecla, and we have heard predictions that this power will ultimately supersede steam power in all departments, the argument being that it is cheaper and more satisfactory.

AVERAGE NUMBER OF WAGE-EARNERS EMPLOYED IN COPPER MINES OF MICHIGAN DURING 1902.

January	13,839
February	13,257
March	13,679
April	14,118
May	14,512
June	13,952
July	14,249
August	13,760
September	13,660
October	13,978
November	13,490
December	13,711

RESULTS.

Number of companies	20
Capital stock and bonds issued	$46,453,750
Total shares authorized	1,960,000
Par value shares	$49,000,000
Total shares issued	1,908,150
Par value	$46,453,750
Dividend paid, 1902	$3,200,000
Assessments levied	$7,368,348
Assessment exceeding dividends	$4,168,348

PRODUCTION OF THE UNITED STATES AND OF LAKE SUPERIOR, 1883 TO 1902.

[United States Geological Survey, "Mineral Resources of the United States," 1902.]

[Long tons.]

Year—	Total production, United States.	LAKE SUPERIOR. Production.	Per cent. of total.
1883	51,574	26,653	51.6
1884	64,708	30,961	47.8
1885	74,052	32,209	43.5
1886	70,430	36,124	51.3
1887	81,017	33,941	41.9
1888	101,054	38,604	38.2
1889	101,239	39,364	38.7
1890	115,966	45,273	38.9
1891	126,839	50,992	40.2
1892	154,018	54,999	35.7
1893	147,033	50,270	34.2
1894	158,120	51,031	32.3
1895	169,917	57,737	34.0
1896	205,384	64,073	31.2
1897	220,571	64,858	29.4
1898	235,050	66,291	28.2
1899	253,870	65,803	25.9
1900	270,588	64,938	24.0
1901	268,782	69,772	25.9
1902	294,423	76,165	25.9

WORLD'S COPPER PRODUCTION.

Hayden, Stone & Co. say: Although it is not possible at this early time to give the actual figures of the 1903 production of copper, we give herewith close approximations governed by data already at hand, showing the estimated production of the world for this year as compared with the actual figures of 1902. The production of Montana is shortened by reason of the shut-down of the Amalgamated mines for a couple of weeks, and the closing down of the Anaconda smelter for ten weeks. The production from Mexico is materially larger by reason of the enlarged output of the Greene Consolidated and other producers, and Michigan with 190,000,000 pounds produces the largest amount in its history, due largely to the development of the South Range mines. The production of Spain and Portugal was lessened by reason of the strike of the miners at the Rio Tinto. Comparative figures follow:

United States—	1902
Arizona	119,841,280
California	25,038,720
Michigan	170,663,990
Montana	240,050,000
Utah	23,939,900
Other	40,436,220
Total United States	619,970,130
Mexico	81,280,000
Spain and Portugal	101,534,000
Japan	60,502,000
Chile	59,786,000
Australia	58,196,000
Total	1,067,526,000

DIVIDEND DISBURSEMENTS.

Dividend disbursements of lake mines are given in the appended table. The figures are for every fifth year from 1850 to 1900, and for each succeeding year:

Year.	Dividends.
1850	$ 84,000
1855	168,000
1860	120,000
1865	510,000
1870	700,000
1875	1,920,000
1880	3,080,000
1885	1,970,000
1890	3,415,060
1895	3,280,000
1900	9,811,200
1901	7,496,900
1902	3,440,000
1903	4,680,000

AVERAGE PRICE PER POUND OF COPPER IN THE ORE BY STATES AND TERRITORIES, 1902.

STATE OR TERRITORY.	Cents.
United States	11.2
Arizona	11.0
California	11.5
Colorado	10.0
Michigan	11.7
Montana	11.2
New Mexico (1)	5.5
Utah	10.2
Southern states (2)	10.7
All other states (3)	11.7

(1) The price for New Mexico was a flat price, from which no deduction was made for smelting and freight.
(2) Includes North Caroline, Tennessee, and Virginia.
(3) Includes Idaho, Nevada, Oregon, Washington, Wisconsin, and Wyoming.

COPPER MINING COMPANIES.

AHMEEK.

The Kearsarge amygdaloid, 16 feet wide, and rich, is reported to have been located on the Ahmeek property, says the Native Copper Times. In view of developments in Mohawk and North Kearsarge the report of the rich strike does not come as a surprise to anybody familiar with the relative positions of three properties. Were the report otherwise, then there would be cause for a big surprise. Ahmeek is situated between North Kearsarge and Mohawk and extending to the west of the latter mine. The company has a very large property—920 acres—which contains an immense workable area of Kearsarge lode. The fact that the lode deflects so rapidly to the east between Mohawk and North Kearsarge means much for the Ahmeek, as by falling back in that direction it gives the company a magnificent range of vein outcrop and vein underlay within its own lands. The company's capitalization is 60,000 shares—a little over one-half of the capitalization allowed under the laws of Michigan. It is hinted that the company will be reorganized, the capital stock increased, and 40,000 shares sold for developing the property. Such a move would be commendable, and have the approval of Lake holders of the shares. 40,000 shares at $10 or $11½ per share would make $400,000 or $500,000. While that amount of money would not open up, develop and put the mine on a paying business, it would be sufficient to make a fine start, and put workings well under way to that desirable condition. The shares are now selling for about $15.00 and it is generally thought the stock will become a market favorite.

ADVENTURE CONSOLIDATED COPPER COMPANY.

President, Isaac A. Meserve; secretary and treasurer, W. R. Todd.

Main Business Office—45 Broadway, New York City.

Location of mineral lands—N. E. ¼ sec. 35, 51-38; part of secs. 35 and 36, 51-38, and part of secs. 1 and 2, 50-39. Mill site in sec. 19, 55-35. Company also owns timber lands in sec. 16, 52-39.

Mine office—Greenland, Mich.

Mine management—Thomas Dennis, superintendent; S. A. Prince, chief clerk; A. H. Sawyer, mine engineer; John Chynoweth, mine captain; mill superintendent, R. G. Dinster, Redridge, Mich.

Total assessments to Jan. 1, 1903, $1,300,000. Amount in 1902, $400,000. Dividends none. Production in 1902, 669,644 pounds refined copper. Per cent copper in stamp rock .68. One head of the stamp mill was placed in commission in October, 1902.

Concerning Adventure, the Boston News Bureau says in answer ton an inquiry: There is no denying the fact that there have been mistakes of management in connection with the Adventure property. A very expensive surface equipment, far beyond the known capacity of the mine, was bought and paid for before there had been sufficient demonstration of the character and extent of the territory underground. You may rest assured, however, that the management is more anxious than the average stockholder to secure the best possible results, as the president is one of the largest, if not the very largest, stockholder, and his stock averages him not less than $12 per share. He has great faith in the ultimate success of the enterprise, and is more optimistic regarding it than the average Lake Superior man acquainted with the Ontonagon mines. Adventure stockholders have to date paid in $1,800,000, or $18 per share. This represents several hundred thousand of dollars in excess of the calls made upon the stockholders of the new flotations, several of which can now show much more substantial results than have yet been obtained at Adventure. The mill has a capacity for treating 1,500 tons of rock per day, but the underground openings have been so irregular that only 320 tons of selected rock can now be supplied to one of the three stamps, and that one stamp is only working half time. As at present operated, Adventure, on a thirteen cent-copper market, can a little more than make a new dollar for an old one, keeping up at the same time a limited amount of development work. To date Adventure has not met expectations, but the fault has not been due to the dishonesty of the management, but rather to its mistake in erecting an expensive mill before it had

demonstrated the existence of a mine capable of feeding it.

ALLOUEZ MINING COMPANY.

President, H. F. Fay; secretary and treasurer, Geo. C. Endicott.

Main business office—60 State Street, Boston, Mass.

Location of mineral lands—S. W. ¼ Sec. 12, T. 56, R. 32; locations of lands unexplored, Sec. 31, 57-32. Mill site, fractional Sec. 11, S. W. ¼ of Sec. 13, S. E. ¼ of N. E. ¼ and lots 1 and 2 of Sec. 14, all in T. 57, R. 33.

Mine office—Calumet, Mich.

Local management—James Chenoweth, superintendent; A. D. Nichols, chief clerk; Charles Botsford, mine engineer; Abraham Warne, mine captain.

The Allouez own, with the exception of 80 acres, a tract three-quarters of a mile wide and a mile and a half long, containing 3,600 acres, extending west from the Ahmeek. The Kearsarge lode underlies this entire area, although its value of course, is not positively known. Three forties of this tract were brought from the St. Mary's Mineral Land Company a year ago last December, and concerning this purchase, President Fay says: "We took up an expiring option on this 120 acres of land, which secured a straight and natural boundary to the property on the north, and also greatly increased the underlie of all the known lodes, especially the Kearsarge. The quality of this lode has become now so well demonstrated in the Mohawk, Osceola, (Kearsarges), Wolverine and Centennial mines that we feel confident the purchase will prove a valuable asset in the future."

The Allouez adjoins the Osceola's North Kearsarge property on the north and Ahmeek on the west. The latter mine is sinking for the Kearsarge lode, which is supposed to outcrop on the property, and that work is expected to be in the vein formation within a few weeks. Osceola's value today lies mainly in the Kearsarge lode, which carries its richest values to the north, or in close proximity to Allouez. Allouez is believed to have a length of about 1¼ miles on the Kearsarge vein, now considered one of the master lodes of the Lake Superior copper district.

The Kearsarge lode underlies the Osceola lode at a horizontal distance of approximately 3,000 feet, while the Osceola underlies the Allouez lode at a horizontal distance of about 2,600 feet. The Kearsarge lode has never been opened in any manner on the Allouez property. The Osceola lode, however, has been quite extensively developed. The shaft is down 1,200 feet and the total amount of openings in shaft, drifts and cross cuts amounts to more than 4,000 feet. Concerning the work there President Fay says: "So far as exposed, the lode shows substantially the same average characteristics as indicated in other mines. We feel that we have accomplished the end sought, in proving the quality of the lode at this point."

ARCADIAN COPPER COMPANY.

This company was the most "magnificent failure" the Lake Superior region has ever produced. It is said to have been backed by the Standard Oil interests. The company started out in 1899, under New Jersey laws, succeeding the first Arcadian company in 1898, under the Michigan statute. There was a capitalization of $3,750,000, in 150,000 shares of a par value of $25. A vast amount of improvement work was begun, including the building of a considerable town and the installation of powerful and costly machinery. But the starting of the mill brought only disappointment, and the stock, which sold at one time as high as $90 a share, is now valueless.

The latest available financial statement showed a floating debt of $903,669. The main office is in Boston, the general manager's office in Chicago. On the board of directors are such men as William C. Rockefeller, H. H. Rogers, W. A. Paine, A. C. Burrage, Sidney Chase, Nathan F. Leopold and C. M. King. During the boom of 1898 no other new mine created such a stir throughout the copper country as did the opening of the Arcadia. Most of the stock was sold in Chicago, Detroit and the east, where the distant prospects pictured in glowing terms caught many an investor.

President, Albert C. Burrage, Boston; general manager, Nathan F. Leopold, Chicago, Ill.; secretary, Charles D. Burrage.

Main business office—Boston, Mass.

Mine office—Hancock, Mich.

Total assessments called to 1903, $1,800,000. Production in 1902, 445,206 pounds refined copper.

ARNOLD MINING COMPANY.

President, C. L. Davenport; secretary and treasurer, John Brooks.

Main business office—50 State St., Boston, Mass.

Except for the lands of the Ashbed Mining Company, the Arnold owns all of Secs. 1, 2, 10, 11, 12, 13, 14, 15, T. 58, E. 31. Mine post office, Copper Falls Mine, Keweenaw County, Michigan. Superintendent, Wesley Clark. Property now idle. Product in 1902, 13,414 pounds refined copper. Total assessments, $810,000. Total dividends, $100,000.

ATLANTIC MINING COMPANY.

President, Joseph E. Gay; secretary, John E. Stanton, treasurer, John Stanton.

Main business office—11-13 William Street, New York City.

The mine location consists of about 640 acres in Secs. 4 and 9, T. 54, R. 34. The Company also owns Sec. 16, T. 54, R. 34, on which a small amount of exploring has been done, old mill site and dock on Portage Lake in Secs. 33 and 34, and several thousand acres of timber land, and stamp mill site and water rights on Salmon Trout River and the shore of Lake Superior.

Mine office—Atlantic Mine, Mich.

Mine management—Agent, Frank McM. Stanton; superintendent, F. W. Denton; chief clerk, A. D. Edwards; mine engineer, Theo. Dengler; mine captain, John Stratton. Mill superintendent, Frederick G. Coggin, Redridge, Mich.

Total of all assessments, $280,000. Total dividends to Jan. 1, 1903, $940,000. Amount and date of last February, 1901. Production in 1902, 4,949,366 pounds of refined copper. Per cent of copper in stamp rock, 11.095 pounds per ton.

Sinking is confined to No. 3 shaft. It is the present plan to continue sinking to a depth of 1,000 feet. At that point the lode should yield a better grade of rock. Operations are closely confined at the mine and stamp mill, and every effort is being made to place the property on a dividend-paying basis. All work devoid of immediate results has been discontinued with the exception of sinking No. 3 shaft.

BALTIC MINING COMPANY.

President, John Stanton; secretary and treasurer, John R. Stanton.

Main business office—11-13 William Street, New York City.

Location of mineral lands—E. ½ Sec. 20, W. ½ Sec. 21, N. E. ¼ Sec. 21, all in T. 54, R. 34. Timber lands—E. ½ of N. W. ¼ Sec. 27, S. W. ¼ of N. W. ¼ Sec. 27, N. W. ¼ of S. W. ¼ Sec. 27, T. 54, R. 34.

Mine office—Baltic, Mich.

Mine management—Agent, Frank McM. Stanton, superintendent, F. W. Denton; chief clerk, William C. Cole; mine engineer, Theodore Dengler; mine captain, Martin Trewethey. Mill superintendent, F. G. Coggin, Redridge, Mich.

Total assessments to Jan. 1, 1903, $800,000. Amount and date of last, $300,000, April, 1901. Dividends, none. Annual production at present provided for, 15,000,000 pounds. Production in 1902, 6,285,819 pounds. Per cent copper in stamp rock, 1.61. Four incline shafts. Operations show steady growth.

The four shafts are now supplying stamp-rock to the mill at Redridge. The daily output of the mine averages from twenty-eight to thirty cars of forty tons capacity. In transporting this rock to the mill, it is loaded into Copper Range cars, but the Old Atlantic road is still used to carry it to Redridge. The shafts at this mine are numbered, not according to their situation, but in the order in which they were sunk; and accordingly one finds No. 1 between No. 2 and No. 3. For a considerable time there has been no surface work at No. 2, which is the furthest shaft south, operations being suspended here because of the desire of the management to rush the work in other portions of the mine as quickly as possible. However, this does not mean that the ground here is not being developed, for drifts are being run to this shaft from both No. 1 and No. 3, and it is the general impression that work from the top will again be resumed whenever it is deemed proper to do so. No. 1 has reached a depth of three levels, while 3 and 4 are about at equal depths, they being down to the eighth level. A large Nordberg hoist is in commission, commencing operation early in July.

BELT COPPER MINE.

The Belt Copper mine, S. W. ¼ of Sec. 29, and E. ½ of Sec. 31, and N. W. ¼ of Sec. 32, and S. E. ¼ of Sec. 30, T. 51, R. 37, owned by R. R. Goodell, of Houghton, Michigan, was under option to Capt. W. A. Dunn, also of Houghton. Considerable work was done in cleaning out the old workings, but option was permitted to lapse.

CALUMET & HECLA MINING COMPANY.

President, Alexander Aggassiz; vice-president, T. L. Livermore; secretary and treasurer, G. A. Flagg.

Main business office—12 Ashburton Place, Boston, Mass.

Location of mineral lands being operated on Secs. 13, 14, 22, 23, 56-33. Company owns many thousands of acres of timber lands throughout the peninsula. Stamp mill, located on Torch Lake, Sec. 6, 55-33.

Mine office—Calumet, Mich.

Mine management — Superintendent, James MacNaughton; chief clerk, J. H. Lathrop; mine engineer, E. S. Grierson; mine captain, J. W. Milligan; mill superintendent, H. W. Cake, Lake Linden; reduction works superintendent, J. B. Cooper, Hubbell, Mich.

Capital paid in on organization of company in May, 1878, $1,200,000. Never an assessment called. Total dividends to Jan. 1, 1903, $78,850,000. Date of last dividend, December, 1902. Production in 1902,

81,248,319 tons of refined copper. Per cent copper in stamp rock, 2.74.

The *News Bureau*, Boston, makes the following analysis of the annual report of the Calumet & Hecla company for the year ended April, 1902, which gives evidence of the recent economies which have been instituted under the MacNaughton management.

The cost of treating a ton of rock, which cost includes mining, milling, smelting, construction and expenses of every character, was reduced to $3.51, against $4.35 in 1901-02 and $6.33 in 1900-1.

For a series of years these costs have been as follows:

1902-3	$3.51
1901-02	4.35
1900-01	6.33
1899-00	6.77
1898-99	3.90

The rock tonnage, estimating the rock to have yielded during the year 2½ per cent, or 50 pounds of copper per ton, was 1,532,660 against 1,322,733 the previous year. For a series of years the tonnage of rock has been as follows:

1902-03	1,532,660
1901-02	1,332,733
1900-01	1,210,586
1899-00	1,310,400
1898-99	1,481,686

The cost per pound of refined copper was reduced to seven cents. We compare average price received and cost per pound as follows:

	Average price rec'd	Cost per lb.
1902-03	13.50c	7.00c
1901-02	14.00	7.25
1900-01	16.75	10.55
1899-00	17.00	8.99

The heavy cost in 1900-1 was due to the fire, which materially reduced production.

The company is evidently compensating for the declining copper values in its rock by economy in operation. This is demonstrated by the fact that although a larger rock tonnage was handled last year than in the year previous and a smaller output of refined copper obtained, the cost per pound of copper was reduced between one-third and one-half cent per pound, a very large item when applied to an annual production of 76,000,000 pounds of copper.

The new sand wheel house of the Calumet & Hecla company—the largest structure of its kind in the world—is now completed. The building has been in course of construction since the latter part of September, 1901. During the intervening time, however, it has been necessary several times to delay work on the erection of the big structure while the big wheel was being place in position.

Taken as a whole the erection of this building is one of the most remarkable pieces of structural work accomplished in the copper country. A similar piece of work cannot be found in the United States, and its successful completion without a single serious accident cannot but be a source of satisfaction and pride to J. M. Clark, who acted in the capacity of superintendent of erection for the American Bridge company of New York, as well as the mining company.

The aggregate weight of the steel used in the building is 1,000,000 pounds. Four monster trusses weighing 20 tons each are contained in the structure and are elevated a height of 61 feet from the first floor. The bulk of the 500 tons of steel is supported by 11 immense columns weighing 12 tons each. These columns are 70 feet in height and rest on a solid foundation of concrete.

There are practically three floors in the building, the main floor, and two gallery floors. The two latter completely surround the great wheel enclosed in the structure, and from these the engineers can reach any part of the machine needing attention after it is put in commission. Fine rolled steel checker plates are used in the gallery floors and one of the neatest pieces of workmanship in the entire building is the manner in which these plates are snugly fitted around the east pedestals and cast base of the sand wheel.

A continuous railing extending from the first floor to the third and encircling the two galleries is also one of the novel features in the interior construction.

Supported by the four heavy trusses at a height of 61 feet is a monster hoisting crane with a capacity of 45 tons. The crane is a product of William Sellers & Company, of Philadelphia. It was used in the erection of the 60-foot wheel, and it is probable that the machine will never again be used.

The interior of the sand wheel house is now being given a coat of paint by the company painters and soon the structure will have a very neat appearance. Some two or three months will be required to complete the large wheel and it will be some time later before it will be put in commission. The great apparatus will be operated by electricity, furnished from the new power plant now being equipped by the company.

It may not be generally known that the compressor plant at No. 2 Calumet is the largest in the world. The Calumet & Hecla company has several pieces of heavy machinery which are ahead of anything in the world and the big compressor plant at Calumet is of them. It has no equal anywhere in the mining districts of this country or in Europe. The plant, when operating to its full capacity, will furnish air to no less than 300 drills.

The machinery at the Red Jacket shaft is capable of hoisting ten tons of rock at the rate of 3,600 feet a minute, and with the new skips in commission it will hoist all the rock that can be brought to the shaft. The big shaft is now supplying about 625 tons of rock daily. Stoping is confined to the three upper levels. Drifts have extended to the lode at every third level. The ground in the upper levels is very good, while below all the rock sent to the mill is from new openings, which is good and bad at times, but as there is being no stoping done, a fair estimate of the value of the lode is not obtainable. No. 4 shaft of the Calumet & Hecla has attained a depth of 6,900 feet, which is unequalled in the world by any shaft

sunk on the plane of a lode. This shaft will be extended to a depth of 8,100 feet, at which point it will reach the Tamarack boundary. No. 4 shaft will not be active below the 57th level, but the openings will furnish excellent ventilation to the Red Jacket shaft. The lower level of the big shaft has been extended to the Tamarack boundary, also some of the levels above so that sinking and raising can be conducted at No. 4. No. 8 shaft, at the south end of the mine, is becoming a leading producer with an output of about 550 tons of rock daily. Of interest, also, is the fact that at the 59th level No. 10 shaft is looking better than at any time in its career. The Calumet & Hecla is supplying the stampmill with about 6,000 tons of rock every 24 hours. The Calumet & Hecla has 100,000 shares of stock on which apparently $12 per share has been paid in cash, and this $1,200,000 stands as its capital stock. The company has paid $78,850,000 in dividends and has also earned a surplus of $22,466,000 which is invested in $18,000,000 worth of real estate and machinery, and $6,500,000 worth of cash, copper and bills receivable less $557,000 of bills payable, all of which means, when boiled down, that the Calumet & Hecla company has $5,700,000 of surplus assets in cash and copper. This contrasts with a cash and copper surplus of $6,557,023 on April 30th, 1903, which was of course reduced by the $1,000,000 dividend paid June 19th.

CENTENNIAL COPPER MINING COMPANY.

President, H. F. Fay; secretary and treasurer, George G. Endicott.

Main business office—60 State Street, Boston, Mass.

Location of mineral lands—S. E. ¼ Sec. 12, T. 56, R. 33 and N. W. ¼ Sec. 18, T. 56, R. 32. Mill site—S. E. ¼ of S. E. ¼ and forties in Sec. 5, T. 55, R. 32.

Mine office—Calumet, Mich.

Local management—Superintendent, James Chenoweth; clerk, A. D. Nicholas; mine engineer, C. W. Botsford; mine captain, John Pentecost.

Production during 1902, 66,679 pounds of refined copper. Shafts sunk 263 feet, drifts 1,575 feet, cross cuts 38 feet.

The shaft on the Kearsarge amygdaloid has reached a depth of 2,000 feet, or thereabouts, a point where levels begin to lengthen out and where blocks of ground may be developed that will count when needed for production; the shaft it may be remembered was started in a corner owing to the fact that the lode outcropped just east of the boundary line of the company's land, and for quite a depth the shaft continued within narrow limits, but now it is down where the ground lengthens rapidly with depth and where every level will mean something when production begins in earnest. From the moment sinking was commenced splendid progress has been made there. The shaft is modern in construction, substantially timbered, of large capacity, and equal to almost any duty the management may find for it. The hoisting engine is also of the latest and most approved make, powerful and in keeping with the shaft and general surroundings.

Then developments on the lode are said to be quite satisfactory and fully up to the expectations of the management and company. In the two Kearsarges and in Wolverine, and also in the Mohawk still further north, the Kearsarge amygdaloid carries excellent copper values, and many good judges reckon it the most valuable amygdaloid belt worked in the district. Centennial management seems to consider it much more valuable than the Osceola amygdaloid, for while that formation is practically neglected the Kearsarge amygdaloid is being vigorously developed, and with great promise for the future of the company. On that formation movements may be somewhat cramped for a time, but when down a few hundred feet further the territory will be practically unlimited, as the company owns the whole unbroken section and underneath the whole of it lies embedded the Kearsarge-Wolverine lode.

CENTRAL MINING COMPANY.

President, Joseph E. Gay; secretary and treasurer, John Stanton.

Main Business Office—15 William Street, New York City.

Company own upwards of 20,000 acres of land in Townships 56, 57, 58, Ranges 30 and 31.

Local agent, F. McM. Stanton, Atlantic mine, Michigan; chief clerk, John F. Roberts.

Capital stock, $100,000; only assessment, $40,000, made in January, 1902. Total dividends paid, $1,770,000.

Work in hand, diamond drill exploring. Total depth of all holes, 6,012 feet. Several belts carrying copper in some degree cut. At present no work is being done.

CHAMPION COPPER COMPANY.

President, W. A. Paine; secretary and treasurer, Arthur B. Stanwood.

Main Business Office—Painsdale, Mich.

Location of Mineral Lands Being Explored—Secs. 30 and 31, T. 54, R. 34, and Secs. 25 and 36, T. 54, R. 35. Mill site in Sec. 25, T. 55, Range 35.

Local Management—Lucius L. Hubbard, superintendent; Michael J. Harrington, chief clerk; R. R. Seeber, mine engineer; John Broan, mine captain; F. C. Coggan, mill superintendent; address, Freda, Mich.

Annual production 1902 pounds ingot, 4,165,784. Per cent. of copper in stamp rock, 34.29. Shipping of rock to mill began in January, 1902.

The St. Mary's Mineral Land Company owns 50,000 shares of the stock in this company and the remaining 50,000 by the Copper Range Consolidated interests. New feature introduced during the year is the cross compound stamp heads from which a saving of 15 per cent. fuel cost was expected. This means a reduction of 7½ per cent. mill cost.

According to George L. Walker, an authority, Champion is able under existing conditions to produce and sell its copper at a profit of over 100 per cent. over cost. In other words, there are in each ton of rock eighteen pounds of copper for expenses and nineteen pounds for profit. The Champion is a very large property and can be developed to a point where it will supply ten or more modern stamps with rock. With such a capacity and a continued yield of 36.9 pounds per ton of rock, Champion's annual output would be 55,350,000 pounds of fine copper. The profit on this, figuring copper at twelve cents, would be $3,431,700, which is considerably more than half as much as is being earned by the Calumet & Hecla. Half of these profits would go to the Copper Range Company and half to St. Mary's Mineral Land company. It is anticipation of such results as these that has caused the recent advance in Copper Range, and started investors on a still hunt after stray shares of St. Mary's stock. There is a possibility, even a probability, that Champion will produce and treat its rock at a cost of less than $2 per ton. Its mineral-bearing lode is twice as wide as those mined by the Quincy, Osceola, Wolverine and Calumet & Hecla. It is mining openings near the surface, and finds very little "lean" or barren rock. So far the Champion has done no stoping, and not more than 10 per cent. of the run of the rock from shafts and drifts, encountered in development work, is being discarded. Other Lake mines treat only from 40 per cent. to 70 per cent. of their rock. When Baltic got its rock exclusively from shafts and drifts its average yield per ton was only nineteen pounds. It now gets twenty-five pounds to the ton. Will Champion's yield also increase twenty-fie per cent. when regular mining begins?

COPPER CROWN MINING COMPANY.

Reports from the Copper Crown Mining Company's property are very encouraging. A new air compressor has already been received and another is in transit. Nearly all plans and specifications for the 500 ton stamp mill is nearly ready, with $50,000 in the treasury, or due the company for stock already sold, and all debts of the company are paid. New buildings are being erected for the men, preparatory to beginning the erection of the stamp mill. It is hoped to see the Copper Crown property on a paying basis within 12 to 15 months. Capitalists are becoming much interested in the property, and altogether its future is very bright. We hope that such may prove to be the case, as it has a lot of enterprising gentlemen behind it who are certainly entitled to success.

COPPER RANGE CONSOLIDATED COMPANY.

President, William A. Paine; secretary and treasurer, Frederic Stanwood.

Main Business Office—27 State Street, Boston, Mass.

This is a security corporation, controlling subsidary companies. It owns a controlling interest in the Baltic Mining Company, Copper Range Company, and Copper Range Railroad Company, and one-half the capital stock of the Champion Copper Company. Original land holdings about 10,000 acres. Present land holdings consist of 8,720 acres. It also has a long term option on 2,000 acres of mineral land owned by St. Mary's Company. Copper Range Railroad Company has a capital of $5,000,000. The main line is 41 miles in length with numerous branches and spur tracks to the mines. A branch to Calumet and Lake Linden is now under construction.

The following figures are secured from the statement rendered to the state, Jan. 1, 1902:

Amount cash paid in on capital stock	$1,549,550.00
Amount cash pain in by conveyance of property to company	750,000.00
Entire amount invested in real estate	1,301,944.19
Amount of personal estate	3,134,500.00
Amount of unsecured or floating debt	10,000.00
Amount due the corporation	2,040.16

ELM RIVER COPPER COMPANY.

President, H. F. Fay; secretary and treasurer, George G. Endicott.

Main Business Office—60 State Street, Boston, Mass.

The company owns Sec. 6, except the N. E. ¼ and the S. W. ¼ of N. W. ¼, T. 52, R. 35, and Sec. 1, except the N. ½ of N. W. ¼; S. ½ of Sec. 2; Sec. 11; N. W. ¼ of Sec. 12, T. 52, R. 36; the S. W. ¼ and W. ½ of N. E. ¼ of Sec. 36, T. 53, R. 36.

Mine Office—Calumet, Mich.

Local Management—Superintendent, James Chynoweth; chief clerk, A. D. Nicholas; mine captain, Samuel Chynoweth. Mine postoffice address, Calumet, Mich. Mine engineer, Charles Botsford.

Operations are confined to No. 1 shaft, on the Winona lode, at the Elm River property. It is the present purpose of the management to continue sinking in this shaft until a depth of a thousand feet has been reached, when a cross-cut will be extended to explore the Winona lode. The good showing at the Winona mine has led the management to formulate this plan. Work at the Elm River has been in progress for the past four years, but nothing of exceptional promise has been found so far. The property has a good equipment and there are ample funds in the treasury of the company for explorations for some time.

FRANKLIN MINING COMPANY.

President, Francis H. Raymond; secretary and treasurer, Daniel L. Demmon.

Main Business Office—15 Congress Street, Boston, Mass.

Location of Mineral Lands—W. ½ Sec. 24, T. 55, R. 34. Old mine; Sec. 7, T. 55, R. 33, Franklin, Jr. Mill site, Lots 2, 3 and 4, Sec. 16, T. 54, R. 33, S. ½ of N. W. ¼ Sec. 10, T. 54, R. 33, and Lot 3, Sec. 9, T. 55, R. 33.

Mine Office—Hancock, Mich.

Mine Management—Joshua D. Hasking, superintendent; chief clerk, Arno Jaching; mining captains, Cyrus Truran and John Dancy. Mill superintendent, E. S. Warne, Point Mills, Mich.

Total assessments to 1902, $220,000. Amount and date of last, June, 1871. Total dividends declared, $1,280,000. Amount and date of last, January, 1894, $2.00 per share on 40,000 shares. Production of mineral at present provided for, 8,000,000 to 10,000,000 pounds. Production in 1902, 5,237,460 pounds refined copper. Per cent. of copper in stamp rock, 1.3270 per cent.

The company in November, 1902, decided to sink a new shaft on the conglomerate lode at its Junior property. The rock from the conglomerate is well charged with copper and is reported to be showing increased richness. The intention is to make a big mine of the Junior. The new shaft will be located about 1,200 feet south of the Peninsula shaft, the only one on the property. The survey has been completed, the stakes have been set and a derrick is being erected, so the actual work of sinking will start the first of next week.

HAMILTON.

The *Ontonagon Herald* says: "Exploratory work upon the Hamilton property in Matchwood township is being pushed forward vigorously. Good progress is being made in the tunnel which is being driven from the base of the high bluff. It is generally conceded that this is the most advisable way of testing the merits of the property. It will require sometime yet to reach the Meads, or what is considered the master lode of that district; but it will be tapped at a depth where the relative value of the vein can be ascertained without any question. The Norwich district is attracting considerable attention and the operations upon the Hamilton are being watched with interest. There are many in this county who have confidence that paying mines could be developed there if properly handled."

ISLE ROYALE COPPER COMPANY.

President, A. S. Biglow; vice-president, Edgar Buffum; secretary and treasurer, W. J. Ladd.

Main Business Office—Boston, Mass.

This company owns the entire Secs. 1, 2, 10 and parts of 11, 12, 9, 15, in T. 54, R. 34, and the S. W. ¼ of Sec. 36, T. 55, R. 34, and the N. W. ¼ of Sec. 6, T. 54, R. 33. Present operations are confined to the N. W. ¼ of Sec. 1, and the S. W. ¼ of Sec. 26.

Mine Office—Houghton, Mich.

Mine Management—W. E. Parnell, superintendent; assistant, R. M. Edwards; chief clerk, H. L. Haddock; mine captain, Edward Warmington; mill superintendent, James G. Glanville.

Total assessments called to Jan. 1, 1903, $2,000,000, amount paid on organization. Dividends, none. Production for 1902, 3,569,148 pounds.

Concerning Isle Royale, the *Boston Financial News* says: It is admitted that the recent developments on the property have given it a new lease of life and a prospective value which the market is proceeding to discount.

The consolidation of the Isle Royale and the Miners marked one of the turning points of the 1899 copper boom and a good many people who hung onto their Miners when it had advanced more than 100 per cent. above its par value found themselves hung up with Isle Royale at steadily diminishing prices. The Isle Royale began to redeem itself in 1902 and 1903, and 1904 promises to show a big skip forward in the development of mineral resources on this property. The company owns 3,240 acres of mineral lands and up to within a month or so had been confining operations to working two amygdaloid veins, the Isle Royale and the Portage. No. 1 shaft is still out of commission, having been burned out last year, but No. 2 is producing copper steadily.

Attention has lately been attracted to Isle Royale because of the developments on section eleven, where it is practically certain that the Isle Royale lode has been uncovered. Operations have thus far been confined to a single point, where the several blasts made have revealed a showing of copper scarcely equalled by the early surface disclosures at the Champion. The location of the recent strike is about one mile south of the Huron workings, and in the direction of the productive copper zone of the south range. The site of the exploratory shaft is distant about a mile and a half from the company's south boundary, and, as the territory can be mined to unlimited depths, it will be seen that an extensive tract is available. The width of the vein at the site of the new shaft is not less than twenty-four feet.

While the new field ranks among the most promising of recent years, yet it is possible that a lesser degree of interest would have been manifested were it not that the continuance of values with depth has already been demonstrated. The vein was located last summer with the aid of a diamond drill, and penetrated to a depth of about 400 feet from surface, where the showing, as

revealed in the cores, was of such an encouraging character as to lead to the work now under way.

No company in the district is in better position, to develop a new property quickly and at a low cost, possessing as it does an abundance of working capital and a high-class equipment for both mining and milling. The management has a reputation for doing good work in a quiet manner, and while those about the mine are somewhat reticent regarding the new find, the degree of satisfaction exhibited has broadened to the extent that it is everywhere visible.

KAUKAUNA.

The Kaukauna property, which comprises Sections 9 and 10 in Township 52 N., Range 36 W., the southwest portion of Houghton County, optioned to John C. Watson, will probably soon be placed on the Boston market—the first flotation on the fifteen-cent copper market. The new company will probably have 100,000 shares, and the stock will be placed with the public at $6 per share.

MAYFLOWER MINING COMPANY.

President, H. F. Fay; secretary and treasurer, George C. Endicott.

Main Business Office—60 State Street, Boston, Mass.

Location of Mineral Lands—N. W. ¼ Sec. 8, T. 56, R. 32. Mill site, N ½ of N. E. ¼ of N. E. ¼ Sec. 8, T. 55, R. 32, and Lot 1, excepting 20 acres.

Mine Office—Calumet, Mich.

Local Management—James Chynoweth, superintendent; A. D. Nicholas, chief clerk; Charles Botsford, mine engineer; Joseph B. Chynoweth, mine captain. An exploration with two shafts. Work during the year confined to drifting, aggregating 620 feet.

THE MASS CONSOLIDATED MINING COMPANY.

President, Charles A. Lamb; vice-president, C. W. Hunton; secretary and treasurer, W. A. Bancroft.

Main Business Office—6 Beacon Street, Boston, Mass.

Location of Mineral Lands—S. W. ¼ Sec. 35, 51-38. Other lands in 51-38, 50-38 and 51-39, upwards of 1,000 acres. Mill site in 52-34, on Keweenaw Bay.

Mine Office—Mass, Mich.

Mine Management—Superintendent, J. M. Wilcox; chief clerk, W. A. Brown; mine engineer, E. F. Douglass; mine captain, Thomas Hall. Mill superintendent, C. H. Krause, Keweenaw, Bay, Mich.

Total assessments to Jan. 1, 1903, $900,000; last assessment April, 1903, $2.00 per share. Production in 1902, 2,400,000 pounds refined copper. Per cent. of copper in stamp rock, 1.25.

Operations at the Mass mine are being carried on in a progressive manner and the results obtained are very satisfactory, showing that as soon as the property is opened a little more extensively it is sure to make a large producer. From 20 to 22 carloads of rock are being shipped to the mill daily and the *Herald* is informed that the returns now show about 1 per cent copper. No trouble is being experienced in furnishing this amount of rock and it is very probable that it will be increased sufficiently in the near future to keep both heads in the mill running full time. This property is easily maintaining its record as a producer of mass and barrel work. Its output since the mill went into commission last fall has exceeded fifty tons per month and there seems to be a gradual increase in this product as well as in the richness of the stamp-rock.

Sinking is going on in A and B shafts and the west drifts from the latter show that the lodes gain in value as the opening are being extended under the high bluff just to the west of this shaft. This certainly is a strong augury that rich ground will be tapped by C shaft. The work of enlarging this to a three compartment shaft is progressing nicely. While this shaft is on the Butler vein it is the intention of the management to cross-cut to all the other parallel lodes which are known to traverse this property and in this manner a large amount of ground can be opened very economically. A little later another shaft will be started still farther west.

In September, 1902, the mine was shipping to the mill about 550 tons of rock every 24 hours, which is all that can be stamped under the present arrangement. The Mass continues to yield a considerable amount of silver, but the greater portion is lost in the mineral that is shipped to the smelters. At present about $100 worth of silver is saved at the mill each month. It is a very good opinion that when the Mass is supplying rock to three heads it would pay the company to erect a refining plant with provision made for the saving of the by-product which, it is estimated, would pay the entire smelting process. Experiments of Mass mineral, made in Chicago, proved that it contained silver value equal to about $55 per ton, or nearly three cents for every pound of copper. From this it is clearly evident that the by-product of the Mass will eventually become an important factor in the success of the property.

MICHIGAN SMELTING COMPANY.

The Michigan Smelting Company is the name of the new corporation which will build and conduct a new smelter on the shore of Portage Lake, about three miles west of Houghton, to treat the mineral output of the South range mines. The amount of capital stock is $500,000 and the number of shares is 20,000, par value $25,000 each.

The amount of cash actually paid in on the capital stock is $50,000. The cash valuation of any property real or personal, conveyed to the corporation contemporaneously with its organization, is nothing. The purposes for which the corporation was formed are: To engage in and carry on refining, smelting and manufacturing copper, and all other kinds of ores, minerals and metals; to acquire, own and possess all such real estate and personal property as may be necessary or convenient for the carrying on of such business, and to do any and all such acts and things with relation to the carrying on of said business as are not in conflict with any of the laws of the state.

The names of the stockholders' respective residences, and number of shares held by each, are: Lucius L. Hubbard, Painesdale, ten; Fred. W. Denton, Atlantic, ten; John H. Rice, Houghton, ten; Allen F. Rees, Houghton, ten; R. T. McKeever, Houghton, ten; and Allen F. Rees, trustee, Houghton, 19,950. The business office of the corporation will be located at Boston, while at Houghton will be located the office for the transaction of business within the state. The business of the company will be carried on in Houghton county. Five will constitute the board of directors. Those elected for the ensuing year are: L. L. Hubbard, F. W. Denton, J. H. Rice, Allen F. Rees and R. T. McKeever. The term of existence of the corporation is thirty years.

MICHIGAN COPPER MINING COMPANY.

President, John Stanton; secretary, J. Wheeler; treasurer, John R. Stanton.

Main Business Office—15 Williams Street, New York City.

Location of Mineral Lands—N. W. ½ Sec. 15, 50-39; also has mineral land sin Secs. 9, 10, 11, 14, 15, 16, 17, 21, 22, 23, 24, 50-39; also 2,038 acres of timber lands in Secs. 2, 34, 25, 26, 27, 28, 50-39.

Mine Office—Rockland, Mich.

Mine Management—Superintendent, Samuel L. Brady; chief clerk, Henry Stubensky; mine engineer, T. E. Vance; mine captain, J. C. Thomas.

Total assessments to Jan. 1, 1903, $500,000; last assessment, $150,000 in May, 1903. Total dividend paid, $1,820,000. Rock sent to the mill of Mass mine. Production during 1902, 163,749 pounds of mass copper or 133,373 pounds refined copper. Work during year: Shaft sinking, 3,817 feet; drifting, 17,966 feet; cross-cutting, 2,969 feet. The new machinery consists of new cone hoists and 40-drill compressor.

The Michigan mine includes the old Minnesota, Rockland and Superior mines. All these mines made copper in the old days, and the Minnesota paid $1,820,000 in dividends. The Michigan carries all the known lodes of the district, including the Calico, Minnesota contact, North contact and Branch veins, the Knowlton, Mass, Ozima, South amygdaloid and others. The Michigan mine is well developed and starts producing under favorable conditions. Two three-compartment shafts have been sunk to a depth of 1,750 feet, and a wide expanse of copper-bearing lode is available for selection. Michigan company was organized in 1899, being a consolidation of the old Minnesota, Rockland and Superior properties. The Minnesota was without question the most famous mine on Lake Superior in the early days. As a producer of monstrous masses of native copper it was rivaled only by the Phœnix, and only the Cliff equalled it in point of profits. Undoubtedly the Minnesota deserves the title of the richest copper mine ever opened. More valuable mines may exist, but no other property has yielded such enormous amounts of the red metal from such limited openings as has the Minnesota. In 1856 the Minnesota revealed the largest mass of virgin copper, with one exception, ever found. It weighed 525 tons, and required twenty men a year and a half, working with long-handled chisels, to cut this huge mass into chunks small enough for hoisting. Many smaller masses ranging in weight from five to several hundred tons, were taken from the property. The old Minnesota paid dividends of $1,820,000 during its period of prosperity, the greater part of this amount having been paid in thirteen years, from 1854 to 1866, inclusive. Subsequent to the closing of the mine by the owners, miners working on tribute took several hundred thousand dollars' worth of copper from the upper levels, and ten years after the mine was abandoned as worthless, miners "scramming" in the levels above the waterline obtained twenty-five tons of copper in a single season. No such remarkable occurrence was ever known in this district. There were about 975 stockholders of record of the Michigan Copper Mining Company on December 31, 1902. This stock seems to be a favorite in the copper country as well as all over the state. Detroit probably holds more of this stock than of any other copperdom mine. James B. Book, of that city, holds 10,245 shares, or more than one-tenth of the entire capitalization, while there are many others there owning from five to several hundred shares each. Considerable of this stock is held in Rockland, Ontonagon, Houghton, Calumet, and all over the copper country and notwithstanding the low price of the stocks generally local holders still have abiding faith in the future of Michigan.

MISKWABIK.

Capt. James Chynoweth, of the Fay mines, one of the best known mining men in the district, has assumed advisory charge of the development work at the property of the Miskwabic Development Association in Keweenew county. He is well satisfied with the progress of the work and the appearance of the rock encountered to date. The original pit has been sunk to a depth of eighty feet on the dip of the lode and drifting south is now under way. The Federal Copper Company and the Union Land

& Copper Company, the former a Duluth organization and the latter one of the Fay group, are interested with the Miskwabic, which is a local association, in the work. The various interests intend to consolidate and the details of the consolidation will, it is expected, be arranged in three or four weeks. The property is about four miles from the Mohawk in an easterly direction, and the lode is the Kearsarge. The work of development was started last summer, and it has been encouraging from the very first. The land of the three companies interested adjoins and a consolidation of their interests will result in a strong organization controlling some 1,200 acres of valuable mineral land. Local people are watching the progress of operations with interest.

MOHAWK MINING COMPANY.

President, John Stanton; secretary and treasurer, John R. Stanton.

Main Business Office—11 and 13 William Street, New York City.

Location of Mineral Lands—Secs. 27, 28, 33, 34, T. 57 N., Range 32 W. Dock—Ninety-three acres in Sec. 35, T. 56, R. 31. Mill Site—One hundred and twenty-four acres in Secs. 19 and 30, T. 56, R. 30.

Mine Office—Mohawk, Keweenaw County, Mich.

Mine Management—Superintendent, Fred Smith; assistant, Willard J. Smith; chief clerk, F. H. Getchell; mine engineer, W. F. Hartmann; mine captain, John Trevarrow. Mill Superintendent, B. S. Shearer.

Total assessments to 1903, $850,000. Amount and date of last one, May, 1902, $3.00 per share, $300,000. Annual production of present provided for, between 6,000,000 and 7,000,000 pounds. Production in 1902, 226,824 pounds. Per cent. copper in stamp rock, about 1.50 per cent. No dividends. Work confined during the year to sinking, drifting and stoping. The ground was average. It is excepted to increase product one-half early in year. In the way of new equipment we note a fourteen-foot cone drum, 20x60 hoist and 60-drill compressor. An assessment of $2.00 per share was called in January, 1902.

The shipment of Mohawkite from the Mohawk mine has ceased, the vein having pinched out. Of late it has been very irregular, varying from three feet to one inch in thickness. The drift on the seventeenth level has not extended far enough in to strike the zone of the vein, but it is believed that it may show up again there. Total shipments of Mohawkite amounted to 1,700 tons. The management never regarded the presence of Mohawkite as permanent.

Considerable significance is attached to the fact that the Mohawk openings improve with depth. This is notably true of Nos. 1 and 2 shafts, which are the deepest on the property and serve to indicate that with Mohawk the history of the Kearsarge lode is to be again repeated. The Wolverine operated on the same belt, and was poor in the upper levels, and, with the exception of the first and second levels, the same applies to the North Kearsarge. Centennial “A” shaft affords the most striking illustration; it is the deepest on the Kearsarge, and its lower openings contain as fine stretches of copper ground as are to be found anywhere on this master lode, says S. J. Beahan, a well-known and reliable writer on copper topics.

The Mohawk entered the producing lists with an aggregate of about five miles of ground openings. Four shafts have been opened on the property, commencing with No. 1, which is located about 1,500 feet southwest of the point where the outcrop of the lode passes over the northeastern boundary of the company’s lands. South of No. 4 shaft, the Mohawk lands carry the strike of the Kearsarge lode for a distance of over 3,000 feet, from which it will be seen there is ample territory for two additional shafts.

No. 1, sunk to the eighth level, is the deepest Mohawk shaft. Drifting north and south at the seventh and bottom levels is well under way, and the ground in this vicinity is uniformly charged with shot copper. This shaft, as well as No. 2, can be extended to a depth greater than 4,000 feet, while in the undeveloped territory south, even still greater depths will be permissible.

No. 2 shaft has reached the seventh level, and sinking to the eight will be resumed next month. No. 3 shaft is sinking to the seventh level, while at No. 4 sinking to the sixth level will be commenced at no distant date, as it is expected that this shaft will be extended to the seventh level by the time the new hoist will be ready for service.

Nos. 1, 2 and 3 shafts are connected at the various levels to the sixth, inclusive. Nos. 3 and 4 shafts are connected at the second and third levels, and but a short time remains until the fourth is holed through.

The ground in the bottoom levels of No. 2 shaft is well impregnated with copper. The second level south of No. 4 offers an unbroken stretch of copper ground that promises to yield handsomely and the same, to a lesser extent, applies to the fifth level north of No. 4.

The Mohawkite fissure vein is rather looked upon as a defunct proposition; it has been regarded as a sort of freak from the time of discovery, and its importance as a future asset has never been dwelt upon. This vein will be reached by the seventh level drift north of No. 1 shaft within a short time, but it is not likely to exhibit any important values, judging from its appearance at the two levels above.

Where crossed by the fissure vein the Mohawk lode is exposed to its entire width of from 15 to 18 feet, which is about the same as that of Wolverine.

Nos. 1, 2 and 3 shafts are provided with hoists capable of operating to a depth of 1,500 feet, while, as already stated, a permanent hoisting plant will be installed at No. 4 during the coming summer.

The mine is operating 27 drills, which number is to be slightly increased in the near future. The company's compressor power is sufficient for 30 drills, which is ample for all current needs; but it is quite certain that a new compressor will be contracted for during the year.

The Mohawk is a new mine from grass roots down. The mineral lands comprise 800 acres, and while they undoubtedly carry other copper belts, no attempt has yet been made to locate them, nor is it likely that there will be much of an effort made in this direction until the Kearsarge lode shafts are producing well up to their capacity.

Mohawk will need no further assessments, and it is doubtful if the recent one would have been called if the mill machinery had been delivered so that production could have commenced last August, when the mine was in readiness.

Mohawk is looked upon by conservative investors as among the very best copper stock investments in the lake group, a fact testified to by the heavy holdings in this district. In short, the mine promises to be a credit to the lode that promises to furnish employment for more men, and for a greater period than any in the Michigan copper district.

OLD COLONY COPPER COMPANY.

President, H. F. Fay; secretary and treasurer, Geo. C. Endicott.

Main Business Office—60 State Street, Boston, Mass.

Location of Lands—S. E. ¼ Sec. 18, T. 56, R. 32. Mill site, N. W. ¼ of S. E. ¼ and Lot 3, Sec. 5, T. 55, Range 32.

Mine Office—Calumet, Mich.

Local Management—James Chenoweth, superintendent; chief clerk, A. D. Nicholas; mine engineer, Charles Botsford; mine captain, Joseph B. Chenoweth.

President Fay, in his annual report, says: “The superintendent’s report shows that aside from the interesting and valuable investigations on the ‘west lode’ (and which from the showing made it is our purpose to continue for present) our work has been confined to explorations with the diamond drill, further operations at the tunnel having been meanwhile discontinued.

"The drill was started last year near the western boundry of the property and since that time has covered the entire distance to within fifty feet of the western end of the tunnel. By the drill cores thus obtained and by the information previously derived from the tunnel openings, our engineer has been able to prepare a geological cross-section of approximately the whole formation from the initial point to the eastern sandstone.

By this means not less than seventy-five distinct amygdaloidal lodes have been located, in five of which at least the cores indicate rich copper deposits. It is now our purpose to examine the best of these in order by exploratory shafts, drifts and cross-cuts, to ascertain whether they are sufficiently well mineralized throughout to produce the metal in paying quantities.

"The treasurer's statement shows a relatively small outlay and the balance now in the treasury is sufficient, at present rate of expenditure, for several months to come."

The treasurer's report shows cash on hand October 1st, 1902, of $22,037, as compared with $66,667 October 1, 1901, a decrease of $44,630.

The report of Superintendent Cheynoweth shows that on the west lode over 2,000 feet have been covered during the year with the drill. Openings on the lode foot up: Sinking 148 feet; drifting 659 feet, cross-cutting 161 feet, trenching 82 feet. Further explorations are recommended to determine the permanent character the lode. Further exploration of the eastern part of the property is also recommended, as a number of lodes on this side are very promising.

OSCEOLA CONSOLIDATED MINING COMPANY.

President, A. S. Bigelow; secretary and treasurer, W. J. Ladd.

Main Business Office—199 Washington Street, Boston, Mass.

Location of Mineral Lands—Parts of Secs. 11, 26, 27, 56-33; also Secs. 5, 6, 7, 56-32. Mill site, Sec. 14, 55-33. Former mill site, not now in use, Secs. 34, 35, 55-34. Also lands in Secs. 8, 9, 10, 16, 17, 18, 57-31.

Mine Office—Opechee, Mich.

Mine Management—Superintendent, W. E. Parnell; assistant, W. J. Wren; chief clerk, W. Veale; mine engineer, W. J. Watson; mine captain, J. P. Richards. Mill superintendent. A. L Burgan, Hubbell, Mich.

Total assessments to Jan. 1, 1903, $1,700,000. Total dividends to Jan. 1, 1903, $4,247,300. Amount and date of last dividend, October, 1901, $288,000. Production in 1902, 13,416,396 pounds of refined copper. Per cent. of copper in stamp rock, .72796. Mine has six active shafts.

The following table shows the comparative results for the last two years, the first column representing 1901 and the second column 1902:

Production.	Tons.	Tons.
Rock mined	958,272	969,835
Rock hoisted	892,172	908,264
Rock stamped	793,207	836,400
	Pounds.	Pounds.
Mineral obtained	18,807,616	18,430,012
Fine copper obtained	13,723,487	13,416,396
Copper in ton rock hoisted	15.4	14.8
Copper in ton rock stamped	17.3	16.0
	Per cent.	Per cent.
Copper in mineral obtained	72.934	72.797
Cost.	Cts. lb.	Cts. lb.
At mine, expense construction	10.94	9.91
Construction	3.52	0.64
Smelting, frt., com. etc	1.45	1.25
Total for refined copper	15.91	11.77
	Cost Ton.	Cost Ton.
Mining, including stamping	$1.57	$1.37
Stamping per ton hoisted	0.23627	0.20015
Stamping per ton stamped	0.26575	0.21735

ITEMS FOR 1902.

ASSETS.		
Cash and accounts receivable at Boston and copper on hand, sold but not paid for	$392,121.57	
Cash and accounts receivable at mines	6,279.22	
Supplies on hand at mines	211,354.36	
Wood and timber lands	43,309.18	
M. R. R. Co. stock	100,000.00	
L. S. Smelting Co. stock	60,000.00	
Total assets		$ 813,064.33
LIABILITIES.		
Accounts payable at mines	$190,597.96	
Accounts payable at Boston, including advances on copper, since paid from the sale of same	848,492.19	
Total liabilities		$1,039,090.15
Balance of liabilities December 31, 1902		$226,025.82

There still remains in the treasury 3,850 shares of the company's stock which is not included in above statement.

The Osceola company has paid to date 52 dividends, amounting to a disbursement of $4,247,300. The first dividend was paid November 15, 1878, the allotment being $1 a share on 40,000 shares; $1.50 a share was paid on the same capitalization in 1879 and in 1880. In 1880 the capitalization was increased to 50,000 shares and dividends were paid quite regularly at stated intervals, generally three or four times a year thereafter. In 1897 the consolidation occurred, taking in the Kearsarges and Tamarack Junior. The capitalization then became 100,000 shares. The last dividend was for $3 a share on 96,150 shares, disbursing $288,450. It was paid December 23, 1901.

The report of the late William E. Parnall, superintendent of the Isceola Consolidated Mining Company, is dated Calumet, Mich., Feb. 3, 1903.

Opening work for the year in the various branches has been as follows:

OSCEOLA BRANCH.	Feet.	Feet.
No. 5 shaft sunk	105.6	
No. 6 shaft sunk	171.7	
Total shaft sinking		277.3
Sinking and drifting for pillars and drifting in the various levels from the 24th to 40th, inclusive		11,247.1
		11,524.4
Deduct 2,770 feet, which are designated as pillar openings		2,770.0
Total openings in new ground for the year		8,754.4

NORTH KEARSARGE BRANCH.	Feet.	Feet.	Feet.
Sinking and raising No. 1	648.5		
Sinking No. 3	84.0		
Raising winze from the 18th to the 16th levels south of No. 3 shaft	50.0		
Drifting in the various levels from the 4th to the 24th, inclusive	5,339.1	6,121.6	
Cross-cutting at the 4th and 6th levels No. 3	167.4		
Cross-cutting at the 17th level No. 1	14.0	181.4	
		6,303.0	
Deduct 181.4 feet cross-cutting		181.4	6,121.6

SOUTH KEARSARGE BRANCH.	Feet.	Feet.	Feet.
No. 1 shaft sunk	117.0		
No. 2 shaft sunk	126.0		
Total shaft sinking		243.0	
Raises at the 2nd and 3d levels north of No. 1		21.0	
Drifting north and south from both shafts from the 1st to the 6th level, inclusive		5,736.1	
Total opening work for the year at this branch			6,000.1
TAMARACK JUNIOR BRANCH.			Feet.
Sinking winze below the 12th level south of No. 2 shaft			51.1
Opening for pillars in Osceola branch			2,770.0
Cross-cutting Kearsage branch			181.4
Total openings of all classifications			23,878.6

PHOENIX CONSOLIDATED COPPER COMPANY.

President, John E. Stanton; vice-president, William C. Stuart; secretary and treasurer, J. Wheeler Hardley.

Main Business Office—15 William Street, New York City.

Location of Mineral Lands—S. ½ of Secs. 29 and 30, T 58, R. 31. Mill site in N. E. ¼ Sec. 30, on Eagle river.

Mine Office—Phœnix, Mich.

Local Management—Agent, Prank McM. Stanton; postoffice, Atlantic Mine, Mich.; superintendent, Dunbar D. Scott; chief clerk, James B. Hagen; mine captain, Edward Hall. Mill superintendent, Cornelius Bedell; postoffice, Phœnix, Mich.

The ground openings from both Phœnix shafts are satisfactory, the average mineral yield, including that from stock piles, being thirty-seven pounds or twenty-seven pounds of refined copper. The west vein shaft opened to the tenth level and the bottom openings bear close resemblance to the rich copper courses mined at Cliff near by, years ago. The St. Clair vein is narrow and largely a mass copper producer. The Phœnix probably will not become a larger producer, but it makes its copper at a fair profit. At the St. Clair shaft at the mine, a rockhouse is in course of construction. Work on the superstructure is now under way. The rockhouse will be a duplicate of that at the West shaft. Rock shipments from stock pile are still being sent to the mill and

considerable rock from underground is also going forward. The underground showing in both shafts continues good, and considerable mass copper is being encountered. The fissure veins maintain a good average of copper contents.

The report for the year ending December 31, 1902, shows that the receipts were $201,891, of which $200,000 were in assessments, while expenditure amounted to $236,481; balance of assets, December 31st amounted, to $12,993. It was expected the new stamp mill would be in operation before the close of the year, but various unavoidable interruptions delayed the matter. The stamp mill, when completed, will be practically modern in every particular, even though the old head that did such good work at the Wolverine will be used. The mill will be equipped with twenty-four jugs—twelve of the best from the Wolverine mill and twelve of Hodge's latest improved—with four Wilfley tables to care for slimes. The management is disappointed at the delays in getting the mill ready, but expects soon to see it prepared to go into commission. The St. Clair shaft is now 1,450 feet deep, 960 feet of which was sunk this past year, and the West Vein shaft about 600 feet.

QUINCY MINING COMPANY.

President, W. E. Todd; vice-president, C. J. Devereaux; secretary and treasurer, W. A. O. Paul.

Main Business Office—45 Broadway, New York City.

Location of Mineral Lands—Secs. 23, 24, and 26, T. 55, R. 34. Stations, etc., about 2,700 acres. Stamp mills and docks on Torch Lake. Reduction works and docks in Sec. 25, T. 55, R. 34, on Portage Lake.

Mine Office—Hancock, Mich.

Mine Management—Superintendent, J. S. Harris; chief clerk, H. C. Fish; mine engineer, C. H. Hitchcock, Jr.; mine captain, Thomas Whittle. Mill superintendent, James W. Shields, Hubbell, Mich. Smelter superintendent, W. P. Smith, Hancock, Mich.

Total assessments, $1,450,000. Total dividends, $13,570,000. Amount and date of last dividend, $2.50 per share, August, 1902, $700,000. Production in 1902, 11,797 tons.

The electric haulage at No. 6 shaft, the first installed in the copper district, has proved to be of great saving in the cost of tramming rock. Four electric locomotives are in commission; they are operated by a current furnished by the local electric light and power company. The General Electric Company of Chicago is now figuring on the installation of an electric power plant of sufficient capacity for general underground haulage, as well as surface haulage for transporting mine timber, drills and general supplies now delivered to the various shafts and shops by teams. This electric plant will probably be installed at the stamp mill location.

The method of handling and hoisting rock has been receiving careful attention of late. Bins have been made, between some of the levels, on the hanging side of the shaft, of approximately 500 tons capacity. These are constructed so the rock from them can be run directly into skips, a change that will much facilitate hoisting. The present steel skips, which have a capacity of about six tons, will be replaced by skips of eight tons capacity. Two of these, about fourteen in length, are nearing completion at the company's smithy. Changes whereby the cost of crushing rock is lessened materially and the disposition of poor rock is greatly facilitated have been completed at No. 4 rock house. Similar improvements will have been made at the other rock houses by the time the larger skips go into commission.

The new No. 7 shaft, located at the brow of the hill, is sunk to the fifth level, with drifts being extended north and south at the fifty-second and fifty-third and bottom levels. The first stoping ground at this shaft was offered at the sixth level, while below the fourteenth level the shaft penetrated virgin territory. No. 4 shaft reached its maximum depth at the fifty-first level, from which point the capacity of the hoist is drawn upon. In any event of the situation permits of the ground below the fifty-first level being handled to better advantage at either No. 2 or No. 7 shaft. Nos. 2 and 6 shafts have reached the fifty-seventh and fifty-sixth levels, respectively. The new No. 8 shaft is down about 1400 feet and is sinking to the thirteenth level. The lode at this shaft shows the same characteristics that were exhibited since sinking commenced. The vein is very bunchy, and it is believed that the shaft is not yet down into the regular copper channel. The bottom stopes look fairly well. North of No. 6 shaft the levels are extended under the Franklin and back toward No. 8. Between the Franklin and Mesnard there is a rich vein that the Quincy will be operating to advantage before the expiration of the current year. This vein proved highly productive at the thirty-sixth level of No. 5 shaft of the Franklin and shows very well at the Franklin boundary line. It is for the purpose of operating this stretch of territory to the best advantage that electrical engines are being secured for tramming.

RHODE ISLAND COPPER COUNTRY.

President, Charles J. Devereaux; secretary and treasurer, W. R. Todd.

Main Business Office—45 Broadway, New York City.

Location of Mineral Lands—Entire Sec. 5, S. W. ¼ Sec. 4, T. 55, R. 33.

Mine Office—Hancock, Mich.

Mine Management—Superintendent, Thomas Dennis; chief clerk, M. M. Dennis; mine captain, Richard Hodges.

Total assessments, $600,000. Amount and date of last, $200,000, July, 1902. Production, none. Shaft sinking,

drifting and cross-cutting has been carried on with encouraging results. The report of the treasurer is as follows:

Balance January 1, 1902	$31,415.85	
From interest, etc.	1,354.41	
From assessment	84,374.00	
		$117,144.31
Mining expenses, taxes, etc.		39,040.80
Unexpended cash		$ 78,103.51
Assessments unpaid		15,626.00

SOUTH RANGE MINING COMPANY.

President, H. H. Stevens; secretary and treasurer, H. W. Wessan.

Main Business Office—60 State Street, Boston, Mass.

Company owns about 6,000 acres of mineral lands in Ontonagon County, Mich.

The company furnished part of the lands for the present Winona and Elm River Companies and it is understood that on these transactions alone it has been recompensed for the entire investments to date. The company is doing no work.

ST. MARY'S CANAL MINERAL LAND COMPANY.

President, Nathaniel Thayer; vice-president, Charles J. Payne; secretary and treasurer, Arthur G. Stanwood.

Main Business Office—199 Washington Street, Boston, Mass.

Company owns 110,000 acres of land on the South Copper Range. Now exploring with two diamond drills on Sec. 22, T. 53, R. 35.

Local Agent, R. R. Goodell, Houghton, Mich.

This company is the successor of the St. Mary's Canal Mineral Land Company. The older company received a large grant of land from the government as a bonus for the building of the first Sault Ste. Marie canal. The choosing of the lands was left to the pleasure of the grantees and rare shrewdness was exercised. Among the tracts were the present Tamarack, Wolverine, Baltic, Tri-Mountain, Champion and other valuable mines and prospects.

From the organization of the old company in 1863, till its successor took over the affairs in 1901, cash dividends to the amount of $111 per share, aggregating $2,220,000, were paid, allotments of stock dividends also were paid as follows: One-fourth share Boston & Albany for each share of Canal & Mineral Land stock; one share of Tamarack; one share of Iroquois; one and one-half shares of Baltic; one-half share of Winona. The last dividend was on November 28, 1899, amounting to $4. The total dividends for that year were $29, while for the year before $8.50 was paid.

TAMARACK MINING COMPANY.

President, A. S. Biglow; secretary and treasurer, W. R Todd.

Main Business Office—199 Washington Street, Boston, Mass.

The Tamarack mine property comprises about 1,000 acres of irregular outline located in Secs. 10, 11, 14 and 15, T. 56, R. 33. The company also owns 45,000 acres of timber lands.

Mine Office—Calumet, Mich.

Mine Management—Superintendent, W. E. Parnell; assistant superintendent, W. J. Wren; chief clerk, J. I. Reeder; mine engineer, John B. Watson; mine captain, Thomas Martin. Mill superintendent, A. L. Burgan, South Lake Linden.

Total assessment called, $320,000. Total dividends paid, $8,490,000. Amount and date of last one, December, 1901. Production, 1902, 15,961,528 pounds refined copper. The company works a conglomerate lode yielding 1.4357 per cent, copper. The underground development shows an average lode. Vertical shafts are required to reach the copper-bearing ground of this location, as the vein outcrops on Calumet & Hecla lands.

A large portion of the great hoisting plant for No. 5 shaft, Tamarack mine, which will be a duplicate of the quadruple-cylinder hoist now in commission there, arrived early in January. The compressor plant, with a capacity of 100 drills, will be ready for installation in a short time. After the machinery is received the first attention will be given to putting the compressor in commission. It is probable that no work will be done on the hoisting plant until the former task is completed. The present compressor at No. 5 has a capacity for handling only 30 drills and it is important that the permanent compressor be installed before other large undertakings are put under way at No. 5. At present air is being furnished from old Tamarack and North Tamarack to operate drills and pumps in No. 5. The new compressor will meet all the requirements and may be in position to furnish air to other portions of the property if it should be needed. When the compressor house was built provision was made for the equipment now to be installed, and the foundation is in readiness to receive it. In the main essentials the new hoisting engine, parts of which are at mine, will be a duplicate of the one now operating. They are built to carry 6,000 feet of hoisting cable, which will work the mine to an approximate depth of 6,000 feet, of 1,000 feet below its present bottom. Each engine has a capacity to hoist a net load of six tons of rock. In addition to this the cage and skip will weigh about six tons more. The skips and cages now operating in No. 5 shaft are not intended as permanent and will be replaced in the course of time by a system differing considerably from the present. Like the compressor house, the engine house was also built with provision for the added machinery now arriving, and the foundation is in readiness to receive the hoist. When

this work is accomplished No. 5 shaft will have an equipment which in power and efficiency will far surpass that of not only any other shaft in the Lake district, but also in the world. The Red Jacket shaft of the Calumet and Hecla mine now has the distinction of possessing the most powerful hoisting plant in the world. It consists of a pair of engines whose aggregate horse-power is about 8,000. At No. 5 Tamarack, the hoisting will eventually be performed by two duplicate direct Nordberg engines whose combined strength will reach the enormous figure of 12,000, showing the latter shaft will have hoisting power equal to one and one-half times that which now has the reputation of being the most powerful on earth.

TECUMSEH COPPER COMPANY.

President, H. Stevens: secretary and treasurer, D. L. Demmon.

Main Business Office—Boston, Mass.

The company owns the S. ½ of the N. E. ¼ of Sec. 32; S. ½ of N. ½ of Sec. 33; S. ½ of N. W. ¼ and N. ½ of N. E. ¼ of N. W. ¼ of Sec. 34, T. 56, R. 33.

Mine Office—Calumet, Mich. Superintendent, James Chynoweth.

In compliance with orders received from the eastern office, work at the Tecumseh Copper Company property has been discontinued. No explanation has been given out, but it is understood that the copper bearing ground lacks consistency.

The report of D. L. Demmon, treasurer, shows a cash balance in treasury, January 1, 1902, of $21,732.69, and a total of $32,920 expended during 1901, also that there is in the treasury 45,041 shares of the capital stock of the company. There is also given a statement of assets, including cash, fuel, buildings, machinery, etc.; at mine January 1, 1902, which foots up $22,279.09. Supt. James Chynoweth, in his report to the directors, says: "At the time of writing my last report we were conducting exploratory operations on the western end of your property in search of the Pewabic amygdaloid lode. In all 663 feet of openings were made in that territory. Several amygdaloid formations were discovered, none of which, however, warrant further prosecution of work there, and operations were discontinued last spring. The latter part of May last, sinking was resumed in the shaft on the Osceola lode, which at this writing has attained a depth of 1,623 feet, having been sunk a distance of 528 feet during the past eight months by one party of miners, consisting of four men. The lode in this shaft continues healthy and well denned and dips at a uniform angle. During the past few weeks, the rock coming from this shaft has been impregnated with considerable fine copper. While this showing of copper would not warrant treating the rock in a stamp mill, it is, however, very encouraging and indicates that the shaft is nearing the channel of ground which has yielded so much copper in the Osceola mine adjoining your property on the north. On the 1st inst., an additional party of miners were set at work drifting north of the shaft, from which I hope to be able to report favorable results in the near future. The buildings at the mine and also the machinery and equipment have been kept in good repair."

TRIMOUNTAIN MINING COMPANY.

President, H. F. Fay; treasurer, George G. Edicott; secretary, W. B. Moseman.

Main Business Office—60 State Street, Boston, Mass.

Location of Mineral Lands—E. ½ Sec. 19, W. ½ and Lot 3, Sec. 20, W. ½ Sec. 29, and N. E. ¼ Sec. 30, T. 54, R. 33, 1,189.15 acres. Mill site, part Sec. 25, T. 55, R. 33; part Sec. 19, T. 55, R. 35; part of N. W. ¼ of N. W. ¼ Sec. 30, T. 55, R. 35.

Mine Office—Trimountain, Mich.

Mine Management—James Chynoweth, superintendent; clerk, John M. Wagner; mine engineer, John Knox; mine captain, Thomas Rapson.

Total assessments to Jan. 1, 1903, $800,000. Amount and date of last, $3.00 per share, $300,000, March, 1902. Production 1902, 5,730,807 pounds. Per cent, copper in stamp rock, about 1.25.

Mine has four shafts. Three of the shafts are being equipped for a depth of 5,000 feet, one shaft for 1,000 feet.

In February, 1903, a dividend of $1.50 per share was declared.

Trimountain occupies a position directly between the Baltic and Champion mines of the Copper Range Company, has ceased to be a speculative feature, says Geo. L. Walker. Mr. Walker is told that Trimountain rock is making an average return, month in and month out, of thirty pounds of fine copper to the ton or better. The lode is thirty feet to fifty feet wide, and extends for more than a mile on the Trimountain property. Here is material enough to make possible a very large output, and the form of deposit is such that can be taken out at a very low cost. The gross cost of production by the Trimountain should not exceed $1.75 per ton of rock treated. With a yield of thirty pounds to the ton this means that the gross cost of thirty pounds of copper will be $1.75, or a trifle less than six cents per pound. With the three stamps now in commission, two of its own and one at the Arcadian mill, the Trimountain must be producing at the rate of over 13,000,000 pounds of copper annually, and earning over $7 per share on its stock. These earnings, however, will probably be devoted to development work for some time to come. The property owned by the Trimountain is large enough and will be developed on such a scale that six stamps will eventually be required to treat its product. Its present mill will have four stamps. When the company

operates six stamps, and has everything working smoothly, it give promise of a production of over 27,000,000 pounds of copper annually, and net earnings with copper at 12 cents of over $16 per share on its capital stock.

UNION COPPER LAND AND MINING COMPANY.

President, H. F. Fay; secretary, W. B. Mosman; treasurer, George C. Endicott.

Office—60 State Street, Boston, Mass.

Company owns 7,000 acres, all located on. the so-called "Mineral Belt." The total expense during the past year, less interest, etc., amounted to $8,850.91. The cash balance in the treasury on January 1, 1903, was $83,856.12.

VICTORIA COPPER MINING COMPANY.

President, Calvin Austin; vice-president, C. D. Hanchette; secretary and treasurer, James P. Graves.

Main Business Office—53 State St., Boston, Mass.

Location of mineral lands being operated on Sec. 30, 59-39. Company owns about 2,000 acres in a compact tract in Secs. 19, 20, 29, 30, 31, T. 50, R. 39, and in Secs. 25 and 36, T. 50, R. 40. The shaft is located in the S. W. ¼ of Sec. 30, T. 50, R. 39.

Mine Office—Victoria, Mich.

Mine Management—Superintendent, Thomas Hooper; chief clerk, C. R. Everett; mine engineer, C. R. Forbes; mine captain, Hooper.

Total assessments to Jan. 1, 1903, $800,000. Dividends none.

The Victoria is still centering its energy on the development of its surface work, and with ground opened sufficient to maintain rock shipments of 300 tons a day for five years, there is no thought of resuming work underground until the hydraulic air compressor is completed.

This system of hydraulic air compression, says the Calumet News, consists of an immense dam across the Ontonagon River which diverts the water above Glen Falls into a canal some 6,000 feet long. This canal terminates in a forebay, which has an elevation of seventy-one feet above the water level of the river below the falls. In this forebay will be three vertical cylindrical shafts each 334½ feet deep and 5 feet in diameter.

The water will pour down these shafts and in its course through the hood, which will enclose their tops, it will entrain the atmosphere through nearly 1,700 three-eighths inch tubes in each head, making an aggregate of 5,000 tubes in the three heads. The air thus entrained will enter the water in the form of bubbles and will be carried downward by the flow.

At the bottom of the three shafts, which are nineteen feet apart from center to center, the water and air will enter a fan-shaped chamber twenty-six feet high. At the end where the three shafts have their lower extremities this chamber is sixty feet wide. At the distance from the end where the shafts enter increases, the chamber narrows until it reaches a width of eighteen feet, which width is maintained to the other end of the tunnel, the height of twenty-six feet being maintained throughout.

This tunnel will be 360 feet long from the end in which the three vertical shafts terminate to the point where the air chamber ends. There the height will be reduced from twenty-six feet to ten feet, but the width of eighteen feet will be maintained and the tunnel, with dimensions of 10x18 feet, will continue for forty feet. At that point it will connect with a shaft sunk on an incline of eighty degrees and having dimensions of 16x20 feet.

This small end of the tunnel, and the incline shaft, will be the channel of egress for the water which has poured down through the vertical intake shaft. By having the slope of larger dimensions than the larger part of the tunnel, the water will be allowed to flow out and upward through the incline shaft, but the compressed air will be entrapped in the large chamber.

The 16x20 feet eighty-degree shaft has been completed and the tunnel toward the point where the vertical shaft will terminate has been driven sixty feet. As this tunnel is to be 400 feet long there remains 340 feet yet to drive. The tunnel is not being carried into its full size, so that the strike line of the vertical shaft may be reached more rapidly.

Five-inch drill holes have already been driven in the strike line of these vertical shafts. As soon as the tunnel reaches the strike line of the vertical shafts the drilling of these cylindrical five-foot shafts will begin, the tool for this purpose being a specially constructed drill bit with four cutting faces radiating 2½ feet from the shank. A No. 9 Rand air drilling machine will be used to actuate the bit.

The dam and canal are entirely completed and water has been allowed to pass through the forebay. A safety dam has been built across the canal at a short distance above the forebay so that if a leak or break of any kind occurs at the inlet gates at the main dam and water should come into the canal of this safety dam will divert it from its course and prevent it from flooding the work which is now in progress at the compressor plant. This safety dam is equipped with easily manipulated gates which can be opened and closed at will.

The Victoria mill site is on a plateau which has been leveled off from a hillside adjacent to the hydraulic compressor plant and forebay of the canal. The grading of this mill site is now practically completed.

Almost all of the timber to be used in the mill construction by the Victoria will be that which has been

removed from the mill purchased by the company from the Belt. The Belt purchase also included a number of cars, which will be used on the gravity road.

No. 1 shaft of the Victoria mine is being put into fine condition for permanent operation when the period of production begins.

WINONA COPPER COMPANY.

President, John Stanton; secretary, J. W. Hardley; treasurer, J. R. Stanton.

Main Business Office—11 and 13 William Street, New York City.

Location of Mineral Lands—E. ½ Sec. 19, N. E. ¼ Sec. 30, N. W. ¼ Sec. 29, W. ½ Sec. 20, W. ½ of S. E. ¼ Sec. 20, T. 52, R. 36. Timber lands—N. E. ¼ Sec. 32, N. W. ¼ of N. W. ¼ Sec. 22, N. W. ¼ of S. W. ¼ Sec. 22, Lot 3, Sec. 22, all in T. 52, R. 36.

Mine Office—Winona, Mich.

Mine management—Superintendent, F. W. Denton; chief clerk, William C. Van Orden; mine captain, John Peterson.

Total assessments, $900,000. Amount of last one, $100,000. Dividends, none. Production in 1902, 101,188 pounds of refined copper. Per cent. of copper in stamp rock, about 1.000 per cent.

The new shaft south of No. 2 is opening excellent ground. It is sunk ins the richest chute of copper ground found at the Winona. Sinking has reached the sixth level. The shaft was opened in short order, raising and sinking from the levels south from No. 2 shaft hastening the work. Recent developments in the territory south from No. 2 shaft have been as surprising as the first few days' mill run. The present promising outlook is all the more gratifying because of the unfavorable aspect a year or so ago. It is not denied that the property has the making of a good mine, but what the development will cost is merely a matter for conjecture.

WOLVERINE COPPER MINING COMPANY.

President, John Stanton; secretary and treasurer, J. R. Stanton.

Main Business Office—11 and 13 William Street, New York City.

Location of Mineral Lands—N. W. ¼ and W. ½ of N. E. ½ and N. E. ¼ of N. E. ¼ of Sec. 7, T. 56, R. 32. Mill site, forty acres S. E. ¼ of S. W. ¼ Sec. 19; 30 acres in Sec. 30, T. 56, R. 30.

Mine Office—Kearsarge, Houghton County, Mich.

Mine Management—Fred Smith, agent; Willard J. Smith, superintendent; Charles L. Woetzel, chief clerk; William A. Hartmann, mine engineer; William Pollard, mine captain. Mill superintendent, Barnett S. Shearer, Mohawk, Mich.

Total assessments called $180,000; amount and date of last one, $60,000, March, 1895. Total dividends declared to January 1, 1903, $990,000; amount and date of last one, $120,000, October, 1902. Annual production as at present provided for, 9,000,000 pounds. Production for 1902, 6,473,181 pounds. Per cent. of copper in stamp rock, amygdaloid, 1.478 per cent.

President Stanton says the Wolverine mine has a life of between 25 and 30 years on the Kearsarge lode at the present rate of production—9,000,000 pounds per annum. He does not care to say how long he expects the rock now being milled to contain 30 pounds of copper to the ton. He says it has been running at this figure for some months, and the richest ground is in the lower levels. “No less an authority than old John Daniell told me in the early days that I was making a big mistake to spend money in search of the Kearsarge lode,” says Mr. Stanton. “He knew there was no copper in it. To-day it has become one of the master lodes of the Lake Superior district.” J. R. Stanton, secretary, says that the reason for increasing the Wolverine divided was the increase in production, due to three months’ operations of the new mill, which increased the capacity of the mine from 500 tons to 1,000 tons a day. The company is now producing about 700,000 pounds of finished copper a month, and he considers it a conservative estimate to say the annual production beginning July 1st, when the new plant will be in perfect running order, will be from 9,000,000 to 10,000,000 pounds. The company has now spent all the money it intends on plant and mine equipment. Its policy henceforward will be to maintain the surplus at about its present amount, from $250,000 to $275,000 which is considered a sufficient working capital, and to devote all profits over and above that amount to dividends. Since 1898 the company has steadily increased its dividends, paying $1 semi-annually in 1898, $1.50 in 1899, $2 in 1900, 1901, and 1902, and $2.50 this year. During the present half-year it is expected that earnings will show up still better than in the last, as in addition to the full benefit of the new plant the company will have the advantage of the increased price of copper.

WYANDOTTE COPPER COMPANY.

President, Henry Stackpole; vice-president, Irving J. secretary and treasurer, W. D. Gay.

Main Business Office—4 Liberty Square, Boston, Mass.

Location of Mineral Lands—Secs. 28 and 21, S. E. ¼ of Sec. 20, S. ½ Sec, 16, T. 52, R. 36.

Mine Office—Houghton, Mich.

Mine Management—Superintendent, F. L. Van Orden; chief clerk, John H. Hicock; mine engineer, F. L. Van Orden, mine captain, Louis LaRochell.

Total assessments to date, $700,000. Exploratory works—shaft sinking, drifting and crosscutting, on Sec. 28, T. 52, R. 36. There has recently been some improvement in the underground developments at the Wyandot property, not sufficient to cause any great enthusiasm, but still enough to give the management some encouragement. The Wyandot property lies between the Winona and the Elm River and both the Wyandot and Elm River properties were floated on the basis of the showing at Winona. The Wyandot people now have a shaft down between 500 and 600 feet and in a cross-cut recently driven at depth a mineral bearing lode was encountered which contained some copper, not in commercial quantities but sufficient to warrant further explorations.

OTHER COPPER COMPANIES.

Resolute Mining Company, not active.

Oneco Copper Mining Company. Report says, "The company terminated all its mining operations more than two years ago and has not been in active operation or business since."

Torch Lake Mining Company, not in active business.

The annual meeting of the stockholders of the Washington Copper Mining Company will be held at the company's office, Boston, Mass., Tuesday, March 24th, 1902. The annual report of H. F. Fay, president, says: "In accordance with the recommendation in the annual report for 1901, no operations have been prosecuted during the past year, as no important developments on neighboring lands have occurred, and while your directors feel that the policy of waiting should continue, there is encouragement for the future because of the further extension of railroad facilities in Keweenaw County, which seems fair to assume, should greatly increase and hasten investigation in that section. The treasurer's statement for the fiscal year ended Dec. 31st, 1902, which follows, does not include the Michigan taxes for 1902, amounting to $87.62, as these were paid in January of this year." The treasurer's statement shows: Cash, Jan. 1st, 1902, $4,394.67; interest, $86.18; total, $4,480.85; expense account for registration, transfers, Massachusetts taxes, annual meeting and legal expenses, $264.98; cash on hand Jan. 1st, 1903, $4,215.87; total, $4,480.85.

IRON.

INTRODUCTORY.

The production of iron in all ranges in 1902 reached the enormous total of 27,571,121 tons. When the total of 20,593,537 tons was produced in 1901 it was thought the capacity of the mines of the Lake Superior region had been reached. But in one year the record is pushed up 6,977,584 tons. This is the greatest increase in any one year in the history of iron mining. In 1893 the total production of all the ranges was but 6,065,716 tons, being less than the increase in 1902 over 1901. Of this enormous total the Marquette range produced 3,853,010 tons; the Menominee range 4,627,524 tons; the Gogebic range 3,663,484 tons; the Mesaba range (Minnesota) 13,342,840 tons, and the Vermillion, also in Minnesota, 2,084,263 tons. Total production of the three Michigan ranges, 11,144,018 tons; of the two Minnesota ranges, 15,427,103 tons. Michigan was forced into the second rank as an iron ore producing state in 1901, when the Minnesota ranges exceeded the production of the Michigan ranges by 988,369 tons. In point of production the Lake Superior ranges now stand as follows:

	Tons.
Masaba	13,342,840
Menominee	4,627,524
Marquette	3,853,010
Gogebic	3,663,484
Vermillion	2,084,263
Total of all ranges in 1902	27,571,121

From the viewpoint of total production, the Marquette range is still at the head, the grand totals for the several ranges being as follows:

	Tons.
Marquette	66,686,502
Masaba	53,747,807
Menominee	42,267,233
Gogebic	37,818,274
Vermillion	19,016,506
Grand total for all ranges	219,531,642

The year 1902 was not only a record breaker in point of shipments, but from nearly every other standpoint. Wages ruled higher; more men were employed, more permanent improvements were made, and more exploratory work was done, and, I might add, that fewer results were secured from exploratory work. I cannot recall that the discovery of a single valuable deposit of ore as a result of the expenditure of over a $1,000,000 in the work. It is true that several deposits of a low grade ore were developed, but the existence of these deposits has been known for years. The only new mine added to the shipping list was Verona, Menominee range, with an output of over 40,000 tons. It is true that many of the old-timers, long idle, returned to the shipping list, but, as far as the Michigan ranges are concerned, the great bulk of the increased shipments came from old stock-piles. You have evidence of this fact in the total for the big Chapin mine, the total over 1901 being less than 20,000 tons.

UNITED STATES STEEL CORPORATION.

A few words regarding the United States Steel Corporation will not be out of place in this introduction. In the last report it was predicted that the advent of this great corporation would give such stability to the iron business as it had never enjoyed before. Time has established the truth of the prediction. No one has been crowded out of business. Indeed, the progressive policy pursued by the management of its mining adjunct—the Oliver Iron Mining Company—has been most beneficial in all directions. Some few facts regarding the Steel Corporation gleaned from its annual report will no doubt interest every reader of this report:

Gross receipts	$560,510,479
Manufacturing and operating expenses	$411,408,818
Total net income	$157,657,084
Net earnings	$133,308,764
Paid in dividends	$ 56,052,867
Undivided profits	$ 34,253,343
Average number of employes	168,127
Total wages and salaries	$120,528,343
Finished products, tons	8,000,000
Iron ore mined, tons	16,000,000
Coke manufactured, tons	9,500,000
Blast furnaces product, tons	8,000,000
Steel ingots, tons	9,700,000

The Boston News Bureau sums up an exhaustive article on the United States Steel Corporation as follows: "The United States Steel Corporation is a trustee for steel prices and steel dividends and for about ninety per cent. of the known hard ores in the United States necessary for the manufacture of steel. Its duty, therefore, is plain. It should follow the path so admirably marked out by the Chicago, Burlington & Quincy board: Pay no attention to the stock market, but maintain the "stability of dividends" making no useless sacrifice of its trusteeship, but continuing to pay dividends so long as the company is fairly earning them with reasonable margin for protection of the property. If business falls off, the company's cash output should diminish and its receipts and cash in the treasury increase. As it is understood to hold about $60,000,000 of cash at the present time, there can be no question entering into the consideration of dividends but the question of earnings. When the United States Steel Corporation was formed, J. P. Morgan declared to his associates that the net earnings of the combined companies would reach the startling aggregate of $100,000,000, or $25,000,000 more than was required for interest and dividends. His associates thought this prediction was too strong. It was justified the first year when the earnings were $111,000,000, or $11,000,000 more than Mr. Morgan has predicted. The next year they were $133,000,000. They are expected to be this year $125,000,000.

The "quick assets" of the Corporation in October, 1902, were placed at $245,000,000, meaning raw materials, bills and accounts receivable and cash on hand. In October, 1902, contracts were let for lake steamers aggregating in value $10,000,000. According to the plans adopted by the board of directors of the United States Steel Corporation, in connection with the $250,000,000 bond conversion plan, $5,075,000 will be expended on the plant of the company at South Chicago, and $1,050,000 on the Joliet plant. The improvements provided for at the plants of the company throughout the country aggregate $36,000,000. The plan provides for the issuance of $250,000,000 of 5 per cent. bonds, $200,000,00 of which are to be exchanged for $200,000,000 of 7 per cent. preferred stock. Judge Gary, chairman of the executive committee, gave out an official statement to the effect that plans which have been under consideration and preparation for over a year for harmonizing, extending, and rounding out the various plants will be pushed forward with all possible dispatch. It is estimated that when these expenditures are completed there will be added to the total capacity of the various subsidiary companies 2,700,000 tons of all products. The estimates in detail are as follows:

Illinois Steel Company at South Chicago, Ill.:	
Construction of the new open-hearth furnace plant, blooming mill and finishing mill	$3,000,000
Remodeling the 132 plate mill train	650,000
Additional heating capacity at rail mill	200,000
Improvement of Bess. department	150,000
New blast furnace blowing engines	475,000
For repairing stoves at furnaces Nos. 1-4	400,000
Addition to machine shop and foundry	200,000
Illinois Steel Company at Joliet, Ill.:	
Remodeling blast furnaces Nos. 1 and 2	$ 900,000
Addition to converting mill	150,000

In addition to the foregoing, sundry improvements of lesser magnitude have been authorized at South Chicago and Joliet, at an estimated expenditure of $420,000.

National Tube Company, at McKeesport:

The entire rebuilding of the present rolling mills and tube and pipe mills, together with the addition of one new blast furnace, an additional Bessemer converter, and the installation of a new water and power plant; all at an estimated cost of $9,255,662.

At Lorain, Ohio:

The erection of two additional blast furnaces with accessory works, additional rolling mills, and a new tube and pipe mill; all at an estimated cost of $8,646,096. These improvements will increase the annual production of pig iron 347,000 tons, of rolling mills 330,000 tons, and of the tube and pipe mills 300,000 tons.

American Steel and Wire Company:

Various improvements at Newburgh Steel works, Consolidated works, American works, Central works, Emma furnace, and at Central furnace docks in the Cleveland district; at Shoenberger works, Rankin works, Edith furnace, Neville furnaces, in the Pittsburg district; at Waukegan, De Kalb, Rockdale, Scott Street and Anderson works, in the Chicago district, and at Worcester, Mass., works, and Allentown, Pa., works to the aggregate amount of $4,536,000.

American Sheet Steel Company:

The rebuilding with modern equipment and buildings of the Canal Dover plant, at Canal Dover, Ohio; an addition to the polishing department at the Wellsville plant; the improvement of McKeesport works at McKeesport, Pa.; the erection and installation at Vandergrift works, Vandergrift, Pa., of improved and modern operating methods, all of the above to cost $355,000.

Carnegie Steel Company, at Homestead works, Homestead, Pa.:

The erection of an additional 140-inch plate mill; the improvement of the 32-inch mill and of the boiler plant; $1,135,000.

Other companies for which improvements are provided are as follows:

Edgar Thompson works, Braddock, Pa.	$ 275,000
Duquesne works, Mushall, Pa.	330,000
National Steel Company.	1,592,000
American Steel Hoop Company.	285,000
American Tin Plate Company.	1,000,000
H. C. Frick Coke Company.	445,000

MINING COMPANIES.

The erection of a crusher plant at Escanaba, Mich., $143,810, with an annual capacity for crushing 510,000 tons of ore; also the erection of additional power houses, shafts and mining plants on the Vermillion, Gogebic and Menominee ranges, $317,000.

TRANSPORTATION PROPERTIES.

Duluth, Mesaba & Northern Railway.	$543,691
Duluth & Iron Range Railroad.	187,000
Chicago, Lake Shore & Eastern Railway.	300,000
Pittsburg Steamship Company.	208,000
Pittsburg & Conneaut Dock Company.	40,000

Judge Gary's statement says it is estimated "that under normal conditions the increased earnings from this increased and improved capacity will be about $7,000,000 a year, and that there will be a manufacture of about $5,000,000 a year, or a total of something like $12,000,000 a year added to the profits of the several subsidiary companies."

OLIVER IRON MINING COMPANY.

President, Thomas F. Cole; vice-president, Dr. Nelson P. Hulst; secretary, C. D. Fraiser; treasurer, Charles E. Scheids; assistant secretary and treasurer, Geo. D. Swift; auditor, W. E. Jefferey; general manager, William J. Olcott.

Main Business office—Duluth, Minn.

General Superintendents—John H. McLean, Gogebic range, Ironwood, Mich.; William H. Johnston, Marquette range, Ishpeming, Mich.; Otto C. Davidson, Menominee range, Iron Mountain, Mich.

This company is the mining branch of the United States Steel Corporation, and is by far the largest producer of iron ore and owner of mining properties in the state. In many cases its operations are carried on through subsidiary companies.

HISTORICAL.

The first discovery of iron ore in Michigan was made September 19th, 1844, by a party of United States surveyors, about a mile south of Teal Lake in Marquette County.

The first location of iron lands was made in the summer of 1845, one year later.

This entry was made by P. M. Everett, who, with four others, came to the upper peninsula on an exploring tour for precious metals. S. T. Carr and E. S. Rockwell, members of the expedition, were lead to the spot by an Indian guide bearing the picturesque name of Manjckijik.

The permit to locate and explore the lands was issued in the name of James Garrison. When the government surveys were finally completed, the lands were purchased at $2.25 per acre. The lands included the Jackson mine.

The Jackson party became involved in a law suit with D. Hamilton, of Watervliet, N. Y., who, it seems, had secured a prior permit—No. 158—covering Sec. 1, T. 47, R. 27. Subsequently Hamilton withdrew his application, and when the survey was finally completed the Jackson party made the purchase.

It will no doubt shock the superstitious to learn that the first iron mining company organized to operate in Michigan was composed of thirteen men. As a matter of state pride, it is equally interesting to record that this company was composed entirely of Michigan men, residents of Jackson. In honor of their town, the organizers decided to name the corporation the Jackson Mining Company. A. V. Berry, president; P. M. Everett, secretary and treasurer.

In 1846, the first iron ore was mined in Michigan, the Jackson company sending four men to their lands for the purpose of securing samples. Two hundred pounds of the ore was "packed" to Jackson. From these samples the first iron derived from Lake Superior ore was made in a blacksmith's forge at Jackson.

In this year an iron mining company had been organized at Cleveland and Dr. Cassels was sent to the peninsula to locate lands. His entry became known, arid is now known as the Cleveland location.

In 1847 the Jackson company built the first forge in Michigan. It was located at the mouth of the Carp River, on Lake Superior, a short distance below the (now) City of Marquette.

The first iron made in Lake Superior was in this forge on February 16, 1848. A water wheel furnished the motive power, and a few days after the first forge was made the dam was carried out by a freshet. In the summer the dam was rebuilt. This forge was operated irregularly and by various parties, but was never a success from a financial standpoint. The daily product was about three tons—when working smoothly, which was not often.

In 1856, the forge was abandoned and was succeeded in later years by what is now known as the Carp River furnace of the Cleveland-Cliffs Iron Company.

The Jackson Mining Company was re-incorporated in 1849 as the Jackson Iron Company and the controlling interest was sold to Pennsylvania parties, represented by General Curtis, of Sharon, Pa.

It was General Curtis who conceived the idea of shipping Michigan iron ore to the coal fields of Pennsylvania. In

this year it took seventy tons of the Jackson ore to Sharon, Pennsylvania where it was made into pig iron that gave excellent satisfaction. This was the first considerable shipment of iron ore from the Lake Superior region.

The transportation expense was too heavy to warrant additional shipments and no progress was made in developing the mines until the outbreak of the Civil War, when the great demand for iron again directed attention to the Lake Superior fields. The Jackson was the first to benefit by the new order of things and it is recorded as an interesting fact that this company paid its first dividend in 1862.

After a contest in the courts covering three years, the Cleveland parties established their title to the Cleveland location. Possession was taken of this in 1846 by Dr. Cassels in the name of the Dead River Silver and Copper Mining Company. No mining work, however, was done until 1853, in which year a deal was closed for the property of the Marquette Company. The Marquette Company was one of the unsuccessful contestants for the Cleveland lands and had built a forge for blooms of ten-fire capacity. The Cleveland company continued to operate the forge for some time, but it was never a success. In 1854, the forge was destroyed by fire. In this year the Cleveland company made the first considerable shipment of ore from Lake Superior, the total being 1,449 tons.

The Lake Superior mine was owned by the Cleveland association in 1853, but a few years later it was sold to the Lake Superior company for $30,000.

In 1857, the iron mines of the Marquette range were connected with Marquette harbor by a railroad, H. B. Ely being the promoter. This road is now a part of the Duluth, South Shore & Atlantic Railway system.

In 1852, Congress granted the State of Michigan 750,000 acres of land to aid in the construction of the canal at the Soo. The first ground was broken on June 4th, 1853, and the canal was completed in June, 1855.

In 1864, the Chicago & North-Western road was built from Escanaba to the Marquette range.

1883, the Marquette, Houghton & Ontonogan Railway was extended from L'Anse to Houghton and Hancock, where a connection was secured with the Mineral Range Railway to Calumet.

In 1881, the Detroit, Mackinac & Marquette Railway was built from St. Ignace to Marquette. At St. Ignace an ore dock was built, but it has since been demolished.

The Chicago & North-Western road was extended from Powers to the Menominee range in 1877, and for many years enjoyed the monopoly of the iron ore business. This range, however, is now served by the Chicago, Milwaukee & St. Paul Railway, with a large ore dock at North Escanaba, and a third railroad has now reached the mines—the Wisconsin & Michigan—which proposes to deliver the ore direct to the furnaces in Chicago and Milwaukee by means of car-ferry system.

In 1882, the Chicago & North-Western built a branch to the Felch mountain district.

The first ore was shipped from the Menominee range in 1876, a consignment of about 10,000 tons—5,812 tons from the Breen and 4,593 from the Vulcan.

The Lake Shore & Western road was the first railroad to reach the Gogebic range, in 1884, and was closely followed by the Wisconsin Central, and later by the Chicago & North-Western, the last named road first extending its Menominee range division and hauling the ore to Escanaba, the first building from Ashland, where ore docks were erected. Later the Chicago & North-Western absorbed the Lake Shore road and now has two large ore docks at Ashland.

Attention was first attracted to the Gogebic range in 1872 by the report of the Geological survey, compiled by Maj. T. B. Brooks and Professor Pumpelly.

It is recorded that ore was first discovered in the Gogebic range in 1879, and taken from the Ashland mine—501 tons, but no further shipments are noted until 1882, when the Metropolitan (Norrie) forwarded to the docks 23,854 tons.

Prior to 1854, a total of 75,033 tons of ore were shipped from the Michigan mines—25,000 tons from the Jackson mine, 50,000 tons from the Marquette and 83 tons from the Hungerford & Harlow, all in Marquette County. In 1854, 3,000 tons were shipped from the Cleveland mine; in 1855, 1,449 from the Cleveland and 447 tons from Jackson. In 1857, the Jackson shipped 12,442 tons and the Cleveland 13,204. In 1858, the Lake Superior mine bell came a shipper with a product of 4,658 tons, the Cleveland shipping 7,909, and the Jackson 10,309. Since 1858, the Michigan output of iron ore by years has been as follows:

1859	68,832
1860	114,401
1861	49,909
1862	124,169
1863	203,055
1864	247,059

1865	193,758
1866	296,713
1867	465,504
1868	510,522
1869	639,097
1870	856,507
1871	813,984
1872	948,553
1873	1,195,234
1874	899,934
1875	881,166
1876	993,311
1877	1,025,129
1878	1,127,583
1879	1,420,745
1880	1,948,334
1881	2,125,729
1882	2,656,933
1883	2,518,048
1884	2,225,146
1885	2,205,190
1886	3,260,748
1887	4,376,855
1888	4,554,924
1889	6,447,961
1890	6,123,711
1891	6,176,435
1892	8,300,346
1893	5,631,475
1894	5,006,747
1895	6,569,612
1896	5,964,659
1897	6,910,284
1898	8,145,765
1899	9,853,918
1900	9,594,088
1901	9,798,284
1902	12,144,018

MINNESOTA RANGE TOTALS.

Vermillion Range.

Prior to 1885	62,124
1885	225,484
1886	304,396
1887	394,252
1888	511,953
1889	844,682
1890	880,014
1891	894,618
1892	1,167,650
1893	820,621
1894	948,513
1895	1,077,888
1896	1,088,099
1897	1,278,481
1898	1,265,142
1899	1,771,502
1900	1,655,820
1901	1,786,063
1902	2,084,263
1903	1,676,699
Total output	20,738,205

MASABA RANGE TOTALS.

1892	4,245
1893	613,620
1894	1,793,052
1895	2,781,587
1896	2,882,079
1897	4,275,809
1898	4,613,766
1899	6,626,384
1900	7,809,535
1901	9,004,890
1902	13,342,840
1903	12,892,542
Total	66,640,349

MENOMINEE RANGE.

CUNDY MINING COMPANY.

This corporation is subsidiary to the Oliver Company, having been acquired from the Illinois Steel Company. It has two shafts and is well supplied with machinery. Joseph H. Cundy is the local superintendent at Quinnesec. O. C. Davidson is the general superintendent. In 1902, 183,052 tons of ore were produced. Only one grade, known as gray iron, 43.91 iron, .038 phos.

THE PEWABIC COMPANY.

President, George D. Van Dyke; vice-president, J. H. Van Dyke; secretary and treasurer, William D. Van Dyke.

Main Business Office—Wells Building, Milwaukee, Wis.

This company operates the Pewabic mine, located on the S. ½ of N. W. ¼ Sec. 32, and the Walpole, now included in the Pewabic, and located on the N. E. ¼ of N. E. ¼ Sec. 31, T. 40, R. 30. The company also owns several thousand acres in Northern Wisconsin and Michigan of prospective mineral value. Post-office address of the mine is Iron Mountain, Michigan. General manager, E. F. Brown; cashier, W. G. Monroe; mine engineer, John M. Goldsworth; mine captains, Edward Lord and Benjamin Martin. The shipment for the year was 530,291 tons, of five grades, as follows: Pewabic, 64.37 per cent. iron, .118 per cent. phos.; Tyrone, 59.87 per cent. iron, .073 per cent. phos.; Toledo, 55.00 per cent. iron, .012 per cent. phos.; Pewabic Genoa, 43.21 per cent. iron, .010 per cent. phos. At the Walpole mine, owned by the Pewabic Company, the work of sinking No. 2 shaft from the sixth to the seventh level was finished during the year. Cross-cutting to the north is now proceeding. It is proposed to connect No. 1 and No. 2 shafts with this drift. No. 1 shaft only has a depth of 350 feet. When the seventh level cross-cut from No. 2 shaft reaches this point a raise will be put in, thus connecting the two shafts. It will require some accurate engineering to reach this result. The Pewabic Company at present has three crews at work in the Iron River district—two at work with diamond drills and one sinking stand-pipes. While no well defined ore deposits have been encountered, the results obtained are not discouraging. The company will also do considerable work on its lands in the Gogebic range. Within a week a crew will commence operations near Mellen, on the Wisconsin side of the range and others will be started later.

MINERAL MINING COMPANY.

This corporation is composed of some of the officials of the Pewabic Company. E. F. Brown, Iron Mountain, is the general manager. Early in 1902, the company secured options on the Beta and Nanaimo mines in the Iron River District. In June the work of unwatering the shafts and open pits was commenced. This work will be pushed as rapidly as possible and the management anticipates sending some ore to market in 1904. The Beta and Nanaimo mines were among the first opened in the district and have an output to their credit of 144,892 tons—Beta 17,326, and the Nanaimo 127,566 tons. This company is also doing some exploratory work in the new Baraboo, Wis., district, and has several Menominee range properties under consideration. It is destined to become an important shipper.

FELCH MOUNTAIN RANGE.

This district, true to its past history, has had many ups and downs during the year. In 1902, George; A. St. Clair, of Duluth, Minn., secured an option on all the old properties in this district —the Northwestern, Calumet, Metropolitan and Hecla. A vast amount of work was done in the way of unwatering and clearing out the old shafts and pits. At Northwestern, now known as the Northern, during the winter of 1902, the shaft has been sunk another lift of seventy-five feet and now has a total depth of 325 feet. Considerable drifting and cross-cutting has been done and a fine body of red Bessemer ore proven up. The western drift is making a splendid showing. A new plant of machinery consisting of new boilers and new double drum hoisting plant, has been in stalled. There are fifty men on the pay roll. At the Calumet, the work of driving the tunnel an additional three hundred feet under the old workings of the mine had been let to Fred Dickerson. This tunnel now has a length of several hundred feet and when the work was stopped, about a year ago, the outlook was decidedly encouraging. About the first of April, the old shaft, which has been cleaned out and retimbered, will be sunk an additional one hundred feet. The present plant of machinery at the Northern mine will be moved to the Calumet. Considerable diamond drill work has been done in the vicinity of this property and the results are decidedly encouraging. It was expected to mine 56,000 tons of ore from the Northern during 1903. The North-Western Railway has rebuilt its spur track to the property. Charles J. A. Forell, Metropolitan, Dickinson County, Mich., is in charge of the work.

THE ANTOINE ORE COMPANY.

This company is now affiliated with the Republic Iron & Steel Company. The mines of the company are: Traders, Clifford, Keel Ridge, and Vulcan Silica. The Clifford is the only one in operation. It is located on the S. E. ¼ of S. W. ¼ and S. W. ¼ of S. E. ¼, Sec. 17, 40-30. This is considered the best “lean ore proposition” in Michigan and the deposit is practically unlimited. Considerable “dead work” in the way of sinking, raising, driving and cross-cutting was done during the winter and a new shaft-house was erected. Another large area was also stripped. Hon. Alexander Maitland, Negaunee, Mich., is the general mananegr. W. H. Watson, Iron Mountain, the superintendent, and Frank Cartis, mining captain. During 1902, 110,993 tons of ore were shipped; in 1901, 63,155 tons.

THE ALGOMA COMMERCIAL COMPANY LIMITED.

The concern has suspended all operations in Michigan after an expenditure of half a million dollars. All options were permitted to expire. Exploratory work was without results. Francis H. Clergue, Sault Ste Marie, Mich., is the president.

VICTOR SCHLITZ MINING COMPANY.

President, Victor Schlitz; vice-president, G. W. Youngs; secretary, Fred Reuter; treasurer, Victor Schlitz.

Main Business Office—Milwaukee, Wis.

This company operates the Hiawatha mine, located on the S. W. ¼ of S. E. ¼ of Sec. 35, T. 43, R. 35. Mine post-office address, Iron River, Michigan. Superintendent, G. W. Youngs; mine captain, Josh Brooks. During the year the mine produced 74,596 tons of non-Bessemer ore, running about .053 per cent. iron. Plans are being made for increased shipments.

COMMONWEALTH IRON COMPANY.

President, E. W. Oglebay; secretary, C. W. Merrill; treasurer, John F. Whitelaw.

Main Business Office—76 Wade Building, Cleveland, Ohio.

This company operates the Commonwealth mine, located on Sec. 34, T. 48, R. 18, E., Wisconsin. Post-office address, Commonwealth, Wisconsin. Superintendent, E. W. Hopkins; clerk, N. C. Jensen; mine captains, L. W. Erickson and Edward Larson. The production for the year 1902 was 112,704 tons, known as Davidson ore, 56.00 per cent. iron, .130 per cent. phos. What is known as the Badger mine, or pit, is part of the Commonwealth mine. This company also owns some 2,000 acres of mineral land in the same township on which considerable exploring is being done.

THE DESSAU COMPANY.

Main Business Office—No. 9, Maiden Lane, New York City.

The company operates the Millie mine, located on the N. W. ¼ of N. E. ¼ and N. E. ¼ of N. W. ¼ of Sec. 31, T. 40, R. 30. Mine post-office address, Iron Mountain, Mich. Superintendent, S. J. McGregor. During the year the mine shipped 25,935 tons. No underground work was done during the year. Ore was shipped from an excavation in a side hill. The ore averages better than 40 per cent, iron with a low phos. content and the management has a record for low mining cost. The ore supply is, seemingly, practically unlimited, the present working being at the base of a mountain. The above company will likely make a heavy shipment of ore from its open pit mine this season. The property is being opened up rapidly. The crusher is in operation and is crushing about 150 tons daily at present. The machine has a capacity of 1,000 tons, and will likely be running to the limit soon.

ARAGON MINE.

A property of the Oliver Iron Mining Company and one of its largest and best equipped. It is located at Norway, Mich. O. C. Davidson, Iron Mountain, is general superintendent; G. A. Hellberg, mining engineer; Joseph Milks, chief clerk; G. A. Albor, mine captain, Norway, Mich. The production for 1902 was 646,203 tons as against 466,086 tons in 1901. Two grades of ore—Granada and Levida—are produced.

Many improvements have been made during the year. The new shaft—known as No. 5—is progressing finely. This work was commenced in April, 1901, and finished in July, 1902. The bottom timbers of the shaft are 1,081 feet from the surface and the bottom level is 1,060 feet. The shaft is Henberry slates its entire length and is one of the most substantial in the Lake Superior region. It will be modern in its equipment. The dimensions of the shaft are ten by fourteen feet inside the collar and it contains four compartments—two hoisting compartments, one large cageway for timber and men, and one for ladders and pipes. The two hoisting compartments are four feet eight inches in size; the cageway for timber and men is five feet one inch by ten feet in size, and the ladder and pipe compartment is ten feet by two feet ten inches. In the matter of timber compartment the shaft is the superior to any in the Lake Superior region. The plans for the shaft were drafted by Mr. Davidson and in preparing them he arranged for an extra large cageway for the handling of timber; in doing so he has secured a great saving in labor, this being the object desired. At this shaft it will be possible to load the timber cars at the saw-mill, lower them without rehandling of the timber to any level and team the timber to the point needed. Under the old method it was necessary to unload the timber from the trucks on to the cage at the surface, unload the timber from the cage on to tram cars at the level desired and tram cars at the level desired and tram same to point where it was to be used. This shaft is the only one sufficiently equipped to permit the handling of timber so expeditiously, and the saving in time will be appreciated by all mining men. At the bottom level of the shaft a large station will be cut out at once. A compound pump for temporary use will be erected. Ultimately a large crank and fly-wheel pump capable of handling 2,000 gallons of water per minute will be installed. The contract for this mammoth machine has not been placed as yet. The cross-cut, northeast to the present workings of the Aragon, will commence as soon as possible. The distance is estimated at about 1,200 feet, and the drift will be sufficiently large to accommodate a double track system of haulage. The tramming will be done with pneumatic locomotives of the Porter type, which will necessitate doubling the capacity of the present plant. The bottom level of No. 5 shaft is about one hundred feet deeper than the present workings at the Harrison shaft, the lowest level of which is 950 feet, and with which the new shaft is to be connected. When the workings on the tenth level of the Harrison are advanced as far west as the cross-cut from No. 5 shaft, a winze will be sunk an additional one hundred feet and it will then be possible to carry on the drifting from both ends, which will greatly expedite the work.

General Superintendent Davidson says “that it is the purpose of the company to centralize the business of the mine around No. 5 shaft. This, in itself, will be a great undertaking, as it means the removal from their present locations of the office, laboratory, machine shop, carpenter shop, blacksmith shop, warehouse, dryhouse and saw-mill, in addition to the erection of a large pumping station and boiler house.

The work of installing the new compressor plant for the pneumatic haulage plant at the Aragon mine was commenced in June, 1902. It is a high pressure four-stage machine with cylinders 12 and 22x50, Corliss compound condensing engine. The air cylinders are four in number—one twenty inches in diameter, one twelve, one seven and a half and the fourth four and a half inches. The capacity is 480 feet of free air compressed to a pressure of 850 pounds. The haulage will be operated in two levels.

In February, 1902, orders were placed for two Prescott pumps for No. 5 shaft. The measurements of the pumps are 18 and 28 and 47x12x24 inches each, and the duty guaranteed is 1,500 gallons of water against a head of 1,100 feet with 125 pounds steam pressure at the pumps. The pumps will be placed side by side in the pump-house so that they may be operated separately or together, as the occasion may demand. The hoisting plant for this shaft has also been ordered, but figures are not obtainable at this time. It will be similar to the plants now in operation at the Sibley and Savoy mines, on the Vermillion range, but will be considerably larger.

The cross-cut from No. 5 shaft to the present workings of the mine has attained a length of 510 feet. The total length of this cross-cut will be about 1,000 feet. Fine progress is being made and the work will be completed as soon as anticipated.

CHAPIN MINE.

This is the largest mine on the Menominee Range. It is owned and operated by the Oliver Iron Mining Company, and is located at the City of Iron Mountain, Mich. It includes the original Chapin and the Hamilton and Ludington mines to the west. O. C. Davidson is the general superintendent; John A. Ryan, cashier; Stephen J. James, mining engineer, and Martin Goldsworthy, mine captain. The production for the year was 956,812 tons compared with 927,747 tons in 1902. Two grades of ore are produced—Chapin and Ajax.

In 1902, work was commenced on a new shaft to be known as C. Ludington. It will be located in the foot-wall about five hundred feet west of the Ludington shaft. It is proposed to sink the shaft to a depth of 1,165 feet before any cross-cutting is done. The new shaft will be the most modern in the Lake Superior region, as well as the

largest, and will be provided with labor-saving and life-saving devices. The size of the shaft, inside measurements, will be ten feet four inches by twenty-three feet one inch and will con-four compartments, viz.: Two hoisting compartments five by feet in size, one cageway five by ten feet four inches, and pump compartment ten feet four inches by eleven feet one inch. In this last compartment will be erected the mammoth Cornish pump which performed such splendid service at abandoned D shaft, pump was dismantled for the reason that it was thrown out of by the withdrawal of ore in the vicinity. It was dismantled in summer of 1899. This pump is the largest and most perfect jumping plant ever erected in the Lake Superior iron region and is said to have originally cost a quarter of a million dollars. It the pet of Master Mechanic Richards, and he wishes it under-that nothing was added to the original cost in the way of during the time it was in operation. The upper cylinder of mammoth machine is 50 inches and the lower one 100 inches in diameter, and the stroke ten feet. The engines are connected with the pumping bob, which weighs fifty tons. The fly-wheel is forty feet in diameter and has a total weight of one hundred and fifty tons, and the crank shaft is twenty-seven inches in diameter. The connecting rods are fifteen inches at the center and eleven at the neck. The pump rods are of iron, about seven inches in diameter, and calculated for a depth of fifteen hundred feet. The plunger is twenty-eight inches in diameter, with ten-foot stroke, and the water column twenty-eight inches in diameter. The capacity of the pump at normal speed is a fraction more than three hundred and nineteen gallons of water per stroke with ten strokes per minute. The surface machinery is estimated to weigh eight hundred tons. The plant has a capacity to handle three thousand gallons per minute against a head of fifteen hundred feet. When this pump is again in operation the water problem will have no further terrors for the management, and will be possible to open much new ground. The shaft will be lined with steel frames, from the surface down, “lathed” outside with heavy planks that will be broken at various points to avoid a continuous sheeting of combustible material, making the shaft practically fire-proof.

At the Hamilton shaft is located one of the largest underground pumping plants in the world, all enclosed in a steel lined room. The pump is 6⅞x9⅝x30 inch differential Reidler, driven by a 32x36x03 inch horizontal tandem engine, a Corlis compound condensing. The weight of engines and condensers is 346,000 pounds, one of the heaviest underground pumping engines in the world. The engine is so constructed that anyone of the three may run independently of the other, or any two may be worked together, or all three, the danger from stoppage due to accident to any one thus being reduced to a minimum. Its normal capacity is 1,800 gallons per minute against a 1,700 foot head, or a maximum capacity of 2,200 gallons against the same head, this being attained with a speed of 65 revolutions per minute. This engine is working smoothly and satisfactorily and in every way pleases the management of the mine. It is using but 8⅓ tons of coal to do the work that necessitated 30 tons in the running of the boilers. The water column is 13 feet in diameter, the weight of water in the column being about 37½ tons.

In March, 1903, the contract for the new steel flume at the Hydraulic Works of the Oliver Iron Mining Company was let to the American Bridge Company, and it was expected that the work would commence in June. This work will necessitate the closing down of the works for several months and during this time the air needed in operating the Chapin mine will be supplied by three large compressors to be erected at C shaft engine-house. The Oliver Iron Mining Company will also improve the opportunity to build an immense concrete dam across the Menominee river at the works. The wheel wells will also be deepened, so as to generate more power. A large electrical generating plant will also be installed. This plant will furnish motive power for the electric haulage system on the new twelfth level at the Chapin and will also, it is expected, be transmitted to the Aragon, Cundy and Forest mines for various purposes. In fact, the entire plant at the Hydraulic Works is to be overhauled and remodeled and the cost will aggregate $500,000.

DICKEY MINING COMPANY.

Organized at Marquette in July, 1902, with a capital stock of $25,000. The directors are: William F. McKnight, Grand Rapids; Timothy Nester, of Munising; Rush Culver and John R. Gordon, Marquette; John M. Duffie, Chicago, Ill. This corporation has acquired the homestead of Capt. James S. Dickey, at Iron Mountain, consisting of about 150 acres, and the organization has been formed for the purpose of exploring the property, but nothing has been done to date.

CASTLE MINING COMPANY.

Organized in August, 1902. The capital stock is $100,000. Edward W. Hopkins, of Commonwealth, general manager for Oglebay, North & Co., of Cleveland, is president and secretary of the company, R. C. Flannigan is vice-president, and Charles T. Winnegar treasurer. The Castile has secured control of the Spencer properties in Sections 6 and 8, and will do some extensive exploration work thereon. The company has also secured control of the laid Meteor mine on the Gogebic Range. It is affiliated with Oglebay, Norton & Co., Cleveland, Ohio.

LORETTO IRON COMPANY.

President, D. F. Bremner; secretary, H. V. Hayes; treasurer, W. A. Amberg. Main business office, 1040 Marquette building, Chicago, Ill. This company operates the Loretto mine, located on the N. W. ¼ of S. W. ¼ Sec. 7, T. 39, R. 28, and controls adjoining lands in Sec. 12,

T. 39, R. 29. Postoffice address, Loretto, Michigan. General manager, J. Ward Amberg; superintendent, H. Truscott; mine captain, Tim Donovan. The production for the year 1902 was 128,300 tons. Three grades of ore are produced as follows: San Jose, 64.34 per cent. iron; .014 per cent. phos.; Loretto, 57.97 per cent. iron; .019 per cent. phos.; Russell, 51.25 per cent. iron; .055 per cent. phos. The mine is equipped to produce 100,000 tons annually. During the year built an addition to its engine-house to accommodate a new compressor of thirty-drill capacity, which it is expected will be received early in July. Arrangements are also being made to heat the office, dry, machine shop, blacksmith shop, carpenter shop and shaft-house with exhaust stream, which means a nice saving. William Thexton, of Ishpeming, has the contract to build the foundations for the new compressor plant. The company is also preparing to build four large dwelling houses on the south side of Pine creek, where a new townsite will be laid out. The mine is looking healthy and is making a fine record under the conservative management of Supt. Truscott.

QUINNESEC IRON MINING COMPANY.

President, James Corrigan; vice-president, Stevenson Burke; secretary and treasurer, J. E. Ferris. Main business office, Cleveland, Ohio. This company operates the old Quinnesec mine, located on the S. E. ¼, Sec. 34, T. 40, R. 30. It is now one of the Corrigan-McKinney mines. Mine postoffice, Quinnesec, Mich. Mine captain, W. J. Trevarthen. The production for the year was 62,531 tons. The following officials are located at Crystal Falls: Superintendent, W. J. Richards; mine engineer, John A. Knight. An important lense of ore was cut during the year and this property, which was abandoned as "worked out" at least half a dozen times, now gives promise of a long life. The ore is a higher grade than that produced heretofore. In September, 1902, in running a tunnel what was thought to be the "Old Quinnesec run" or high grade ore was cut.

The breast of ore in the tunnel has been cut about fourteen feet, and averages 64 per cent, in iron and .014 in phosphorus for the entire length. It is a beautiful soft blue ore. The ore is making in the direction of the new Vivian property, which warrants the belief that a Bessemer ore will be found in this mine soon. On the fifth and sixth levels, where mining is being conducted, the same conditions are being found, as in the tunnel prior to the discovery of the high grade ore, and Captain Richards is certain that the same quality will soon be cut in these levels. Should his prediction prove true the uncertainty of the discovery proving a large ore body will be removed. The shaft now working has a total depth of 555 feet. It is the intention of the management to sink it down an additional one hundred feet and then cross-cut north ninety feet. Should no ore be located by this work, the shaft will be sunk another 100 feet with a second crosscut to the north. If the results expected are not secured, some diamond drill work will be done in the bottom of the shaft.

CORRIGAN, McKINNEY & COMPANY.

Main business office, Cleveland, Ohio. This is a co-partnership, operating mines as follows: On the Gogebic Range, the Puritan, Ironton and Winona mines, located on the S. ½ Sec. 17, T. 47, R. 46, and the Meteor mine on the S. W. ¼ Sec. 11, T. 47, R. 45, with Henry Whitburn as superintendent, at Bessemer, Michigan. The product for the Meteor mine was 19,117 tons, and of the other mines, 19,229 tons. The Puritan has since been transferred to the Oliver Company.

In the Crystal Falls district the firm operates the Tobin and the Armenia. Postoffice address, Crystal Falls, Michigan. On the Felch Mountain range is the Groveland mine. Postoffice address, Randville, Michigan. The following officers are located at Crystal Falls: W. J. Richards, general superintendent; chief clerk, James D. Vivian; mine engineer, John. A. Knight.

The Tobin mine is located on the S. W. ¼ Sec. 30, T. 43, R. 32. Mine captain, John Barker. Product for the year, 55,238 tons.

The Armenia mine is located on the E. ½ of S. E. ¼ Sec. 23, T. 43, R. 32. Mine captain, Ed Pengilly. Product for the year, 100,864.

The Groveland mine is located on the N. W. ¼ of S. E. ¼, Sec. 31, T. 42, R. 29. Clerk, F. W. Williams; mine captain, Harry Lowry. The product for the year was 7,599.

At the following mines the company has done more or less exploring during the year: Paint River mine, produced 10,303 tons in 1902, located on Lots 4 and 5, and N. E. ¼ of S. E. ¼ Sec. 20, T. 43, R. 32. William Carlson, captain. The Dunn mine on the N. E. ¼ Sec. 1, T. 43, R. 32. Mine captain, Thomas Carlyon. The Lamont mine, located on Lot 6, Sec. 20, T. 43, R. 32. Mine captain, William Carlson. Postoffice address, Crystal Falls, Mich. A new shaft is being sunk at the Dunn; produced 2,816 in 1902.

VERONA MINING COMPANY.

President, Samuel Mather; vice-president, Walter Seranton; secretary, H. S. Haselton; treasurer, H. G. Dalton. Main business office, Western Reserve Building, Cleveland, Ohio. The company operates the following mines on the Menominee Range: The Verona, the Vivian, the Caspian, the Baltic, and the Young exploration; and on the Gogebic Range the Mikado mine, with a number of explorations.

For the Menominee Range mines the general superintendent is Chas, E. Lawrence; clerk, C. W.

Extrum; mines engineer, W. J. Rashleigh. Postoffice address, Amasa, Michigan.

The Verona mine is located on the N. E. ¼ of the N. E. ¼ Sec. 15, and N. ½ of N. ½ Sec. 14, T. 39, R. 28. Postoffice address, Vulcan, Michigan. Mine captain, James Brew. During the year the mine produced 43,245 tons of two grades: Athens, 60 per cent. iron, non-Bessemer; Madrid, 63 per cent. iron, .025 per cent. phos. The mine can produce 20,000 tons annually.

The Vivian mine is located on the S. ½ of the S. W. ¼ of Sec. 34, T. 40, R. 30. The lease includes the entire west half of the section. Postoffice address, Quinnesec, Michigan. Mine captain, E. R. Hughes. During the year this property was explored and became a shipper of ore of 42 per cent. iron and .020 phos., or better. The product for 1902 was 40,384 tons.

The Caspian is located on the N. E. ¼ of Sec. 1, T. 42, R. 35. Postoffice address, Iron River, Michigan. The company is sinking a shaft to reach the ore body, which has been located by diamond drills.

The Baltic mine is located in the W. ½ of N. W. ¼ Sec. 7, T. 42, R. 44. Postoffice address, Stambaugh, Michigan. Assistant superintendent, W. H. Jobe. The product for 1902 was 64,664 tons, 59 per cent. iron, non-Bessemer. The mine is equipped to produce 140,000 tons, and has a large body of ore.

The Mikado mine is located on the N. W. ¼ and N. W. ¼ of N. E. ¼ Sec. 18, T. 47, R. 45, on the Gogebic Range. Postoffice address, Bessemer, Michigan. Superintendent, G. S. Barber. The mine produced in 1902, 98,843 tons of 58 per cent. iron, non-Bessemer; this mine is prepared to produce 110,000 annually.

The Verona Mining Company is conducting explorations on the S. ½ of S. W. ¼ Sec. 6, T. 42, R. 34, Iron county. This is known as the Young exploration.

PENN IRON MINING COMPANY.

This is a subsidary of the Cambria Steel Company. In this connection the following information regarding the latter company from the annual report of President Powell Stackhouse for the fourteen months ending December 31, 1902, will be of interest. The next income was $5,056,963, out of which were paid three dividends amounting to $2,025,000. A balance to credit of income account amounting to $495,128, made of the total credit to income account $5,516,091. The sum of $800,000 is set aside for the general depreciation fund and $1,500,000 for the betterment and improvement fund. The assets of the company are given as $52,746,213 and the liabilities a like amount. The report states that in addition to $2,145,997 spent upon improvements, $404,274 has been expended for replacements and alterations, and adds: "The unfilled orders on your books are greater than ever before. The increasing cost of raw material, transportation and labor will reduce your profits, as corresponding advances in your leading products cannot now be secured. With this exception there is no reason to believe that there will be in the near future a break in the prosperous conditions now prevailing."

The officers of the Penn Iron Company are: President, Powell Stackhouse; secretary and treasurer, A. P. Robinson. Main business office, Philadelphia, Pennsylvania. Mine management: William Kelly, general manager; assistant, Franklin Capeland; cashier, Anton Johnson; mine engineer, Frank A. Janson. The company operates the East Vulcan, West Vulvan, Curry, Norway and Celops mines. The latter has shipped ore since 1892 and has a total production to its credit of 286,093 tons. The company also has some exploratory work in hand in the Iron River district. In 1902 the Norway mine produced 65,000 tons of ore; the West Vulcan 173,000 tons, East Vulvan 78,000 tons, and the Curry 23,000 tons; total production 339,200 tons. During the year a change-house, considered a model in many respects, was erected by liberal management.

NORTHERN ORE COMPANY.

This company has succeeded to the ownership of the Appleton mine in Wancidon Township, Dickinson County, Mich., and has renamed it the Eleanor. Considerable work in the way of shaft-sinking and drifting was done, then machinery was added and new buildings erected. The ore production was 4,619 tons. The property is now idle. The company is now doing some work on Sec. 6 at the old Cuff workings and the results are encouraging. Adolph King, Unity building, Chicago, is the secretary.

FLORENCE IRON RIVER COMPANY.

The Florence mine of this company, located at Florence, Wis., has been almost entirely under the energetic direction of the new management. The old stock docks, which were without number and scattered all over the location, have been concentrated and modernized. There were twenty-two of these docks by actual count; now there are two. A new shaft-house has been built at No. 4 shaft upon other principles than the existing wooden shaft-houses on the range in so far as the braces were arranged in a special way, to transfer the stresses in the framework systematically to the corner posts, each brace running from the corner post to the middle part of one of the girds, corresponds to another brace, which in the following floor forms the prolongation of the former, receiving axially the pressure of same and thus preventing a bending of the gird and lessening of the connections. I decided for this construction after a close examination of several wooden shaft-houses in this region, where the small braces had become loose almost everywhere and had to be replaced by longer and stronger ones. All the connections are painted with "carbolincum" to prevent the timber from rotting. The

arrangement for directing the hoists of ore either into the pockets or into the cars on the trestlework is also different from the one applied at the existing shaft-houses of the range. A steel plate, capable of being turned round a horizontal axle, can be placed into two different positions and leads the dumped ore to the left or right, into the pocket or to the trestlework cars. The local circumstances, showing the level of the stock-pile ground considerably lower than the pocket track, called for a small height of the trestlework at the pocket. The trestlework therefore starts on one side of the pocket in the level of the bottom of the latter, not as usually on top of the pocket. It is the intention of the company to provide No. 7 shaft with a similar pocket. The production of ore in 1902 was 130,798 tons; in 1901 15,395 tons. Felix A. Vogle is the general manager of the company.

VIVIAN MINE.

During the winter of 1902-1903, two new shafts were sunk several hundred feet to the south and west of No. 1 and several hundred feet lower. No. 1 shaft on the hill is soon to be abandoned and the machinery will be used at Nos. 2 and 3. At No. 2 the shaft has been sunk to an underlay, about eighty-five feet in depth. The distance to the first level is seventy-five feet and from this there is a north cross-cut at present one hundred feet in length, passing through the ore body. The milling system will be employed in mining the ore. This cross-cut has passed through twenty-five feet of slate and seventy-five feet of about 40 per cent. ore. The pocket is twenty by twenty-two feet in size and the total height of the shaft-house is fifty feet. The size of the shaft inside the collar is five by ten feet. The machinery at this shaft consists of one 125-horse power boiler, which is to be supplemented by another boiler of the same capacity when No. 1 shaft is abandoned. A new compressor has been installed and a double hoist. The engine is of slide-value make, but will soon be replaced by a larger one. The new engine-house at this shaft is sixty-five by twenty-five feet in size and is sheeted with iron. A large office and warehouse building has been erected in the near vicinity, fifty by twenty feet in size, and a large dry-house is in course of construction. New No. 3 shaft is located several hundred feet further west. It is a two compartment affair, five by fourteen feet within the timbers; provision is also made for a ladderway. This shaft is a vertical one. It has reached a depth of seventy-five feet—the first level, and there is cross-cut to the north seventy feet. This cross-cut will be carried forward under the works of the old Weimer exploration. The company will soon be employing about seventy-five men. During the year ten neat dwellings were erected. This mine is operated by the Verona Iron Company, controlled by Pickard, Mather & Co. Charles E. Lawrence, Amasa, Iron County, Mich., is range superintendent.

FOREST MINE.

This property is located near Lake Fumer, near Iron Mountain, and is controlled by the Oliver Iron Mining Company. A shaft was sunk to a depth of 300 feet. In August, 1902, a fine ledge of blue Bessemer ore was cut, but it soon pinched out, about 10,000 tons being mined. Diamond drill work is now being done. The location is a most "likely one," and has attracted many explorers. Some ten years ago it was prodded, "deep and often," by the Inter-State Mining Company, offshoot of the Pewabic Company. It is estimated that more than $500,000 has been expended in this section within the past ten years.

MUNRO MINE.

This property is owned by the Buffalo & Susquehanna Iron Company. It is located on Sec. 6, N. E. ¼ of S. W. ¼ and N. W. ¼ of S. E. ¼, 39-29. At the time of the last report it was being explored by W. S. Shaw, of Bayne City, Mich., under option from John Spencer. A shaft was sunk and much money expended, but Mr. Shaw did not consider the outlook encouraging, and threw up his option. Mr. Spencer resumed the work in a small way. In March, 1903, the property was transferred to the present holders. The new owners commenced operations by sinking a second shaft about 80 feet to the north of the Shaw shaft. At this writing it has reached a depth of eighty feet and is now bottomed in ore of merchantable nature. The bottom of the shaft is known as the first level. Between the shaft and the winze there is a cross-cut of ninety feet. The main level is continued on under the hill to a distance of seventy-five feet, another drift has been extended twenty feet north and south of the winze. At this point miners are drifting east and west. The new shaft house is completed and has a total height of sixty feet. It is a well-built structure. The machinery plant consists of a Corliss engine, a double hoisting plant of five feet extent, and ample boiler power. The management is well pleased with the outlook and the prediction is freely made that, in another year, the mine will be employing several hundred men. The Buffalo & Susquehanna Company is “a newcomer” in the iron region. It owns several mines on the Mesaba Range and is interested in others in the Michigamme district, Marquette Range, Henry McDermott is the local superintendent. Postoffice, Norway, Michigan.

AUSTIN F. MINING COMPANY.

An organization of Iron Mountain capitalists, formed to exploit the N. ½ of S. W. ¼ and W. ½ of S. E. ¼, Sec. 33. A considerable amount of work was done in sinking and with diamond drill. It is a most elusive formation and just when the explorer was confident he had struck the formation, the vein would peter out. In July, 1902, the property was under option to W. J. Rattle, of Cleveland, and upon his recommendation the Buffalo & Susquehanna Iron Company had agreed to furnish the

capital to continue the work. John Fredericks is in charge of the property.

THE BIRD IRON COMPANY.

President, Geo. V. Penwell; vice-president, John Crerar; secretary, M. S. Sanders; treasurer, A. Floyd Clinch. Main business office, Crystal Falls, Mich. This company formerly operated the Foxdale mine, located on E. ½ of N. E. ¼ , Sec. 10, T. 47, R. 29, on the Marquette range. The mine postoffice address is Humboldt, Mich. The mine is now idle. The company also operates two explorations in the Crystal Falls Iron River district, the Bird mine, located on the W. ½ of S. E. ¼ Sec. 13, T. 43, R. 32. Operations are now at a standstill.

SCOTT IRON COMPANY.

This corporation was organized in August, 1903, to explore in Sec. 10, Dickinson County. Some work in the way of diamond drilling, shaft sinking and test-pitting was done and some indifferent ore was cut; also small veins of good ore. After working several months the option was abandoned. Frank A. Spies, president; J. W. Thompson, secretary and treasurer, Menominee, Mich.

BRISTOL MINING COMPANY.

President, E. W. Oglebay; vice-president, L. B. Miller; secretary, C. W. Merrill; treasurer, D. Z. Zorton. Main business office, Cleveland, Ohio. This company operates the Bristol mine. The Bristol mine is located on the E. ½ of S. E. ¼ , Sec. 19,formerly known as the Clare, also the W. ½ of the S. E. ¼, Sec. 19, formerly known as the Quincy. The company also controls the S. W. ¼ of N. W. ¼, Sec. 19, all in T. 43, R. 32. Postoffice address, Crystal Falls, Michigan. Superintendent, E. W. Hopkins; assistant superintendent, Arvid Bjork; clerk, F. H. Miller; mine captain, August Frangquist. The postoffice address of E. W. Hopkins is Commonwealth, Wisconsin. The production for the year 1902 was 129,305 tons. Two grades of ore are produced: Bristol, 56.70 per cent. iron, .496 per cent. phos.; manganate, 51.55 per cent. iron, .550 per cent. phos. A number of important improvements were made during the year. A boiler house is being erected. The building is of a substantial nature and will be forty by fifty feet on the foundations. In this building will be placed a battery of three boilers each of 125 horse power capacity and 150 steam pressure capacity. An order has also been placed for a new compound pumping plant. The plant will be manufactured by the Prescott Steam Pump company, of Milwaukee, and will have a capacity for handling 500 gallons per minute from a depth of 800 feet. The shipments from the Bristol for the 1903 season will exceed over 250 thousand tons, it is expected. This is the largest shipment in the history of the property. Last season the mine shipped 129,035, the largest output prior to 1903. In 1892 the mine made its first shipment, a total of 57,352. The following year the mine was only worked for a short time and the output was only 9,612 tons. The Bristol was then idle from 1894 until the season of 1899, when it became the property of the operators. The output that year was 80,915, and has been gradually increased until the present fine total has been reached. The total output for the Bristol, including this season, is 615,136 tons.

CRYSTAL FALLS IRON MINING COMPANY.

President, James Corrigan; vice-president, Stevenson Burke; secretary and treasurer, J. E. Ferris. Main business office, Cleveland, Ohio. This company operates the Crystal Palls mine, located on the E. ½ of N. E. ¼, Sec. 21, T. 43, R. 32. Postoffice address, Crystal Falls, Michigan. Superintendent, W. J. Richards; chief clerk, James Vivian; mine engineer, John A. Knight; mine captain, James Langdon. This mine is also one of the Corrigan, McKinney & Co. group, and during the year produced 195,555 tons.

Affairs at this property are taking on a more promising air than for a long time past. The ore was cut in the cross-cut from the new lift recently and the results so far go to show that the ore deposit will again take on its old size. The converging of the walls on the level worked upon last year, together with the shortening of the length of the lens, made operators look pretty blue. However, the same thing occurred on a level further up and on the succeeding level it righted again so that they have been living on the hope that history would repeat itself. While it is too early to say definitely, yet it looks as if the Crystal Falls on the new level will be as good as ever.

DUNN MINE.

This property is now controlled by Corrigan, McKinney & Co., the Dunn Iron Mining Company having abandoned the lease. The mine was idle during a portion of the year but made a shipment of 32,113 tons of ore from old stockpiles and from the old open pit.

The new shaft which is being sunk at this property is down about 400 feet. Sinking is rather slow from the fact that the shaft is in very hard ground. The depth to which the shaft is to be carried is 800 feet. It is the intention to tap the old workings with a diamond drill when a depth of 600 feet is reached and drain off the water that is in the old mine. Then a lot of exploring will be done to prove up the ground at that depth, which is also about where the old lense began to cut out or take a roll in the old workings of the property. The ore that was worked on from that depth down was of a different character from the ore above, indicating that it is a new lens and that the old one had taken a roll to either side. The exploring will be done in an endeavor to prove up this theory. The

work of stripping in the open pit continues. A bunch of ore was left to support the pocket in days that work is being done. It as proved to be of greater proportions than was first anticipated and quite a shipment will be made from it this season. There is no telling what may lie behind it. The surface is being stripped off and run down in the open pit.

DUNN IRON MINING COMPANY.

President, Ferdinand Schlesinger; vice-president, F. E. Woodbury; treasurer, Charles Ray. Main business office, 22 University building, Milwaukee, Wis. This company owns the Palms mine, located on the N. W. ¼, Sec. 14, T. 47, R. 46. Postoffice address, Ironwood, Michigan. Superintendent, James E. Thompson. This mine was idle during the year 1902, but made a shipment of 32,113 tons. It is said that a new lense of ore has been discovered, but I have not yet inspected same.

The *Bessemer Herald* says of the present status of things at the Palms mine: "The drift which the company has been at work on for some time, running west from the Anvil workings, has reached the new shaft on the north line of the Palms property, and a raise has been put in connecting the shaft with the drift. The ore taken from, the lens, which we understand is of considerable extent, has heretofore been hoisted from the Anvil shaft, but as soon as the shaft house and skip roads are in readiness the ore mined on the Palms side of the line will be hoisted from the new shaft at that property. This shaft was sunk to a considerable depth two years ago, when the company closed the Palms mine down. Since that time, however, the mining work done by this company here has been confined to the Anvil workings and the drifting process which has proved successful at a number of properties here has. been the means of again finding a body of ore on the Palms property.

The Palms mine was first opened in 1887 and has been a steady producer every year since, up to the time it was closed in July, 1901. The property has produced a total of 1,100,680 gross tons of ore, of which 139,658 tons were gotten out in 1900. For several years it has been under lease to the present company. J. R. Thompson, of Ironwood, is superintendent, and Wm. Rowe, of Bessemer, is mining captain. The mine has always been a reliable support to the business people of Bessemer, having at all times furnished employment to a considerable number of men, and the fact that one shaft of the property at least is to resume operations will be welcome news to the people here.

GREAT WESTERN IRON MINING COMPANY.

President, James Corrigan; vice-president, Stevenson Burke; secretary and treasurer, J. E. Ferris. Main business office, Cleveland, Ohio. This company operates the Great Western mine, located on the E. ½ of S. W. ¼, Sec. 21, T. 43, R. 32. It is known as one of the "Corrigan-McKinney" group of mines. Postoffice address, Crystal Falls, Michigan. Superintendent, W. J. Richards; clerk, James D. Vivian; mine engineer, John A. Knight; mine captain, Edwin Jacka. Product for the year was 42,470 tons.

For the first time since it closed down over a year ago, ore was again hoisted from the Great Western mine in August, 1902. The ore is being hoisted only from No. 2 shaft, the bailer still being in operation in No. 1 shaft, which is somewhat deeper than the former. A good number of men have already been put to work underground and the force will be increased right along until enough men have been secured.

The Michigan subsidiary companies are as follows:

HEMLOCK RIVER MINING COMPANY.

President, Samuel Mather; vice-president and treasurer, H. G. Dalton; secretary, H. S. Haselton. Main business office, Western Reserve building, Cleveland, Ohio. This company operates the Hemlock mine, located on the W. ½ of S. W. ¼ and E. ½ of W. ½ and W. ½ of E. ½, Sec. 4, T. 44, R. 33. Mine postoffice address, Amasa, Michigan. District superintendent, Chas. E. Lawrence; clerk, C. W. Extrum; mine engineer, W. J. Bashleigh; mine captain, C. W. Hughes. The production for the year 1902 was 123,331 tons. This is about the annual capacity of the mine. The ore is non-Bessemer., runs about 56 per cent. iron.

The Hemlock is securing its ore from the fourth, fifth and sixth levels, principally. It is a one-shaft proposition, and last year made an excellent showing. For some time previous the mine was wrought in a very quiet way and this did not permit of the best results per man, the product being too small to bring the cost to a point where there was any profit to the operators. The ore deposit lies under the river and heavy pillars have been left to prevent such accident as occurred at the Mansfield some years since. On the seventh level greenstone has been encountered, the lowest in the mine, and some uneasiness is being felt by the management who fear the bottom of the mine may have been reached. Greenstone is the formation in which the ore is enclosed, and there is a chance that the bottom of the trough may have been found. However, this cannot be told for some months yet, and in the meantime General Manager Chas. Lawrence is hoping for a turn of the formation which may give the ore lens greater depth. During the year the eighth shaft was sunk another level and a large Prescott pump had been received by the company and was placed on the seventh level of the mine. It is a 12x22x78, compound condensing, pot form pump and is capable of handling much more water than the mine makes.

LINCOLN IRON MINING COMPANY.

President, James Corrigan; vice-president, Stevenson, Burke; secretary and treasurer, J. E. Ferris. Main business office, Cleveland, Ohio. This company operates the Lincoln mine, located on the W. ½ of S. W. ¼, Sec. 21, T. 43, R. 32. Postoffice address, Crystal Falls, Michigan. Superintendent, W. J. Richards; chief clerk, James D. Vivian; mine engineer, John A. Knight; mine captain, Edwin Jacks. The mine produced 7,747 tons during the year, and is one of the "Corrigan-McKinney" group of mines.

At this property some exploring work was done during the year. The old Volunteer shaft was freed of water and the intention was to do some sinking. The Volunteer is an old time exploration that gave great promise at one time, years ago, when J. B. Schwartz sunk the main shaft about 200 feet and cut seams of ore here and there. It is located on the S. W. ¼ of Section 29, and is directly east of the Columbia mine, one-half mile. The reason for the resumption at the Volunteer is the exceptionally fine showing that is being made by exploratory work in the Tobin mine. It is practically conceded that the ore body at the Tobin makes east across the Finnerty forty and onto the Volunteer forty. From work that has been done in the Tobin it is comparatively easy to locate the course of the formation, data that was not at hand years ago when the first work was done on the Volunteer. It is the opinion of the Tobin operators that the Volunteer workings, if extended at the right depth, will cut the ore and it is on this theory that the work is being done.

OLIVER IRON MINING COMPANY.

Range office, Iron Mountain, Mich. Otto C. Davidson, general superintendent; George J. Eiscle, assistant; John A. Ryan, chief clerk; Stephen J. James, mining engineer.

Operates the following mines: Iron Mountain district, Chapin, Ludington, Hamilton, Cundy, Forest; also owns the West Ludington, Federal No. 1, Cuff, Indiana; Norway district, Aragon; Crystal Falls district, Mansfield, Columbia, Michigan, Gibson; Iron River district, Iron River and Riverton.

President, Thomas F. Cole; vice-president, Dr. Nelson P. Hulst; secretary, C. D. Fraiser; treasurer, Charles E. Shields; assistant secretary and treasurer, Geo. D. Swift; auditor, W. E. Jeffery; generel manager, William J. Olcott. Main business office, Duluth, Minn.

This company is the mining branch of the United States Steel Corporation, and is by far the largest producer of iron ore and owner of mining properties in the state. In many cases its operations are carried on through subsidiary companies.

PICKANDS, MATHER & CO.

Pickands, Mather & Co. are now operating the following mines in the Lake Superior region, covering all Ganges but the Vermillion and Marquette:

MESABA.

Company.	Mine.	Superintendent.	Location.
Corsica Iron Co.	Corsica	W. P. Chinn	McKinley, Minn.
Hobart Iron Co.	Elba	W. P. Chinn	McKinley, Minn.
Hobart Iron Co.	Minosca	Jos. Roskilly	Virginia, Minn.
Sparta Iron Co.	Sparta	J. O. St. Clair	Sparta, Minn.
Malta Iron Co.	Malta	J. O. St. Clair	Sparta, Minn.
Crete Mining Co.	Utica	W. H. Downing	Hibbing, Minn.
Crete Mining Co.	Albany	W. H. Downing	Hibbing, Minn.
Crete Mining Co.	Troy	James Reed	Eveleth, Minn.

GOGEBIC.

Odanah Iron Co.	Cary	L.M.Hardenburgh	Hurley, Wis.
Odanah Iron Co.	Windsor	L.M.Hardenburgh	Hurley, Wis.

MENOMINEE.

Verona Mining Co.	Mikado	G. S. Barber	Bessemer, Mich.
Verona Mining Co.	Baltic	W. H. Jobe, Asst.	Stambaugh, Mich.
Verona Mining Co.	Caspian	W. H. Jobe, Asst.	Stambaugh, Mich.
Verona Mining Co.	Vivian	C. E. Lawrence	Quinnesec, Mich.
Verona Mining Co.	Verona	C. E. Lawrence	Vulcan, Mich.
Hemlock River Min. Co.	Hemlock	C. E. Lawrence	Amasa, Mich.

The first mentioned eight of these are on the Mesaba range, and of the eight the Minorca, Utica, Troy and Albany are, or are to be new shippers this year. The Minorca was bought three years ago, but was not opened until now, and the three remaining were bought this spring. They are all being actively pushed into the shipping lists. In addition to them the firm has an option on the Elizabeth. One hundred and twenty acres of state school land in section 12, T. 57, R. 21, and will probably take the property at the $50,000 asked by the first lessees.

There are 11,700,000 tons of ore shown on this land that will average 58 per cent, iron, some Bessemer and some not. The explorations have not been completed and more ore will probably be shown. If this is taken it will be opened another year. Pickands, Mather & Co. are among the heaviest shippers in the lake region outside of the United States Steel corporation, and will be very much larger another year. Their great activity has come since the blast furnaces of the Lackawana Steel Company approached completion. Chas. H. Munger, of Duluth, is general manager of these mining interests, and Charles E. Lawrence is the firm's representative in Michigan, with headquarters at Amasa, Iron county; Will J. Jobe, assistant, address Stambaugh, Michigan. L. M. Hardenburgh is the representative in Wisconsin with headquarters at Hurley.

VERONA MINING COMPANY.

President, Samuel Mather; vice-president, Walter Scranton; secretary, H. S. Haselton; treasurer, H. G. Dalton. Main business office, Western Reserve building, Cleveland, Ohio.

The Company operates the following mines on the Menominee range: The Verona, the Caspian, the Baltic, and the Young exploration; and on the Gogebic range the Mikado mine, with a number of explorations.

For the Michigan range mines the general superintendent is Chas. E. Lawrence; clerk, C. W. Extrum; mines engineer, W. J. Rashleigh. Postoffice address, Amasa, Michigan.

The Verona mine is located on the N. E. ¼ of the N. E. ¼, Sec. 15, and N. ½ of N. ½, Sec. 14, T. 39, R. 28. Postoffice address, Vulcan, Michigan. Mine captain, James Brew. During the year the mine produced 43,245 tons of two grades: Athens, 60 per cent. iron, non-Bessemer; Madrid, 63 per cent. iron, .025 per cent. phos. The mine can produce 20,000 tons annually.

The Vivian mine is located on the S. ½ of the S. W. ¼ of Sec. 34, T. 40, R. 30. The lease includes the entire west half of the section. Postoffice address, Quinnesec, Michigan. Mine captain, E. R. Hughes. During the year this property was explored and became a shipper of ore of 42 per cent. iron and .020 phos., or better. Production in 1902, 40,384.

The Caspian mine is located on the N. E. ¼ of Sec. 1, T. 42, R. 35. Postoffice address, Iron River, Michigan. The company is sinking a shaft to reach the ore body, which has been located by diamond drills.

The Baltic mine is located in the W. ½ of N. W. ¼, Sec. 7, T. 42, R. 44. Postoffice address, Stambaugh, Michigan. Assistant superintendent, W. J. Jobe. The product for 1902 was 64,664 tons, 59 per cent, iron, non-Bessemer. The mine is equipped to produce 140,000 tons, and has a large body of ore.

The Mikado mine is located on the N. W. ¼ and N. W. ¼ of N. E. ¼, Sec. 18, T. 47, R. 45, on the Gogebic range. Postoffice address, Bessemer, Michigan. Superintendent, G. S. Barber. The mine produced in 1901 76,116 tons of 58 per cent, iron, non-Bessemer; this mine produced 98,834 tons.

MISCELLANEOUS.

William Turner and associates have secured an option from the Hamilton-Merryman Company upon the old Perkins mine, in the Norway district, and will reopen the same in hopes of finding some new lenses ore. The Perkins have been idle since 1887. It was operated from 1874 to 1885 by the Saginaw Mining Co., with Capt. John Perkins as superintendent. It has a total shipment to its credit of over 350,000. It was abandoned by the Saginaw Company in 1885, having caved in badly. It was then taken hold of by Capt. Perkins as a personal venture, with the result that he mined and sold nearly 36,000 additional tons.

The Groveland mine in Felch Township, Dickinson County, operated by Corrigan, McKinney & Co., resumed mining in January, 1903, after a long idleness. A large crusher plant—the one used at the Ropes gold mine—has been erected and the ore will be crushed before shipping. The ore, while of low grade, find a ready sale owing to the low phosphorus contents.

The Oliver Mining Company is doing some exploratory work on Section 6, adjoining the new Aragon shaft, with a diamond drill. One hold has reached a depth of 1,000 feet. An ore formation was cut, but it is not of a merchantable grade.

The Verona Iron Company has control of the Louis Auer exploration near Commonwealth, in January, 1903, and will give the property a systematic proving up, work having already commenced. Considerable exploratory work was done on the lands years ago and the work was. not altogether devoid of results.

Oglebay, Norton & Co., of Cleveland, who, several months ago, secured an option from John T. Spencer on several forties adjoining the Aragon mine on the west, released the property, in December, 1902. Considerable work was done, but the showing was not satisfactory.

John O'Callagan, of Sagola, and George Maas, of Negaunee, were preparing in July, 1903, to do some extensive exploratory work on Section 7, west of the city of Norway, south of the Chicago & Forth-Western track. The work will be done with a diamond drill, and it is proposed to put down a hole one thousand feet in depth. Walter Mass will have charge of the work. The territory is considered promising.

The boiler and machinery at the Federal exploration near Lake Fuma, Dickinson County, was moved to Quinnesec in October, 1902, the option has been abandoned. This property was optioned to the Illinois Steel Company by Capt. John T. Spencer. Considerable work was done on the property and the outlook for a new mine was decidedly encouraging at one time. A shaft was sunk to the depth of one hundred feet. In drifting to the north about a year ago a heavy flow of water was struck and the men driven out. Since that time nothing has been done.

Captain Cundy, who has been in charge of the Federal No. 1 mine, better known as the West Ludington property of the Oliver Iron Mining Company, at Iron Mountain, received orders to close the mine and pull up the pumps in July, 1902. It looks as though this property was to be abandoned for good.

The Oliver Iron Mining Company has a crew of men exploring on Section 13, near the East Vulcan mine. This property was under option to E. F. Bradt some months ago, and a shaft was sunk. This work is being continued by the Oliver people and the formation is being cross-cut to the south.

The Oliver Iron Mining Company has secured control of the old Hancock property, on the Felch Mountain range, about four miles from the village of Metropolitan, and has an exploratory party at work. An old pit has been cleared out and an exploratory shaft is being sunk. This shaft has now reached a depth of 45 feet. Some standpipe work for diamond drill operations is also in hand. The Handcock never was a shipper, and exploratory work was confined to test-pitting and sinking. The work was conducted by a company known as the Hancock Mining Company, of which M. M. Sherman, of Milwaukee, was president.

MARQUETTE RANGE.

OLIVER IRON MINING COMPANY.

Range business office, Ishpeming, Mich. General superintendent, William H. Johnston; assistants, John C. Greenway, C. E. Hendricks; chief clerk, J. C. W. Chapman; mine engineer, C. E. Hendricks.

The company operates on the Marquette range the following mines: Hard Ore, Hematite, Section 16 and Section 21, known as the Lake Superior group; the Winthrop, Negaunee, Bessie, Moore, Stegmiller, Primrose, Champion, North Champion, Hartford, Bessie, the Regent group, including the Queen, Prince of Wales, Buffalo, South Buffalo and Blue; also the Volunteer, which was acquired from the Donora company, in January, 1903, together with the Sharon, Sweeney, Penobscot and Donora on the Mesaba range.

The workings on the Lake Superior group are located on Secs. 9, 10, 16, and Sec. 21, T. 47, R. 27. General superintendent, William H. Johnston; assistants to the superintendent, John C. Greenway and C. E. Hendricks; chief clerk, J. C. W. Chapman; mine engineer, C. E. Hendricks; mine captain, Hard- Ore, John McEncroe; Hematite, Jos. Hodgson; Sec. 16, Joe. Hodgson; Sec. 21, John Trebilcock. Production for 1901, 680,822 tons; annual production provided for, 700,000 tons. Grades of ore: Alford, 63.70 iron, .048 phos.; Abbotsford, 62.88 iron, .030 phos.; Bedford, 60.16 iron, .140 phos.; Chatford, 50.96 iron, .114 phos.; Beresford, 63.47 iron, .106 phos.; Castleford, 56.90 iron, .087 phos.

The Winthrop mine is located on Sec. 21, T. 47, R. 27. Mine engineer, Andre Formis; mine captain, John Trebilcock. Annual production at present provided for, 112,000 tons. Production in 1902, 129,496 tons. Grades of ore, (1) Bell, 40.00 iron, .034 phos.

Regent group is located in Sec. 5, T. 47, R. 26. Chief clerk, George McDonald; mine engineer, Andre Formis; mine captain, Richard Roberts. Annual production provided for, 400,000 tons; production in 1901, 337,629 tons. Grades of ore: Buffalo, 61.65 iron, .099 phos.; Cameo, 58.08 iron, .109 phos.

The Negaunee mine is also in Sec. 5, T. 47, R. 26. C. G. Mason is the mining engineer, and James Piper, captain. Annual production at present provided for, 200,000 tons; output in 1902, 204,286 tons. Grades of ore: (1) Bessemer, 59.60 iron, .062 phos,

The Hartford mine is located in Sec. 36, T. 48, R. 27. Andre Formis is mining engineer, and Elijah Toms, mine captain. Production for 1902 7,440. Grades of ore: Averhart, 61.47 iron, .020 phos.; Bernhart, 58.02 iron, .075 phos.

The Bessie is located in Sec. 35, T. 48, R. 29. Andre Formis, mining engineer; W. J. Allen, mine captain. Annual production provided for, 20,000 tons. 1902 output, 5,007 tons. Grades of ore: (1) Bessie, 53.47 iron, .032 phos.

The Oliver Company also owns the Stegmiller mine, not now in operation.

At the Moore mine, on the Cascade range, which was acquired by the company last year, the company is stripping a large area of the surface above the ore body, so that when mining operations are commenced there will be no interruptions for some time on account of the dirt being in the way. The stripping job is progressing most satisfactorily. About -fifty men and several teams have been working on it for nearly six months past. The Moore will be the only steam proposition in Michigan. The ore will not be scooped up as is done at some of the Mesaba properties, for it is too hard to be handled without blasting. After it is blasted down and in chunks small enough for the dipper to catch it it can be loaded rapidly. The ore is not as hard as some mined on the range. It will break readily and it can be mined and loaded cheaper than the ore at any other property in the Cascade district. There is an immense tonnage in sight and it will be many years before the supply is exhausted. The ore runs near the Bessemer limit, being very low in phosphorus. It is thought that the quality will improve as depth is attained. The company recently completed a dwelling for Captain Anton Hanson, who will move his family from Ishpeming before the end of this week. An engine house is being erected and machinery will soon be on the ground. The company will sooner or later be obliged to erect houses for the workmen and their families at the location. During the year the company also purchased the southeast quarter of Section 24, Town 47, Range 26, on the Cascade range. It was owned in fee by Chas. Muck, Jos. Richardson and Mrs. Bridget Joyce, of Negaunee. The price paid was $19,000. The Primrose mine, producing silicious ores, is located on the property. Some work has been done here, and there is a large outcropping of ore of this class. The company needs it to mix with its Mesaba range ores. By this purchase they get practically the best of this range of silicious ores.

At the Hartford mine a new shaft-house has been erected. It is constructed entirely of steel, being in the shape of a pyramid. It is the only one of its kind in the Lake Superior district. It is 127 feet high, cost $18,000 and was built by the Duluth Bridge company. The Hartford was closed for a long period until two years ago when it was secured by the United States Steel corporation, which has developed it into one of the most promising mines of the district, giving employment to about 200 men. A number of other important surface improvements have been made, including new engine and boiler houses.

The Champion mine, which was acquired from the Clairton Steel Company in January, 1903, is one of the most valuable assets of the company notwithstanding that it is now idle. The ore of the Champion is for the most part of specular and required crushing to put it in shape for the market. Its hardness and its phosphorus content have made it somewhat slow on the market, but it is an excellent ore for the manufacture of basic pig

iron, which is the use to which it will be put in the practice of the new owners. There are three grades of ore from the Champion. The Champion No. 1 crushed runs 64 in iron, .060 in phosphorus, 455 in silica, .20 in manganese, 238 in alumina, .32 in lime, 29 in magnesia, .013 in sulphur and 80 in moisture. The Champion B crushed has 60.30 in iron, .058 phosphorus, 8.96 silica, and .95 moisture. Champion hematite runs 52.25 in iron, .397 in phosphorus, 984 in silica, 1.67 in alumina, 3.16 in lime, 1.81 in magnesia, and 8.60 in moisture. The Champion was opened in 1868, being then the most westerly on the range. Its largest output was in 1890, when 223,442 tons went to market. In 1899, the output was 215,074 tons. The total output up to the close of last year was 3,815,476 tons. The mine suffered severely during the depression of 1893. The Mesaba mines were attracting attention and seemed so much more promising than the Champion that it was proposed to take out the magnificent plant of machinery and transfer it to some Mesaba mine, but other counsel prevailed. A fine crushing plant was installed and all the ore was crushed. Shipments were made from stock in 1893 and 1894, the mine not being in operation. In the spring of 1895 work was resumed in part. In the following fall, the western part of the mine was unwatered and regular running was resumed in the spring of 1896. Mining has since been continued steadily, the average output being about 135,000 tons. The lowest workings are about 1,500 feet from the surface. The deposit is a true vein and the dip is nearly vertical. In the central part of the mine, a large barren area was found. The most westerly shaft is about 2,400 feet from the most easterly. The walls in the west end are remarkably stable and the ore is entirely removed, no supporting pillars being needed. The mine makes little water.

At the Winthrop, the company is operating two large open pits. The largest of these is being worked under the name of "No. 3 Pit." It has a length of about 400 feet, is 150 to 200 feet wide, and they are carrying a stoping face of about 60 feet. Up to within recently there was little stripping to do to prepare the ore for mining, but as they extend operations westward the drift grows heavier until they now have something like 15 to 18 feet to handle. To the east there is little stripping needed, the ore coming to surface. The coming season they will probably put a steam shovel at work assisting in removing the overlying drift at the west end. They are now employing hand shovelers, a tedious and expensive plan. The ore is blasted down from the sides of the pit, placed in tram ears and run by gravity to a shaft which reaches the bottom of the pit at the southern side. The ore is hoisted in a skip from this shaft to a Gates crusher, where it is reduced to the required fineness for market, is loaded directly into cars and forwarded to lake ports. The shaft referred to is being sunk for another lift, or bench, which will be 100 feet thick on the angle of underlay, which is 45 degrees. A drift will be extended from this shaft through the ore body, raises put in at frequent intervals, and the ore milled into tram cars and sent to shaft, as now. There is more or less paint rock and soap-stone mixed with the ore. In places, particularly the east end of the pit, they find occasional bunches of fine blue ore, but by reason of the rock mixture they do not attempt to pick it, sending all to the crusher, making only one grade. To the northward the ore gradually thins out, while upon the south side of the pit is a belt of soapstone back of which ore may be found. In depth the deposit possesses considerable extent, the exact thickness not being known. No. 5 pit, a few hundred feet to the southeast of No. 3, is one upon which work was only fairly begun last year. The ore is of the silicious class, similar to that of No. 3, with probably a trifle less iron per ton of material. It is unquestionably the same deposit as that upon which No. 3 is located, and eventually both will be brought into one open cut as work progresses. They attacked the ore from the south side of the bluff where it is exposed, carried an open cut into the south side of the bluff where it is exposed, carried an open cut into the side hill, and then opened out upon all sides. They have now fourteen tracks running to the breast of the cut, on the east, west and north sides, the ore being taken out upon the south, dumped into a car which is pulled to the crushing plant, through a Gates centrifugal breaker direct into shipping cars. Had the original operators begun work lower down the hill-side they could have had 100 feet more stoping height. As it is they now have a face of ore above the level of the bottom of the pit about 75 feet high. They blast down immense masses of ore from the sides of this pit, one set of holes giving them ore enough to keep the trammers and breakers busy for several weeks. Long holes are put down from surface, six or seven kegs of powder put into each, and a row of these holes is blasted at once by battery. The tonnage thus dislodged is immense. Much of the ore breaks in very large pieces, some of them being eight or ten feet square. These are reduced to sizes permitting their being handled into cars by placing sticks of dynamite upon them and blasting. The force of the powder, with just a little earth or sod covering the cartridge, is ample to reduce the large pieces to the required size. Formerly they used to block-hole the masses, but find the new plan breaks the mass well and is much more readily and cheaply performed.

As they work north on the deposit they will pass through the apex of the hill, after which the stoping face will quickly grow less. To the west they will continue to have plenty of ore above the present level of the pit. It will continue to have plenty of ore above the present level of the pit. It will be an easy matter to take additional slices of the ore by putting down a shaft or by driving a tunnel into the hill at a lower level than that being now attacked, power drills are used for preparing the ground for blasting.

A spur railroad track is now being laid to the Bessie mine, and will be completed shortly. This mine was recently acquired by the Oliver people. This will enable this property to get its output to the market. There is a neat little stock pile at the mine which has come from the work of opening underground. Thus far there has been

no stoping cone, but for some time past they have been sinking the shaft and extending drifts on the several levels and have brought to surface considerable ore. The mine is looking well and gives promise of repaying its operators for all they have done in getting it ready for production. The shaft has been repaired of late, the skip road improved, the shaft house put up, and everything will soon be in readiness for active mining.

THE CLEVELAND-CLIFFS IRON COMPANY.

President, W. G. Mather; vice-president, J. H. Wade; auditor, R. C. Mann; secretary, J. H. Sheadle; treasurer, W. G. Mather. Main business office, Cleveland, Ohio.

This company owns the largest estate of any corporation in Michigan and is rapidly adding to its possessions, and during the year operated the following mines: Ashland, Cleveland Hard Ore, Cleveland Lake, Cliffs Shaft, Michigamme, Salisbury and Tilden.

Mine agent, M. M. Duncan; mine auditor, A. J. Yungbluth; mine engineer, J. E. Jopling; general offices at Ishpeming, Mich.; land agent, Samuel Redfern; office at Negaunee, Michigan.

The Ashland mine is located on the fractional S. ½ of S. W. ¼, Sec. 22, and fractional N. ½ of N. W. ¼, Sec. 27, T. 47, R. 47. Postoffice address, Ironwood, Michigan. Superintendent, H. F. Ellard; clerk, W. W. Smith; engineer, S. R. Elliott; mine captain, G. A. Anderson. The production for the year 1902 was 301,824 tons. A large shaft is being sunk.

The Cleveland Hard Ore mine is located in the N. E. ¼, Sec. 10, T. 47, R. 27. Postoffice address, Ishpeming, Michigan. Mine captain, Duncan Campbell. Production for the year 1901 was 76,815 tons.

The Cleveland Lake mine is located in the S. E. ¼, Sec. 10, T. 47, R. 27. Postoffice address, Ishpeming, Michigan. Mine captain, Alfred Collick. Production for the year 1901 was 468,333 tons.

The Cliffs Shaft mine is located in the N. E. ¼ of N. E. ¼, Sec. 9, and N. W. ¼ of N. W. ¼ of Sec. 10, T. 47, R. 27. Post-office address, Ishpeming, Michigan. Mine captain, James Stephens. Production for the year 1901 was 274,259 tons.

The Salisbury mine is located in the S. ½ of N. W. ¼, Sec. 15, T. 47, R. 27. Postoffice address, Ishpeming, Michigan. Mine captain, James Matthews. Production for the year 1902 was 686,411 tons.

The Tilden mine is located in the S. ½, of S. E. ¼, Sec. 23, T. 47, R. 27. Postoffice address, Ishpeming, Michigan. Mine captain, John Skews. Production for the year 1902 was 468,672 tons. Open pit workings, and operated during shipping season only.

The Michigamme mine is located in the S. E. ¼, Sec. 19, and S. W. ¼, Sec. 20, T. 48, R. 30. Postoffice address, Michigamme, Michigan. Mine captain, Joseph Rosskelly. The mine was closed in October, 1901.

The most important work carried on by the company during the year was the sinking of the Maas shaft near Negaunee. Many difficulties were encountered, the shaft being in the quicksand. The work of sinking was commenced February 10, 1902, and has been vigorously prosecuted every hour since that date. That besetting obstacles to progress would be encountered, was well understood and provision was accordingly made to overcome them. Nothing suggested by experience in the prosecution of similar undertakings was left unprovided. The only unexpected condition of the work was the presence of shelves of clay well down in the sand, so hard as to be misleading in the location of the ledge and which proved very troublesome to the work of sinking as they were reached. With much difficulty they were overcome, however. As the first of these was reached at about 130 feet in depth the lateral pressure on the shaft was so great that its downward movement was almost imperceptible for weeks. The work of filling on the outside was suspended and some 150 tons of pig iron lodged along the shaft, which in addition to the great weight of the shaft itself, and that of five large steam pumps, proved sufficient to overcome the pressure and the work was only interrupted by occasional boilings until the ledge was reached. The fact that there was a raise of some eight or ten feet of the ledge on one side of the shaft as compared to the opposite side presented another difficult problem in bottoming and securing the shaft. This was successfully performed, however, and the bottom set of the shaft is now imbedded some two feet in the rock or slate formation. With this ends the uncertainty and problematical condition of the work, so that sinking the additional 350 feet is but a matter susceptible of close calculation, which will be prosecuted night and day until completed. This depth attained, the work of driving a drift through rock 600 feet ore body remains to be done, when the real work of opening out the mine will speedily follow. Evidence of the vast expense at which the work has been accomplished up to this time is not wanting about the surface of the location. Besides the thorough equipment of machinery, buildings, trestles, a 4,000 foot launder, etc., there are huge piles of timber and lumber yet to be used. Some idea of the work may also be formed from the disturbed condition of the surface. An area of nearly if not quite an acre about the shaft, is settled down from 10 to 60 feet, forming a gulf from which the shaft protrudes and was held straight by a carefully watched system of guys. That it was practically held in line and prevented from buckling, is considered as a most fortunate result.

The company has leased the lands of the Escanaba River Land & Iron Company in the Swanzey district, about 385 acres, and has purchased the Pendill lands in the Negaunee district. The latter deal includes the Lucy mine. This property has had an eventful history. It used to be known as the McComber mine, and bore that title for years. Later it became the property of the Pendills.

The Pendills leased the mineral rights to the Cambria Iron Mining company, which operated the mine for a long period of years. In 1893 the Cambria's lease of the mine expired and the management offered the owners a royalty of twenty-five cents per ton for all the ore mined and. agreed to mine a minimum of 500,000 tons each year as long as the five year lease that they were desirous of obtaining should last. The Pendills refused to consider the proposition, as they had been receiving forty cents previously and wanted to get the same amount on the five year lease. The negotiations failed, and while the matter was unadjusted the Cambria company suddenly removed the entire equipment, not leaving a single piece of machinery that it would pay to remove. The panic then came on and the mine was allowed to remain dismantled and unworked. In November, 1902, an option was secured on the Barara mine from the Barara Iron Mining company, and it will be unwatered for examination. Considerable exploring has been done at this property, but no ore shipped. There is a large body of lean ore blocked out.

The company has also become interested on the Mesaba range and in July closed a deal for the properties of the Itasca Mining company. The property is composed of 160 acres, and adjoins the Hawkins mine, recently leased of the Deering Harvester people, on the north. It is a quarter of a mile northwest of the new town of Nashwauk, to which settlers are rapidly flocking, and where explorations are developing many excellent prospects. The land lies in sections 31 and 32, town 57, range 22 west. The ore is pronounced by mining men as of excellent quality and already 3,000,000 tons of it have been shown up by explorations, which are not completed, which means that over $200,000 royalty is already assured. The mine was but recently opened, and five drills have been put to work. It will at once be made a shipper, and drills will renew operations at once to show up the ore. It is expected that the first product under the new management will be brought out within a short time. Terms of the deal are attracting considerable attention among mining men who have learned of the facts, owing to the royalty on the ore as explored, instead of as mined, the usual stipulation.

In addition to its mines, furnace, railroad, and other interests, it is strongly intimated that the Cleveland-Cliffs Company will ultimately become a maker of steel. In this connection comes a report from Toledo, Ohio, to the effect that the concern is arranging for the erection of a plant in the near future and for this purpose it has purchased 125 acres of land and water property at East Toledo. Ore docks will be built immediately. The Toledo property has a frontage of 2,800 feet; sixty acres of the land are covered with water, but will be filled in.

Memoranda relating to the operations of the Cleveland-Cliffs Iron Co., Pioneer Iron Co., and their allied interests:

Iron ore mined in 1903 (gross tons)	1,649,567
Total mined up to 1903 (about)	18,000,000
Charcoal pig iron made in 1903	81,444
Charcoal pig iron made 1854-1903 (about)	721,000
Wood alcohol made in 1903 (gallons)	446,423
Acetate of lime made in 1903 (net tons)	3,000
Miles of standard gauge railroad operated	228
Tons carried in 1903 on railroad operated	2,212,219
Ships owned, steam and sail	8
Gross tons freight carried	481,392
Average men employed 1903	3,500
Average wages at mines, per day	$2.21
Average wages on vessels	2.23
Average wages at furnaces	2.20
Acres of land owned and controlled	1,400,000

All of the iron ores and the wood used by the Pioneer Iron Co. are furnished from the mines and lands of the Cleveland-Cliffs Iron Co. and are over railroads owned or controlled by the same interests.

PITTSBURG & LAKE ANGELINE IRON COMPANY.

President, James Laughlin, Jr.; secretary and treasurer, William J. Pollock. Main business office, Western Reserve Building, Cleveland, Ohio. This company operates the Lake Angeline mine, located on the N. ½ of N. ½ Sec. 15, T. 47, R. 27, and controls other lands in the neighborhood. Mine post-office address, Ishpeming, Mich. The agent is Capt. Thomas Walters; cashier, Geo. P. Persons; mine engineer, Rudolph Ericson; mine captain, William Tregambo. This property includes the Lake Angeline proper and the East End mine. The production for the year 1902 was 304,125 tons. Though there are many thousand tons of silicious ore in the mine, the end of the high grade ore is in sight, as shown by underground development. This company has also acquired extensive interests on the Mesaba (Minnesota) range and has organized the Inter-State Mining company for the purpose of operating. Chas. T. Fairbairn is the superintendent on the Mesaba. The Jackpot mine, on the Gogebic Range, and the Monongahelia, on the Menominee Range, operated by this company, have been abandoned.

ROGERS, BROWN & CO.

This concern is a new one in the mining field. The firm has purchased the Beaufort and Ohio mines near Michigamme, Marquette range, from Oglebay, Norton & Co., of Cleveland. G. L. Woodworth is the local superintendent. During the year a shipment of tons of ore were made from the Beaufort and tons from the Ohio. The power plant was added to and the equipment increased by the addition of a 40-drill compressor. Two new incline shafts were being sunk and the outlook for the property is considered excellent, Rogers, Brown & Co. are also interested in a number of Mesaba range properties.

The Breitung Estate has decided upon the policy it is to adopt with reference to the mineral lands which it owns on the Marquette range, says *Ishpeming Iron Ore*. It will give its properties thorough exploration, and wherever ore is found in paying quantity it will give leading mining

and manufacturing interests an opportunity of securing the lease and carrying on the mining business. The gentlemen who are representing the estate recognize the fact that the business of working iron mines has fallen into comparatively few hands, that the individual operator is laboring against large odds, and that the concerns which consume the ore as well as operate the mines producing it have a decided advantage in their favor. These corporations have also the means at hand to bring about rapid developmenet of a property, giving the earliest and largest returns in the way of royalties per ton of ore brought to light, and this is what the owners of the lands are seeking. The Breitung Estate is now exploring the tract of land lying in the corporate limits of the city of Negaunee, a task it has been conducting for several months past, and where, if reports be true, they are being well rewarded for their pains. The field is the one over which there was recent litigation, the Cleveland-Cliffs company, believing it had a claim under an old agreement, but which the courts have thus far decided has no power. It is a tract which occupies a desirable neighborhood, a portion of it lying alongside the properties of the Regent Iron Company, these being the Blue, Queen, Prince of Wales, Buffaloes and others. It is a spot where the keen explorer would quickly drive his stakes. The Cleveland-Cliffs Company did some diamond drilling here while the case was being discussed, but they learned of the formation which is their secret. The Breitungs have kept the work going, and, while they tell nothing of what they have found, they do say they will develop a mine, and that results have met their expectations. If this be true then it is reasonable to expect there will be a fine mine brought forth at this location and another important labor-employing enterprise added to the Marquette range and the city of Negaunee. There are two square miles of lands in the vicinity of Negaunee which are owned by the Breitungs, and they look for more than one mine as the result of their investigations. A diamond drill has also been placed on the old New York Hematite property which will be explored systematically. There has been considerable work done at this point in the past, and a find of ore was once reported from the operation of a diamond drill which was never followed by a shaft. It was said the ore was found at a considerable depth for the period when the boring was done, but which would be considered an easy one in these later days. The coming on of hard times discouraged the development of the ore body which is said to have been penetrated. The present effort will soon show just what there was to the old story.

The company organized to develop the properties is known as the Breitung Hematite Company. A new boiler house was built, the large 100 horsepower boiler has been put in place and is about ready to generate steam. The new four-drill compressor has been unloaded from the ears and will be put into operation in a short time. Two diamond drills are at work near the shaft exploring the underlying ore bed. A third drill is on hand ready for use, but on account of the lateness of the season, will probably not be placed in commission.

REPUBLIC IRON COMPANY.

President, Powell Stackhouse. This company operates the Republic mine, located on Lots 2, 3, 5, and 8, Sec. 7, T. 46, R. 29. The production for the year 1902 was 157,646 tons. The only grades of ore reported was Specular, 67 per cent. iron, .038 per cent. phos.

The transfer of the property of the Republic Iron Co., consisted of the Republic mine on the Marquette range, the steel steamer Republic, the wooden steamer Continental, and the schooner Grace Holland, to the Cambria Steel Co., was consummated Tuesday, Aug. 12th, 1902, when new directors were elected as follows: Powell Stackhouse, Philadelphia; A. P. Robinson, Philadelphia; Wm. Kelly, Vulcan, Mich.; H. S. Endsley, Johnstown, Pa.; John W. Townsend, Philadelphia; F. J. Firth, Philadelphia; Wm. D. Rees, Cleveland; Peter White, Marquette, Mich., and J. V. Painter, Cleveland. Mr. Stackhouse, who is president of the Cambria Steel Co., was elected president, and Mr. Robinson, who is assistant secretary and treasurer of the Cambria Company, was elected secretary and treasurer. Mr. Townsend is first vice-president and Mr. Endsley solicitor and general agent of the Cambria Company. Permanent headquarters are in Philadelphia. The Republic Iron Co. was organized in 1870 under the laws of Michigan with a capital of $500,000—20,000 shares, par value $25—upon which $12.50 per share was paid in cash. That is all that was ever paid on the shares. The shipping of ore was commenced in 1871 with 11,025 tons and the total shipments to December 1901, were 5,014,855 tons. In 1873 the price of ore was $15 per ton, which declined to $12 in 1874. The mine has been immensely profitable, having paid in dividends $9,050,000. Deducting the amount paid in originally, $250,000, from the sale price, $1,500,000, leaves $1,250,000, which added to the dividends for the whole period, gives $10,300,000 as the net profits.

William Kelly, Vulcan, Mich., is the general superintendent; D. T. Morgan, Republic, Mich., local superintendent; H. R. Gambee, chief clerk; Peter W. Pascoe, mine captain.

CHESTER MINING COMPANY.

President, Joseph Sellwood; secretary and treasurer, R. M. Sellwood. Main business office, Duluth, Minn. This company operates the Chester mine, located on the S. ½ of N. E. [¼], Sec. 7, T. 47, R. 26. This property was for many years known as the Rolling Mill mine. Postoffice address, Negaunee, Michigan. Superintendent, Alfred Newcomb; clerk, N. L. Leach. The production for the year 1902 was 24,874 tons. The mine produces two grades of ore, a Bessemer of 40 per

cent. iron, .040 per cent. phos., and a non-Bessemer of 50 per cent. iron, .070 per cent phos. From open developments it is estimated there are a million tons of ore in sight.

DONORA MINING COMPANY.

President, W. H. Donner; vice-president and treasurer, A. W. Mellon; secretary, Oscar Rohn. Main business office, Duluth, Minn. This company operates the Volunteer mine, located on the S. ½ of S. ½ Sec. 30, and N. ½ of N. ½ , Sec. 31, T. 47, R. 26. Postoffice address of mine, Palmer, Marquette County, Mich. Superintendent, O. B. Warren; assistant superintendent, Frank Keese; clerk, A. E. Hodgkins; mine captain, Alfred Edwards. During the fall and exploring the property thoroughly with underground openings and diamond drilling. The Comrade ore, 56 per cent. iron, .112 per cent phos., was what the mine formerly produced. The Donora Mining Company also explored the old Platt mine, located on the N. E. ¼ of Sec. 32, T. 47, R. 26. Gilbert Archambeault is mine captain. In addition to underground work the diamond drill will be used. Output during 1902 was 32,736 tons.

REPUBLIC IRON & STEEL COMPANY.

President, A. W. Thompson; secretary and general auditor, W. B. Haagsma; treasurer, John F. Taylor. Main business office Stock Exchange Building, Chicago, Ill. The company operates the Cambria and Lillie mines. The Cambria mine is located on the S. E. ¼ of S. E. ¼, Sec. 35, and W. ½ of S. W. ¼ of S. W. ¼, Sec. 36, T. 48, R. 27; the Lillie being on the S. W. ¼ of S. E. ¼, Sec. 35, T. 48, R. 27. Alexander Maitland is general manager; A. W. Maitland, assistant; the clerk is F. E. Nightingale; mining engineer, B. E. LaLonde; mine captain, John Deacon. Office at Negaunee, Michigan. During the year 1901 the Cambria produced 63,967 tons and the Lillie 79,919 tons. This company also has extensive ore deposits on the Menominee range, having purchased the properties of the Antoine Ore Company during the year. It also owns and operates various mines on the Mesaba (Minn.) range.

JACKSON IRON MINE.

President and general manager, Capt. Sam Mitchell; vice-president, J. H. Wade; secretary, Thos Pellow; mine captain, William Penglase. Main business office, at the mine, Negaunee, Michigan. The Jackson mine is located on Sec. 1, T. 47, R. 27. During 1902 the mine shipped 15,499 tons, 46 per cent, iron, non-Bessemer. This was taken from old rock piles. The mine still contains large bodies of medium grade ore, but the management does not think the present prices warrant the mining of it.

ISHPEMING MINING COMPANY.

President, F. B. Baird. The company operates the East New York mine, located on the S. W. ¼ of S. W. ¼ of Sec. 2, T. 47, R. 27. Main office at the mine, Ishpeming, Mich. Mine captain, Frank Platto. During the year the mine produced 38,761 tons. The company has secured control of the old Martel furnace at St. Ignace and prepared it for operation, but soon after going into blast it was destroyed by fire.

SWANZY DISTRICT 1902.

This district is situated fourteen miles from Negaunee in a direction slightly east of south, in T. 45, R. 25. It is reached by a spur of the C. & N.-W. R. R. from Swanzy.

The only producing mine during the year was the Princeton, owned by Tod, Stambaugh & Co.

President, Frank Billings; vice-president, John Stambaugh, Jr.; secretary and treasurer, J. T. Frawley. Main business office, Perry Payne Bldg., Cleveland, Ohio.

This company operates on S. E. ¼, Sec. 18, and N. W. ¼, Sec. 20, T. 45, R. 25. The local officers are as follows: Superintendent, John Thomas; chief clerk, Geo. J. Sarasin; mining engineer, Bruce A. Middlemiss; mining captain, William Jory.

The production for the year 1902 was 118,170 tons, in two grades—Princeton No. 2, iron 62, phos. .130, and Cambridge, iron 61, phos. .600. The company reduced their force forty per cent, the first of 1903.

The Cleveland-Cliffs Iron Company has an exploration on S. W. ¼, Sec. 20, T. 45, R. 25. They have sunk a shaft, cut a station, and have done some drifting. Have installed a hoisting plant and built a shaft-house. The railroad is not completed to the mine yet. The outlook for this property seems good.

George Maas explored in this district with a diamond drill but the results were uncertain.

The Brotherton mine controlled by the Oliver Iron Mining Company was idle during the year.

GOGEBIC RANGE.

OLIVER IRON MINING COMPANY.

General superintendent, John H. McLean; assistant to the superintendent, D. E. Sutherland; chief clerk, Laurence T. Stephens; mining engineer, Willard Bay less; general office at Ironwood. W. H. Knight is the mining captain at Bessemer. The company operates the following mines in the Gogebic County; North Norrie, East Norrie, Pabst, Aurora, Tilden, Chicago and has a number of explorations in hand, including the Royal, Puritan, Old Davis. With recent acquisitions of lands on the Grogebie range the Oliver Iron Mining Company now

has a practically unbroken line of lands along the formation there extending five miles, and ending with the Norrie properties at Ironwood. The Puritan, the latest of these acquisitions, is to be explored at once, extensively and thoroughly. The company also owns the Atlantic mine, the largest property on the Wisconsin end of the range.

At the Norrie their new "A" shaft located directly back of the old No. 3, is 700 feet deep. It is four-compartment, two for skips, one for cage and one for ladder, pipes, etc. They drifted from the 8th level under the downward line of the shaft and then raised, this greatly assisting in the speed of the work. The shaft is steel-lined. Eventually it will be carried to a depth of 2,000 feet, or as far as the ore makes downward. There is a new shaft going down back of old No. 7, Norrie, it being down 6,000 feet. Work upon it was commenced last November. It is 5x10 feet, two-compartment, and intended to take the ore pillars left in that portion of the mine, and also to serve as a permanent avenue for reaching the ore in the locality. The old No. 7 ties up a large amount of ore and the new shaft was necessary in order to secure the pillars. At the Aurora mine they are changing the plant of machinery from a geared hoist to one operating in balance. They will add another engine and greatly increase the effectiveness over the former machinery. At No. 5 shaft they are erecting a steel shaft house. The Aurora was one of the first mines in the iron regions of Michigan to put in houses constructed of this material.

The new steel shaft at the North Norrie is nearly completed so far as the structural iron work is concerned, the workmen expecting to be through with the job inside of two weeks. The shaft which will be served by this shaft-house will be put down 1,500 feet at the start and is said to tap large ore bodies. It is south of number two shaft of the Norrie which was recently closed. A new power house will be built at the above shaft in the spring and a powerful new hoist will be installed, capable of raising six ton skips from the deepest part of the mine. At the East Norrie the engineers have made a survey of the location of the new No. 3 shaft which is to be started at once in the footwall 236 feet south of the old shaft which it is to replace. The shaft will be sunk through a hard slate formation and it will require approximately a year and a half to put it through to the bottom of the mine. The shaft will be steel lined with shaft-house also of steel, the same as all the modern shafts of the company. Out on section thirteen the work of sinking a shaft north of the New Davis is going on at a favorable pace. This is in a new field for the Oliver Company, but it is expected to tap the main vein upon which their older mines are working at a depth of not less than eight or nine hundred feet. At the Puritan a shaft is going down to tap the ore bodies which are supposed to lie deep at that point. If the two latter shafts are successful, and there is every reason to suppose they will be, they will practically prove the value of the territory between this city and Bessemer. It is argued by mining men that the old explorations between these cities did not go deep enough to the ore, which is known to extend east from the Aurora, Pabst and Newport. The Oliver Company built a new sawmill just south of the machine shop is at the East Norrie during the year. They will saw their own square timber and lumber in the future instead of depending on outside mills to do the work. The mill will have one circular saw besides the usual cut offs, edgers and planer.

During the year the mines of the company produced tons of ore divided as follows: North and East Norrie mines, 1,080,032 tons; Aurora, 402,981 tons; Tilden, located at Bessemer, 468,672 tons; Chicago, 44,625 tons. No shipment was made from the Pabst.

ASHLAND MINE.

This property was purchased in 1901 by the Cleveland-Cliffs Iron Company. In point of production it is the second largest mine on the Gogebic range and it is known to have extensive stores of ore. The production in 1902 was 301,824 tons. It is located at Ironwood on the fractional S. ½ of S. W. ¼, Sec. 22, and fractional N. ½ of N. W. ¼, Sec. 27, T. 47, R. 47. Postoffice address, Ironwood, Michigan. Superintendent, H. F. Ellard; clerk, W. W. Smith; engineer, S. R. Elliot. The new steel shaft at the Ashland mine went into commission on the first of July. While hoisting to its fullest capacity will not be under way at the shaft for a month or so yet, the machinery was tested on the above date and found to be in good working order. Hoisting of ore has since been continued on a moderate scale. A larger new double deck cage is being made at the machine shops of the mine and will soon be put in place. Two new boilers are being installed in the power house. The sinking and equipping of Ashland's new shaft was a rapid piece of work. The sizes of the compartments are as follows: Cage compartments 5 ft. by 9 ft. 8 in.; two skip compartments, each 4 ft. 8 in. by 5 ft. 8 in.; Counterweight compartment 1 ft. 8 in. by 2 ft. 8 in.; ladderway, 2 ft. 6 in. by 2 ft. 8 in.; pipe compartment 2 ft. 8 in. by 4 ft. 4 in.; all inside dimensions. The timbers used are as follows: Wall plates and end pieces 14 in. by 14 in. white pine; cage divider 10 in. by 12 in. tamarack; Divider for foot of skip compartment 12 in. by 12 in. tamarack; all other dividers 6 in. by 12 in. tamarack; cage runners 5 in. by 8 in. and skip runners 6 in. by 7 in. Norway pine; studdles 12 in. by 12 in. white pine.

NEWPORT MINING COMPANY.

President, Ferdinand Schlesinger; vice-president and general manager, F. E. Woodbury; secretary, Wilmot Saeger; treasurer, Charles Ray. Main business office, 22 University Building, Milwaukee, Wis. This company operates the Newport and Anvil mines. The Newport mine is located on the N. ½ of Sec. 24, T. 47, R. 47. Postoffice address, Ironwood Michigan. Superintendent,

James R. Thompson; clerk, L. C. Brewer; mine engineer, C. W. Williams. Production for the year 1902 was 141,571 tons. Four grades of ore were produced: Melrose, 60.33 per cent. iron, .041 per cent. phos.; New Era, 58.01 per cent. iron, .039 per cent. phos.; Newport, 53.24 per cent. iron, .041 per cent. phos.; Bonnie, 50.55 per cent. iron, .038 per cent. phos. The skill shown in selecting these grades of ore is to be commended.

The Anvil mine is located on the N. E. ½, Sec. 14, T. 47, R. 46. Postoffice address, Ironwood, Michigan. Superintendent, James R. Thompson; clerk, W. W. Boyce; mine captain, W. C. Rowe. The production for the year 1902 was 135,502 tons.

COLBY MINE.

This mine had a production to its credit in 1902 of 22,526 tons; total production, 1,794,674. It is operated by Corrigan, Mc-.Kinney & Co. The Colby was the first mine opened on the Gogebic range. It was the original steam shovel mine, and when Joseph Sellwood began taking out iron ore by that means, the news sent congestive chills up and down the spinal columns of mine operators on old ranges; the fright then experienced being premonitory of the more serious scare given the older ranges, including the Gogebic, when the Mesaba ore fields were opened, nine years later. After three seasons of steam shovel operations it became necessary to resort to underground work, as in the older districts.

The Colby made its first shipment, amounting to 1,022 tons, late in the fall of 1884. The second year, 1885, 84,302 tons were shipped and the next season 257,432 tons. In 1888 the mine reached its maximum tonnage with a production of 285,880 tons. The mine is credited with a total production of 48,672 tons. The property now known as the Tilden was a part of the Colby tract at the time of the opening of the mine and until the close of 1890, therefore the figures are somewhat misleading. Of the total production of 1,217,025 tons credited to the Colby in the seven years from 1884 to 1890 inclusive, it is probable that at least 500,000 tons should be credited to the Tilden.

After the Tilden was divorced from the Colby in 1890, the latter was considered almost valueless, and was discarded for that reason. There were known to be considerable deposits of ore on the property, but was in very poor condition for reopening. After the setting aside of the Tilden, the Colby's production dropped to 9,619 tons in 1891, as compared with 193,038 tons in the preceding year, practically all of which was from the Tilden portion of the mine. The mine was originally opened by the Penokee & Gogebic Development Compaq, but the lease was surrendered in 1890. The Colby was taken by Corrigan, McKinney & Co. in 1896. In September, 1902, another important discovery of ore was reported. The Colby is in the Bessemer district. Henry Whitbum, Bessemer, is the local superintendent. He also has charge of Ironton with a production of 8,555 tons for 1902. The Puritan, formerly controlled by this firm, is now owned by the Oliver Company, and the Meteor by the Castile Company.

METEOR MINE.

Operated in 1901 by Corrigan, McKinney & Co., when it produced 34,140 tons, is now controlled by the Castile Mining Company in which Oglebay, Norton & Co., of Cleveland, are large stock holders. The mine is located near Wakefield. G. H. Abeel, Ironwood, is the superintendent and Chas. H. James is in immediate charge. The Meteor produced tons in 1902 and has a total production record of tons.

JACKPOT MINE.

The above property in the Bessemer district, which was operated in 1901 by the James-Laughlin Company and produced 19,988 tons of ore, was abandoned in November, 1902, and a few weeks later was taken over by Corrigan, McKinney & Co. Recent developments at the Federal to the east indicate that ore may be found at a greater depth in the Jackpot and it is the purpose of the new holders to do some sinking. The Jackpot has a total production to its credit of 61,741 tons. In 1902, 102 tons.

BROTHERTON IRON MINING COMPANY.

President, Joseph Sellwood; vice-president, J. H. Bartow, secretary and treasurer, R. M. Sellwood. Main business office, Duluth, Minn. This company operates the Brotherton mine, located on the N. ½ of S. E. ¼, Sec. 9, T. 47, R. 45. Postoffice address, Wakefield, Michigan. Superintendent, N. B. Roscorla; clerk, James Cary; mine engineer, L. W. Treetner; mine captain, Wm. Downey. Production for the year 1902, 53,255 tons. The analysis gives 63 per cent. iron, .030 per cent. phos. The underground developments prove a good body of ore in sight. A new equipment of boilers, pumps, engine and hoists has been added.

SUNDAY LAKE IRON COMPANY.

President, Joseph Sellwood; vice-president, M. M. Drake, secretary and treasurer, E. M. Sellwood. Main business office, Duluth, Minn. This company operates the Sunday Lake mine, located on the W. ½ of S. W. ¼, Sec. 10, T. 47, R. 45. Postoffice address, Wakefield, Michigan. Superintendent, N. B. Roscorla; clerk, James Carey; mine engineer, L. W. Treetner; mine captain, Wm. Downey. The 1902 production was 144,630 tons. The analysis gives 63 per cent. iron, .030 phos. Underground developments prove a good body of ore in sight. A new equipment of boilers, pumps and hoists

were added during the year. The annual production at present provided for is 125,000 tons.

RANDOM IRON MINING NOTES.

Following a few random facts are presented that, while of general interest, cannot be very well embraced under one heading or division.

The total production of iron ore by the Lake Superior ranges during the year 1902, was 27,571,121 tons. Of this total the three Michigan ranges produced 11,144,018 tons and the two Minnesota ranges 15,427,103 tons. The Michipocoten (Ontario) range produced 205,498 tons. The all-rail shipments of iron in 1902 totaled 531,953 tons; in 1901, 431,715 tons, and in 1900, 489,078 tons. The iron ore shipments, as will be seen by the tables printed elsewhere, show an increase from every range. Of the total ore shipments the Oliver Iron Mining Company, subsidary to the United States Steel Corporation, shipped 16,136,787 tons—more than half —to be accurate, 58.5 per cent. The average price of Bessemer pig iron during the year was $16.75, the highest point was $22.35, and the lowest $14.45. The great quantity of timber used underground in the copper and iron mines can be imagined from the fact that the Calumet & Hecla alone uses sometimes 30,000,000 feet of 12x12 pine. All the active mines operate saw mills. The question of securing a supply of timber is becoming a most serious one. In the iron country, where pine and hemlock was formerly employed exclusively, hardwood timber of all kinds are now utilized. Changes in mining methods—the "filling" and “caving" systems, for instance—have lessened the demand for timber very materially, but it is only a question of time when it will be necessary to employ steel. Steel shaft-houses are fast replacing the timber structures, and in the new shafts now being sunk by the Oliver Iron Mining Company steel is employed almost exclusively.

At this writing, the Oliver Iron Mining Company is engaged in sinking no less than six great shafts, all to be of much depth and diameter. One of these, the new Chapin shaft, will be the largest bore ever made in the iron region, the shaft being of a net diameter inside timbers of 10.4x23.1 feet. Several of these shafts will be lined with steel plates, steel wire rope, or other form of non-combustion material. At Norrie, Iron wood, a shaft is being sunk that may eventually go 2,000 feet; at Savoy, on the Vermilion, is another that will reach fully 1,300 feet and perhaps more. None of the larger of these new shafts is expected to be of less annual capacity than 500,000 tons, and some will be more. An enormous sum will be spent in sinking and equipping these shafts and in building head frames, all of which are to be of steel. One of these, at the Savoy, is 165 feet high and of corresponding other dimensions.

The extension of the full benefits of the "Carnegie Relief Fund,” to the employes of the Oliver Iron Mining Company, is, in my opinion, one of the most noteworthy features of the year. In making this request for an extension of the benefits, Mr. Carnegie has stated that, if the present fund of $4,000,000 is not sufficiently large for the purpose, he would increase the amount of his original donation. The original donation was made by Mr. Carnegie in March, 1902. In a letter addressed to the heads of the several companies Mr. Carnegie stipulates that the income of the $4,000,000—about $200,000—was to be applied as follows:

"First.—To provide for employes of the Carnegie company, in all its works, mines, railways, shops, etc., injured in its service, and for those dependent upon such employes as are killed.

"Second.—To provide small pensions or aids to such employes as, after long and creditable service, through exceptional circumstances need such help in their old age, and who make good use of it.

"Third.—This fund is not intended to be used as a substitute for what the company has been in the habit of doing in such cases—far from it—it is intended to go still further and give to the injured or their families, or to employes who are needy in old age, through no fault of their own, some provision against want as long as needed, or until young children can become self-supporting.

"Fourth.—A report is to be made at the end of each year, giving an account of the fund and its distribution, and published in two papers in Pittsburg, and copies posted freely at the several works, that every employe may know what is being done. Publicity in this matter will, I am sure, have a beneficial effect.

"Fifth.—I make this first use of surplus wealth upon retiring from business as an acknowledgment of the deep debt which I owe to the workmen who have contributed so greatly to my success.

The rules adopted by the trustsees of the fund provide that accident benefits are payable to employes injured in the performance of duty, at the following rates: $500 for the widow of deceased and $100 additional for each child under 16 years of age on date of death of deceased employe. $500 for the relative or relatives of deceased unmarried employes, provided the latter was the sole supporter of, or a regular contributor to, the support of, such relatives. At the close of each month, by mail, in installments depending on the financial condition of the beneficiary—as a general rule—until the whole amount be paid.

"A pension allowance is also provided for and is payable to employes of companuies which have been ten years within the Carnegie interests, who have reached the age of sixty years, have been at least fifteen years in service of one or more of the affiliated companies or associations, if it be found by medical examination that they are not able to work any longer, at the following rate:

"For one year of service, 1 per cent, of the average regular monthly pay received for the entire term of service.

"To employes who may be found by medical examination to be permanently totally disabled before reaching the age of sixty years, if the case fulfills all the other conditions above mentioned, at foregoing rates.

"At the close of each month, by mail, during lifetime.

"Employes placed upon the pension list must retire from, and cannot re-enter the service, but may engage in other business, if they so desire.

"Employes who leave, or are dismissed from the service, thereby forfeit the years of service then to their credit, and their privilege of application for pension allowance, unless reinstated within two years.

"Employes whose cases fulfill all of the foregoing conditions, and who wish to retire and be placed upon the pension list, may apply to their employing officer, who will take up their case through the proper channels with the manager of the fund, and he when granted, notify them by mail, as to the amount and date of beginning of allowance."

Andrew Carnegie in a recent interview made the prediction that the present known iron ore deposits of the United States would probably not last more than sixty or seventy years, though he admitted that it was probable that immense deposits would yet be discovered. The question of the duration of the iron ore supply probably need not worry the nation as a whole, for vast ore bodies are discovered almost yearly in different parts of this immense country, but to the people of any particular iron mining region it is a very serious matter, especially if mining be the main support of the region's prosperity. Mr. Carnegie in making his estimate, probably, did not take into consideration the vast stores of lean ores of the Cascade, Marquette and Menominee ranges. These ores are fast coming into the market, and it may be remarked that lands containing such ores are being purchased by consumers with an eye to the future. Lean ore propositions are in demand.

The largest train of iron ore ever hauled in the Lake Superior country can be credited to the Chicago, Milwaukee & St. Paul road. The train consisted of eighty-five 100,000 pound capacity cars. It was 1,894 feet long, gross tonnage 4,821 tons. The average speed of the train was 12 miles and miximum speed 21 miles per hour. Maximum draw bar pull 48,000 tons.

The question of the taxation of mineral reservation has long been under debate. The law governing "mineral rights" is such that the original owner of the land may, at any time, no matter how often the "surface rights" may have changed ownership, enter upon and explore the same, the law only providing that the owner of the "mineral rights" must pay the owner of the "surface rights" for such improvements as he may have made. The owner of the "surface rights" cannot explore the lands for minerals, nor can he sublet this right. Should he desire to explore the lands it is necessary for him to secure an option to do so from the owner of the "mineral rights"; and should the owner of the "surface rights" find mineral on the land as a result of his exploratory work, no matter how much money he may have expended in the work, he cannot remove a pound of the mineral unless he firsts pays to the owner of "mineral rights" a "royalty" to be agreed upon. I believe that nearly every instrument of transfer executed in the counties of the Upper Peninsula contains these provisions. The laws of Michigan do not cover this property right and the owner of the "surface rights" must pay the full tax on the lands. It is the contention that this is an injustice. It is so held in the neighboring state of Wisconsin, and I desire to call attention to the fact that the legislature of that state has undertaken to place upon the holder of these mineral reservations his share of the tax. A law enacted last winter provides that:

"Any and all rights and reservations to enter upon and take away any minerals from any lands within the state of Wisconsin, granted by or reserved in any deed or conveyance of such lands the title to which right or reservation is vested or may hereafter become vested in any person or corporation other than the owner of the fee to which such right is attached, is hereby declared to be taxable and the same shall be separately assessed for taxation upon the written request of the owner of the fee to which such right or reservation is attached and not otherwise, and upon his furnishing to the assessors satisfactory proof of such ownership."

This law will be applied for the first time in 1903.

SHIPMENTS OF MICHIGAN IRON MINES FOR 1902, WITH TOTAL PRODUCTION.

MARQUETTE RANGE.

Name of Mine.	1902.	Total.
American (Sterl'g)	.....	112,933
Barnum (B)	.....	801,851
Bessie	5,007	5,854
Beaufort	59,781	155,919
Blue	.....	92,639
Boston	.....	62,542
Buffalo (A)	.....	217,730
(Mitch'l)	.....	136,636
Braastad (Wint'p)	.....	831,445
Cambria	63,967	1,431,341
Champion	205,721	4,021,197
Chester	24,874	308,874
Cleveland-Cliffs Iron Co.	1,104,864	11,569,116
Curry	.....	16,671
Detroit	.....	140,841
Dexter	.....	118,512
East Champion	.....	76,002
East New York	38,761	261,687
Fitch	.....	31,817
Foster (B)	.....	171,893
Gibson	.....	16,357
Grand Rapids (Davis)	.....	110,736
Hartford	7,440	21,729
Hortense (N. Chapin)	.....	30,574
Humboldt	.....	723,961
Iron Cliffs (K)	.....	1,700,537
Imperial	.....	149,762
Jackson	15,499	3,769,463
Lake Angeline	304,125	304,125
Lake Superior	832,796	11,117,890
Lillie	79,919	1,414,293
Lucy (McComber)	.....	516,159
Manganese	.....	6,359
Marquette (C)	.....	152,907
Mesabi's Friend	.....	16,043
Michigamme (K)	.....	880,362
Milwaukee	.....	375,451
Moore	.....	42,303
Negaunee	204,286	1,958,722
Negaunee Con. Wks.	.....	12,708
New York (York)	.....	1,123,071
N. Y. Hematie	.....	37,587
Norwood	.....	5,753
Nonpareil (St. Law.)	.....	23,395
Pascoe	.....	59,806
Pendill	.....	45,993
Phenix (Daliba)	.....	59,114
Pioneer	.....	15,409
Pitts & L. Angel's	.....	5,990,519
Platt	.....	73,844
Princeton (Sw'nz'y)	118,048	558,274
Queen	418,044	3,531,225
Republic	157,646	5,172,501
Republic Reduction Co.	.....	47,174
Richmond	50,041	190,320
Riverside	.....	16,160
Saginaw	.....	451,424
Salisbury (B)	.....	686,411
Sam Mitchell	.....	17,780
Samson (Argyle)	.....	267,805
South Buffalo (A)	.....	245,412
Spurr	.....	164,244
Star West (Wheat)	.....	204,649
Taylor	.....	32,970
Titan	.....	90,371
Volunteer	32,736	1,185,085
Webster	.....	34,905
West Republic	.....	133,077
Wetmore	.....	50,870
Winthrop	129,496	1,570,135
Miscellaneous	.....	392,450
Total	3,853,010	66,686,502

A—Now Queen. B—Now Iron Cliffs. K—Under Cleveland Cliffs Iron Co. after 1895.

MENOMINEE RANGE.

Name of Mine.	1902.	Totals.
Antoine	110,993	729,496
Appleton	.....	12,102
Aragon	646,263	3,169,628
Armenia	100,864	198,613
Baltic	64,664	81,990
Beta	.....	4,211
Breen	.....	17,430
Brier Hill	.....	14,981
Bristol (G)	129,305	365,136
Calumet	.....	38,713
Chapin	956,812	11,256,413
Columbia	186,798	914,820
Commonwealth	112,704	2,439,898
Cornell	.....	49,302
Crystal Falls	195,555	1,057,606
Cuff	.....	58,419
Cundy	183,052	726,116
Curry (F)	.....	416,928
Cyclops	.....	286,093
Delphic	.....	33,770
Dober (H)	.....	65,192
Dunn	2,816	1,059,762
Emmett	.....	66,655
Ethel (Hennepin)	14,455	14,455
Fairbank	.....	8,500
Florence	130,798	1,514,873
Foxdale	15,015	19,662
Great Western	42,470	729,191
Groveland	7,599	20,092
Half and Half	.....	7,524
Hamilton	.....	96,072
Hemlock	123,331	829,783
Hersel	.....	955
Hiawatha	74,596	108,843
Hilltop	.....	12,409
Hollister	.....	4,098
Hope	3,373	21,191
Indiana	.....	17,871
Iron River (H)	.....	904,587
Keel Ridge	.....	93,101
Lamont (Monitor)	47,267	275,151
Lee Peck (D)	.....	2,844
Lincoln	7,747	180,644
Loretto	128,300	583,487
Ludington	.....	1,001,518
Manganate	.....	6,844
Mansfield	31,181	586,933
Mastodon	.....	425,708
Metropolitan	.....	107,027
Michigan Exploration Co.	53,272	55,141
Millie (Hewitt)	25,935	257,690
Monongahela	.....	2,397
Nanaimo	.....	127,566
Northwestern	1,324	18,530
Norway (F)	.....	1,291,352
Paint River	10,383	234,070
Penn Iron Mining Co.	273,443	2,446,688
Perkins	.....	397,225
Perry	.....	3,138
Pewabic	530,291	3,739,840
Quinnesec	62,531	450,015
Riverton	215,850	408,976
Selden	.....	2,092
Sheridan	.....	116,299
South Mastodon	.....	8,203
Stephenson	.....	39,350
Sturgeon River	.....	18,404
Tobin	55,238	74,195
Verona	43,245	59,863
Vivian	40,384	40,384
Vulcan (F)	.....	1,668,654
Wallpole	.....	19,089
Youngstown	.....	151,425
Total	4,627,524	42,267,233

D—Cherry Valley ore. F—1893, and later under Penn Iron Mining Co. H—Now Riverton. G—Formerly Claire.

GOGEBIC RANGE.

Name of Mine.	1902.	Total.
Ada	8,555	41,579
Anvil	135,502	450,088
Ashland	301,824	3,200,665
Atlantic	190,213	757,717
Aurora	402,981	3,393,398
Bessemer	.....	20,889
Blue Jacket	.....	1,799
Brotherton	53,255	983,920
Cary (and Superior)	136,895	1,121,481
Chicago	44,625	42,762
Colby (E)	22,526	1,794,674
Eureka	.....	128,719
Federal	.....	27,928
Harmony (Germania)	20,502	363,494
Hennepin	36,383	250,514
Imperial	.....	8,515
Iron Belt	79,121	1,092,507
Iron Chief	.....	12,199
Ironton	8,555	66,923
Jack Pot	102	61,843
Kakagon	.....	71,904
Meteor (Comet)	19,117	150,624
Mikado	98,834	218,279
Minnewawa	.....	1,255
Montreal	136,354	1,576,066
New Davis	31,530	88,842
Newport	141,571	2,266,195
Nimikon	.....	28,635
Norrie	1,080,032	10,703,167
Odanah	.....	77,124
Ottawa	26,141	26,141
Pabst (J)	.....	2,366,583
Palms	32,113	1,150,396
Pence	.....	40,566
Pike	6,343	16,123
Puritan (Ruby)	.....	108,313
Section 33	.....	253,590
Shores	.....	55,808
Sparta	.....	4,862
Sunday Lake	144,630	692,138
Superior	.....	121,627
Tilden	468,672	3,736,533
Trimble	.....	25,931
Tyler's Forks	.....	10,683
Upson	11,065	11,065
Windsor	.....	148,905
Yale (West Colby)	26,043	38,879
Miscellaneous	.....	6,426
Total	3,663,484	37,818,274

E—Includes Tilden up to 1891. J—Under Norrie after 1901.

VERMILLION RANGE.

Name of Mine.	1902.	Total.
Chandler	645,786	7,673,616
Minnesota	275,168	7,453,511
Pioneer	673,863	2,683,163
Savoy (and Sibley)	322,241	795,556
Zenith	167,205	455,660
Total	2,084,263	19,061,506

SHIPMENTS OF MINNESOTA MINES FOR 1902, WITH TOTAL PRODUCTION.

MESABA RANGE.

Name of Mine.	1902.	Total.
Adams	1,242,923	4,425,162
Aetna (Lowmore)	196,316	215,684
Agnew	45,582	45,582
Auburn	38,283	2,143,028
Biwabik	623,127	4,053,731
Canton	.....	713,048
Chisholm	200,629	235,202
Cincinnati	.....	134,041
Clark	350,799	613,436
Cloquet (Vega)	.....	163,444
Columbia	.....	15,627
Commodore	65,833	768,447
Corsica	59,292	86,130
Croxton	18,594	18,594
Day	106,516	127,142
Duluth	150,220	744,047
Elba	207,454	563,902
Fayal	1,919,172	6,405,024
Franklin	111,085	1,396,961
Genoa	399,719	1,868,278
Glen	23,875	23,875
Grant	51,946	51,946
Hale	54,289	279,447
Hawkins	5,892	5,891
Jordan	147,931	147,931
Kanawha	24,829	145,310
Lake Superior Group	766,311	2,320,519
La Belle	70,753	70,753
Laura	16,453	16,453
Leetonia	28,784	28,784
Lincoln	87,908	87,908
Longyear	22,788	22,788
Mahoning	1,038,645	4,791,651
Malta	222,640	442,900
Minorca	35,499	35,499
Minnewas	.....	15,998
Morrow	35,571	35,571
Mountain Iron (& Rath)	1,421,456	7,245,201
Norman	.....	421,132

Name of Mine.	1902.	Total.
Ohio	.....	714,073
Oliver (I)	5,131	3,143,237
Pearce	54,884	54,844
Penobscot	209,531	704,456
Pettit	17,278	17,278
Pillsbury	238,122	666,055
Roberts	28,972	190,154
Sauntry	249,837	700,140
Sellers	193,428	772,728
Sharon	224,526	281,336
Sparta	227,444	1,116,035
Spruce	543,203	924,393
Stevenson	1,434,681	2,156,985
Union	103,522	204,928
Utica	9,009	9,009
Wills	12,158	12,158
Williams (N. Cincinnati)	.....	44,890
Total	13,342,840	53,747,807

I—Masaba Mountain and Lone Jack.

PIG IRON DIVISION.

There are now six active pig iron furnaces in the Upper Peninsula and five in the lower peninsula. The Pioneer Iron Company affiliating with the Cleveland Cliffs Iron Company, is the largest producer in the state. Two new furnaces went into operation during the year—Pioneer No. 2 at Marquette and the Hanna furnace at Zug Island, near Detroit. Following are the organizations:

PIONEER IRON COMPANY.

President and treasurer, William G. Mather; vice-president, J. H. Wade; secretary, J. H. Sheatle.

Main Business Office—Cleveland, Ohio.

The company operates three furnaces—Pioneer at Gladstone, which commenced operation April 16, 1896; Pioneer No. 2, at Marquette, made its first cast April 15, 1903, and the Carp furnace also at Marquette. A rumor is current that this company also intends building a

furnace at Munising. The company has also acquired a large acreage with extensive water front, for furnace purposes, at Toledo, Ohio.

MANISTIQUE IRON COMPANY.

President, Joseph H. Berry; vice-president, W. G. Smith; secretary and treasurer, E. H. Flinn.

Main Business Office—Detroit, Mich.

The company operates two furnaces—one at Manistique and one at Newberry. The plant at Manistique was erected by the Western Iron Company and the one at Newberry by the Vulcan Iron Company. The furnace at Manistique was idle a portion of the year, resuming operations April 11, 1902. The chemical works were destroyed by fire, the loss exceeding $150,000, but has since been rebuilt.

William H. Nelson is general manager at Manistique.

The furnace at Newberry was acquired by the Manistique Iron Company in October, 1902. It is being modernized at a heavy expense. Forty charcoal kilns will be built, and a new chemical plant for the making of wood alcohol is planned. A large acreage of hardwood lands has been acquired. The furnace has been idle for eight years.

MARTEL FURNACE.

This old plant; which had been idle for a period of fifteen years, was purchased in August, 1902, by Frank R. Baid, who is associated with M. A. Hanna & Co., of Cleveland. The furnace was rebuilt at a large expense. After being in operation for a short time, it was destroyed by fire in April, 1903, at a loss of $25,000. Some work in the way of rebuilding was done, but later it was decided to remove the plant to Boyne City, Charlevoix County, where an abundance of charcoal was assured.

ELK RAPIDS IRON COMPANY.

President—N. K. Fairbank.

Vice-President and Superintendent—H. B. Louis.

Secretary—Dexter Fairbank.

Treasurer—Charles Durkee.

Main business office and furnace at Elk Rapids, Mich.

THE ANTRIM IRON COMPANY.

President—T. J. O'Brien.

Vice-President—J. M. Barnett.

Secretary and Treasurer—J. C. Holt.

The main business office is at Grand Rapids, Michigan. The furnace is located at Antrin; post office address, Mancelona, Mich.

PENINSULA IRON COMPANY.

President—Theo. H. Eaton.

Vice-President—Robert Leite.

Secretary and Treasurer—Solon Burt.

Main office and furnace is located at Detroit, Mich. This furnace went out of blast early in 1902, and, it is believed, marks the end of the charcoal pig iron smelting in Detroit.

GAYLORD IRON COMPANY.

President—Chas. A. Kent.

Vice-President and Secretary—Frank B. Gaylord.

Treasurer—Nicholas Woods.

Main office and furnace at Detroit, Mich.

Furnace has been out of blast since May 1, 1901.

SPRING LAKE IRON COMPANY.

President—I. M. Been.

Vice-President—J. C. Spencer.

Secretary and Treasurer—J. C. Ford.

Postoffice address, main business office, and furnace, at Fruitport, Mich.

PRODUCTION OF PIG IRON.

Table prepared by Hon. William G. Mather giving the total production of pig iron in Michigan since the first furnace was constructed to present year:

Upper Peninsula.	Tons.
Pioneer Furnaces	637,299
Collins Furnace	41,977
Northern Furnace	15,059
Bancroft Furnace	55,608
Morgan Furnace	56,563
Champion Furnace	31,048
Michigan Furnace	40,511
Greenwood Furnace	40,202
Fayette Furnace	229,288
Munising Furnace	28,312
Bay Furnace, Onota	50,706
Deer Lake Furnace	93,579
Marquette & Pacific R. M. Co.	38,859
Grace Furnace	11,346
Carp River Furnace	83,500
Excelsior (Peat) Furnace	68,634
Menominee Furnace	59,553
Escanaba Furnace	8,048
Martel Furnace	58,349
Vulcan Furnace	73,829
Gogebic Furnace	3,700
Manistique Furnace	150,904
Florence Furnace	5,400
Total Upper Peninsula	1,882,274
Lower Peninsula.	**Tons.**
Michigan Central Iron Co.	42,998
Bangor Furnace Co.	126,957
Peninsular Iron Co.	217,632
Eureka Furnace	185,183
Leland Furnace	10,082
Frankfort Furnace	13,917
Elk Rapids Furnace	444,544
Detroit & L. S. Iron Mfg. Co.	78,691
Union Iron Co.	129,503
Spring Lake Iron Co.	405,934
Detroit Iron Furnace Co.	133,086
Gaylord Iron Co.	97,262
Antrim Iron Co.	369,903
Pine Lake Iron Co.	40,252
Total Lower Peninsula	2,295,944
Total for state of Michigan	4,178,218

From a paper prepared by Mr. Mather the information is gained that 5,000,000 cords of wood are used each year in Michigan in the manufacture of charcoal iron. This means that nearly 70,000 acres of land are demanded. The by-products—wood alcohol—is estimated at 982,308 gallons, having a market value of over $80,000.

CHARCOAL PIG IRON PRODUCTION OF MICHIGAN.

The following figures are from the records of the American Iron and Steel Association.

Years.	Gross tons.
1872	77,536
1873	101,763
1874	115,151
1875	90,897
1876	73,640
1877	67,157
1878	63,262
1879	90,660
1880	137,879
1881	167,003
1882	187,674
1883	154,629
1884	154,316
1885	127,787
1886	170,298
1887	190,663
1888	190,403
1889	191,389
1890	230,769
1891	213,145
1892	184,421
1893	117,538
1894	95,171
1895	91,222
1896	149,511
1897	132,578
1898	147,640
1899	134,443
1900	163,712
1901	170,762
1902	155,213
Total for 31 years	4,338,232

HOW IRON HAS ADVANCED.

In the American Iron and Steel Association's annual report are contained some highly interesting comparisons of prices during the last few years. A clear idea may be obtained from these figures as to the actual movement of steel and iron products during this period. Particularly noticeable are the violent advances of the 1898-99 period, the relapse of 1900, and the subsequent upward movement toward new high levels.

In the subjoined tables the 1902 figures are the averages for last month only. Figures for years prior to 1902 are average prices for the entire year. Iron products compare as follows, per ton:

	No. 1 foundry iron, Phila.	Bar iron at mills.	Old rails Pitts.
1897	$12.10	$1.10	$12.49
1898	11.66	1.07	12.39
1899	19.36	1.95	20.36
1900	19.98	2.15	19.51
1901	15.87	1.80	19.32
1902	20.50	2.02	25.00

Finished steel products make the following comparison all in prices per ton at mill:

	Rails.	Billets.	Bars.
1887	$18.75	$15.08	$0.97
1898	17.62	15.31	0.98
1899	28.12	31.12	1.03
1900	32.29	25.06	1.63
1901	27.33	24.13	1.47
1902	28.00	32.20	1.80

It will be seen that old iron rails, steel billets, and steel bars have doubled in price within four years.

LARGEST ORE SHIPPERS.

There were 16 mines in the Lake Superior region which shipped over 500,000 tons each in 1902. The list of these mines and their shipments is as follows:

	Tons.
Marquette Range:	
Cleveland-Cliffs	1,104,864
Lake Superior	832,796
Menominee Range:	
Chapin	956,812
Aragon	646,203
Pawabic	530,201
Gogebic Range:	
Norrie	1,080,032
Vermillion Range:	
Pioneer	673,863
Chandler	645,786
Mesaba Range:	
Fayal	1,919,172
Stevenson	1,434,681
Mountain Iron	1,421,456
Adams	1,242,923
Mahoning	1,038,645
Lake Superior Group	766,311
Biwabik	623,127
Spruce	543,203

The big shippers of the Mesaba range are nearly all open-cut or "steam-shovel" mines, while the old range shippers take their ore from underground workings. From the latter class the Cleveland-Cliffs had shipped up to the end of 1902 a total of 11,569,116 tons, and the Chapin a total of 11,256,413 tons.

ORE CRUSHING PLANT.

In the $36,000,000 program of improvement work recently made public by the United States Steel Corporation was an item of $143,810 for a crusher plant at Escanaba, to have a capacity for crushing 510,000 tons of ore a year. This is the first of the central crushing plants planned for the Lake Superior mines of the corporation. The second is expected to be erected at Two Harbors, Minn., but no appropriation has been made as yet. The plant at Escanaba, will take care of such ores shipped by way of Escanaba as require to be crushed to bring them to sizes most advantageous for use in the blast furnace.

The new crusher will be located about a mile from the docks at Escanaba, immediately adjacent to the yards in which the ore trains are received and sorted. The plant will be in two parts, one for crushing ores that will be coarse after breaking and the other for ores that are to be crushed fine. For the former only one machine will be used—a No. 9 Gates gyratory machine, the ore coming from it being at once in shape for shipment. For the fine crushing a second No. 9 Gates machine and two pairs of 36-inch Edison rolls will be employed. The No. 9 machine will give the fine-crushing ores a preliminary breaking. The ore will then be passed over a screen and thence to the first of the two pairs of rolls for further crushing; thence over a second screen, and finally to the second pair of rolls—the fine crushing thus being accomplished in three stages. Experience shows that the ore passing through the screens is a considerable proportion of the amount passing a given machine.

The two No. 9 crushers referred to above will be placed side by side in a deep pit, a large pocket being built above each crusher to receive the ore from the cars. The tracks serving the crushing plant will pass over the tops of these pockets, so that ore will be dropped directly from the cars into the pockets.

PORTLAND CEMENT.

The following facts regarding this important industry in which Michigan now occupies the front rank, are taken from the report of the Labor Bureau, Hon. Scott Griswold, commissioner; Hon. M. J. McLeod, deputy commissioner.

"The twentieth century opens with advanced thought in all directions. One great commodity is scarcely exhausted before another, and possibly a better one, takes its place. Students of industrial ecenomy have realized that timber and lumber for building material was fast approaching the time of exhaustion, and the question as to what will take its place, has been looked upon most seriously, especially in Michigan, where the products of the forest was one of her greatest industries.

"Investigation shows that Michigan can still lead in the production of one of the best building materials yet produced, and that she will lead is evidenced by the enormous capital which is being invested in the manufacture of Portland cement, an industry which already extends to all parts of the lower peninsula, and which will eventually extend to the counties north of the straits.

"The raw material from which Portland cement is manufactured by all factories in Michigan (save two), is marl and clay, with a very small per cent, of gypsum added. The two plants not using marl are at Alpena and Wyandotte, each of these using a species of limestone for the principal ingredient. The proportion of marl is about 75 per cent., to 25 per cent. of clay, although this varies slightly at the different plants, and according to chemical test. The marl used is generally found in the beds or bottoms of small lakes, the deposit being from 20 to 60 feet in depth, the supply being practicably inexhaustible. The proper kind of clay required is not so general in the southern part of the state,—although there is much that is excellent, but in the more northern counties, beds of the best kind of great breadth and depth have been found, assuring an abundant supply of this article.

"It has long been known that in Michigan there was raw material in quantities to furnish the world's supply of Portland cement, the only question being its manufacture at a cost warranting the enormous outlay in the construction and operation of the plants (factories) for its manufacture. The discovery of the new process for making the cement was a long step forward in this direction, while the increasing demand for the article stimulated enterprise, and capital has been forthcoming, so that at the present time there are ten plants completed, eight of which are running day and night, turning out over 6,000 barrels of the finished product daily. Five other plants are in the course of construction,

some of which are nearing completion, and locations have been selected for eight more, all of which are contiguous to great deposits of the raw material, and on which the work will be rapidly pushed.

"The completed plants in the state are located as follows: The Alpena Portland Cement Company, two miles east of the city of Alpena, Alpena county; The Elk Rapids Portland Cement Company, one mile south of the village of Elk Rapids, in Antrim county; The Newaygo Portland Cement Company, at the village of Newaygo, Newaygo county; The Coldwater Portland Cement Company, one plant one mile west of the city of Coldwater, and one at the village of Quincy, both in Branch county; The Bronson Portland Cement Company, two miles east of the village of Bronson, in Branch county; The Peerless Portland Cement Company, at the village of Union City, in Branch county; The Peninsula Portland Cement Company, offices in the city of Jackson, plant thirteen miles south of the village of Woodstock, in the northwest corner of Lena wee county; The Omega Portland Cement Company, four miles north of the village of Jonesville, in Hillsdale county. There is also a plant operated by the Michigan Alkali Compaq at Wyandotte, in Wayne county.

"The capital stock of these ten corporations aggregates $7,450,000. The average cost of each plant will be about $465,000 and new improvements and buildings are constantly being added at large expense. The daily capacity of the ten plants aggregates 8,500 barrels of 380 pounds each, or an average for each plant of 850 barrels every 24 hours.

"The five plants in process of construction have an authorized capital stock of $8,070,000. It is estimated that their cost will average about $500,000 each, and that their aggregate daily capacity will be over 8,000 barrels. It is intended that three of these factories will be making cement the present season, and the other two will be ready to start early in 1902. They are located as follows: The Great Northern Portland Cement Company, two and one-half miles south of the village of Baldwin, in Lake county. This will be one of the largest plants in the world, the output being estimated at 4,000 barrels daily. They have the finest material of all kinds in sight, that will last hundreds of years. They expect to give steady employment to over 400 persons. Detroit Portland Cement Company and the Egyptian Portland Cement Company are each located about two miles north of the village of Fenton in Genesee county; The Zenith Portland Cement Company at the village of Grass Lake in Jackson county; The German Portland Cement Company at the village of White Pigeon in St. Joseph county.

"Articles of incorporation have been filed and eight other companies have been organized, the capital stock of which aggregates $8,345,000. Locations have been selected, and land and lakes containing an abundance of raw material have been secured. Work has been begun on some of the plants, and those most interested are sanguine that they will be put in successful operation. They are located at Bay City, Bay county; Bellaire, Antrim county; Farwell, Clare county; Fenton, Genesee county; Hamburg, Livingston county; Spring Arbor, Jackson county; Kinderhook, Branch county; and Three Rivers, St. Joseph county. The aggregate daily capacity of these plants when built and equipped as contemplated, will be about 10,000 barrels.

"It will be seen by the above that the Michigan plants already in operation, those in process of construction, and the ones where companies have been organized with a view to immediately commence building, will number 23, and that their authorized capital stock will aggregate $23,865,000. Estimated by the cost of those already built, the magnitude of those nearing completion, and the plans of those about to be commenced, the construction of these twenty-three plants will aggregate a cost of about $11,000,000. They will aggregate a daily capacity of over 25,000 barrels."

There are some large deposits of marl in the tipper peninsula, also, notably in Mackinac and Menominee counties, but to date they have not been worked.

FELDSPAR.

For some time past several Menominee gentlemen have been quietly at work developing a new enterprise in the upper peninsula of Michigan. Those interested in the enterprise are A. B. Stryker, Peter Sibenaler, F. C. Nowack, H. B. Switzer and Dr. R. A. Walker. They have obtained a thirty year option on a section of land within one-fourth mile of the village of Republic, in Marquette county. On this land is a large deposit of red potash feldspar, of which the gentlemen mentioned are ascertaining the commercial value. A carload of feldspar was quarried and shipped to East Liverpool, Ohio, where it is crushed in mills and used in the manufacture of porcelain. The mineral is of a light shade of yellow, streaked with red or green, but when it is heated in a furnace it turns a crystal white, the manufactured product resembling porcelain in lustre and beauty. One Ohio chemist has made an analysis of this feldspar as follows:

	Per cent.
Silica	65.25
Alumnia	18.60
Iron Oxide	0.40
Lime	0.38
Magnesia	0.23
Soda	1.99
Potassa	13.40
	100.25

The chemist, in submitting the analysis, writes as follows: "I beg to call your attention to the very high proportion of potash as shown by the analysis, and the very low amounts of lime, magnesia and iron. The material is in every sense a true potash feldspar of the highest commercial quality, and if the large sample shipment sent is the representative of the entire deposit, it is certainly well worth developing for all the purposes for which feldspar is used. It contains scarcely any appreciable ingrowth of either quartz or mica. This is a

very important circumstance in conjunction with exploiting feldspar, as by far the larger cost in preparing the same for market is the amount of hand sorting and picking over which is necessary in the case of many feldspars which are largely contaminated with these two minerals." There are few deposits of feldspar in this country situated so convenient to a railway as to be cheaply marketed and the Ohio porcelain factories are supplied with raw material principally from Canada. There seems to be no .question as to the commercial value of the feldspar deposits in which the Menominee gentlemen are interested, and if advantageous shipping rates can be obtained the enterprise ought to prove a financial success. They have plenty of funds to develop the enterprise and it is not likely that any stock will be placed on the market.

OIL.

After investing about $10,000 in prospecting for oil on the Black property near Rapid River in Delta County, the shareholders of the Michigan Oil and Improvement Company held a meeting and raised $2,000 additional to prosecute the work still further, believing that the undertaking will prove fruitful. C. C. Phelps, secretary of the company, called the meeting, and the existing conditions in connection with the explorations were fully discussed by those present. Those interested in the enterprise believe that oil will be found in paying quantities. It is claimed there is a vein of hematite iron ore, about twenty-eight feet through, at a depth of between 700 and 800 feet, and if oil is not found it is possible that the company will turn its attention to mining. The ore, however, is not of a high grade, and whether it will pay for mining is a question yet to be decided. The finances of the company are said to be in good condition. This is a Wisconsin concern with offices in Milwaukee. There was considerable excitement relative to an alleged discovery of oil at one time and many thousands of acres of land were obtained, but these were permitted to lapse. In August, 1902, a discovery of oil was reported from Ontonagon, but nothing has been heard relative to same since.

COAL.

State Labor Commissioner Griswold has issued the following bulletin showing the number of mines operated in each county where coal is mined and the output of coal in Michigan for the quarter ending September 30th, together with the labor employed and the compensation therefor.

Also the amount of coal mined for the first nine months of the current year.

SAGINAW COUNTY.

In July 12 mines were operated, employing 1,591 persons, at an average wage of $3.19 per day each. The mines averaged eight hours per day, and 22 days for the month. There was 89,001 tons of coal mined, the total cost for mining being $144,755.60.

In August 13 mines were operated, employing 1,725 persons, at an average wage of $3.13 per day each. The miners averaged eight hours per day, and 22 days for the month. There was 89,325 tons of coal mined, the total cost for mining being $148,943.49.

In September 13 mines were operated, employing 1,742 persons, at an average wage of $3.04 per day each. The miners averaged eight hours per day, and 22 days for the month. There was 89,352 tons of coal mined, the total cost for mining being $164,138.50.

For the three months an average of 1,686 persons were employed in the Saginaw county mines, whose average daily wages were $3.12 each. They worked an average of eight hours per day and averaged 22¼ days each month. There was 276,950 tons of coal mined at a total cost of $457,837.59.

BAY COUNTY.

In July eight mines were operated, employing 783 persons, at an average wage of $3.06 per day each. The miners averaged 7¾ hours per day and 22½ days per month. There was 40,957 tons of coal mined, the total cost for mining being $61,605.77.

In August eight mines were operated, employing 821 persons, at an average wage of $3.19 per day each. The miners averaged 7¾ hours per day and worked 23 days during the month. There was 44,052 tons of coal mined, the total cost for mining being $66,836.80.

In September eight mines were operated, employing 858 persons, at an average wage of $3.28 per day each. The miners averaged 7½ hours per day and worked 23½ days during the month. There was 47,071 tons of coal mined, the total cost for mining being $75,292.10.

For the three months an average of 821 persons were employed, in the Bay county mines, whose average daily wages were $3.18 each. They worked an average of 7¾ hours per day and 23 days each month. There was 132,080 tons of coal mined, at a total cost of $203,734.67.

SHIAWASSEE COUNTY.

In July one mine was operated in this county which employed 26 persons, the average daily wage being $1.40, they working eight hours per day and 24 days in the month. They mined 473 tons of coal at a cost of $1,355.60.

In August one mine was operated, employing 28 persons, the wages averaging $1.32 per day, their day's work averaging eight hours, working 25 days in the month. They mined 548 tons of coal at a total cost of $1,648.65.

In September two mines were operated (one just commencing, taking out only 40 tons), employing 32 people, at an average wage of $2.26 per day, they averaging eight hours per day, and working 20½ days during the month. They mined 659 tons of coal, at a total cost of $1,623.00.

For the three months there was an average of 24 people employed in these mines, their average daily wages being $1.66. They averaged eight hours per day and worked 23¼ days during the month. There was 1,680 tons of coal mined at a total cost of $4,627.25. The prospects for this county for the future is much brighter. Three mines will soon be in operation.

JACKSON COUNTY.

In July one mine was operated, employing an average of 47 people, whose daily wages averaged $2.47. They averaged eight hours per day and worked 14 days during the month. There was 1,075 tons of coal mined, at a total cost of $2,472.50.

In August one mine was operated employing 48 persons, at an average daily wage of $2.57. They averaged eight hours per day and worked 17 days during the month. There was 1,247 tons of coal mined at a total cost of $2,743.40.

In September one mine was operated employing 48 persons, at an average daily wage of $2.50. They averaged eight hours, per day and worked 16 days during the month. There was 1,361 tons of coal mined at a total cost of 3,062.25.

For the three months there was an average of 48 persons employed in this mine, whose average daily wages were $2.51. They averaged eight hours per day and worked 15⅔ days during the month. There was 3,683 tons of coal mined at a total cost of $8,278.15.

HURON COUNTY.

In July one mine was operated, employing 24 persons, whose wages averaged $2.52 per day. They averaged eight hours per day and worked 22 days during the month. There was 256 tons of coal mined, at a total cost of $512.

In August one mine was operated, employing. 8 persons, at a daily wage of $2.36, they working eight hours per day, but worked only six days during the month. Only 90 tons of coal was taken out, at a cost of $163.80.

In September one mine was operated, employing 30 persons, whose average daily wages were $2.40, and who worked eight hours per day and 24 days during the month. There was 360 tons of coal mined, at a total cost of $658.80.

For the three months this mine employed an average of 21 persons, whose average daily wage was $2.43, and who worked an average of eight hours per day and 17⅓ days during the month. There was ruined 706 tons of coal, at a total cost of $1,334.60.

This mine was undergoing repairs during this period, merely taking out coal to supply their own wants. They will make a greatly increased showing in the near future.

EATON COUNTY.

In July five small mines were partially worked, employing an average of 15 persons, whose daily wage was $1.69, they averaging seven hours per day and working an average of 19 days during the month. There was mined 290 tons of coal at a total cost of $587.40.

In August four mines were worked, employing an average of 15 persons, whose daily wages were $1.85, they averaging seven hours per day and averaging 21½ days for the month. There was mined 321 tons of coal, at a total cost of $633.24.

In September only three mines were operated, employing 12 persons, at an average daily wage of $1.82, who worked an average of 6⅔ hours per day and 23⅔ days during the month. There was mined 252 tons of coal, at a total cost of $471.23.

For the three months an average of 14 people were employed, at an average daily wage of $1.79 each, they averaging less than seven hours per day and averaging 23⅔ days per month. There was mined 863 tons of coal, at a total cost of $1,691.87.

RECAPITULATION.

In July 28 mines were operated in the state, employing 2,486 persons, at an average daily wage of $3.10 each. They averaged 7⅔ hours per day, and worked an average of 21½ days during the month. There was 132,052 tons of coal mined at a total cost of $211,288.87.

In August 28 mines were operated, employing 2,645 persons, at an average daily wage of $3.12 each. They averaged 7¾ hours per day and worked an average of 21½ days during the month. There was 135,610 tons of coal mined, at a total cost of $220,969.38.

In September there were 28 mines operated, employing 2,722 persons, and the average daily wages were $3.10 each. They averaged 7¾ hours per day and worked an average of 22⅔ days during the month. There was 148,300 tons of coal mined, at a total cost of $245,245.88.

In the three months the 28 mines in operation in the state employed an average of 2,618 persons, whose average daily wages were $3.10 each. They averaged 7¾ hours per day and worked an average of 22 days per month. There was 415,962 tons of coal mined in the three months, at a total cost of $677,504.13 for mining.

It must be remembered that the costs given are only for mining, to which must be added a vast amount of miscellaneous expenses not here enumerated.

CONDENSED STATEMENT FOR THE FIRST NINE MONTHS OF 1903.

Mines operated in the state	28
Average number of employes	3,099
Average daily wages	$2.53
Average hours per day	7.6
Average days per month	21
Total tons coal mined	1,175,451
Total cost of mining	$1,847,412.95

Appearances indicate that more coal will be mined in the three closing months of the year than at any other period, the output of which will approximate 1,500,000 tons for the year.

The cost of mining this output will average approximately $1.50 per ton, which means over two and a quarter million dollars for mining alone. To this must be added a large outlay for keeping the mines in repair and the necessary incidental expenses, which foot up thousands of dollars. It can readily be seen that the coal industry of the state is one of great importance. Aside from the millions of money put in circulation in their operation a vast amount of coal is supplied to home consumers, saving the great cost of transportation which has the effect to lessen the price of the imported article.

The most important item is that the coal industry in Michigan is yet in its infancy. If the ratio of increased production is maintained the mines in the state will soon produce 2,000,000 tons of coal, which is the equal, if not superior, to any bituminous coal produced. Michigan operators are alive to the importance of these statistical facts and the results of their enterprise will soon be most apparent.

SALT.

Michigan, for many years one of the principal salt producing districts, is steadily increasing its annual output of the saline staple and its salt business is getting on a more stable and permanent basis than ever before. Since the opening of the industry in 1860, Michigan has produced in excess of 111,766,623 barrels of salt. The years of the salt industry may be divided into two periods, that prior to the passage of the law providing for salt inspection and the years since such state inspection has been operative.

During the first period, from 1860 to 1868, inclusive, Michigan produced 3,282,681 barrels of salt, as follows:

	Barrels.
1860	4,000
1861	125,000
1862	243,000
1863	466,000
1864	529,073
1865	477,200
1866	407,997
1867	474,721
1868	555,690

Since 1868, until November 30, 1904, the state inspectors have inspected salt as follows:

	Barrels.
1869	561,288
1870	621,352
1871	728,175
1872	724,481
1873	823,346
1874	1,026,970
1875	1,081,856
1876	1,482,729
1877	1,660,997
1878	1,855,884
1879	2,058,040
1880	2,676,588
1881	2,750,299
1882	3,037,317
1883	2,894,672
1884	3,161,806
1885	3,297,403
1886	3,667,257

	Barrels.
1887	3,944,309
1888	3,866,228
1889	3,846,979
1890	3,838,637
1891	3,927,671
1892	3,812,054
1893	3,514,485
1894	3,133,941
1895	3,529,362
1896	3,336,242
1897	3,622,764
1898	4,171,916
1899	4,732,669
1900	4,738,085
1901	5,580,101
1902	4,994,245

It will be noted that there was a shrinkage in production of nearly 600,000 barrels in comparison with the output of 1901.

The annual report of Salt Inspector John S. Porter, showing the operation of state inspection law for the year ended November 30, 1903, shows that there are sixty-six salt plants, having an aggregate manufacturing capacity of 10,480,000 barrels of salt.

There is very little indication of an increase in the manufacture of salt during the coming year. Those districts that have cheap fuel continue to make the bulk of the salt, and while at the present time Saginaw and Bay County districts are the smallest producers, it seems that it cannot be many years before these two districts will be more favorably located to manufacture salt than any other in the state on account of the continued development of mining in these two counties. New shafts are constantly going down and more coal being hoisted each year, which produces a greater quantity of slack, and following the trend of such matters in older coal districts, there soon comes a time when there is no demand for all the slack produced, and consequently either the coal companies themselves will manufacture salt for the purpose of getting rid of their slack, the same as the large lumber companies do now to get rid of their waste, or else they will sell at such a price that independent manufacturers will use it for this purpose.

'A large number of the blocks have remained shut down during the year, and there is little prospect of those that have been shut down during 1903 starting next year, unless the price of salt should materially increase, or the cost of fuel decrease.

The salt producing territory of the state is divided into eight districts.

District No. 1, Saginaw County, has seventeen salt companies, with seventeen steam blocks and one thousand solar salt covers, having a manufacturing capacity of nine hundred thousand barrels of salt.

District No. 2, Bay County, has thirteen salt companies, with twelve steam blocks and one vacuum pan block, a manufacturing capacity of eight hundred thousand barrels of salt.

District No. 3, St. Clair County, has eight companies with six steam and four vacuum pan blocks, manufacturing capacity of two million barrels of salt.

District No. 4, Iosco County, has one salt company, a steam block capacity of fifty thousand barrels of salt.

District No. 5, Midland County, has two salt companies, both steam blocks, manufacturing capacity of fifty thousand barrels of salt.

District No. 6, Manistee County, has nine salt companies, with nine steam and three vacuum pan blocks, a manufacturing capacity of three million barrels of salt.

District No. 7, Mason County, has three salt companies, with three steam and two vacuum pan blocks, manufacturing capacity of one million barrels of salt.

District No. 8, Wayne County, has twelve salt companies, with twelve steam and two vacuum pan blocks, and a manufacturing capacity of one million seven hundred thousand barrels of salt.

In Wayne County the interesting experiment of sinking shafts, similar to those in the copper and iron counties, for the mining of salt, is now being made by the Michigan Salt Rock Co.

In the construction of this shaft which passes through 92 feet of surface earths and clays to the limestone bed, a hole of 15 feet in diameter was made, encircled with 30 inches of brick work. About 200,000 bricks, six car loads of cement and 12 car loads of sand were used, and on account of the gushing up of the muck at the bottom of the shaft Mr. Currie has taken out of it more than 15 times what would be its cubic contents if the latter were not constantly renewed. The brick work had to be lifted up as fast as each new layer was built, until at the end it was necessary to lift up and support a dead weight of 2,200 tons.

Having passed through the soft marshy ground and accomplished what was said to be impossible, the company now has about 700 feet of limestone and sandstone to penetrate before reaching the rock salt stratum. This will take about one year. The company will then have the only rock salt mine west of New York state, and as Chicago is the principal market, its output can be sold cheaper than the New York product on account of the difference in transportation rates.

John M. Porter, of Saginaw, Michigan, is State Salt Inspector, with assistants in the several districts.

[MISCELLANEOUS MINERALS]

PEAT.

Several companies have been organized in the state for the purpose of exploiting the peat deposits for fuel purposes. The most important of these is the National Peat Fuel Company of Detroit, with a capital stock of $1,000,000, organized under the Delaware law. The company is operating in the vicinity of Chelsa. The concern claims to have the best and only real peat bog in the state. Small quantities were shipped and are said to have given good satisfaction as a fuel.

ASBESTOS.

A valuable deposit of asbestos has been proved up near the Ropes gold mine, several miles from Ishpeming on the Marquette Range, according to press reports, and a local company is organized to develop the find. It has been known for fifteen years that the fibre existed in that section, but it was not until two months ago that systematic exploratory operations were started by a force of miners. The work has been done on a hill that rises 300 feet in height. Numerous test pits have been dug, and the asbestos has been found to exist in a deposit 800 feet long by 200 in width. How much larger, it has not been determined, but it is certain that the mineral extends several hundred feet into the earth. In some of the pits the asbestos is found in the form of a huge curl, or cork-screw, a foot in diameter, but practically all over the hill it lies in seams varying from a foot to three feet in thickness. In some cases it is covered with pure granite. There are many thousands of tons of the mineral in sight, and it is figured that at least a ton can be dislodged at every blast. The fibre averages five inches in length and is worth $40 a ton. While it has long been known by miners that asbestos existed in the locality, it was the general impression it would not be found in paying quantities. At the time of the world's fair some of the fibre was sent to Chicago for exhibition and there aroused the curiosity of two western mining men, who later quietly visited the location of the find. They were satisfied with the showing and desired to develop the tract, but a deal for the purchase of the land fell through. As far as known asbestos has never been found in any other section of the Lake Superior district. *Ishpeming Iron Ore*, an authority on mining matters, in October, 1902, printed the following relative to the find above mentioned: George R. Persons and James Clancy, of Ishpeming, who are interested in the

development of the asbestos property just south of the Ropes gold mine, have begun a drift from the base of the hill in which the mineral has been found, the object being to expose the latter at greater depth than heretofore attained, and to get away from all action of the weather. If this drift finds the asbestos, as they hope, it will conclusively prove that there is enough of the mineral to warrant extensive operations. Their experience here has shown that the deeper the exploring pits were sunk the better the quality of the asbestos, it being of longer fibre and of better color. This was natural, as surface deposits had been damaged by the action of the weather. A number of men will be placed at work to put in the drift, which will be carried north sufficiently far to determine just what the hill holds at that level. This will be something like 100 feet below the apex of the hill. We hope that it will result satisfactory and that another important industry will be added to those we now possess. Iron; ore has received many inquiries of late concerning the asbestos find. Interested ones wish to know something of the location of the property, the quality, the quantity, and so on. This shows there is a demand for the asbestos. An expert from Chicago who visited the prospect this week was much pleased with the showing.

Relative to the reported discovery of Asbestos in the Iron County there is nothing new to report.

KAOLIN.

It is not generally known, perhaps, that the copper district possesses other mines than those producing the red metal. However, in Ontonagon County, for instance, the production of kaolin has attained considerable proportions and gives work to no inconsiderable number of men, says the *Hancock Evening Journal*. The deposits are located principally along the Ontonagon River, and there is always a good market for the product, which is used in the manufacture of the best grades of chinaware and also enters into the manufacture of certain grades of paper. The mineral is taken out in blocks and piled up to dry. It is nearly white when the moisture has been evaporated and consist of a fine, smooth, powder like clay. Kaolin as ordinarily found has to be refined, but the Ontonagon product is so pure that it is shipped without being put through the usual washing process.

GOLD MINES.

The following article relating to gold mining was prepared by ex-Commissioner Hewitt for his paper, *Ishpeming Iron Ore*, and is such an excellent statement of conditions as they now exist that we appropriate the same for this report:

Michigan, noted for its mines of iron ore and copper, has not a single property producing gold. For some years Ishpeming boasted the only mine from which the precious metal was being secured, but for several years it has been silent underground, the only attention paid it being in the cyaniding of the tailings which were the waste from the mills, and the result of a great tonnage of rock which had been reduced under the Cornish stamps. Those tailings, so we have been told by Corrigan, McKinney & Co., the present owners of the mine, are sufficiently rich in gold and silver to yield a neat profit per ton of material put through the baths, and are another evidence that the quartz in the Ropes mine contains enough gold to pay for its mining and extraction leaving a margin of profit to the operator. This is providing the work be intelligently prosecuted. We have written many columns of matter in *Iron Ore* to prove the value of the Ropes mine. We have always contended the property was not given a fair opportunity of proving its real merit. One of the greatest drawbacks, and one that was ever present, was the failure to open the mine far enough ahead of the mill so that proper selection of rock could be made. The forty stamps were kept; constantly dropping and no opportunity was given the mine to get ahead of the daily needs of the mills. The company was poor and needed the money to pay its debts. The shareholders would not pay any more assessments, and much money was thus frittered away. Had the mill been closed for a year and the money put into sinking shafts and adding new levels from which only pay rock would be sent out, the Ropes would be running to-day and returning satisfactory dividends to those possessing its shares. It was a great mistake to stamp all the vein regardless of what it contained, which was done under the old order of things. The Calumet & Hecla couldn't win on such a plan. It costs as much money to break, hoist and stamp a ton of poor rock as one rich in gold and poor and good alike went to the mill. The Ropes had a single shaft which was down to the fifteenth level, 850 feet below surface. Ore bodies occur to both east and west of it. For several years the mining was all to the east of the shaft, the ore bodies being apparently cut off by a crossing of limestone twenty feet thick which has followed down from surface through all of the levels. A short time before the mine was closed some exploring was done underground and ore found to the west of the limestone crossing. This was at the 5th level. Quartz rich in gold was encountered. The body of quartz is 150 feet further west than any previously found in the mine, and is another evidence of what might be found by exploring. The shaft, as stated, is to the 15th level, the bottom being out of the ore body. About 300 feet east of it an incline is down for another level, a transfer having been used to take the rock to the surface. The quartz has a thickness of 12 feet and is rich enough to pay for mining and treatment. On the property only one spot has been worked, this to a depth of 975 feet, with the quartz still holding strong. It shows the persistency of the ore bodies and suggests that so strong a measure should possess merit at many other places on the strike of the formation. The talcoid slates and serpentines are typical gold bearing structures which here possess remarkable width and regularity. The fact that the Ropes

has yielded $643,902.37 in gold and silver, the gold largely predominating, should be encouraging to the present owners to give the property a systematic exploring. It would really be criminal to abandon a mine which, under its many disadvantages of operation, has done so well. There is but little water in the workings, timber is seldom needed to protect the hanging walls, there is water to supply the stamps all the year, and labor and supplies are obtained at reasonable cost. We believe that a diamond drill could be used to excellent advantage in exploring here. From the lowest levels, the adjacent ground could be readily tested. The rocks are soft and the drill would make rapid headway. The success of the venture would be a good thing for the owners and of great importance to Ishpeming City and the gold field. We trust Corrigan, McKinney & Company will give the mine a chance to show what it possesses, feeling sure it has much merit if intelligently operated. There are other veins in the Ropes property which hold gold and upon which little in the way of exploring has been done. The original discovery point of gold-bearing quartz here was some distance from where the shaft is sunk. Intervening is a small swamp which the company did not care to enter. It would be an easy matter to get through this with modern pumps, and the location is a favorable one for the finding of pay ore bodies. The mine buildings are intact and resumption of underground operations could be had in a few weeks. There is an attempt being made to sell stock to re-open the Michigan property, located in the Ishpeming field and a few miles west of the Ropes. Parties who have faith in the ore bodies of this location are now in the east endeavoring to interest capital. The Michigan was a producer of some of the handsomest specimens ever mined. They were the admiration of all who saw them, and the wonder is that there was not an uninterrupted search for other rich pockets. The gold giving out in the vein, little was done in the direction of locating similar rich places. It is strange to those familiar with the prospect that work was not carried forward more enthusiastically. The only excuse we can apply is that those in charge were iron miners, knowing little or nothing of gold workings, and did not fully realize the importance of that which they had discovered. From these pockets something over $15,000 in gold nuggets were taken by the company, while much more was stolen, the precious metal not being closely guarded. The Ropes and Michigan are the principal properties operated in this section. There were several other explorations none of which were followed far. Generally there was a lack of sufficient capital to prosecute work as it should have been done. There is gold here and some day it will be taken out at profit.

GYPSUM.

There is nothing new to report regarding the gypsum deposits in Mackinac County. The field bounded by Moran Bay was investigated during the year. What results were secured, and whom the parties represented, I have been unable to learn. The owners of the property seem to be in no hurry to develop their beds and are inclined to give as little information regarding the properties as possible. Some day these deposits will be the basis of a large industry in Mackinac County. Gypsum was mined in Mackinac over forty years ago.

Some drilling for salt has been done to the north of St. Ignace during the year by Soo capitalists, but the effort seems to have been barren of results.

GRAPHITE.

It is said that Michigan has the only graphite mines in the Northwest—two in number. Both are located in Baraga County and both are active.

The Detroit Graphite Company has been working its mine in a quiet way for some years. The mineral is used almost wholly in the manufacture of graphite paint, which is a very fine article for the treating of iron and steel surface. The United States battleships are users of the Michigan manufacture, and iron and steel roofing and siding are preserved and brightened by its use. The gentlemen who have conducted the enterprise have made a neat fortune out of it.

The product for the year was about 1,000 tons. The mine is located at Summit, about eleven miles from. L'Anse.

The Hathaway Graphite Manufacturing Company also has a mine near L'Anse. It is composed of Detroit, Grand Rapids, Houghton and L'Anse men. E. Hathaway, of L'Anse, is president, August Mengo, of L'Anse, vice-president; M. J. Carroll, of Houghton, secretary and treasurer, and George M. Lyon, of Grand Rapids, general manager. The gentlemen named with W. W. Orth, of Detroit, and Charles Randand, of L'Anse, compose the board of directors. Secretary Carroll's summary for the year is as follows:

"During the year 1903, 3,153 gallons of graphite paint were manufactured, which was sold for $3,129.25. About seventy-five tons of graphite ore also were manufactured and shipped, selling for $2,522.24. This makes the total gross receipts for the year, $5,551.49. A boiler and engine were purchased and installed, which enables the company to operate regardless of the water supply for the turbine wheel. Other equipment also was installed. The handling of eighty-four tons of ore during the year shows a daily treatment of 537 pounds, although the capacity of the mill is much more than this. The commission on goods sold amounts to $1,019.22, and the salaries for the year to $2,431.

"A surplus of about eighty-four tons of ore was on hand since Jan. 1, 1903. No mining was done during 1903 although the company spent $533.85 for labor and equipment. A derrick was put up and equipped in order to dispense with an inconvenient haul by wagon or sled. A bunk house or mess house was built, which makes it possible to provide for the men and to begin mining at once. The company has paid the Michigan Land & Iron

Company, from which the property is held under a long lease, $1,500 in royalties to date. This gives the company the privilege of mining 1,500 tons of ore, and since only about 400 tons have been extracted there remains 1,100 tons to mine without the payment of further royalties. In the future the amount of ore to be mined changes according to the company's contract from 500 tons to 750 tons.

This amount plus the 1,100 tons which is due the company on former royalties, makes the amount to be mined this year 1,850 tons."

Mr. Carroll states that the company is now in a position to begin more extensive operations and this year the business will be greatly extended. Although no mining was done last year owing to the fact that the company was not yet ready to extend the scope of its business, mining operations will be carried on extensively this year. The graphite is easily mined, by means of open pits, and as the overburden is only a few feet thick and little blasting is necessary, the cost of mining is comparitively small. General Manager Lyon will be depended upon almost entirely to look after the matter of business extension, and he will devote all of his time to the work.

It is the intention to establish agencies in different places in the country and arrangements will be made with a New York exporting house to attend to the export business.

The company has an immense deposit of graphite on its land and for the manufacture of paint the quality of the mineral is no where excelled. In fact, it is said to be superior to the graphite of any other section for that purpose. Most of the Hathaway Company's product will go into the manufacture of paint, it being most suitable for that use. Upon the demand for the paint and the ore of course will depend the amount of graphite to be mined, but the company anticipates extensive mining operations, and has prepared for it, because it looks forward to a much larger business scope than heretofore. Its lease of its property is practically for all time. Before the output of graphite ore is sold it is pulverized in the company's mill, going through several processes of crushing, grinding and classifying.

MINE INSPECTORS' DIVISION.

Six counties in the upper peninsula have Mine Inspectors. The salaries of the mine inspectors are paid by the several counties. There is also an inspector of coal mines, of Saginaw, who is paid by the state. It is the duty of the County Inspectors to visit the mines regularly, making recommendations that will safeguard the employes, and investigate all accidents. It can be said that the Mine Inspectors at present in office are practical miners and enjoy the confidence of the men as well as the companies.

The inspectors are as follows:

County.	Name.	Address.
Marquette County	Joseph Tregoning	Ishmeming, Mich.
Iron County	John Warden	Crystal Falls, Mich.
Dickinson County	William Trestrail	Iron Mountain, Mich.
Houghton County	Josiah Hall	Houghton, Mich.
Gogebic County	John H. Taylor	Ironwood, Mich.
Ontonagon County	Richard Chynoweth	Ontonagon, Mich.

Annual reports are issued by the Inspectors—generally at the annual meeting of the several Boards of Supervisors—and from these reports the following statistics are gleaned:

HOUGHTON COUNTY.

According to the report of Capt, Josiah Hall, inspector of mines for Houghton County, submitted to the Board of Supervisors in annual session yesterday, there were employed in the mines of Houghton County during the year ending Sept. 30th, last, 13,498 men, a decrease from the number for the previous year of 473. During the year the number of fatalities among the men so employed was 33 and the number of non-fatal accidents 22. The fatal accidents of the year were apportioned among the various mines of the county, as follows: Atlantic—4; one struck by an over hoist of the engineer; two, premature explosions; one struck by rock from blast. Calumet & Hecla—5; four, falling rock; one by falling down shaft. Franklin—2; one by falling down shaft; one by fall of rock. Isle Royale—2, by falling down shaft. Osceola—4; two by fall of rock; one fall from staging; one struck by descending skip. Kearsarge—1, jammed between skip and timber while riding up shaft. Quincy—4; two, fall of rock; one, blasted; one jammed between timbering and skip. Trimountain—1, falling from bucket down shaft. Tamarack—10; seven by fall of rock; one, fall down shaft; one, premature explosion; one, by falling timber. Total, 33. The fatal accidents were apportioned among the several nationalities as follows: Austrians, 5; English, 7; Finns, 14; German, 1; Irish, 2; Italian, 3; Scotch, 1. Of the 33 killed, 18 were miners; nine were trammers; three were timbermen; one a lander; one a drill boy and one a watchman. In his report Captain Hall takes occasion to answer a number of queries which have been put to him during the year regarding the size, depth, temperature, etc., of the vertical shafts of Houghton County. He states that what is known as the Red Jacket shaft of the Calumet & Hecla mine has been sunk to a depth of 4,900 feet and it is not

probable that it will ever be pushed down lower; the rock temperature at this depth is 87 degrees Fahrenheit, and the shaft has six compartments, arranged in two rows of three each. The Tamarack Mining Company has five vertical shafts, viz.: No. 1, down 3,324 feet; No. 2, 4,240 feet; No. 3, 4,750 feet; No. 4, 4,570 feet, and No. 5, 4,938 feet, being the deepest vertical shaft in the world. The rock temperature at the bottom of the shaft is 87 degrees Fahr.; the shaft has five compartments arranged side by side. The inspector concludes his report as follows: "The past year has been a busy and prosperous one for the mines of the county. And the conditions surrounding them and those employed therein are most favorable, as compared with the mining districts of European countries, reports from which have come under my notice, and those of the mines in other parts of this country. I have been greatly assisted in my work by the unfailing courtesy of the officials of the several mines and by the readiness of the management of each mine to adopt any suggestion looking to the safety or welfare of the men. I am also indebted to my assistant, Peter Dawe, for his efficient work during the year."

Forming a part of the report is a detailed statement of the facts attending each of the fatal accidents of the year together with a summary of the testimony adduced at the several coroner's inquests. The report indicates painstaking attention to the duties of his office on the part of Captain Hall and is one upon which he is to be congratulated.

ONTONAGON COUNTY.

Richard Chynoweth, Sr., in his report for the year says: "There are four working mines in Ontonagon County, namely: Adventure, Mass, Michigan, and Victoria. The total number of men employed in the mines is 775. I find that the officials of each mine are doing their utmost to prevent accidents and I think have been very fortunate the past year. There has been but one fatal accident. The unfortunate man was a Polander and was a train boss in the Mass mine. He was caught between the car and the ground. He lived about 15 hours after the accident. An inquest was held and the jury decided that no one was to blame. Another man had his leg broken by falling rock in the Mass mine. These are the only serious accidents that have happened in the county during the past year.

MARQUETTE COUNTY.

Thirty mines in operation and four explorations. Thirty fatalities occurred during the year. The record is not a bad one when it is considered that over 5,000 men are employed in the mines of the county. Just before the book went to press there were exactly 5,200 men working in and about the mines. The percentage of fatal accidents to each 1,000 men employed is 5⅔.

The Champion mine had more deaths than any other during the past year. The total there during the year was eight; the Cleveland Lake shaft comes next with four, then comes the Negaunee mine with three; Cliffs shafts had one; Salisbury, one; Blue, one; Prince of Wales, one; Republic, one; Lake Angeline, two; Michigamme, one; Moro Shaft, one; Lake Superior Hematite, one; Section 16, one; Section 21, one; and Lake Superior Hard Ore, one.

Six of the fatalities were caused by falling ground, four by explosions, three by caves from surface, one by premature blast, six from falling down shafts and chutes, one by skip, one by being drawn into shaft by dirt, three blasting in rooms, two collapses of rooms, and unknown two. Among the victims of the fatalities eight were Finnish, seven Swedish, eight English, two Italians, two Irish, one French and one German.

IRON COUNTY.

Facts from annual report of Inspector Warden:

Name of Mine.	Output.	Men Employed.	Accidents.
Gibson	Exploration	30	..
Michigan	7,357	45	..
Hemlock	128,605	150	..
Mansfield	96,337	150	..
Armenia	62,000	75	..
Hope	6,432	25	1
Bird	Exploration	Idle	..
Hilltop	Closed	Idle	..
Crystal	135,000	90	6
Lamont	108,000	105	1
Bristol	205,184	100	3
Tobin	97,000	105	2
Great Western	220,000	150	2
Columbia	48,000	85	..
Monongahela	Exploration	25	..
Dunn	6,800	35	1
Baltic	110,217	125	1
Caspian	Exploration	30	..
Riverton	87,527	115	..

Name of Mine.	Output.	Men Employed.	Accidents.
Dober	131,715	110	..
McGillis	Exploration	15	..
Hiawatha	80,000	90	2
Hennepin	Exploration	25	..
Lot 3	Exploration	11	..
Beta	.....	12	..

TABLE OF SUMMARIES.

Number of Mines in County	23
Number of persons employed	1,678
Number of accidents	19
Number of accidents per 1,000 men	11.1
Number tons of ore mined	1,330,074
Tons of ore mined per accident	7,960
Number of men employed Oct. 1, 1902	1,409

RECORD OF ACCIDENTS.

Miners	13
Trammers	3
Timbermen	1
Lander	1
Engineer	1
Total	19
Underground accidents	19
Surface	0
Total	19

GOGEBIC COUNTY.

Following is a resume of the report of Inspector Taylor:

"The mines of Gogebic County have been very fortunate during the past year, in that there has been no loss by fire or flood, and it is very pleasing to record that the fatal accidents are twelve less than they were a year ago. The number of tons of ore mined per man employed will compare favorably with previous years.

"With the opening of the iron mines on the Gogebic range in 1885 a new socalled 'caving system' of mining was adopted. The advantages of this system are many, the principal points in its favor being the cheaper cost per ton of ore mined, the securing of a larger part of the ore body, and greater safety for the miners. The 'caving system' is now in general use. Only by looking backwards can we realize the changes which have taken place in the mining business. Early mining methods in Lake Superior were very crude. Horses furnished most of the power, and the animals were worked in every possible way, and often in almost impossible places. The striking hammer has been supplanted by the power drill. Nitroglycerin and giant powder have taken the place of black powder. Many of the mines are now fitted out both underground and on surface with electric lights and electric motors, the latter taking the place of men trammers and rope haulage. Compressed air occupies a very important place, and the machinery and appliances are modern and render possible great economies. The diamond drill has penetrated far into the earth and disclosed deposits of ore which have been followed by shafts and drifts, in many instances rich deposits being located in workings which were about to be abandoned and in some instances left as of no value.

Not many years ago the machinery in use was poor in quantity and quality, and often ill adapted to the work of raising the ore to the surface; but now single, compound, triple and condensing engines of great power are found throughout the range. The plants are the best and the most expensive known, at some of the mines skip-loads of ore being raised from twelve hundred feet underground to the surface at the rate of half a mile a minute, and in loads of four to six tons. Pumping plants are capable of lifting thousands of gallons of water per minute to heights of 1,000 to 1,500 feet. Steel shaft houses are taking the place of wooden ones, and steel dividers in the shafts are displacing wood. Hand shovels, wheel-barrows and horse carts have been displaced by steam shovels and locomotives. Electric signal bells and telephones have become of much importance in the working of mines, while the Vajen-Bader New Improved Head Protector and Scientific Fire Extinguisher for fighting fires in mines and elsewhere, has become a part of the mine equipment. These and many other modern appliances have resulted in great economies in every branch of the business."

SYNOPSIS OF REPORT.

Number of Iron Mines in the County of Gogebic	18
Number of explorations in the County of Gogebic	6
Number of persons employed underground	3,405
Number of persons employed on surface	1,017
Total number of persons employed	4,422
Number of fatal accidents	17
Number of fatal accidents per 1,000 men	.384
Number of gross tons of ore mined	3,117,205
Number of gross tons of ore mined per fatal accident	183,365
Number of men employed per fatal accident	260

DICKINSON COUNTY.

Inspector Trestrail makes the following report to the County Board:

In the following table the average number of men employed during the year is given. This does not mean the number on the pay roll but the actual number of days' work performed in each property. Were the pay roll figures printed the increase would be a very pronounced one, as few, if any, of the men are found at work each day in the year.

Chapin, Hamilton, Ludington	927
Pewabic	451
Walpole	89
Traders	60
Millie	27
Groveland	30
Cundy	134
Quinnesec	61
Aragon	840
Norway	49
Curry	73
West Vulcan	351
East Vulcan	204
Verona	50
Loretto	170
Eleanor	71
Vivian	58
North-Western	49
Forest	40
Monroe	40
Explorations	230
Total	4,004

From September 30th, 1902, to September 30th, 1903, there were twelve fatal accidents in the mines of Dickinson County, and the number of victims was sixteen. Five met death in the Chapin mine, four at the Millie, two at the Gundy, two at West Vulcan, two at Aragon and one at Pewabic. Four of the number were drowned, two were asphyxiated, one fell from the skip, one fell down shaft, one fell down chute, two struck on head by piece of timber, two were crushed by tram cars, one by fall of ore, one blasted, one knocked into chute. Eight of the victims were married, seven were single and one widower. Nationality of men: Four Englishmen, two Scandinavians, one German, two Austrians, five Italians and one Polander.

AVERAGE DAILY FREIGHT RATES.

The Marine Review presents the usual summary of lake freights. The tendency of late years to keep the "wild" or daily rates throughout the season about equal to the figures at which contracts are made for season business has robbed the lake freight business of much of the interest that was attached to its fluctuations.

In all the past seasons there was but one change in ore freights, a drop of five cents from the contract figures, and no change in coal freights until vessels were loading final cargoes in the last two weeks of the season.

The different summaries of the average rates for five years past follows:

	1903. Cents.	1902. Cents.
Iron ore, Escanaba to Ohio ports	60.9	58.8
Iron ore, head of Lake Superior to Ohio ports, gross ton.	80.9	77.2
Iron ore, Marquette to Ohio ports, gross tons	72.1	66.1
Wheat, Chicago to Buffalo, bu	1.4	1.5
Wheat, Duluth to Buffalo, bu	1.6	1.9
Soft coal, Ohio ports to Milwaukee, net ton	50.7	46.7
Soft coal, Ohio ports to Duluth, net ton	41.5	34.5
Soft coal, Ohio ports to Portage, net ton	40.0	31.8
Soft coal, Ohio ports to Manitowoc, net ton	45.9	41.9
Soft coal, Ohio ports to Sheboygan, net ton	45.9	41.9
Soft coal, Ohio ports to Green Bay, net ton	50.7	46.7
Soft coal, Ohio ports to Escanaba, net ton	45.0	41.4
Hard coal, Buffalo to Milwaukee, net ton	48.1	42.3
Hard coal, Buffalo to Chicago, net ton	48.1	42.3
Hard coal, Buffalo to Duluth, net ton	38.1	32.8
Lumber, head of the lakes to Ohio ports	257.6	254.9

NEW MINING LAW RELATIVE TO INCORPORATION OF COMPANIES.

At the last meeting of the Michigan legislature, several changes in the mining law of the state were enacted which are of great importance. One of these is a statute under which mining companies may now incorporate under the laws of Michigan with capital stock as high as $10,000,000. Under another statute all reports filed by mining companies are now made to the secretary of state, instead of part to the secretary of state and part to the auditor general, as heretofore.

Heretofore Michigan mining companies have filed their annual reports with the auditor general at Lansing. Act No. 33 of the laws of 1903 provides that such reports shall hereafter be filed with the secretary of state at Lansing. Michigan mining companies have also been required heretofore to file with the secretary of state, on or before the first day of January in each year, a list of stockholders. Act No. 35 of the laws of 1903 provides that such list may now be filed during the month of January or February, and that it need not be filed at all by any corporation which files with the secretary of state an annual report containing a similar list of stockholders.

The acts in regard to garnishment of corporations have been amended so that in the upper peninsula of Michigan the writ of garnishment or summons may be served upon the clerk of such corporation, as well as upon other officers mentioned in the statute—but this provision does not apply to corporations not organized under the laws of this state, and as to such corporations, the service must still be made on the agent, etc., as heretofore.

The general mining law has been amended in several particulars, viz.: (a) The capital stock of mining and smelting companies, etc., may now be as high as $10,000,000, the limit heretofore having been $2,500,000. (b) Interest is now chargeable and collectable on assessments levied on stock. Heretofore it was doubtful whether this could be done, and the law was amended so as to put the matter beyond question. (c) Mining companies may now subscribe for, purchase, acquire, and own stock in any company organized under this act, or under any other law (of Michigan) for the purpose of refining, smelting or manufacturing any and all kinds of ores, etc. Heretofore mining companies could not own stock in smelting companies.

There is a disputed point in the Michigan mining laws which, is not cleared up by the new legislation. It is whether or not mining companies operating in the state but incorporated under the laws of other states shall be required to file their annual report. Expert opinion has been expressed on the question both ways. But the eastern counsel for the mining companies has advised against such foreign incorporated concerns filing their reports, with the result that few of them do it. No effort has been made to test the law on the matter.

COLLEGE OF MINES.

Young men who are ambitious to become mining engineers will find abundant opportunity in the Michigan College of Mines to win prizes and scolarships and work their way through.

Students each year compete for six prizes established by J. M. Longyear, of Marquette, in 1887. There are three first prizes of $75 each and three second prizes oil $50 for the best treatises on "Field Geology, Its Methods and Their Application," "The Dial and the Dip Compass and Their Uses'" and "The Diamond Drill and Its Uses." The competition is open to any student, special or regular, or graduate, in any year of his study.

Besides these prizes, there are several scholarships. In memory, of her husband, Mrs. Carrie A. Wright, of Ann Arbor, founded the Charles E. Wright scholarship. This consists of a fund, of $1,000, the income from which is used in aiding indigent students by loans.

In 1890, A. Lanfear Norrie, of New York, founded the Norrie scholarship, consisting of a fund of $10,000, one-half of the income of which yearly is paid to the support of some student whose father has worked in or been connected with some mine in the upper peninsula. The other half is allowed to accumulate until it amounts to $100,000, with other contributions, when it is to be used as a dormitory under the control of the college.

The Longyear funds consist of $2,500, to be loaned to worthy students of one year's standing to enable them to

complete their course of study when they are without adequate means.

An excellent opportunity is offered to one student in each year's graduating class to avail himself of the generosity of the Allis-Chalmers Company, of Chicago and Milwaukee. In the course of four months' employment, with $150 additional, the student may familiarize himself with practical machine shop work in the making of mining machinery.

Twelve scholarships open to residents of the state were established by a legislative act passed in 1897. Students are eligible after a good record of three years, the scholarships to be granted for one year only, but they may be renewed to the same student each succeeding year. The scholarships remit to the students all tuition and laboratory fees up to $75 for any one year. This the students must repay within five years after graduation with 6 per cent. interest, the profits to be applied to the principal. Another legislative act passed in 1899 provides for the incorporating of associations to establish loan funds for the benefit of students who wish to attend the college of mines or any other state institution.

The college of mines does not promise to secure positions for its graduates, but it is kept informed of the whereabouts of men who have graduated, and on its roster of graduates are many who have secured lucrative positions in all parts of the world.

The administrative officers of the College are as follows:

President	Fred Walter McNair
Secretary and Librarian	Frances Hanna Scott
Treasurer	Frederick William Nichols
Superintendent of Grounds	Frederick William Sperr
Superintendent of Buildings	Ozni Porter Hood

That the College of Mines is recognized as one of the best institutions in the world is established by the following summary of students by states and countries for the year:

California	2
Canada	3
Connecticut	1
England	1
Illinois	15
Indiana	1
Iowa	3
Kansas	3
Michigan— Upper, 54 / Lower 61	115
Minnesota	3
Missouri	1
Montana	2
New Jersey	1
New York	3
Ohio	4
Oregon	1
Scotland	1
Virginia	1
Washington	4
Wisconsin	17
Total	182
Average age of students, 1902	22 years