

# MINERAL INDUSTRIES of MICHIGAN

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**MINERAL INDUSTRIES OF MICHIGAN**  
1934 to 1938 and Prior Years

By

O. Floyd Poindexter, Economic Geologist



1940

In Cooperation with the United States Bureau of Mines

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# MINERAL INDUSTRIES OF MICHIGAN

## GENERAL REVIEW

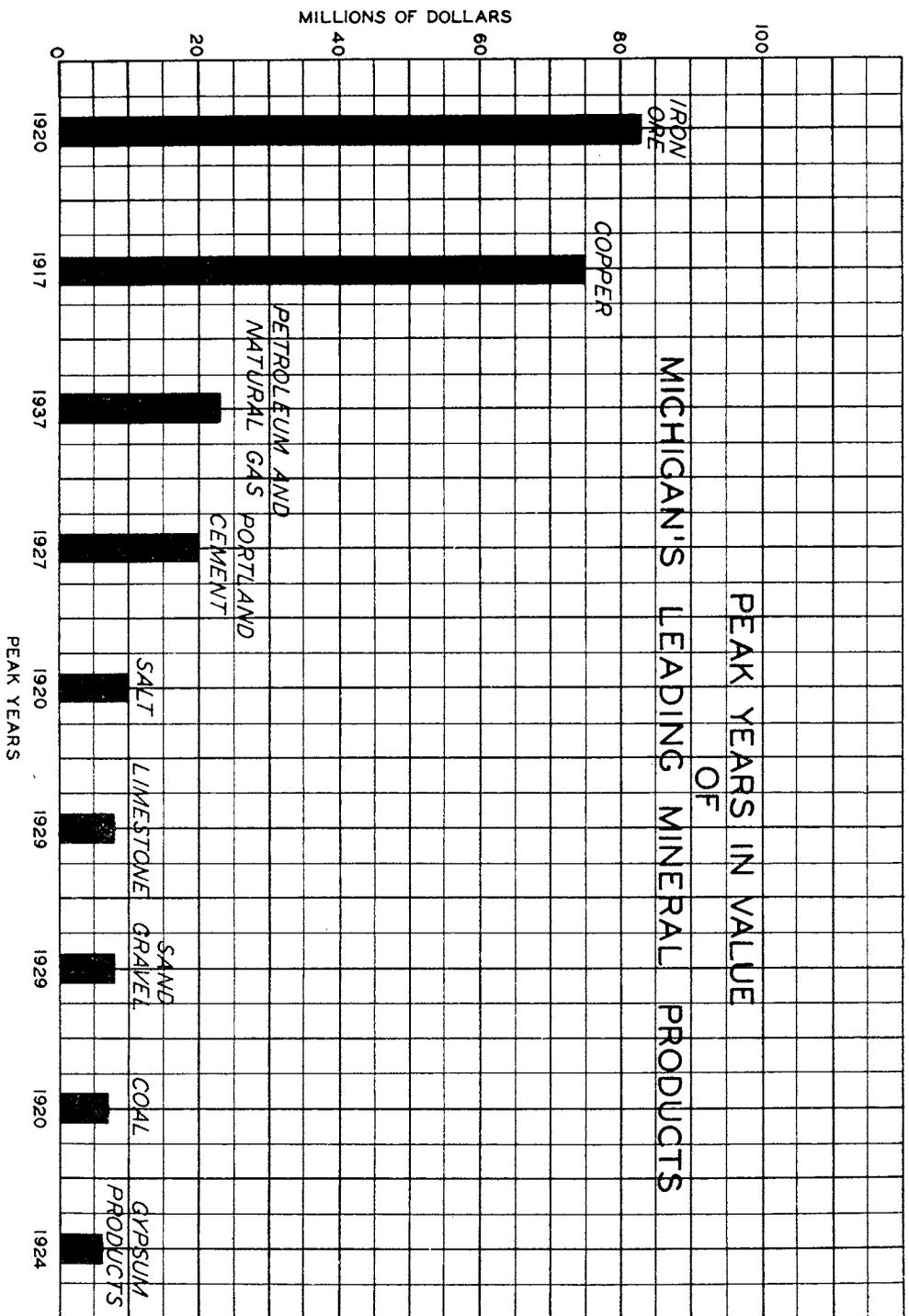
THE year 1932 marked the depth of the depression and the lowest point in mineral production in Michigan since complete statistics covering all minerals and mineral products have been published. Although production of nearly all minerals and mineral products dropped rapidly from the 1929 peak to the 1932 bottom, the decline of the iron ore and copper mining industries during those years was most marked, as these industries dropped from a combined total value of \$80,000,000 in 1929 to \$6,000,000 in 1932. The value of iron ore and copper in 1929 was more than double the value of all minerals produced in 1932, and in their peak years (1917 for copper, and 1920 for iron ore), the separate value of each of these minerals amounted to twice as much as the 1932 value of \$34,000,000 for all minerals in the State.

However, for quite definite reasons, production of certain minerals remained stable or increased during the years from 1929 to 1938. Salt, in the production of which Michigan has led the nation almost uninterruptedly since 1880, is a necessary domestic commodity of such low cost that demand for it has been curtailed little, if at all. The manufacture of bromine and of metallic magnesium are comparatively new industries in the State, yet their production was increased greatly during the decline of other minerals. The reasons for the expansion are the growing use of bromine in the manufacture of ethyl gasoline and the development of the uses of magnesium metal in the fabrication of light weight alloys for aircraft, busses, railway stock, and for other purposes. The growth of the petroleum and natural gas industries in the State is explained by the fact that the principal fields in Michigan have been discovered since 1929 and that new fields are being opened to production to supply a commodity which has become a necessity in our everyday lives. In 1932 and again in 1938 when shipments of iron ore were at a low ebb, petroleum led all Michigan minerals and mineral products in total value.

Prior to 1920 iron ore and copper contributed the bulk of the value of mineral production in Michigan but subsequently non-metallic minerals became of increasing importance due to a nation-wide road building program and to great volumes of construction in cities, both industries requiring large quantities of sand, gravel, crushed stone and Portland cement. Discovery of oil and gas in Michigan, and the great expansion in the manufacture of chemicals were other reasons for the increasing importance of non-metallic production. In 1930, for the first time in the history of mineral production in the State, the combined value of non-metallic minerals and mineral products equalled the combined value of

iron ore and copper. Since 1930 the value of non-metallic production has been in excess of the value for iron ore and copper.

In 1937 Michigan ranked 12th among the states in total value of minerals and mineral products. The State ranked first in quantity and value of salt, sand lime brick, bromine, calcium-magnesium-chloride, magnesium-sulphate and metallic magnesium; second in production of iron ore, gypsum and limestone; fourth in production of cement and sand-gravel; fifth in copper and ninth in petroleum.

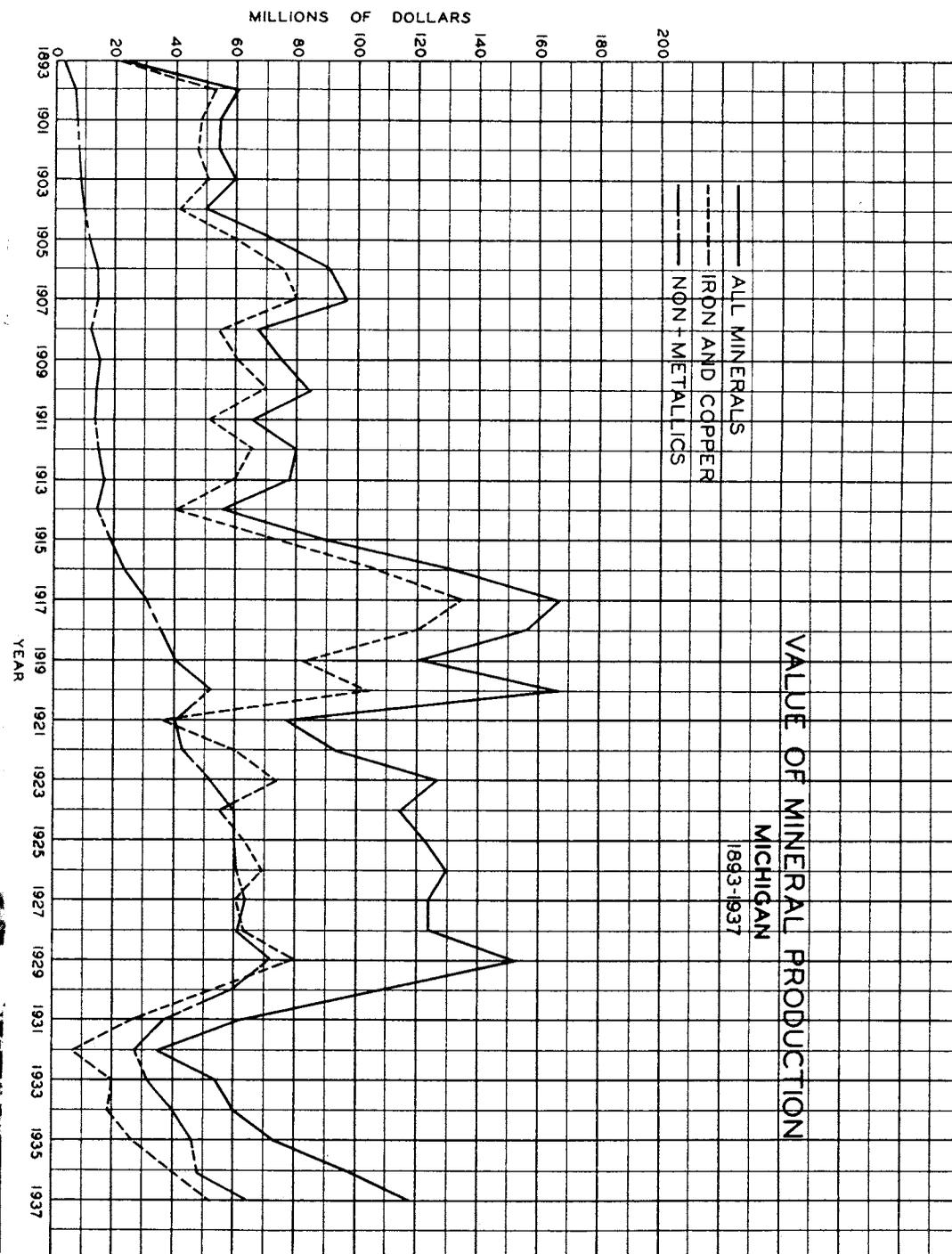


## THE COPPER INDUSTRY OF MICHIGAN

**C**OPPER has been mined in Michigan since 1845 and for more than forty years thereafter this State was the leading producer of copper in the nation. However, with the development of the west and the discovery of large deposits of more cheaply mined copper in Arizona, Montana, Utah, and Nevada, Michigan, considered from the standpoint of annual production, has declined to fifth position in the rank of copper mining states. However, in all time production, from 1845 to the present time, the Michigan copper mining district is exceeded only by the Butte, Montana district in total quantity of copper mined. More than 9,000,000,000 pounds of copper was mined in Michigan to the end of 1938 and copper has enriched the people of the state to the extent of one and one-quarter billion dollars.

The interesting thing about the Michigan copper deposits is that the copper occurs as free or native copper in the rock. They are by far the most important copper deposits of this type in the world. In the large deposits of the western states, the copper is in the form of the sulphide or oxide ores which require more complicated smelting processes than the Michigan copper which is separated from the rock by crushing in stamp mills and then subjected to a combined smelting and refining process.

COPPER INGOTS ON DOCK AT HOUGHTON



More than offsetting the lower smelting costs, however, are the high costs of mining Michigan copper owing to the fact that many of the mines now reach great depths. Some mines are more than a mile in vertical depth below the surface. Costs of mining Michigan copper generally average more than ten cents per pound and when you consider that in 1932 the price of refined copper dropped to an all time low of five cents per pound and rose above ten cents (yearly average) only in 1937 when the average price was a little more than thirteen cents, you can see how seriously the Michigan copper mining industry has been affected. In 1938 the price of copper averaged slightly less than ten cents per pound. Only two mines have operated continuously through the depression, but as better prices prevailed, six mines were in operation at the end of 1938. The mines are located at Painesdale, Houghton, and Hancock, Houghton County, and Ahmeek, Keweenaw County. At Lake Linden the stamp

sand or waste rock washed from the stamp mills into the lake during the earlier operations is being reclaimed and treated by modern methods of extraction which make it profitable to salvage the small amounts of copper remaining in the sand when it is rejected by the stamp mills.

PRODUCTION OF COPPER IN MICHIGAN  
1845-1938

Year	Pounds	Year	Pounds
1845	26,880	1893	112,605,078
1846	58,240	1894	114,308,870
1847	477,120	1895	129,330,749
1848	1,032,640	1896	143,524,069
1849	1,505,280	1897	145,282,059
1850	1,281,280	1898	158,491,703
1851	1,744,960	1899	147,400,338
1852	1,744,080	1900	145,461,498
1853	2,905,280	1901	156,289,481
1854	4,074,560	1902	170,609,228
1855	5,808,320	1903	192,400,577
1856	8,211,840	1904	208,309,130
1857	9,531,200	1905	230,287,992
1858	9,157,120	1906	229,695,730
1859	8,926,400	1907	219,131,503
1860	12,069,120	1908	222,289,584
1861	15,037,120	1909	227,005,923
1862	13,585,600	1910	221,462,984
1863	12,985,280	1911	218,185,236
1864	12,490,240	1912	231,112,228
1865	14,358,400	1913	155,715,286
1866	13,749,120	1914	158,009,748
1867	17,525,760	1915	238,956,411
1868	20,935,040	1916	269,794,531
1869	26,624,640	1917	268,508,098
1870	24,622,080	1918	231,096,150
1871	26,750,080	1919	177,594,135
1872	24,552,640	1920	153,483,952
1873	30,089,920	1921	100,918,001
1874	34,332,480	1922	122,545,126
1875	36,039,360	1923	137,691,306
1876	38,270,400	1924	145,333,227
1877	39,025,280	1925	138,029,764
1878	39,690,560	1926	175,441,565
1879	42,848,960	1927	177,537,775
1880	49,736,960	1928	178,442,704
1881	54,573,120	1929	186,393,974
1882	56,982,765	1930	169,297,775
1883	59,702,404	1931	118,495,055
1884	69,353,202	1932	54,396,108
1885	72,148,172	1933	46,853,130
1886	79,890,798	1934	48,215,859
1887	75,471,893	1935	63,208,689
1888	86,472,034	1936	95,968,019
1889	88,175,675	1937	94,928,000
1890	101,410,277	1938	94,075,588
1891	114,222,709		
1892	123,198,460		9,007,519,682

## MICHIGAN'S IRON MINING INDUSTRY

IRON ORE was discovered in Michigan in 1844 at a site now in the City of Negaunee, Marquette County, but regular shipments of ore did not begin until ten years later when the St. Mary's ship canal was opened. Additional discoveries of iron ore were made on the Menominee Range in Dickinson County in 1877 and mining of ore from the Gogebic Range in Gogebic County in 1884 augmented the state's total of iron ore production. From the time of the first shipments of ore until 1901 Michigan was the leading state in production of iron ore. In 1901, however, production of ore from the newly developed open pit mines of the Mesabi Range in Minnesota reached such a volume that Michigan dropped to second rank in mining of iron ore. The State has remained in this position ever since. Minnesota produces more than 50 percent of all iron ore mined in the United States and Michigan's total is about 20 percent.

Most of the ore is produced from underground mines, some of which are more than 3,000 feet in depth. Open pit mines are at Palmer, Marquette County, and Wakefield, Gogebic County. The principal under-

PRODUCTION AND SHIPMENT OF IRON ORE IN MICHIGAN\*  
1934-1938

	1934		1935		1936		1937		1938	
	Tons Mined	Tons Shipped								
Marquette Range.....	2,330,775	2,473,847	2,865,294	3,265,537	4,415,848	4,627,889	5,503,700	5,747,812	2,634,951	1,476,257
Gogebic Range.....	1,857,429	1,690,897	1,579,028	2,341,985	3,064,944	3,710,468	4,175,870	4,243,391	1,948,783	1,652,904
Menominee Range:										
Dickinson County.....	147,541	317,603	195,930	223,409	285,704	352,629	483,248	431,985	331,588	237,697
Iron County.....	710,534	1,017,424	532,891	1,410,613	1,359,688	1,811,050	1,809,964	2,214,967	992,786	740,722
Total for State.....	5,046,279	5,499,771	5,173,143	7,241,544	9,126,184	10,502,036	11,972,782	12,638,155	5,908,108	4,107,580

\*Figures supplied by F. G. Pardee, Appraiser of Mines, and G. E. Eddy, Geologist.

ground mines are located at or near the cities of Negaunee and Ishpeming, Marquette County, Iron Mountain, Dickinson County, Iron River and Crystal Falls, Iron County, Ironwood and Bessemer, Gogebic County. In 1938 a total of 42 mines were in operation.

In 1932, the bottom year of the depression, shipments of iron ore were at their lowest since 1875. Following 1932 business was on the upturn but demand for iron ore was not steady and accumulations of excess stocks of ore at furnaces and lower Lake ports resulted. Shipments fell off about 70 percent in 1938 but mining was also curtailed to prevent the accumulation of excessive stocks at the mines.

Since the beginning of iron mining in Michigan more than one-half billion tons of ore have been shipped from ports on the upper lakes. The value of these shipments amounts to approximately one and one-quarter billion dollars.

IRON ORE SHIPPED FROM MINES IN MINNESOTA, MICHIGAN AND ALABAMA  
1934-1938\*

	1934	1935	1936	1937	1938
Minnesota.....	15,768,418	20,035,653	32,938,883	47,878,042	14,535,744
Michigan.....	5,497,953	7,235,698	10,491,270	12,626,935	4,092,902
Alabama.....	2,270,923	3,559,934	4,259,804	6,350,316	4,281,332
All Other States.....	23,537,291	30,831,285	47,689,957	66,855,293	22,909,978
Total United States.....	48,074,585	61,662,570	95,379,974	131,710,573	45,820,962

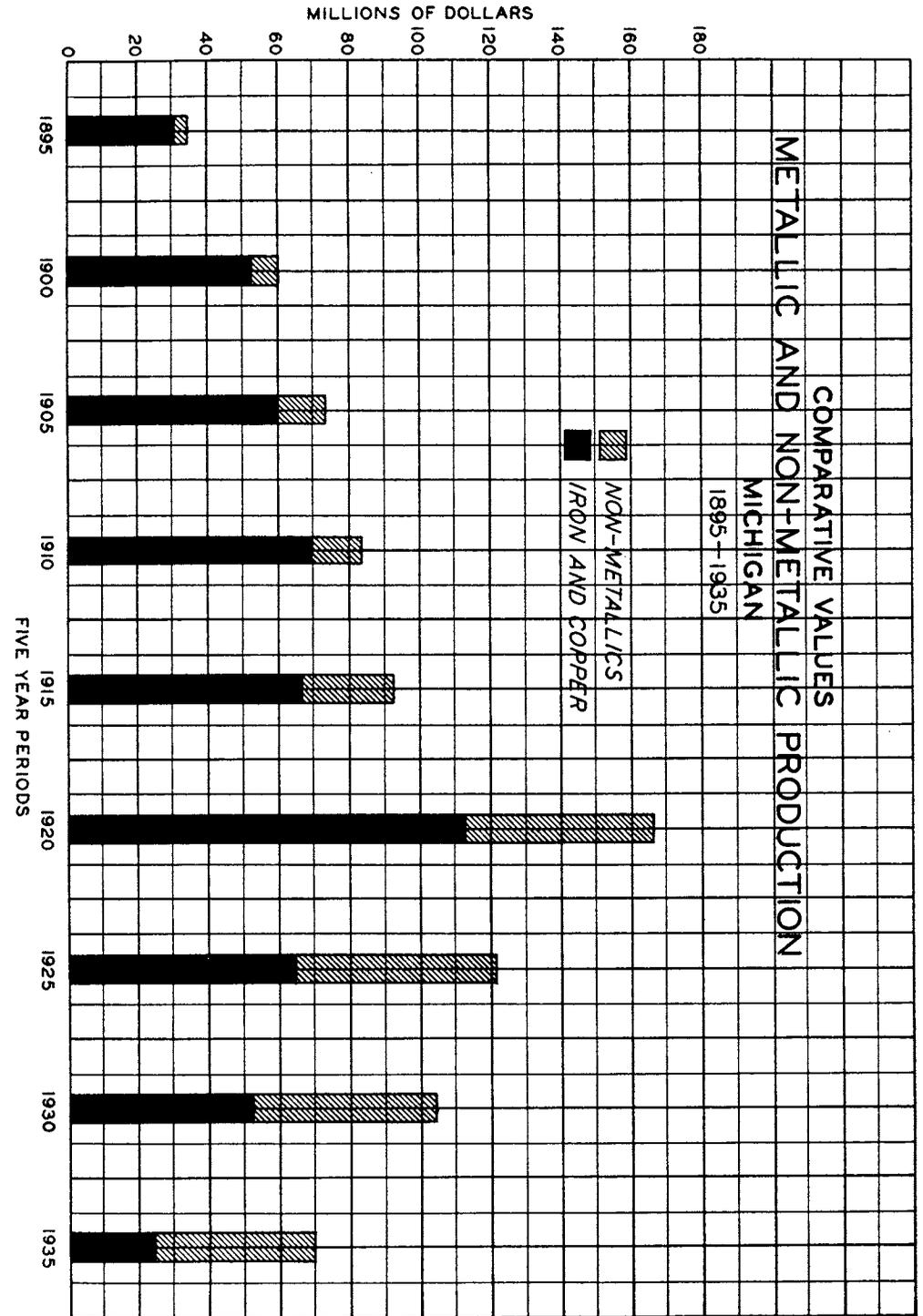
\*Figures from "Minerals Yearbook," U. S. Bureau of Mines.

IRON ORE MINED IN MICHIGAN 1854-1938—By Ranges

Marquette Range.....	197,448,131
Gogebic Range.....	207,398,867
Menominee Range.....	182,889,844
Total.....	587,736,842

**IRON ORE SHIPMENTS FROM MICHIGAN MINES**  
1854-1938

Year	Tons	Year	Tons
Previous.....	75,083	1898.....	7,408,060
1854.....	3,000	1899.....	9,308,731
1855.....	1,449	1900.....	9,237,502
1856.....	6,790	1901.....	9,403,224
1857.....	25,646	1902.....	11,490,273
1858.....	22,876	1903.....	9,154,147
1859.....	68,832	1904.....	7,805,880
1860.....	114,410	1905.....	11,684,432
1861.....	49,909	1906.....	12,149,451
1862.....	124,169	1907.....	12,166,929
1863.....	203,055	1908.....	7,302,060
1864.....	247,059	1909.....	12,251,965
1865.....	193,758	1910.....	11,955,105
1866.....	296,713	1911.....	8,898,554
1867.....	565,504	1912.....	12,428,361
1868.....	510,522	1913.....	12,463,319
1869.....	639,097	1914.....	8,835,274
1870.....	859,507	1915.....	13,506,119
1871.....	813,984	1916.....	18,812,972
1872.....	948,553	1917.....	17,694,731
1873.....	1,195,234	1918.....	17,495,377
1874.....	899,934	1919.....	12,816,304
1875.....	881,166	1920.....	18,470,354
1876.....	993,311	1921.....	5,065,137
1877.....	1,025,129	1922.....	12,433,729
1878.....	1,127,583	1923.....	13,980,769
1879.....	1,420,745	1924.....	10,974,662
1880.....	1,948,334	1925.....	15,116,269
1881.....	2,125,729	1926.....	16,810,160
1882.....	2,656,933	1927.....	14,532,831
1883.....	2,518,048	1928.....	14,241,102
1884.....	2,225,146	1929.....	16,838,568
1885.....	2,205,190	1930.....	11,154,773
1886.....	3,179,511	1931.....	5,555,376
1887.....	3,934,339	1932.....	978,371
1888.....	4,113,803	1933.....	6,075,897
1889.....	5,829,828	1934.....	5,499,771
1890.....	7,185,139	1935.....	7,241,544
1891.....	5,728,081	1936.....	10,502,036
1892.....	7,182,344	1937.....	12,638,155
1893.....	4,370,550	1938.....	4,107,580
1894.....	4,689,291		
1895.....	5,991,968		
1896.....	5,532,967		
1897.....	6,429,520		
		Total Shipments.....	547,166,584



## BROMINE, CALCIUM CHLORIDE, MAGNESIUM, IODINE

THESE products are considered under one heading, owing to the fact that their manufacture depends upon the recovery of a single raw material, namely, brine, obtained from the Marshall formation in the vicinities of Midland, Mount Pleasant, Alma and St. Louis, and from the Detroit River formation at Manistee. In the Porter oil field, Midland County, waste brines produced with oil from the Dundee formation are gathered into pipe lines and delivered to the Dow Chemical Company at Midland for extraction of the valuable chemicals. Large quantities of these valuable brines are available in other fields but are too far removed from the chemical plants to permit disposal in this manner.

### BROMINE

Bromine has been produced at Midland for forty years. It was originally used chiefly for photographic and medicinal purposes, but in recent years an important new use developed which has enormously increased the demand for bromine. Ethyl gasoline is the cause of the boom in the bromide industry, as large quantities of ethylene dibromide are consumed in its manufacture. The motion picture industry and medical profession have also required increasing quantities of bromine compounds. Michigan produces a large proportion of the bromine consumed in the United States. The following table will show how the bromine industry has grown in the United States between the years of 1926 to 1938:

Year	Pounds	Value
1926.....	1,245,760	\$426,837
1927.....	1,756,310	564,689
1928.....	2,164,000	649,475
1929.....	6,414,620	1,759,325
1930.....	8,462,800	2,109,974
1931.....	8,935,330	1,854,650
1932.....	5,727,561	1,182,569
1933.....	10,147,960	2,040,352
1934.....	15,344,290	3,227,425
1935.....	16,428,533	3,483,239
1936.....	20,609,025	4,038,438
1937.....	26,200,256	5,180,177
1938.....	32,324,000	6,610,056

### CALCIUM CHLORIDE

The production of calcium chloride from natural brines is another phase of the chemical industry in which Michigan is predominant. The successful use of calcium chloride as a dust-layer on gravel roads has

greatly increased the demand for this product. It has a further extensive use in curing concrete, as a refrigerant and preservative, and in other chemical processes. The following table shows the production of calcium chloride from natural brines in the United States during the period from 1921 to 1938 inclusive:

Year	Short Tons	Value
1921.....	23,672	\$510,723
1922.....	33,067	571,326
1923.....	44,961	663,384
1924.....	58,791	1,164,848
1925.....	67,870	1,386,639
1926.....	82,340	1,710,405
1927.....	95,721	1,947,796
1928.....	102,090	1,995,603
1929.....	114,240	2,097,061
1930.....	116,160	2,207,800
1931.....	86,156	1,687,166
1932.....	66,286	1,163,385
1933.....	57,813	893,442
1934.....	76,719	1,153,159
1935.....	83,546	1,039,103
1936.....	125,911	1,909,908
1937.....	101,547	1,295,403
1938.....	103,930	1,218,938

The above tables do not include a large quantity of calcium chloride produced from limestone and salt as a by-product of the manufacture of sal soda, caustic soda and other chemicals.

### MAGNESIUM

Since 1927 the Dow Chemical Company at Midland has produced the entire domestic output of primary metallic magnesium by electrolysis of magnesium chloride from the brines of the Marshall sandstone. The magnesium market has expanded greatly since 1932. The demand for light weight alloys for airplane manufacture, and in recent years, the trend toward the lightening of railway stock, busses, trucks, trailers, and other equipment, has brought this metal into keen competition with aluminum. Magnesium is one-third lighter than aluminum and active research on new alloys and properties of the metal promise to further increase its utility. Deoxidizing and desulphurizing of other metals is also an important use of magnesium. The following table of production since 1929 shows the increasing importance of metallic magnesium. The apparent lack of rapid growth since 1934 is due to development of sources of magnesium in foreign countries which decreased exports from this country. Domestic consumption, however, has steadily increased.

PRODUCTION OF MAGNESIUM IN MICHIGAN

Year	Pounds
1930.....	559,631
1931.....	580,463
1932.....	791,699
1933.....	1,434,893
1934.....	4,249,838
1935.....	4,241,218
1936.....	3,903,312
1937.....	4,539,980
1938.....	4,819,617

IODINE

The Dow Chemical Company has recently patented a new process for the recovery of iodine from natural brines.

SALT

SALT is produced in Michigan from three distinct geologic formations, namely, the Marshall, Detroit River, and Salina. Natural brines are produced from the Marshall formation at Midland, St. Louis, Saginaw, and Bay City from which salt is obtained by evaporation; artificial brines from which salt is manufactured are produced from the Salina formation at Detroit, St. Clair, and Port Huron by dissolving beds of rock salt. Rock salt is also mined at Detroit by means of a shaft approximately 1100 feet in depth. The Detroit River formation contains both natural brines and rock salt, which are produced by wells at Manistee. The salt beds at Manistee were formerly correlated with the Salina formation, but deep tests for oil have shown that they are considerably higher in the geologic section.<sup>1</sup>

In addition to the Marshall, Detroit River, and Salina formations, the Dundee, Parma, and Berea formations contain salt brines, the two last named were of some importance in the early days of salt production in Michigan.

Michigan has ranked as the leading salt-producing State for many years. Since 1911 this State has been only twice in second rank in production of salt—in 1921 during the post-war industrial depression, and again in 1924 when an eastern price war, importation of low priced salt from Germany, and other factors demoralized the salt industry in this country.

The year 1929 was the record year for salt production in Michigan. The maximum value was, however, attained in 1920 when post-war price inflation prevailed. The value of the product in 1920 was \$10,698,674, the only time the industry has ever been over the \$10,000,000 figure. From 1925 a steady increase was noted with each succeeding year to 1929, when a new record production of 2,650,212 tons was reached. Keen competition, however, and a tendency toward over-production, kept the prices down, with the result that the value of the product was much less than during the war time years. In 1931 production further declined to 2,053,980 tons valued at \$5,760,001, and in 1932 dropped off to 1,715,304 tons valued at \$5,679,737. From 1933 through 1937 production steadily increased but in 1938 dropped off about 3,000,000 barrels from the 1937 total.

The above figures show that the salt industry has remained fairly stable throughout the depression period. This stability is due to the importance of salt as a necessary domestic commodity and to the great variety of uses for the brines, especially in the chemical industries.

<sup>1</sup>R. B. Newcombe, Interpretation of Recent Discoveries in the Salt Bearing Rocks of Michigan. Vol. XII, Michigan Academy of Science, Arts, and Letters, 1930.

PRODUCTION AND VALUE OF SALT IN MICHIGAN, 1934-1938  
By Methods of Manufacture

Year	Open Pans		Vacuum Pans		Rock Salt and Pressed Blocks		Brine		Total Salt	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
1934	236,030	\$2,190,417	449,402	\$1,629,618	291,917	\$1,025,845	1,035,021	\$624,804	2,012,370	\$5,470,684
1935	210,508	1,813,616	478,949	1,792,759	297,975	1,067,592	1,140,739	663,569	2,128,171	5,337,536
1936	246,695	2,020,186	543,725	1,974,691	328,084	1,152,706	1,235,778	735,135	2,354,282	5,882,718
1937	244,741	2,264,999	613,045	2,240,670	340,200	1,183,186	1,278,420	817,265	2,476,406	6,506,120
1938	241,189	2,284,454	556,252	2,123,941	**	**	**	**	2,078,612	6,151,154

\*\*Included in total.

PRODUCTION OF SALT IN MICHIGAN 1880-1899\*

Year	Quantity Barrels	Percent of U. S. Total
1880	2,485,177	41.7
1881	3,061,832	44.4
1882	3,036,317	47.4
1883	2,894,672	46.7
1884	3,161,806	48.5
1885	3,297,403	46.8
1886	3,667,257	47.6
1887	3,944,309	49.2
1888	3,866,228	47.0
1889	3,856,929	48.2
1890	3,838,632	43.7
1891	3,966,748	39.5
1892	3,829,478	32.8
1893	3,657,898	25.7
1894	3,341,425	26.5
1895	3,343,395	24.5
1896	3,164,238	22.9
1897	3,993,225	24.0
1898	5,263,564	29.9
1899	7,117,382	36.1

PRODUCTION AND VALUE OF SALT IN MICHIGAN 1900-1938

Year	Quantity Barrels	Percent of U. S. Total	Rank Quantity	Value	Rank Value
1900	7,210,621	34.6	2	\$2,033,731	2
1901	7,729,641	37.6	1	2,437,677	1
1902	8,131,781	34.1	2	1,535,823	2
1903	4,297,542	22.7	2	1,119,984	2
1904	5,425,904	24.6	2	1,579,206	2
1905	9,492,173	35.2	1	1,851,332	2
1906	9,936,802	36.3	1	2,018,760	2
1907	10,786,630	35.4	1	2,231,129	2
1908	10,194,279	35.3	1	2,458,303	1
1909	9,966,744	33.1	1	2,732,556	1
1910	9,452,022	32.2	2	2,231,262	2
1911	10,320,074	33.1	2	2,633,155	1
1912	10,946,739	32.8	1	2,974,429	1
1913	11,528,800	33.5	1	3,293,032	1
1914	11,670,976	33.9	1	3,299,005	1
1915	12,588,788	32.9	1	4,304,731	1
1916	14,918,278	32.8	1	4,612,567	1
1917	16,078,136	32.3	1	6,817,202	1
1918	17,165,178	33.2	1	9,048,650	1
1919	17,800,564	36.2	1	9,456,138	1
1920	16,163,679	32.5	1	10,698,674	1
1921	10,196,179	28.7	2	7,439,445	1
1922	14,322,057	29.5	1	8,693,604	1
1923	15,195,800	29.8	1	8,684,148	1
1924	13,703,307	28.2	2	7,864,838	1
1925	15,518,571	29.4	1	7,710,331	1
1926	16,145,174	30.7	1	7,594,418	1
1927	16,218,224	30.1	1	7,551,552	1
1928	17,173,413	29.8	1	8,249,437	1
1929	18,922,513	31.2	1	8,343,607	1
1930	18,166,190	31.8	1	7,884,072	1
1931	14,665,417	26.6	1	5,760,000	1
1932	12,252,171	26.7	1	4,845,379	1
1933	14,573,242	27.4	1	5,679,737	1
1934	15,088,357	26.4	1	5,470,684	1
1935	15,201,264	26.8	1	5,537,536	1
1936	16,813,300	26.6	1	5,882,718	1
1937	17,688,614	26.8	1	6,506,120	1
1938	14,843,657	25.9	1	6,151,154	1

\*For production prior to 1880 see Publication 29, Michigan Geological Survey.

## LIME

Lime burning began in Michigan practically at the time of influx of the first settlers. Monroe County became the initial center for the industry because of the early settlements and the outcrops of easily accessible limestone. Wood was still available for fuel at that time. Lime burning also had an early development on a small scale in Eaton and Jackson counties. However, as the lumbering wastes became less available in the southern part of the State and competition from other states developed, the industry gradually died out in that section. With the extension of the railroads and development of lake transportation, the lime burning industry was transferred to the northern portions of the State where large deposits of high purity limestone exist and where wood was still available as fuel. Lime burning has gradually died out in that part of the State also, and only two plants are in existence. The bulk of the lime made in Michigan is burned at Menominee and Detroit from stone shipped from Northern Michigan limestone quarries.

PRODUCTION AND VALUE OF LIME IN MICHIGAN 1904-1938

Year	Total Lime		Number of Plants Operating	Rank of State Production
	Quantity Tons	Value		
1904	63,601	\$256,955		
1905	48,089	192,844		
1906	68,133	281,465	13	
1907	65,822	276,534	12	16
1908	68,050	282,023	10	15
1909	83,108	354,135	12	13
1910	72,345	303,377	10	14
1911	80,709	352,608	14	14
1912	74,720	311,448	11	16
1913	77,088	331,852	10	14
1914	66,507	287,648	10	14
1915	81,359	349,979	10	15
1916	86,447	385,341	7	13
1917	135,920	892,682	7	7
1918	134,813	1,186,007	6	6
1919	145,783	1,381,534	7	6
1920	140,813	1,386,760	7	8
1921	48,164	445,386	6	15
1922	53,635	484,945	7	16
1923	59,629	612,369	7	18
1924	73,096	702,072	7	14
1925	95,036	909,952	8	14
1926	107,671	995,123	8	12
1927	101,172	931,597	8	13
1928	104,917	962,708	8	13
1929	91,468	844,543	6	15
1930	80,241	630,288	5	11
1931	46,716	334,015	5	12
1932	38,610	267,520	4	11
1933	43,959	292,144	3	11
1934	32,844	240,181	2	11
1935	35,401	260,097	3	17
1936	40,090	286,348	4	17
1937	48,310	351,681	4	19
1938	45,848	339,324	4	16

## PORTLAND CEMENT

THE Portland cement industry in Michigan enjoyed a steady growth from the time of its permanent establishment in 1896 until 1930, although during the peak years the industry suffered because of price wars, keen competition, and over-production.

The cement industry naturally received great stimulus from the nationwide road building and construction program carried on for the last half of the 1920's, 1927 was the peak year, but beginning in 1930 production fell off sharply to a low point of production in 1933.

Less cement was manufactured in Michigan in 1933 than in 1910 when the automobile was still in the experimental stage and concrete road building had scarcely begun. Public works programs have not created a demand for cement comparable to the requirements of private construc-

PRODUCTION AND VALUE OF PORTLAND CEMENT IN MICHIGAN 1896-1938

Year	Number of Plants in Operation	Production Barrels	Barrels Shipped	Value Shipped	Price per Barrel	Stock on Hand Dec. 31	Rank Value
1896	1	4,000		\$7,000	\$1.75		
1897	2	15,000		26,250	1.75		
1898	2	77,000		134,750	1.747		
1899	4	343,566		513,849	1.492		4
1900	6	664,750		830,990	1.25		2
1901	10	1,025,718		1,128,290	1.10		3
1902	10	1,577,006		2,134,396	1.353		3
1903	13	1,955,183		2,674,780	1.367		3
1904	16	2,247,160		2,365,656	1.052		4
1905	16	2,773,283		2,921,507	1.053		5
1906	14	3,747,525		4,814,965	1.284		4
1907	14	3,572,668		4,384,731	1.227		4
1908	15	2,892,576		2,556,215	0.883		7
1909	12	3,212,751		2,619,259	0.815		7
1910	12	3,687,719		3,378,940	0.916		8
1911	11	3,686,716		3,024,676	0.82	506,758	8
1912	11	3,494,621	3,651,094	3,145,001	0.861	370,956	8
1913	11	4,186,236	4,228,879	4,228,879	1.035	473,563	8
1914	11	4,285,345	4,218,429	4,064,781	0.964	538,846	7
1915	11	4,765,294	4,727,768	4,454,608	0.942	569,919	5
1916	11	4,919,023	5,151,818	6,017,911	1.168	338,035	6
1917	11	4,688,899	4,313,771	6,122,887	1.419	701,919	6
1918	10	3,554,872	3,618,088	6,078,167	1.680	635,447	6
1919	11	4,675,244	4,990,308	8,468,196	1.70	219,641	4
1920	11	4,891,457	4,442,465	10,939,633	2.46	666,389	7
1921	11	5,777,533	5,680,156	10,300,289	1.815	760,503	3
1922	12	6,243,805	6,349,751	11,145,573	1.76	759,703	5
1923	14	7,619,792	7,466,283	14,038,322	1.88	738,892	5
1924	15	9,259,781	8,991,270	16,405,761	1.82	782,377	3
1925	16	10,936,181	10,073,453	17,511,908	1.74	1,060,047	3
1926	16	12,037,400	11,959,447	19,499,788	1.82	1,897,474	3
1927	15	13,965,241	13,708,259	20,858,202	1.52	2,205,284	3
1928	14	13,848,561	14,044,230	19,268,707	1.37	2,010,533	3
1929	14	13,748,862	13,325,727	18,916,711	1.42	2,403,185	3
1930	14	11,510,895	10,817,994	14,897,439	1.38	3,096,086	4
1931	14	6,132,768	7,168,720	6,984,725	0.97	2,055,462	5
1932	11	4,295,610	4,886,928	4,442,666	0.91	1,493,778	5
1933	9	3,632,843	3,447,867	4,128,082	1.20	1,678,754	7
1934	10	4,103,902	3,945,375	5,920,214	1.50	1,828,151	5
1935	10	4,578,966	4,325,134	5,971,720	1.38	2,050,894	5
1936	10	7,673,324	7,960,821	10,482,835	1.32	1,764,314	4
1937	11	8,180,969	7,831,880	9,836,999	1.26	2,110,935	4
1938	11	7,159,362	7,192,511	8,767,859	1.22	2,077,781	4

tion and extensive road contracts. A slight upturn, however, took place in 1934, a much better price was obtained, and production has shown an increase each year except for 1938 when about 1,000,000 less barrels were manufactured than in 1937. Shipments, however, were slightly in excess of production and stocks were somewhat decreased.

## GYPSUM

**G**YPSUM is one of the earliest known Michigan minerals. It was discovered along Plaster Creek in Kent County in 1827 and has been mined since 1841. In the early days gypsum was ground almost solely for application to the soil and prior to 1890 the annual production never amounted to 70,000 tons. The growth of the gypsum industry since that time is due to the development and manufacture of various kinds of plasters and plaster boards, and more recently to the development of structural materials which can be used in place of wood. Gypsum, or "rock" lath is now widely used. Slabs of gypsum are used in the construction of sound-proof stages used in the talking picture industry. Gypsum is also used to considerable extent as a retarder in portland cement.

PRODUCTION OF GYPSUM IN MICHIGAN 1900-1938\*

Year	Total Mined Tons	Gypsum and Gypsum Products Total Value	Rank	
			Quantity	Value
Prior to 1900.....	2,285,851	\$9,030,533	.....	.....
1900.....	129,654	285,119	2	2
1901.....	185,150	267,243	1	1
1902.....	240,227	459,621	1	1
1903.....	269,093	700,912	1	1
1904.....	238,385	541,197	1	1
1905.....	247,882	634,434	1	2
1906.....	341,716	753,878	1	2
1907.....	317,261	681,351	3	3
1908.....	327,810	401,928	1	3
1909.....	394,907	1,213,347	2	1
1910.....	357,174	667,199	2	2
1911.....	347,296	523,926	3	4
1912.....	384,227	621,547	2	3
1913.....	423,896	721,325	3	3
1914.....	393,006	705,841	3	3
1915.....	389,791	686,309	3	4
1916.....	457,375	1,066,599	3	4
1917.....	375,803	1,568,655	3	3
1918.....	286,768	1,761,149	4	4
1919.....	339,125	2,390,367	3	3
1920.....	382,212	3,521,028	3	3
1921.....	408,224	3,212,096	2	2
1922.....	471,355	2,843,117	3	4
1923.....	587,987	3,252,993	3	4
1924.....	577,526	5,950,822	3	2
1925.....	649,053	5,447,294	3	4
1926.....	659,685	5,021,465	3	4
1927.....	668,617	4,216,524	3	4
1928.....	677,108	3,159,369	3	4
1929.....	898,547	4,315,334	2	3
1930.....	519,225	3,755,631	2	2
1931.....	383,123	3,537,886	2	2
1932.....	284,542	2,099,044	2	2
1933.....	211,392	2,170,243	2	2
1934.....	281,033	2,469,222	2	2
1935.....	342,989	2,250,806	2	2
1936.....	496,611	3,297,362	2	2
1937.....	553,242	**896,947	2	2
1938.....	483,324	**775,908	2	2

\*For annual production prior to 1900 see Publication 37, Michigan Geological Survey.  
\*\*Value of crude gypsum only.

At the present time gypsum is mined at Grand Rapids and quarried at Alabaster and National City, Iosco County. Manufacturing plants are located at Grand Rapids, National City and Detroit. The plant at Detroit receives crude gypsum by lake freight from Alabaster.

In 1938 Michigan ranked second in production of gypsum in the United States.

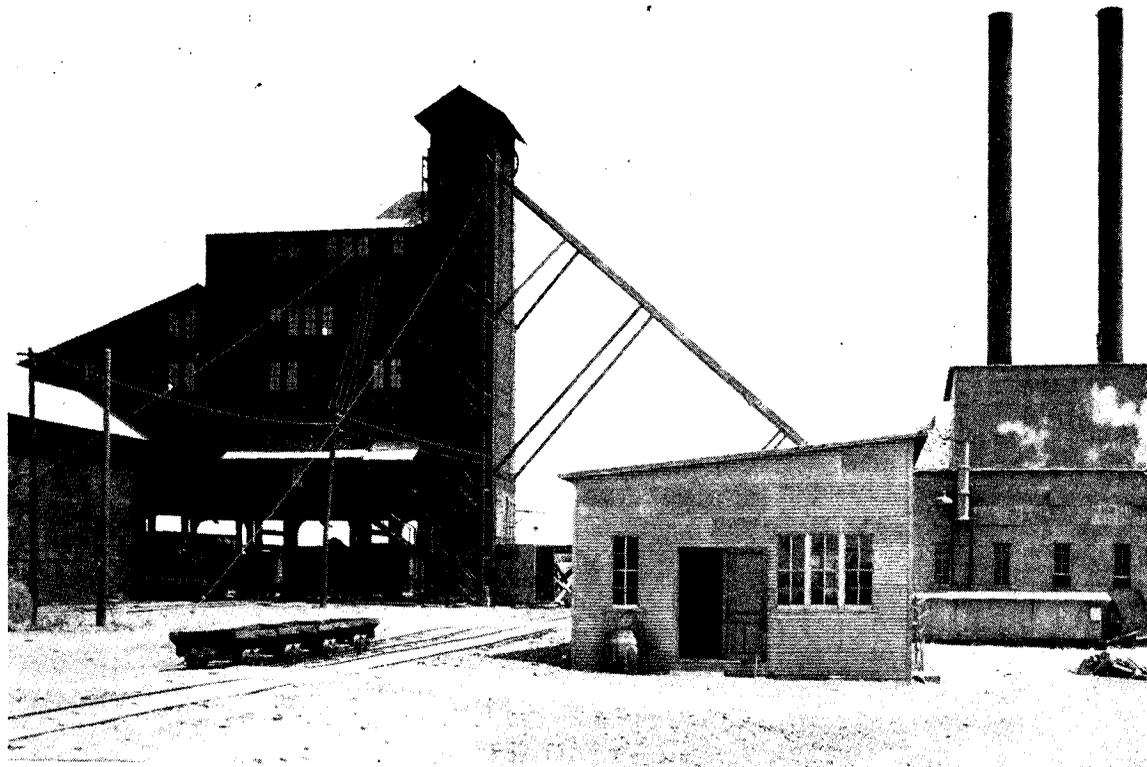
## COAL

COAL has been mined in Michigan since about 1835. The earliest workings on record were at Jackson, Jackson County, and at Grand Ledge, Eaton County. Subsequently numerous mines were opened in Jackson, Calhoun, Eaton, Shiawassee, Ingham, Genesee, Arenac, Huron, Tuscola, Saginaw, and Bay counties. In 1905, 38 coal mines were in operation in Michigan, but the number gradually decreased until 1932 when only 5 mines reported production. The depression stimulated coal mining in Michigan and the number of mines (including some very small or "wagon mines") increased to 25 in 1935. By 1939, however, the number had decreased to 9.

The peak of Michigan coal mining was reached in 1907, when 2,035,858 tons were produced. The value at the mine, however, was only \$1.80 per ton. The maximum value was attained in 1920, when 1,489,765 tons valued at \$7,346,000 were produced with an average price of \$4.93 per ton. The highest price per ton, \$5.05, was obtained in 1922, the result of widespread strikes in the coal fields of the country.

Tests and analyses of some of the earliest mined coal in Michigan showed it to be of a decidedly inferior quality. The coal was generally high in ash, moisture, and sulphur content, and low in fixed carbon. Furthermore, it tended to soften and run together on the grates and caused difficulty in handling. Specially devised grates were often necessary. Later mined coals, however, particularly those in the Saginaw Valley, proved to be considerably different from the earlier tested ones and modern methods of treatment at the mines further improve the quality of the product. Excessive ash may be reduced by washing and chemical treatment facilitates the handling of the coal on the grates. Most Michigan coals are good steam coals, but owing to the generally lower B. T. U. content than the eastern coals, it is advisable when using Michigan coals to make a careful study of heating qualities of the different grades of coal with reference to any particular heating equipment. Some coals may be well adapted to one heating plant with a resultant saving in fuel costs, but the same coal may result in greatly decreased efficiency and higher costs in some other boiler equipment.

The Michigan "Coal Basin" underlies all or part of approximately 30 counties in the south central part of the Southern Peninsula, but it is probable that in only 12 counties will coal ever be profitably mined. The remaining counties are for the most part rather heavily covered by glacial drift which would make shaft sinking a costly operation unless coal beds of unusual quality or thickness should be discovered. The present pro-



COAL MINE

ducing area roughly includes most of the area immediately surrounding Saginaw Bay and, extending southwestward through St. Charles, Owosso, Lansing, and Jackson. Sebawaing, Flint, and Jackson, represent the approximate eastern boundaries of the belt, and Midland, Grand Ledge, Charlotte, and Marshall are near the western limits. Some portions of this belt, however, are either non-productive or too heavily drift covered to warrant development. Most of the mines are underground, coal being mined at depths of from 100 to 200 feet. However, in a few localities the coal is sufficiently near the surface to permit the operation of small "open pit" or "stripping mines."

Coal beds ranging in thickness from a few inches to 5 feet have been reported in various parts of the Coal Basin. However, the commercial seams vary from 30 to 42 inches and to work seams less than 30 inches thick is generally not profitable, although some very small mines work seams as thin as 16 or 20 inches.

PRODUCTION AND VALUE OF COAL IN MICHIGAN 1900-1938

Year	Number Active Mines	Total Tons of Coal Mined	Total Value of Coal Mined	Average Price Received per Ton at Mine
1860-1899*		3,221,643		
1900	31	849,475	\$1,259,683	\$1.483
1901	30	1,241,241	1,753,064	1.412
1902	32	964,718	1,653,192	1.714
1903	34	1,367,619	2,707,527	1.979
1904	33	1,342,840	2,424,935	1.806
1905	38	1,473,211	2,512,697	1.705
1906	38	1,346,338	2,427,404	1.803
1907	37	2,035,858	3,660,833	1.798
1908	38	1,835,019	3,322,904	1.811
1909	36	1,784,692	3,199,351	1.793
1910	34	1,534,967	2,930,771	1.909
1911	32	1,476,074	2,791,461	1.891
1912	26	1,201,230	2,399,451	1.989
1913	24	1,231,786	2,455,227	1.993
1914	23	1,283,030	2,559,786	1.99
1915	20	1,156,138	2,372,797	2.05
1916	18	1,180,360	2,653,182	2.25
1917	22	1,374,805	4,426,314	3.22
1918	25	1,468,818	5,615,097	3.83
1919	22	996,545	3,864,228	3.87
1920	18	1,489,765	7,346,000	4.93
1921	15	1,141,715	5,555,000	4.87
1922	14	929,390	4,693,376	5.05
1923	15	1,172,075	5,545,000	4.73
1924	9	831,020	3,602,000	4.33
1925	9	808,233	3,391,000	4.20
1926	9	686,707	2,829,000	4.49
1927	8	756,763	3,262,000	4.31
1928	7	617,342	2,631,000	4.26
1929	7	804,869	2,904,000	3.61
1930	6	661,113	2,323,000	3.51
1931	6	359,403	1,094,000	3.04
1932	5	446,149	1,219,000	2.73
1933	13	406,741	1,171,000	2.88
1934	24	621,741	1,940,000	3.12
1935	25	628,384	2,017,000	3.21
1936	22	626,145	2,118,000	3.38
1937	14	562,262	(b)	(b)
1938	11	(a) 478,000	(b)	(b)

\*For annual production prior to 1900 see Publication 37, Michigan Geological Survey.  
(a) Preliminary figures, subject to correction.  
(b) Figures not available.

## CLAY PRODUCTS

### BRICK AND TILE

**B**RICK has been manufactured in Michigan since a very early date. The wide distribution of clay suitable for brick manufacture resulted in the establishment of many small independent plants scattered over the southern part of the State. In 1899 a total of 196 brick and tile plants were in operation, but practically every subsequent year showed a fewer number of plants. In 1937 only 16 plants reported production.

The most important products manufactured in Michigan are common brick, drain tile, and face brick. Other products manufactured are hollow building tile, faience tile, sewer pipe, wall coping, flue lining, fire clay, fire brick and refractory cement. The best years for production in Michigan were those just preceding the World War. Immediately after

PRODUCTION OF CLAY PRODUCTS IN MICHIGAN, 1899-1937

Year	Common Brick		Drain Tile Value	Total Value All Products
	Quantity Thousands	Value		
1899.....	200,144	\$933,176	\$140,171	\$1,254,256
1900.....	180,892	863,250	114,747	1,147,378
1901.....	215,836	1,095,254	98,972	1,497,169
1902.....	237,254	1,331,752	96,645	1,660,942
1903.....	215,791	1,251,572	129,028	1,662,414
1904.....	205,196	1,116,714	208,088	1,670,892
1905.....	211,558	1,152,505	205,445	1,719,746
1906.....	206,583	1,178,202	314,098	1,793,367
1907.....	200,817	1,181,015	289,868	1,786,190
1908.....	181,049	994,525	327,630	1,666,381
1909.....	219,820	1,250,787	364,006	1,947,059
1910.....	232,551	1,363,316	348,205	2,083,525
1911.....	252,465	1,301,998	313,072	1,953,442
1912.....	271,189	1,592,283	387,945	2,350,606
1913.....	273,571	1,626,287	415,543	2,451,242
1914.....	269,154	1,633,216	421,941	2,434,872
1915.....	277,399	1,461,188	305,156	2,248,068
1916.....	279,175	1,856,587	548,795	2,705,054
1917.....	236,612	1,882,042	734,042	2,846,264
1918.....	94,746	915,599	565,398	1,708,736
1919.....	200,352	2,734,503	737,124	3,699,929
1920.....	186,526	3,062,660	690,816	3,979,691
1921.....	193,730	2,417,809	381,507	2,915,919
1922.....	248,608	3,613,542	169,419	3,915,310
1923.....	193,350	2,775,925	337,833	3,723,018
1924.....	261,614	2,927,123	381,411	6,912,135
1925.....	260,280	3,030,809	361,130	4,237,422
1926.....	275,294	3,057,589	360,593	4,227,731
1927.....	201,143	2,305,276	393,943	3,989,726
1928.....	159,538	1,747,378	342,942	3,019,297
1929.....	153,110	1,764,400	389,474	3,076,403
1930.....	71,046	856,628	326,065	3,322,901
1931.....	(a)	(a)	(a)	(b) 3,417,585
1932.....	(a)	(a)	(a)	(b) 2,632,226
1933.....	4,276	40,215	103,763	(b) 2,657,248
1934.....	26,208	249,872	22,621	(b) 3,286,382
1935.....	39,660	320,535	132,110	(c)
1936.....	93,609	1,031,723	151,936	5,946,002
1937.....	83,917	(a)	(a)	(c)

(a) Separate figures not available.

(b) Includes pottery and porcelain and other clay products.

(c) Included in summary table under "miscellaneous."

the war production fell off sharply, but the three-year period from 1924 to 1926 showed a volume of production almost equal to the pre-war years, and the value of the products was almost double the value of the 1912 to 1916 period, owing to stimulation from all kinds of building. Following this period, however, production dropped off sharply each year beginning with 1927 and reached a low of 4,276,000 bricks in 1933. With an upturn in building, some increase has been experienced but the industry is still far below the peak years. Concrete products and other competitive materials have made serious inroads on the brick and tile industry.

### POTTERY AND PORCELAIN WARE

Several million dollars worth of porcelain and pottery products are manufactured annually in Michigan. These include spark plugs and other porcelain electrical insulating supplies, sanitary ware, art pottery and red earthenware. Clays found in Michigan are suitable for flower pots and similar red earthenware, but porcelain clay is imported from other states and foreign countries.

## SAND LIME BRICK

THE manufacture of sand lime brick was introduced into this country from Germany about 35 years ago, and Michigan very early assumed the lead in the industry. With the exception of the years marked by industrial depressions, the industry has enjoyed a general upward trend with an increasing popularity of the product. The year 1927 was a record for the industry, 112,181,000 brick valued at \$1,402,647 being produced. Beginning with 1929, however, decline was rapid and in 1934 only 5,575,000 brick were produced. Since that year business has been better but the demand has not increased sufficiently to cause a definite upward trend.

PRODUCTION OF SAND LIME BRICK IN MICHIGAN AND THE UNITED STATES  
1904-1937

Year	Number of Firms Reporting		Quantity Thousands	Value	Total Value U. S.	Rank	
	Mich.	U. S.				Production	Value
1904	10	57	9,886	\$64,034	\$463,128	1	1
1905	12	84	24,841	155,883	972,064	1	1
1906	11	87	27,281	162,879	1,170,005	1	2
1907	13	94	25,488	158,606	1,225,769	1	1
1908	10	87	21,997	131,827	1,029,699	1	1
1909	11	74	34,217	207,082	1,150,580	1	1
1910	10	76	37,648	218,627	1,169,153	1	1
1911	10	66	32,889	192,224	897,664	1	1
1912	11	71	48,129	307,106	1,200,228	1	1
1913	12	68	49,373	315,882	1,238,325	1	1
1914	12	62	41,456	248,113	1,058,512	1	1
1915	11	56	46,513	281,009	1,135,104	1	1
1916	12	53	71,116	491,866	1,474,073	1	1
1917	11	47	46,979	362,246	1,420,330	1	1
1918	7	42	22,248	195,636	883,929	1	1
1919	8	35	42,063	507,010	1,705,163	1	1
1920	8	37	38,810	632,112	2,490,283	1	1
1921	8	26	33,658	46,558	1,268,502	1	1
1922	8	33	64,650	777,693	2,471,536	1	1
1923	11	37	89,239	1,052,435	3,334,503	1	1
1924	13	42	97,828	1,175,776	3,780,639	1	1
1925	13	42	108,434	1,341,284	2,981,492	1	1
1926	12	45	112,181	1,402,647	3,645,842	1	1
1927	12	41	103,056	1,270,778	3,654,590	1	1
1928	12	40	96,511	1,107,708	2,909,635	1	1
1929	13	37	45,391	551,187	1,950,709	1	1
1930	11	31	28,819	222,223	1,236,825	1	1
1931	10	31	8,420	75,717	433,118	1	1
1932	2	10	(a)	(a)	195,318	1	1
1933	4	16	5,575	45,129	355,560	1	1
1934	4	20	10,684	91,409	554,631	1	1
1935	5	23	25,191	226,651	922,662	1	1
1936	5	23	25,191	226,651	922,662	1	1
1937	5	23	16,107	222,990	922,662	1	1

(a) Separate figures for Michigan may not be published.

## PETROLEUM AND NATURAL GAS

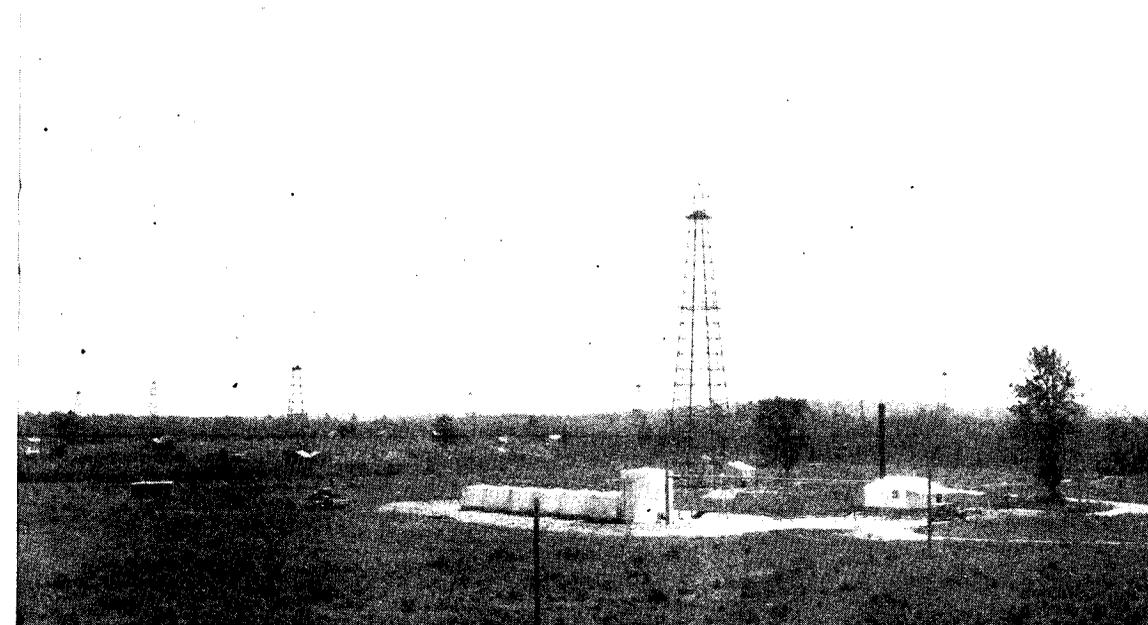
### PORT HURON FIELD

THE first commercial production of oil in Michigan was at Port Huron about 1886. The wells obtained their yield from the Dundee limestone at depths of from 500 to 650 feet and the maximum reported production was about 70 barrels per well per week. By 1920, however, production had declined to such an extent that the wells were abandoned.

### SAGINAW AND MUSKEGON FIELDS

The petroleum industry in Michigan, however, really began with the discovery of the Saginaw field in 1925. The oil is obtained from the Berea sandstone at a depth of about 1800 feet and is of very high grade. Unfortunately, a large part of the field was located in the city limits and town lot drilling resulted in too close spacing of wells which greatly shortened the life of the field. The Muskegon field discovered in December 1927 has a similar history of too rapid overdevelopment. The first production in this field was obtained from the Traverse limestone at depths of 1600 to 1700 feet but deeper drilling found larger "pays" in the Dundee limestone about 400 feet deeper.

### OIL FIELD, CLARE COUNTY



## CENTRAL MICHIGAN FIELDS

Oil and gas development in Central Michigan began with the discovery of oil in Greendale township, Midland County, about 10 miles east of Mt. Pleasant, in February 1928. Subsequently many pools were discovered in Midland, Isabella, Gratiot, Montcalm, Mecosta, Clare and Gladwin counties. Among the more important pools are the Porter, Yost-Jasper, and Edenville fields in Midland County, the Mt. Pleasant, Sherman, Leaton, and Vernon pools in Isabella County, the Buckeye, Bentley, and Beaverton pools in Gladwin County, the Van Horn pool in Clare County, and the Crystal pool in Montcalm County. The Central Michigan fields also include the larger gas pools near Clare, Clare County, Six Lakes, Montcalm and Mecosta counties, Broomfield township, Isabella County, the Austin field near Big Rapids, Mecosta County, and the Shaver field near Sumner, Gratiot County. Although large amounts of natural gas are produced from oil wells, the principal gas fields of the State derive their yield from the Michigan "stray sand" which is about 2000 feet higher than the Dundee limestone which produces most of the oil. In the Ravenna gas pool, Muskegon County, the production is from a geologic formation at the approximate position of the Berea sandstone from which oil is produced in Saginaw County.

## OGEMAW AND ARENAC FIELDS

The Ogemaw and Arenac fields are the most northerly commercial pools in the State. The Ogemaw field is located in and near the City of West Branch and is noteworthy for having the longest "axis" of any Michigan field—approximately 10 miles. The Arenac fields are located southeastward from the West Branch field and on the same structural trend in Clayton and Adams townships.

## SOUTHWESTERN MICHIGAN

In 1937 and 1938 important new fields were opened in Allegan and Van Buren counties. The oil producing <sup>Travers</sup> limestone is found at depths of from 900 to 1600 feet in these counties owing to rise of the strata toward the margins of the State. Drilling costs are therefore much less than in the Central Michigan fields where the wells are about 3500 feet in depth. One of the most prolific of the Southwestern pools at Bloomingdale, Van Buren County, is subject to town lot drilling which caused the rapid decline of the Saginaw and Muskegon fields. Legislation has recently been enacted which will control spacing of wells in pools which extend under villages or cities.

## SOUTHEASTERN MICHIGAN

For several years a small amount of oil has been produced in Monroe County near the village of Deerfield. The oil is from the Trenton limestone, which owing to the rise of the beds, is found at a depth of about 2000 feet. In the Central Michigan fields the Trenton limestone apparently is at a depth of approximately 8,000 feet below the surface.

## OTHER FIELDS

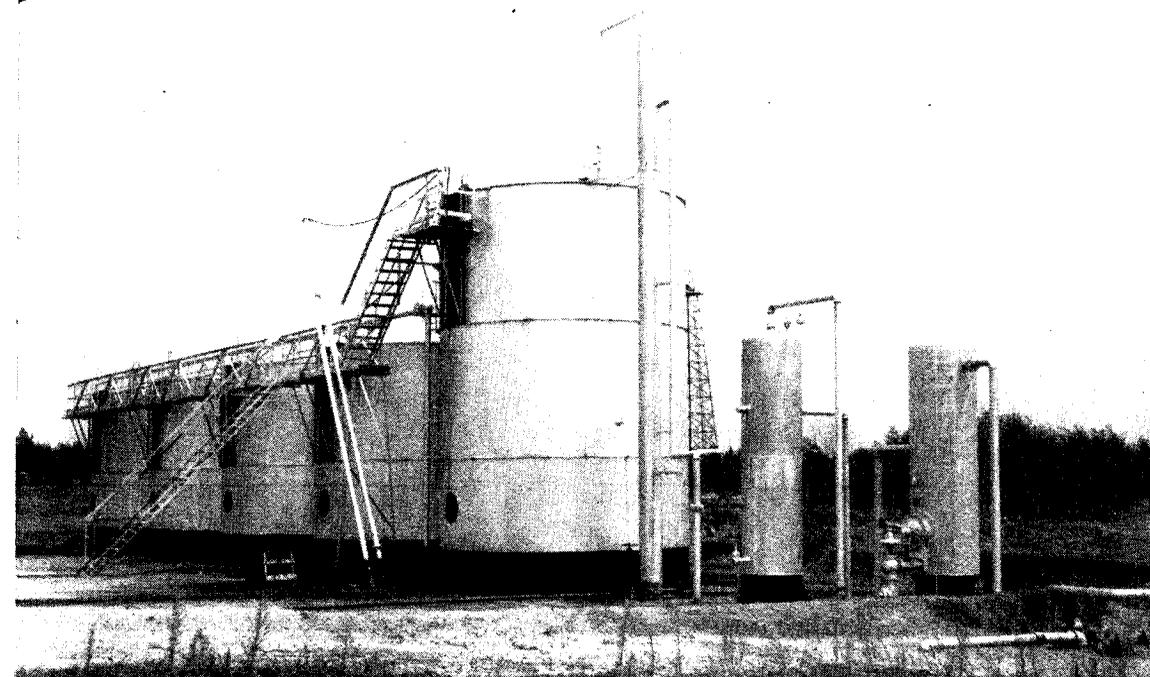
Other oil pools which have not been developed are located in Bay, Tuscola, and Kent counties<sup>1</sup>. A complete record of all fields and pools and their total production through 1938 is given in the accompanying table.

## PRODUCTION AND MARKETS

In 1938 Michigan produced 18,774,709 barrels of crude oil valued at \$19,213,320. This was a record for Michigan oil production and in that year petroleum led all other mineral products of the State in value. The record was made possible, however, by the stagnation of iron ore shipments in 1938. The value of oil marketed in 1938 was less than for 1937

<sup>1</sup>In 1939 Kent County became one of the most important oil producing areas in the State.

MODEL OIL STORAGE PLANT WITH GAS SEPARATORS AND FIRE-WALL, CLARE COUNTY



when better prices prevailed and the industry reached a record value of \$21,678,936.

Twenty-one oil refineries in Michigan process about one-half of the state's production of crude oil. An 8-inch pipe line to Toledo has a capacity of 25,000 barrels daily and additional Michigan crude is shipped

OIL FIELDS OF MICHIGAN

Field or Pool	County	First Production Year	Total Production to Jan. 1, 1939
Saginaw	Saginaw	1925	1,303,182
Muskegon	Muskegon	1927	6,569,200
Mt. Pleasant	Isabella—Midland	1928	20,254,050
Leaton	Isabella	1929	2,449,889
Vernon	Isabella	1930	3,780,937
Porter	Midland	1931	27,972,618
Yost	Midland	1932	5,005,975
Ogemaw	Ogemaw	1933	3,059,767
Edmore	Montcalm	1933	363,243
Birch Run	Saginaw	1934	156,200
Broomfield-Sherman	Isabella	1934	2,706,643
Beaverton	Gladwin	1935	520,833
Mount Haley	Midland	1935	25,133
Crystal	Montcalm	1935	6,865,265
Geneva	Midland	1935	52,672
Larkin	Midland	1935	6,248
Deerfield	Monroe	1935	24,071
Hushnell	Montcalm	1936	4,035
Buckeye (South)	Gladwin	1936	2,976,025
South Beaverton	Gladwin	1936	35,288
Currie	Isabella	1936	125,156
Clayton	Arenac	1936	2,159,010
Winfield	Montcalm	1936	7,139
North Buckeye	Gladwin	1937	10,848,111
Salem	Allegan	1937	1,337,717
Fremont	Saginaw	1937	1,076
Adams	Arenac	1937	66,758
Bentley	Gladwin	1937	225,341
Secord	Gladwin	1937	7,745
Lakefield	Saginaw	1937	1,357
Allegan	Allegan	1938	574
Trowbridge	Allegan	1938	8,184
Edenville	Midland	1938	603,918
Kawkawlin	Bay	1938	7,744
Pine	Montcalm	1938	8,016
Monterey	Allegan	1938	220,997
Dorr	Allegan	1938	127,332
Fremont	Isabella	1938	2,771
Clare	Clare	1938	2,879
Akron	Tuscola	1938	3,484
Diamond Springs	Allegan	1938	445,474
Van Horn	Clare	1938	873,682
Bloomington	Van Buren	1938	514,108
Overisel	Allegan	1938	142,966
Wise	Isabella	1938	8,946
Otsego	Allegan	1938	134
Monterey Sec. 24	Allegan	1938	176
Van Buren	Mid Lake	1938	8,246
Columbia	Allegan	1938	1,957
Walker	Kent	1938	995
New Salem	Allegan	1938	698
Other Pools, production discontinued, (Cass, Shiawassee, Oceana, Mason, Saginaw, Bay, Tuscola)			124,886
Total Michigan production to January 1, 1939			102,019,371

to points out of the State by lake carrier from Bay City and in railway tank cars and truck trailer tanks.

Natural gas produced in Michigan in 1938 amounted to 9,232,509,000 cubic feet valued at \$1,229,770. A number of the larger cities of the State, including Lansing, Grand Rapids, Saginaw, Bay City and Muskegon, and many smaller cities are served with Michigan natural gas.

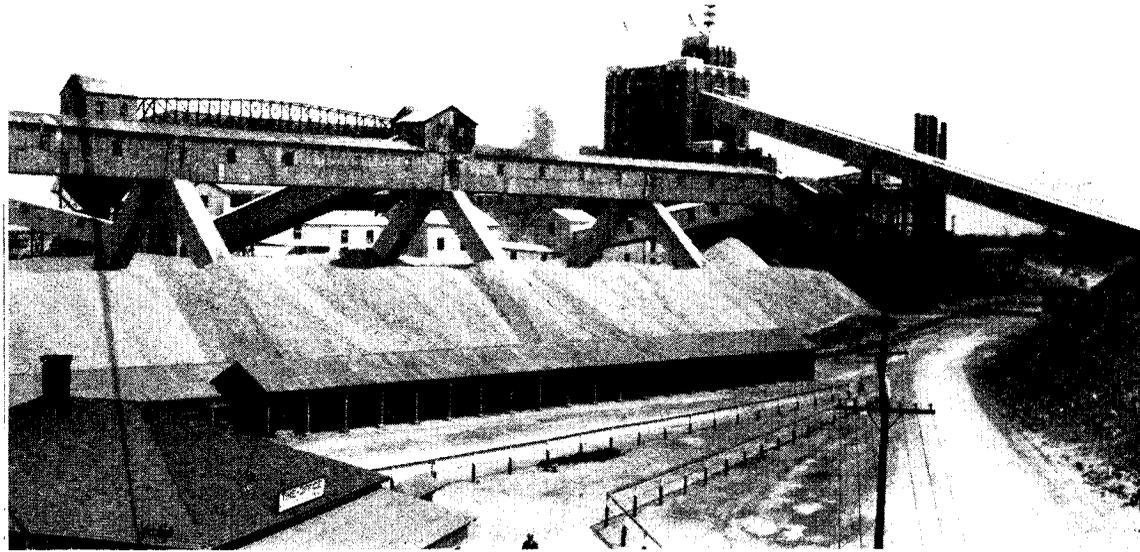
PRODUCTION AND VALUE OF PETROLEUM AND NATURAL GAS IN MICHIGAN

1925-1938

Year	Petroleum		Natural Gas	
	Barrels	Value	M. Cu. Ft.	Value
1925	4,000	\$10,000	*	*
1926	94,000	253,000	*	*
1927	435,928	828,263	*	*
1928	592,620	920,000	469,000	\$60,970
1929	4,641,293	6,312,158	4,526,000	510,256
1930	3,928,229	5,074,465	2,075,000	310,965
1931	3,785,633	2,786,022	594,363	37,082
1932	6,925,665	4,987,418	1,433,159	135,454
1933	7,941,995	7,223,396	1,697,628	157,543
1934	10,602,759	10,818,053	3,008,085	327,094
1935	15,776,237	16,327,183	4,203,000	547,695
1936	11,918,013	15,772,949	7,167,000	838,893
1937	16,628,344	21,678,936	9,310,844	1,255,258
1938	18,744,709	19,213,320	9,232,509	1,229,770

NOTE: Production statistics supplied by F. R. Frye, Petroleum Engineer, Lee S. Miller, Gas Engineer, Department of Conservation, and C. K. Wirth, Gas Engineer, Michigan Public Service Commission. Value oil 1925 to 1930 inclusive computed from average price per barrel as reported to U. S. Bureau of Mines. Value of combined oil and gas production 1930 to 1938 inclusive obtained from records of Michigan State Tax Commission. Value of natural gas computed at \$0.15 per thousand cubic feet for dry gas, and \$0.055 for casing head gas, except value of gas from Muskegon field in 1928, 1929, and 1930 computed from information supplied by Michigan Pipe Line Company, Michigan Consolidated Gas Company, West Michigan Consumers Company, and Continental Motors Corporation.

\*Small amounts of natural gas were produced for many years prior to 1928. See Publication 32 and other publications of the Michigan Geological Survey.



A MODERN LIMESTONE PLANT, ROGERS CITY, MICHIGAN

## STONE

### LIMESTONE AND DOLOMITE

**L**IMESTONE is by far the most important type of crushed stone produced in Michigan. Large deposits of high grade limestone are at the surface in Alpena, Presque Isle, Cheboygan, Emmet, Charlevoix, Mackinac, and Schoolcraft counties, and similarly extensive belts of pure dolomite are in Chippewa, Mackinac, and Schoolcraft counties. Limestone and dolomite beds of lesser importance are found in Arenac, Huron, Wayne, Monroe, and Eaton counties in the southern part of the State. Quarries are in operation at Alpena, Alpena County; Rogers City and Presque Isle, Presque Isle County; Petoskey, Emmet County; Bayport, Huron County; Monroe, Monroe County; Sibley, Wayne County; and in the Northern Peninsula at Ozark and Hunt Spur, Mackinac County; Groos, Delta County; Randville and Felch, Dickinson County. Practically all limestone quarried in Michigan is sold in the crushed state, but small amounts of slab stone are used for building purposes.

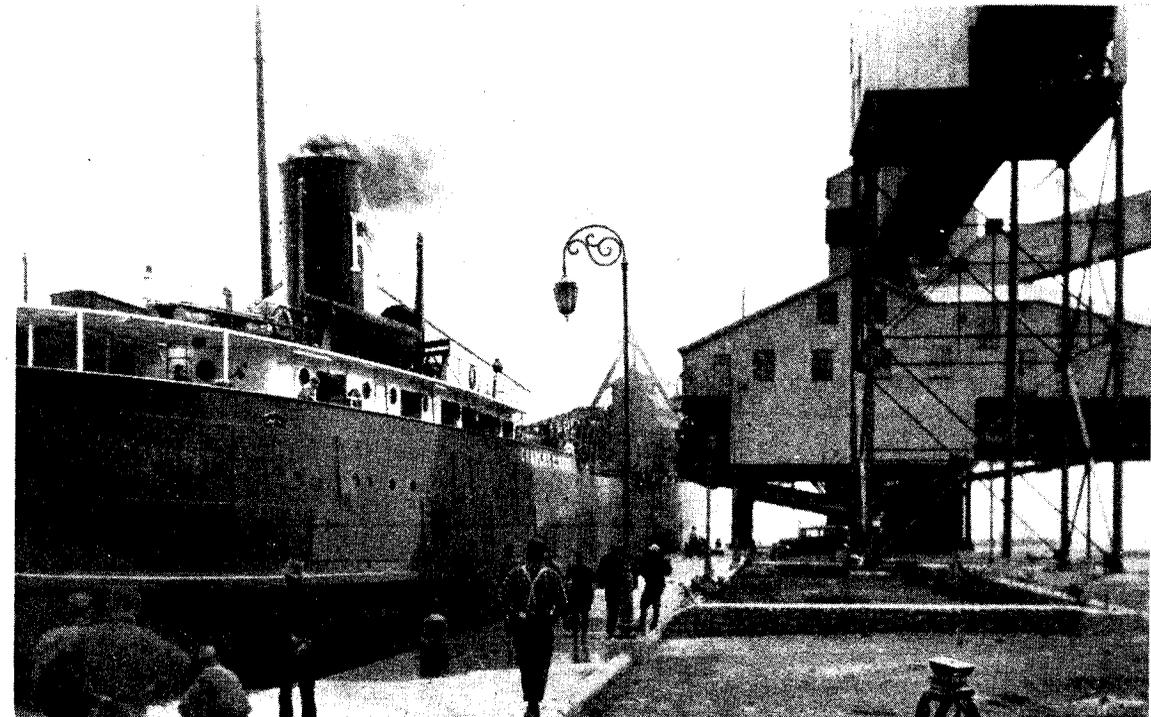
The high purity of many of the Michigan limestones especially adapts them for use as blast furnace flux and for chemical purposes. Since

approximately fifty percent of Michigan limestone is sold for flux, the limestone industry in Michigan generally reflects the condition of the steel industry. An additional large quantity of limestone is used in the manufacture of alkalies, calcium carbide, portland cement, and for various other chemical uses.

In 1935 Michigan attained first rank among the states in tonnage of limestone quarries but in 1936 and 1937 production in Pennsylvania was slightly greater. In 1938 Michigan dropped to fifth position due to the slump in the steel industry.

The location of large deposits of very pure limestone near the shores of the Great Lakes with resulting low cost shipments to steel mills, accounts for Michigan's high position in the stone industry. The year 1929 was a record year in the stone industry for Michigan, 13,572,010 tons valued at \$8,425,261 being produced. In that year the value of stone produced was slightly greater than the value for salt, the first time that any non-metallic mineral out-ranked salt in value in Michigan.

SELF UNLOADING LIMESTONE FREIGHTER

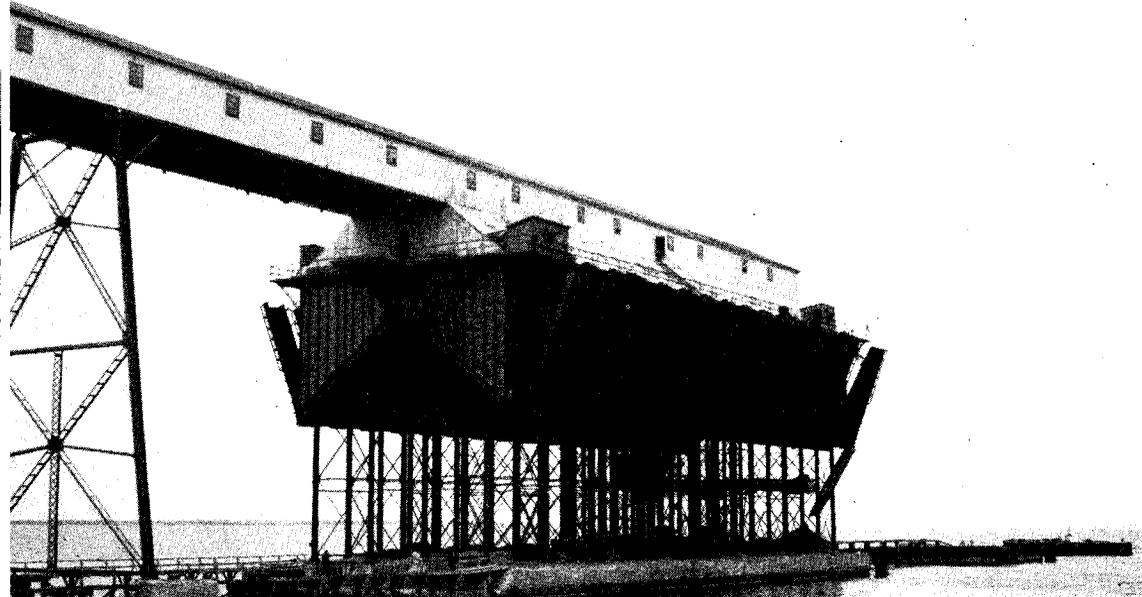


PRODUCTION AND VALUE OF LIMESTONE IN MICHIGAN, 1934-1938  
(By Uses)

Year	Road Metal, Concrete and Railroad Ballast		Furnace Flux		Alkali Works	
	Tons	Value	Tons	Value	Tons	Value
1934.....	576,170	\$381,477	2,739,350	\$1,482,139	2,369,806	\$1,108,427
1935.....	869,470	429,433	3,778,300	1,875,801	2,679,232	1,300,382
1936.....	1,418,750	768,141	5,459,410	2,683,006	2,860,167	1,235,600
1937.....	1,305,680	946,579	7,076,240	3,411,390	3,034,356	1,356,104
1938.....	2,155,900	1,041,611	2,584,220	1,223,819	2,198,000	954,868
	Agriculture		Other Uses*		Total Stone	
1934.....	35,260	\$29,545	793,904	\$607,985	6,514,590	\$3,608,543
1935.....	67,310	37,103	831,118	517,196	8,175,430	4,159,915
1936.....	73,700	42,104	591,303	415,845	10,403,430	5,144,696
1937.....	79,110	57,612	608,584	493,320	12,103,970	6,265,005
1938.....	108,130	71,454	479,180	337,653	7,522,830	3,626,473
	Rank of State					
	Tons		Value			
1933.....	3		6			
1934.....	1		4			
1935.....	2		6			
1936.....	2		5			
1937.....	2		5			
1938.....	5		6			

\*Includes stone sold for riprap, crib fill, rough construction, glass, paper and sugar manufacture, calcium carbide, paint and asphalt filler, art stone, poultry grit, dolomite for refractory purposes.

BINS AND CHUTES FOR LOADING LAKE FREIGHTERS, ROCKPORT, MICHIGAN



PRODUCTION AND VALUE OF LIMESTONE IN MICHIGAN, 1899-1938

Year	Total		Year	Total	
	Tons	Value		Tons	Value
1899.....		\$281,769	1919.....	7,186,760	\$3,797,522
1900.....		330,847	1920.....	9,766,550	5,943,229
1901.....		429,771	1921.....	5,395,780	3,387,722
1902.....		413,148	1922.....	7,646,550	4,533,998
1903.....		390,473	1923.....	10,589,070	5,848,649
1904.....		501,708	1924.....	9,901,910	5,578,642
1905.....		544,754	1925.....	11,460,000	6,327,634
1906.....		656,269	1926.....	10,788,740	6,411,828
1907.....		760,333	1927.....	11,335,780	6,243,751
1908.....		669,017	1928.....	12,381,240	7,407,149
1909.....		750,589	1929.....	13,572,010	8,425,261
1910.....		842,126	1930.....	10,432,950	6,596,713
1911.....		1,005,751	1931.....	6,059,770	3,805,607
1912.....		1,139,560	1932.....	3,592,020	1,918,556
1913.....		1,408,703	1933.....	5,634,520	2,972,761
1914.....		1,457,961	1934.....	6,514,590	3,608,543
1915.....		1,828,766	1935.....	8,175,430	4,159,915
1916.....		2,389,763	1936.....	10,403,430	5,144,696
1917.....		3,320,895	1937.....	12,103,970	6,265,005
1918.....		5,186,867	1938.....	7,522,830	3,626,473

SANDSTONE

The quarrying of red sandstone was formerly of importance at Jacobsville, Houghton County, and the stone was shipped to many cities in the Great Lakes region. Brown sandstone was quarried at Marquette, Marquette County. In the Southern Peninsula an attractive white, red, brown and purple mottled sandstone was formerly quarried near Ionia, Ionia County. The gray and greenish Marshall sandstone was quarried at many places in Jackson, Calhoun, Hillsdale, Huron and Ottawa counties.

At the present time the only sandstone quarried in Michigan is produced from small quarries in the Marshall formation near Battle Creek, Calhoun County, and Napoleon, Jackson County. The stone is used in house construction and is laid flat for walls or on edge as a veneer. The post office at Marshall is an example of recent use of this material in a larger building. Some of the beds in the vicinity of Marshall and Battle Creek contain considerable pyrite and the greenish color after a few years weathers to yellow and rusty brown shades. Other beds contain little or no pyrite and the original color lasts longer but eventually weathers to a dark gray. Some recently uncovered beds near Battle Creek contain considerable lime carbonate and are of an attractive bluish color. The value of sandstone produced in Michigan is included with "miscellaneous stone" in the summary tables.

TRAP ROCK AND QUARTZITE

In the western part of the Northern Peninsula a considerable quantity of "trap rock" is quarried annually. The term "trap rock" includes several varieties of stone. In Houghton, Keweenaw and Gogebie counties

it is the amygdaloidal basalt which contains native copper. In the vicinity of Marquette, Ishpeming and Negaunee the "trap" may be altered gabbro, (the so-called diorite), diabase or quartzite. Much of the production of these miscellaneous types of rock is used by cities and counties for road and street work but some is produced commercially for railroad ballast and roofing granules.

### MARBLE AND VERDE ANTIQUE

A dolomitic marble is quarried near Randville and Felch, Dickinson County, for use in art stone, for bird gravel, and for paint filler. The stone is generally pure white and coarsely crystalline in texture, but some of the material is bluish gray in color. Concentrations of a fibrous mineral known as actinolite impart a bright green hue to some portions of the stone. Although the Randville and Felch marble is very attractive in appearance, large blocks of stone, needed if the material is to be valuable for construction purposes, cannot be easily obtained because geologic processes have shattered the stone. Further quarrying may reveal a less shattered zone.

North of Ishpeming are deposits of serpentine or "Verde Antique" marble. This stone is dark green with white streaks and is very beautiful when polished. It appears to be equal to most of the serpentine marble now on the market. The Ishpeming deposit was formerly worked for the production of crushed material for terrazzo and stucco but no polished slabs have been marketed although borings and experimental work has demonstrated the possibility of obtaining sound blocks of stone suitable for ornamental building use.

### SLATE

About 40 years ago the quarrying of slate was a thriving industry at Arvon, Baraga County. The slate was sold for roofing purposes and was said to compare favorably with slate from eastern quarries.

Slate of roofing quality is known to be present in Iron County and probably similar deposits are in other areas of the Northern Peninsula. No slate is produced in Michigan at the present time.

### GRANITE

Quarries for granite have never been opened in Michigan. An unaltered porphyritic granite almost identical in appearance with varieties in common use for the lower courses of large buildings outcrops in the vicinity of Republic, Marquette County.

### SAND AND GRAVEL

The sand and gravel industry naturally received tremendous impetus in the decade following the war, owing to the great volume of construction in cities and the extensive highway programs. Prior to 1926 building in cities constituted a larger market than road making, but subsequent to 1926 the road construction market has been considerably more important than the city building trade.

Prior to 1920 the record production for sand and gravel was attained in 1913 when 6,422,818 tons valued at \$1,528,892 were produced. Production decreased during the war but subsequently a gradual increase was noted to 1923, when the production jumped to 9,601,562 tons, an increase of 60 percent over the preceding year. By 1926, in which year the State launched an extensive program of concrete road construction, the production increased to 14,398,338 tons, and sand and gravel were exceeded only by salt in value among the non-metallic minerals. This large production placed Michigan in third position among the states in quantity of sand and gravel produced. The production continued to increase through 1929, when a record of 16,884,099 tons was reported.

Since a large percentage of all sand and gravel produced is used for concrete aggregates, the sand and gravel industry naturally parallels the cement industry quite closely. Oakland, Kent, Ottawa, Livingston, Manistee, Muskegon and Osceola counties are the largest producers of sand and gravel in the Southern Peninsula. Oakland County, with more than 2,000,000 tons in 1937, was by far the largest producer. In the Northern Peninsula the chief centers of production are at Champion, Marquette County; Beechwood, Iron County; Loretto, Dickinson County; and Groos, Delta County. Considerable sand and gravel is produced from the Great Lakes and connecting waters on leases issued by the State Conservation Department. Lake St. Clair and the St. Clair River are the most important areas.

Michigan ranks first in production of foundry sand, most of which is produced from sand dune areas along Lake Michigan. Michigan is an important producer of glass sand. The glass sand deposits are located in Monroe and Wayne counties. The sand is pure white and when washed is more than 99% pure silica.

PRODUCTION AND VALUE OF SAND AND GRAVEL IN MICHIGAN, 1934-1938

(By Uses)

SAND

Year	Foundry Sand		Building Sand		Paving and Road Making Sand		*Other Sand	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
1934	522,544	\$163,975	321,533	\$119,612	607,429	\$241,451	249,115	\$254,275
1935	920,616	317,332	428,831	130,326	625,159	233,251	289,478	310,281
1936	1,318,607	472,728	891,283	299,670	1,063,454	401,270	389,558	315,584
1937	1,304,303	513,169	897,512	274,803	1,098,886	366,043	393,560	312,539
1938	471,680	160,880	899,556	282,616	1,320,311	465,593	257,419	264,556

GRAVEL

Year	Building Gravel		Paving and Road Making Gravel		Railroad Ballast and Other Gravel		Total Sand and Gravel	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
1934	348,766	\$207,435	3,120,710	\$1,122,246	231,974	\$98,844	5,432,071	\$2,197,838
1935	474,499	288,606	3,574,972	1,461,239	278,193	112,996	6,591,748	2,794,031
1936	719,122	389,934	5,902,919	2,244,820	577,908	186,925	10,862,851	4,310,931
1937	1,154,455	608,181	5,700,734	2,200,308	357,698	155,541	10,987,148	4,430,584
1938	1,170,622	566,026	5,474,891	1,911,809	226,819	82,524	9,821,298	3,734,012

\*Glass sand, cutting and grinding, blast sand, furnace and engine sand, filter sand, railroad ballast and fill material.

PRODUCTION AND VALUE OF SAND AND GRAVEL IN MICHIGAN, 1905-1938

Year	Total Sand and Gravel		Rank	
	Quantity Tons	Value	Quantity Tons	Value
1905	414,509	\$210,609	10	11
1906	597,789	197,699	12	13
1907	1,024,641	289,595	10	11
1908	842,591	370,365	7	9
1909	2,219,757	685,632	7	8
1910	2,862,738	816,337	7	8
1911	2,185,165	565,969	9	10
1912	2,681,821	818,603	9	8
1913	6,422,818	1,528,892	4	5
1914	3,757,979	1,143,771	7	7
1915	3,776,726	1,036,739	7	7
1916	4,407,475	1,295,717	6	7
1917	3,814,445	1,641,748	6	6
1918	2,837,371	1,239,874	6	9
1919	3,772,535	1,944,143	6	7
1920	4,386,582	2,867,466	6	6
1921	5,515,253	2,916,917	4	6
1922	5,962,916	3,222,043	5	6
1923	9,601,562	5,096,071	5	5
1924	11,381,084	5,975,757	5	5
1925	10,878,375	5,684,474	6	5
1926	14,398,338	7,265,161	3	5
1927	15,419,499	7,800,541	3	6
1928	15,893,090	6,828,431	4	6
1929	16,844,099	7,928,744	3	6
1930	11,389,119	5,161,176	6	7
1931	8,164,571	3,361,729	7	9
1932	5,468,663	2,291,106	6	8
1933	4,619,223	1,805,360	8	7
1934	5,432,071	2,197,838	5	7
1935	6,591,748	2,794,031	5	8
1936	10,862,851	4,310,931	4	7
1937	10,987,148	4,430,584	4	7
1938	9,821,298	3,734,012	4	7

## MISCELLANEOUS MINERALS AND MINERAL PRODUCTS

**M**ISCELLANEOUS minerals and mineral products regularly or intermittently produced in Michigan are graphite, iron ore for paint, manganese iron ore, mineral waters, marl, peat, coke, pig iron, gold and silver. Where possible to disclose figures, the production and value of these minerals will be found in the summary table; otherwise they are included under "Miscellaneous." Considerable quantities are produced of **mineral waters**, but no canvass is made of production and value. The value for **pig iron** is not included in the total value of mineral production in the State, as this would result in duplication of figures, most of the iron manufactured being made from iron ore mined in the State. **Coke** produced in Michigan is made entirely from coals mined in other states. **Silver** is associated with native copper. Small amounts of **gold** were produced in Michigan in 1933, 1934 and 1937 as a result of exploratory and development work in some of the old gold mines near Ishpeming.<sup>1</sup> At the old Michigan mine a new shaft was sunk, machinery installed and milling operations carried on in 1937. The venture was a failure, however, and the mine closed down. **Mineral wool** is manufactured at three plants but production figures are not yet available. The raw materials are blast furnace slag and limestone. Michigan has large deposits of "woolrock" suitable for the manufacture of mineral wool.

### OTHER MINERALS (No production)

**Feldspar** of commercial grade has been mined near Republic, Marquette County. Small concentrations of **talc** and **asbestos** are found near Ishpeming. Various kinds of **gem stones** are found on Isle Royale. Strontium bearing minerals are present in quarries in Wayne and Monroe counties.

<sup>1</sup>See Publication 8, Michigan Geological Survey, for a history of gold mining in Michigan.

SUMMARY TABLE OF PRODUCTION AND VALUE OF MINERALS AND MINERAL PRODUCTS IN MICHIGAN

	1934		1935		1936		1937		1938	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	*Value
Cement, barrels shipped.....	3,965,331	\$5,920,214	4,325,134	\$5,971,720	7,960,821	\$10,482,835	7,831,880	\$9,836,999	7,192,511	\$8,767,859
Clay products.....	a3,286,382	1,940,000	628,384	2,017,000	626,145	2,118,000	652,262	1,557,476	#453,605	1,633,997
Coal, tons.....	2,547,747	d14,348,536	2,432,302	d14,125,590	2,293,653	d13,738,700	2,283,518	d13,816,401	1,742,787	d10,135,722
Coke, tons.....	48,215,859	3,857,269	64,108,689	5,321,021	95,968,019	8,829,058	94,928,000	11,386,288	94,075,588	9,310,765
Copper, pounds.....	2,049	b	2,049	b	2,049	b	2,049	b	2,049	b
Gold, ounces.....	281,033	2,469,222	342,989	1,339,659	496,611	1,479,375	553,242	1,896,947	483,324	1,775,908
Gypsum, tons.....	5,497,953	15,646,165	7,235,698	20,788,153	10,491,270	30,721,075	12,626,935	41,136,292	4,092,292	13,139,823
Iron ore, long tons shipped.....	644,895	d9,987,451	781,458	d12,225,499	873,341	d13,585,519	886,602	d15,064,083	558,782	d9,806,994
Iron, pig, long tons sold.....	32,814	b	35,401	260,097	40,090	286,348	48,310	351,681	45,818	339,324
Lime, tons sold.....	6,514,590	3,608,543	8,175,430	1,159,915	10,403,430	5,144,696	12,103,970	6,265,005	7,522,830	3,626,473
Limestone, tons.....	4,249,838	b	4,241,218	b	3,903,312	b	4,539,980	b	4,819,617	b
Manganese, pounds.....	3,008,085	327,094	4,203,000	16,140	9,627	29,775	9,739	32,442	16,057	1,229,170
Manganese ore, tons.....	10,602,759	10,818,053	15,776,237	547,695	7,167,000	838,893	9,310,844	1,255,258	9,232,509	1,229,170
Natural Gas, M cu. ft.....	15,088,357	5,470,684	15,201,221	10,997	2,015,000	d106,000	2,408,081	d102,599	2,408,000	103,000
Natural gasoline, gallons.....	5,432,071	2,197,838	5,000	10,997	5,489	40,295	5,276	28,832	5,117	28,138
Peat, tons.....	5,575,000	45,129	10,684,000	3,032	25,191,000	256,651	10,987,148	4,430,584	9,821,298	3,734,012
Petroleum, barrels.....	107,113	119,363	60,390	e168,687	286,980	e247,093	25,454	19,689	93,634	60,531
Salt, barrels.....	10,602,759	10,818,053	15,776,237	547,695	7,167,000	838,893	9,310,844	1,255,258	9,232,509	1,229,170
Sand and gravel, tons.....	5,432,071	2,197,838	5,000	10,997	5,489	40,295	5,276	28,832	5,117	28,138
Sand lime brick, number.....	5,575,000	45,129	10,684,000	3,032	25,191,000	256,651	10,987,148	4,430,584	9,821,298	3,734,012
Silver, ounces.....	107,113	119,363	60,390	e168,687	286,980	e247,093	25,454	19,689	93,634	60,531
Stone other than limestone.....		f4,073,077		f8,500,825		f6,462,687		f12,101,434		e438,019
Miscellaneous.....										10,264,719
Total Value.....		\$60,021,605		\$72,655,100		\$97,819,381		\$118,009,512		\$78,844,816

\*1938 figures are preliminary and subject to revision.

a—Includes brick and tile, pottery and porcelain ware.

b—Included under miscellaneous.

c—Figures supplied by National Bituminous Coal Commission.

d—Value not included in total for State.

e—Includes trap rock, sandstone, quartzite, granite, slate.

f—Includes bromine, calcium chloride, magnesium metal, and magnesium salts, graphite, raw clay.

g—Figures supplied by Michigan Department of Labor and Industry.

h—Value crude gypsum mined.

**DIRECTORY OF THE PRODUCERS OF MINERALS AND MINERAL PRODUCTS IN MICHIGAN IN 1938 AND 1939**

**BRICK AND TILE MANUFACTURERS, 1939**

County	Operator	Office	Works
Eaton	American Vitrified Products Co.	Akron, Ohio	Grand Ledge
Eaton	Grand Ledge Clay Products Co.	Grand Ledge	Grand Ledge
Eaton	Grand Ledge Face Brick Co.	Grand Ledge	Grand Ledge
Gratiot	Riverside Brick & Tile Yard	Sumner	Sumner
Gratiot	St. Louis Clay Products Co.	St. Louis	St. Louis
Ingham	Michigan Clay Products Corp.	Williamston	Williamston
Lenawee	Comfort Brick & Tile Co.	Tecumseh	Tecumseh
Macomb	Trombley Brick Co.	6660-14 Mile Road	Warren
Saginaw	Miller City Tile Co.	Findlay, Ohio	Saginaw
Shiawassee	New Corunna Brick Co.	Corunna	Corunna
Wayne	Flat Rock Clay Products Co.	Flat Rock	Flat Rock
Wayne	Clippert Brick Co.	Wyoming and Southern	Detroit
Wayne	Jacob Daniel Brick Co.	4791 Wyoming	Dearborn
Wayne	John S. Haggerty	10450 Michigan, Detroit	Dearborn
Wayne	J. A. Mercier Products Co.	3895 Raulo	Dearborn
Wayne	Pewabic Pottery	10125 E. Jefferson	Detroit

**BRICK (Sand Lime) MANUFACTURERS, 1939**

County	Operator	Office	Works
Huron	Sebewaing Sandstone Brick Co.	Sebewaing	Sebewaing
Kent	Grande Brick Co.	1456 Fuller	Grand Rapids
Oakland	Boice Brothers	545 Telegraph Road	Pontiac
Saginaw	Saginaw Brick Co.	321 N. Hamilton	Saginaw
Wayne	Michigan Pressed Brick Co.	Lawton at M.C.R.R.	Detroit
Wayne	Brick & Block, Inc.	45 St. Jean Ave.	Detroit
Wayne	Genesee Brick Co.	Flint	Flint

**CEMENT MANUFACTURERS, 1938**

Company	Office	Works
Aetna Portland Cement Co.	2349 Union Guardian Bldg., Detroit	Bay City and Fenton
Consolidated Cement Corp.	Cement City	Cement City
Huron Portland Cement Co.	1325 Ford Bldg., Detroit	Alpena and Wyandotte
Peerless Cement Corp.	1144 Free Press Bldg., Detroit	Detroit and Port Huron
Petoskey Portland Cement Co.	Petoskey	Petoskey
Wolverine Portland Cement Co.	5 So. Monroe St., Coldwater	Coldwater and Quincy
Ford Motor Company	Dearborn	Dearborn

**CLAY PRODUCERS, 1938**

County	Operator	Office	Pit
Eaton	Grand Ledge Clay Products Co.	Grand Ledge	Grand Ledge
Ontonagon	Emmond Estate	Rockland	Rockland
Ontonagon	Robinson Clay Products Co.	Akron, O., 1100 2d Nat. Bank Bldg.	Rockland

**COAL MINES OPERATING IN 1939**

Location of Mine County	Operator—Name of Mine	Office
Bay	Monitor Coal Co.	Bay City, R.F.D. 4
Bay	New Michigan Coal Co.	Bay City, R.F.D. 4
Saginaw	Aurora Coal Co.	St. Charles
Saginaw	Chippewa Coal Co.	317 Lyon St., Saginaw
Saginaw	Saginaw Mining Co.	R.F.D. 3, Saginaw
Saginaw	St. Charles and Chesaning Coal Co.	St. Charles
Shiawassee	Magda Coal Mining Co.	R.F.D. 6, Owosso
Shiawassee	Tri-Parti Coal Mining Co.	340 W. First St., Flint
Shiawassee	Consolidated Coal Co., Crapo Mine	Saginaw
Tuscola	Robert Gage Coal Co., Mine No. 10	Bay City

**COKE PRODUCERS, 1938**

County	Operator	Office	Location of Plant
Calhoun	Battle Creek Gas Co.	Battle Creek	Battle Creek
Saginaw	Consumers Power Co.	Jackson	Flint, Jackson, Kalamazoo, Pontiac, Zilwaukee
Wayne	Ford Motor Company	Dearborn	Detroit (Rouge Plant)
Wayne	Michigan Alkali Co.	Wyandotte	Wyandotte
Wayne	Semet-Solvay Company	61 Broadway, New York City	Detroit

**COPPER MINING COMPANIES, 1939**

Operator	Location of Mine	Address
Calumet & Hecla Consolidated Copper Co.	Calumet, Ahmeek, Rockland, (Reclamation at Lake Linden)	Calumet
Copper Range Company	Painesdale	Painesdale
Isle Royale Copper Co.	Houghton	Houghton
Quincy Mining Company	Hancock	Hancock

**PRODUCERS OF GYPSUM AND GYPSUM PRODUCTS, 1938**

Operator	Office	Mine or Quarry	Mill
Certainfeed Products Corp.	104 E. 42d St., New York	Grand Rapids	Grand Rapids
Grand Rapids Plaster Co.	1204 Grand Rapids Savings Bk. Bldg., Grand Rapids	Grand Rapids	Grand Rapids
Michigan Gypsum Co.	Grand Rapids	Grand Rapids	Grand Rapids
National Gypsum Co.	192 Delaware, Buffalo, N. Y.	National City	National City
U. S. Gypsum Co.	300 W. Adams, Chicago	Alabaster	Detroit

IRON MINING COMPANIES, 1939

Operator	Location of Mines	Address
Cleveland Cliffs Iron Co.	Negaunee, Ishpeming, Iron River, Palmer	Cleveland, Ohio
Davidson Ore Mining Co.	Iron River	Buffalo, N. Y.
Globe Iron Co.	Iron Mountain	Jackson, Ohio
M. A. Hanna Co.	Iron River, Palmer, Stambaugh and Wakefield	Cleveland, Ohio
Inland Steel Co.	Ishpeming	Chicago, Ill.
Jackson Iron & Steel Co.	Iron Mountain	Jackson, Ohio
North Range Company	Ishpeming, Iron River	Negaunee
Oglebay Norton & Co.	Ramsay	Cleveland, Ohio
Oliver Iron Mining Co.	Bessemer, Ishpeming	Duluth, Minn.
Pickands, Mather & Co.	Ironwood, Bessemer, Palmer, Stambaugh, Iron River, Wakefield	Cleveland, Ohio
Republic Steel Corporation	Negaunee, Crystal Falls, Bessemer and Ironwood	Cleveland, Ohio

IRON (PIG) PRODUCERS, 1938

Operator	Office	Location of Furnace
Antrim Iron Company	Michigan Trust Bldg., Grand Rapids	Mancelona
Newberry Lumber & Chemical Co.	Newberry	Newberry
Cleveland Cliffs Iron Co.	Cleveland, Ohio	Marquette
Delta Chemical & Iron Co.	Wells	Wells
Ford Motor Co.	Dearborn	Dearborn
Great Lakes Steel Corp.	Pittsburgh, Penna.	Detroit

LIMESTONE AND LIME PRODUCERS, 1938

County	Operator	Office	Quarry
Alpena	Michigan Alkali Co.	Wyandotte	Alpena
Alpena	Thunder Bay Quarries	2925 Koppers Bldg., Pittsburgh, Penn.	Alpena
Arenac	County Road Commission	Standish	Omer
Delta	Biehler Bros.	703 Ludington, Escanaba	Groos
Dickinson	Metronite Company	1529 E. Hartford, Milwaukee, Wis.	Felch
Dickinson	Superior Rock Products Co.	Marquette	Randville
Emmet	Antrim Lime Co. (also lime)	904 Mich. Tr. Bldg., Grand Rapids	Petoskey
Emmet	Petoskey Portland Cement Co.	Petoskey	Petoskey
Huron	Wallace Stone Co.	Bayport	Bayport
Iosco	County Road Commission	Tawas City	Whittemore
Jackson	Agricultural Limestone Co.	Jackson	Jackson
Maekinae	Fiborn Limestone Co.	Sault Ste. Marie, Ont.	Ozark
Maekinae	Inland Lime and Stone Co.	Manistique	Hunt Spur
Menominee	Limestone Products Co. (lime only)	Menominee	None (buys stone)
Monroe	France Stone Co.	1800 2d National Bk. Bldg., Toledo, Ohio	Monroe
Presque Isle	Michigan Limestone & Chem. Co.	Rogers City	Calcite
Presque Isle	Kelley Island Lime & Transport Co.	1122 Leader Bldg., Cleveland, Ohio	Presque Isle
Schoolcraft	Inland Lime & Stone Co. (dolomite)	Manistique	Port Inland
Wayne	Solvay Process Co.	Syracuse, N. Y.	Trenton
Wayne	Belle Isle Lime Co. (lime only)	92 S. St. Jean Ave., Detroit	None

MINERAL WOOL MANUFACTURERS, 1939

Operator	Office	Plant
Therminul Corporation	Kalamazoo	Kalamazoo
Insulation Industries, Inc.	10807 Lyndon Ave., Detroit	Detroit
Northern Rock Wool Co.	Pontiac	Pontiac

PEAT PRODUCERS, 1938

County	Operator	Office	Plant
Mason	Pratt Brothers	Scottville	Scottville
Oakland	Royal Peat Co.	3137 Phillips Ave., Berkeley	Walled Lake
St. Clair	American Soil Sponge Selling Corp.	6 E. 42d St., New York	Capac

POTTERY PRODUCERS, 1939

County	Operator	Office	Works
Macomb	Mt. Clemens Pottery Co.	Mt. Clemens	Mt. Clemens
Monroe	E. W. Ritter Sons Co.	South Rockwood	So. Rockwood
Wayne	Pewabic Pottery	10125 E. Jefferson	Detroit
Wayne	Champion Spark Plug Co. (Ceramics Division)	8525 Butler, Detroit	Detroit
Wayne	Wm. Sparks	Inkster	Inkster

OIL REFINERIES, 1939

Name of Company	Location of Plant
Aurora Gasoline Company	Detroit, Elsie
Bair Oil Company Refinery	Grand Ledge
Bay Refining Company	Bay City
Crystal Refining Company	Carson City
Interlakes Refining Company	Trenton
Imperial Refining Company	Grand Rapids
Leonard Refining Company	Alma
Lube Oil Corporation	Alma
McClanahan Refineries, Inc.	St. Louis
Mid-West Refineries, Inc.	Alma
Naph-Sol Refining Company	Muskegon
Northern Refineries	Alma
Old Dutch Refining Company	Muskegon
Pentagon Refining Company	Plymouth
Producers Refineries, Inc.	West Branch
Roosevelt Oil Company	Mount Pleasant
Socony Vacuum Oil Company	Trenton
Sovereign Refining Company	Saginaw
Sweet Oil Refining Company	Wyman
The Pure Oil Company	Midland
Taggart Brothers	Saginaw

NATURAL GASOLINE PLANTS, 1939

Operator	Location of Plant
Apex Gas, Inc.	Porter Township (Midland County)
Otto H. Grimes	Greendale Township (Midland County)
Otto H. Grimes	Jasper Township (Midland County)
Otto H. Grimes	Weidman Township (Isabella County)

SALT PRODUCERS, 1938

County	Operator	Office	Works
Gratiot.....	Michigan Chemical Corp.....	St. Louis.....	St. Louis
Manistee.....	Manistee Salt Works.....	4200 Forest Park Blvd. St. Louis, Missouri.....	Manistee
Manistee.....	Morton Salt Company.....	208 W. Washington, Chicago.....	Midland
Midland.....	Dow Chemical Company.....	Midland.....	Midland
Saginaw.....	Saginaw Salt Products Co.....	Saginaw.....	Carrollton
Saginaw.....	Strable Salt & Lumber Co.....	1560 Holland, Saginaw.....	Saginaw
St. Clair.....	Morton Salt Co.....	208 W. Washington, Chicago.....	Port Huron
St. Clair.....	General Foods Corp.....	250 Park Ave., New York.....	St. Clair
Wayne.....	Detroit Rock Salt Co.....	Scranton, Pa.....	Detroit
Wayne.....	Michigan Alkali Co. (brine).....	Wyandotte.....	Wyandotte
Wayne.....	Penn. Salt Mfr. Co. (also brine).....	1000 Widener Bldg.....	Wyandotte
Wayne.....	Solvay Process Co.....	Syracuse, N. Y.....	Detroit

PRODUCERS OF BROMINE AND CALCIUM CHLORIDE IN 1938

County	Operator	Office	Works
Gratiot.....	Michigan Chemical Corp.....	St. Louis.....	St. Louis
Manistee.....	Great Lakes Chemical Corp.....	Manistee.....	Piler City
Manistee.....	Rademaker Chemical Corp.....	Manistee.....	East Lake
Midland.....	Dow Chemical Co. (also magnesium).....	Midland.....	Midland

COMMERCIAL SAND AND GRAVEL PRODUCERS REPORTING IN 1938

County	Operator	Office	Pit
Alcona.....	Michigan Gravel Co.....	502 Eddy Bldg., Saginaw.....	Greenbush
Berrien.....	Ireland and Lester.....	Benton Harbor.....	Benton Harbor
Berrien.....	Producers Core Sand Corp.....	Michigan City, Ind.....	Bridgman
Chippewa.....	Soo Sand & Gravel Co.....	Sault Ste. Marie.....	Lake Superior
Chippewa.....	I. L. Whitehead.....	Sault Ste. Marie.....	Sault Ste. Marie
Delta.....	Bichler Bros.....	Gladstone, R. F. D. 1.....	Groos
Dickinson.....	Champion Gravel Co.....	Iron Mountain.....	Loretto
Genesee.....	Kurtz Gravel Co.....	Flint, R. F. D. 6.....	Flint
Genesee.....	Bayer Brice Gravel Co.....	Flint, 4417 N. Saginaw.....	Flint
Genesee.....	Gillespie & Hodge.....	Flint, 219 W. Hodge.....	Mundy Twp.
Genesee.....	Tuscola Sand & Gravel Co.....	Flint.....	Flint
Gratiot.....	No. Star Sand & Gravel Co.....	North Star.....	North Star
Hillsdale.....	Harris-McBurney Co.....	Jackson.....	Jonesville
Ingham.....	Ray Sablain.....	Lansing, So. Cedar St.....	Lansing
Ingham.....	East Lansing Gravel Co.....	Lansing, R. 4.....	Lansing
Ingham.....	Boichot Sand & Gravel Co.....	Lansing, R. 4.....	Lansing
Ionia.....	Grand River Gravel Co.....	Lafayette, Ind.....	Ionia
Iron.....	Champion Gravel Co.....	Iron Mountain.....	Beechwood
Jackson.....	Harris-McBurney Co.....	Jackson.....	Michigan Center
Kalamazoo.....	American Aggregates Corp.....	Kalamazoo.....	Kalamazoo
Kent.....	Wm. J. Breen.....	Box B, Roosevelt Sta., Grand Rapids.....	Grand Rapids
Kent.....	Gezon-Battzes Co.....	Gd. Rapids, 2550 Byron Rd.....	Wyoming Park
Kent.....	Grand Rapids Gravel Co.....	Gr. Rapids, 431 Mich. Trust Bldg.....	Grand Rapids
Lenawee.....	Lenawee Sand & Gravel Co.....	Tecumseh.....	Tecumseh
Lenawee.....	Tecumseh Gravel Co.....	Tecumseh.....	Tecumseh
Livingston.....	American Aggregates Corp.....	Greenville, Ohio.....	Brighton
Livingston.....	O. W. Lundquist.....	E. Detroit.....	Roseville
Macomb.....	Ray Sand & Gravel Co.....	Detroit, 2588 Book Bldg.....	Washington
Manistee.....	Sand Prods. Co. (molding sand).....	Detroit, 2489 1st Nat. Bk. Bldg.....	Manistee
Manistee.....	Bridgeport Core Sand Co.....	Saginaw.....	Manistee
Manistee.....	Farr & Company.....	Chicago, 140 So. Dearborn.....	Onkama
Marquette.....	Champion Gravel Co.....	Iron Mountain.....	Champion
Muskegon.....	Sand Prods. Co. (molding sand).....	Detroit, 2489 First Nat. Bk. Bldg.....	Muskegon
Muskegon.....	Nugent Sand Company.....	Muskegon.....	Muskegon
Oakland.....	Standard Gravel Co.....	Pontiac, Box 357.....	New Hudson

COMMERCIAL SAND AND GRAVEL PRODUCERS REPORTING IN 1938—Continued

County	Operator	Office	Pit
Oakland.....	Koenig Coal & Supply Co.....	Detroit, 1480 Gratiot.....	Oxford
Oakland.....	Foley & Beardslee.....	Clarkston, R. F. D. 3.....	Clarkston
Oakland.....	Ward Sand & Gravel Co.....	Oxford.....	Oxford
Oakland.....	American Aggregates Corp.....	Greenville, Ohio.....	Oxford
Oakland.....	Ray Sand & Gravel Co.....	Detroit, 2508 Book Bldg.....	Rochester
Oakland.....	Ferryview Sand & Gravel Co.....	Royal Oak.....	Rochester
Oakland.....	Stanley J. Pons.....	Royal Oak.....	Royal Oak
Oakland.....	Ray E. Walker Co.....	Birmingham.....	Birmingham
Oscoda.....	Hersey Gravel Co.....	Hersey.....	Hersey
Ottawa.....	Tom Johnson Gravel Co.....	Gd. Haven, 114 Lafayette.....	Grand River
Ottawa.....	Construction Materials Co.....	Chicago, Ill., 33 N. LaSalle.....	Bass River
Ottawa.....	West Mich. Construction Co.....	Holland.....	Holland
St. Joseph.....	T. J. Mowry.....	Colon.....	Colon
Saginaw.....	Valley Sand Co.....	Bay City, 209 S. Chilson.....	Saginaw River
Tuscola.....	Bridgeport Core Sand Co.....	Saginaw.....	Vassar
Tuscola.....	Cass City Sand & Gravel Co.....	Cass City.....	Cass City
Tuscola.....	Great Lakes Fdy. Sand Co. (molding sand).....	Detroit, 2100 Penobscot Bl. Saginaw, 207 Eddy Bldg.....	Juniata
Tuscola.....	Anderson Sand & Gravel Co.....	Killins Gravel Co.....	Juniata
Washtenaw.....	Killins Gravel Co.....	Ann Arbor, R. F. D. 3.....	Ann Arbor
Wayne.....	W. L. Emory.....	Detroit, Ft. of Mt. Elliott.....	Detroit River
Wayne.....	*Michigan Silica Co.....	Rockwood.....	Rockwood
Wayne.....	Nicholson Materials Co.....	Detroit.....	Detroit
Wayne.....	Manning & Locklin.....	Northville.....	Northville

\*Glass sand.

SANDSTONE PRODUCERS, 1938

County	Operator	Office	Quarry
Calhoun.....	Clark Sandstone Co.....	Battle Creek.....	Battle Creek (near)
Calhoun.....	Beard Cut Stone Co.....	Lansing.....	Wheatfield
Houghton.....	County Road Commission.....	Hancock.....	Lake Linden
Jackson.....	Shamrock Sandstone Co.....	Napoleon.....	Napoleon

PRODUCERS OF TRAP ROCK AND MISCELLANEOUS STONE, 1938

County	Operator	Office	Quarry
Gogebic.....	Wakefield Crushed Stone Co.....	Wakefield.....	Wakefield
Houghton.....	Houghton County Road Com.....	Hancock.....	Houghton, Calumet, Hancock
Iron.....	Iron County Road Com.....	Crystal Falls.....	Crystal Falls
Keweenaw.....	Keweenaw County Road Com.....	Ahmeek.....	Phoenix
Marquette.....	City of Ishpeming.....	Ishpeming.....	Ishpeming
Marquette.....	City of Marquette (quartzite).....	Marquette.....	Harvey
Marquette.....	City of Negaunee.....	Negaunee.....	Negaunee
Marquette.....	Advance Industrial Supply Co.....	Chicago, 111 W. Washing- ton Blvd.....	Negaunee Twp.