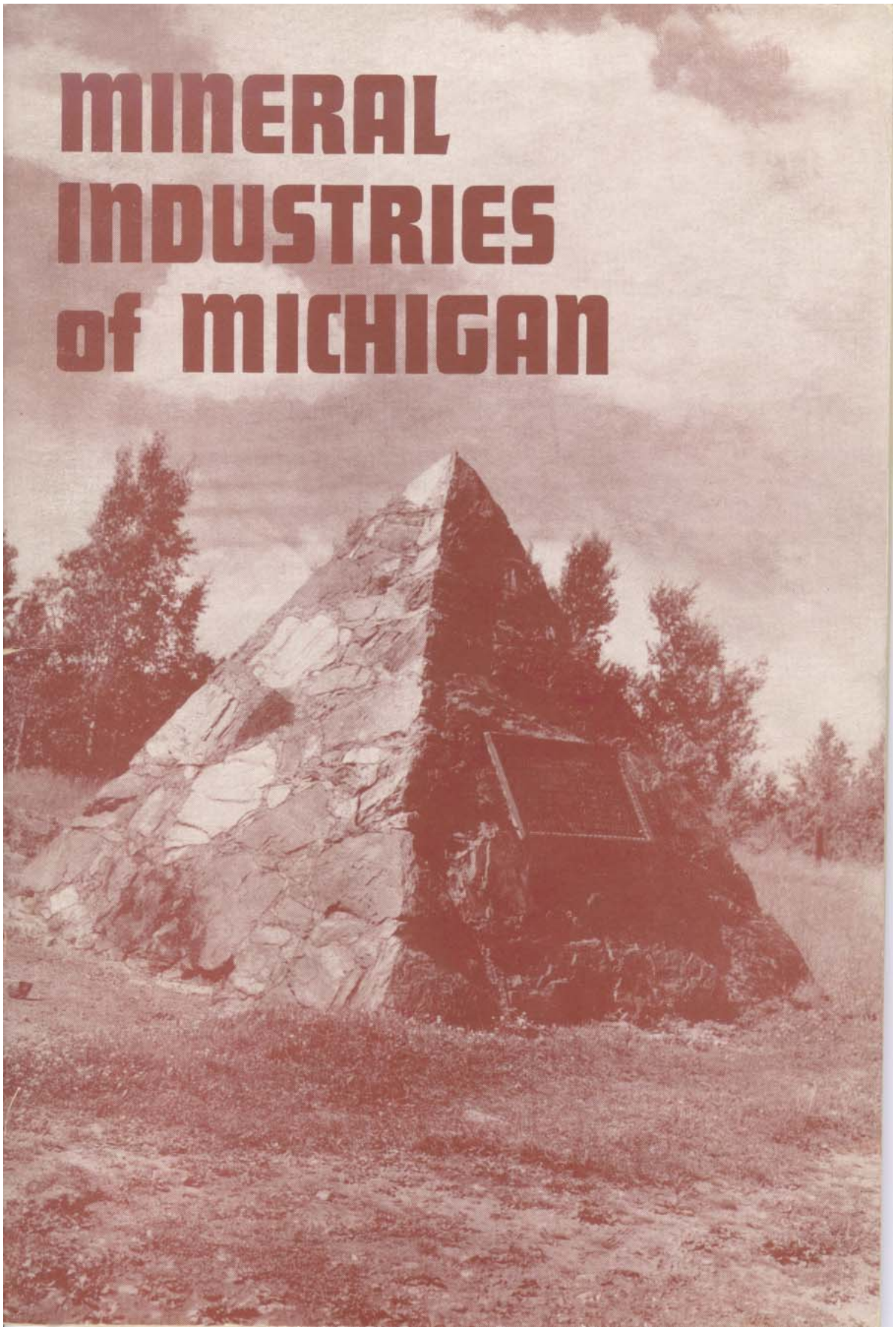

Monument on site of discovery of iron ore in the Lake Superior region, Negaunee, Michigan

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION
P. J. Hoffmaster, *Director*
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MINERAL INDUSTRIES OF MICHIGAN

1934 to 1938 and Prior Years

By

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Lansing 1940

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GENERAL REVIEW

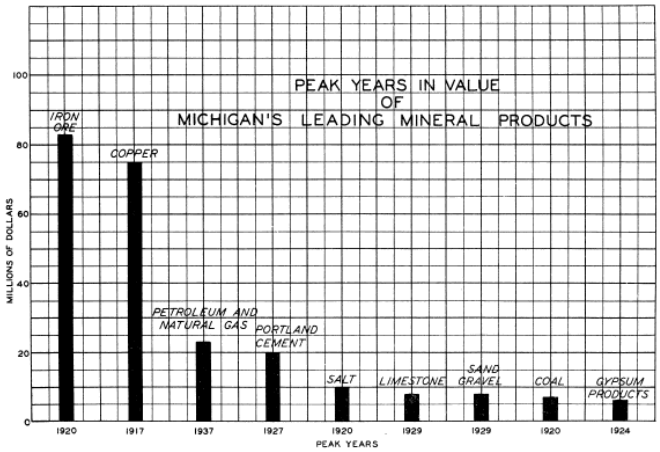
The year 1932 marked the depth of the depression and the lowest point in mineral production in Michigan since complete statistics covering all minerals and mineral products have been published. Although production of nearly all minerals and mineral products dropped rapidly from the 1929 peak to the 1932 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.



Peak years in value of Michigan's leading mineral products

THE COPPER INDUSTRY OF MICHIGAN

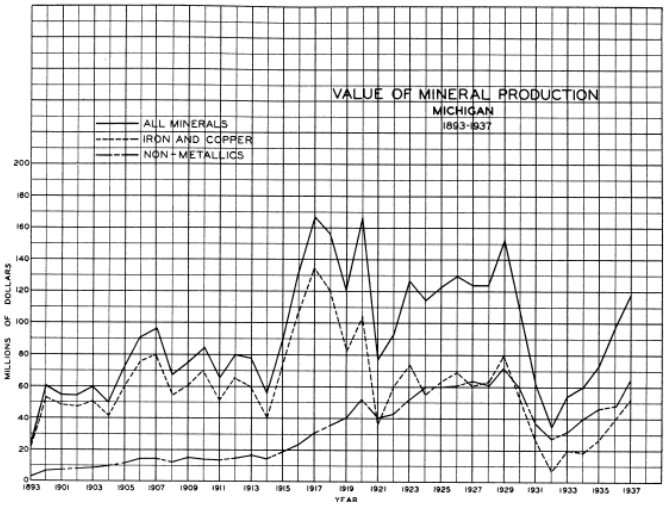
Copper has been mined in Michigan since 1845 and for more than forty years thereafter this State was the leading producer of copper in the nation. However, with the development of the west and the discovery of large deposits of more cheaply mined copper in Arizona, Montana, Utah, and Nevada, Michigan, 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 1838 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.



Value of mineral production in Michigan 1893 to 1973

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	170,600,228
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	12,060,120	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	177,594,185
1872	24,552,640	1920	153,483,952
1873	30,089,920	1921	100,918,001
1874	34,382,480	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	186,303,974
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	95,068,019
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

Production of Copper in Michigan, 1845-1938

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 underground 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 412 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.

	1934		1935	
	Tons Mined	Tons Shipped	Tons Mined	Tons Shipped
Marquette Range	2,330,775	2,473,847	2,865,294	3,265,537
Gogebic Range	1,857,429	1,690,897	1,579,028	2,341,985
Menominee Range:				
Dickinson County	147,541	317,603	195,930	223,409
Iron County	710,534	1,017,424	532,891	1,410,613
Total for State	5,046,279	5,499,771	5,173,143	7,241,544

	1936		1937		1938	
	Tons Mined	Tons Shipped	Tons Mined	Tons Shipped	Tons Mined	Tons Shipped
Marquette Range	4,415,848	4,627,889	5,503,700	5,747,812	2,634,951	1,476,257
Gogebic Range	3,064,944	3,710,468	4,175,870	4,243,391	1,948,783	1,652,904
Menominee Range:						
Dickinson County	285,704	352,629	483,248	431,985	331,588	237,697
Iron County	1,359,688	1,811,050	1,809,964	2,214,967	992,786	740,722
Total for State	9,126,184	10,502,036	11,972,782	12,638,155	5,908,108	4,107,580

Production and Shipment of Iron Ore in Michigan*, 1934-1938

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

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.

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.

	1934	1935	1936	1937	1938
Minnesota	15,708,418	20,035,633	32,938,883	47,878,012	14,535,744
Michigan	5,497,953	7,235,698	10,491,270	12,626,935	4,092,902
Alabama	2,270,923	3,599,904	4,259,804	6,350,316	4,281,382
All Other States	23,537,294	30,831,285	47,689,957	66,855,203	22,909,978
	1,805,312	5,595,201	4,775,741	5,492,492	3,520,932
Total United States	25,342,606	36,426,486	52,465,698	72,347,785	26,430,910

Iron Ore Shipped from Mines in Minnesota, Michigan and Alabama, 1934-1938*

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

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

Iron Ore Mined in Michigan, 1854-1938 – By Ranges

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	7,905,890
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	12,251,985
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	859,567	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	14,582,831
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	3,934,330	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	Total Shipments	547,166,584
1897	6,429,520		

Iron Ore Shipments from Michigan Mines, 1854-1938

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	1,245,700	$426,837
1927	1,756,310	504,689
1928	2,164,000	649,475
1929	6,414,620	1,759,325
1930	8,462,800	2,109,974
1931	8,935,320	1,854,650
1932	5,727,561	1,182,569
1933	10,147,960	2,040,352
1934	15,344,200	3,227,425
1935	16,428,533	3,483,289
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

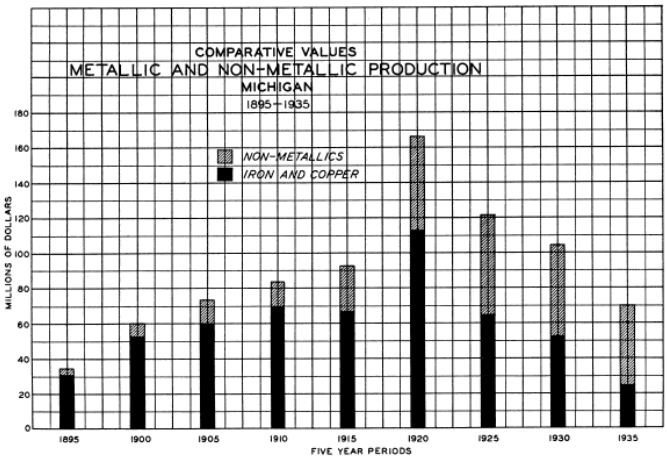
for light weight alloys for airplane manufacture, and in recent years, the trend toward the lightening of railway stock, busses, trucks, trailers, and other equipment, has brought this metal into keen competition with aluminum. Magnesium is one third lighter than aluminum and active research on new alloys 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.

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	4,589,980
1938	4,819,617

Production of Magnesium in Michigan

IODINE

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



Comparative values of metallic and non-metallic production in Michigan 1895-1935

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.[1]

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.

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	543,735	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	613,945	2,240,670	340,200	1,183,196	1,278,420	817,265	2,476,406	6,506,129
1938	241,189	2,284,454	556,252	2,123,941	**	**	**	**	2,078,612	6,151,154

Production and Value of Salt in Michigan, 1934-1938, By Methods of Manufacture

**Included in total

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.

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 construction 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

Gypsum 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.

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.

Year	Quantity Barrels	Percent of U. S. Total
1880	2,485,177	41.7
1881		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	3,057,898	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 of Salt in Michigan, 1880-1899*

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	1,535,923	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	9,906,744	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	7,804,838	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	25.8	1	5,537,599	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

Production and Value of Salt in Michigan, 1900-1938

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

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

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 producing area roughly includes most of the area immediately surrounding Saginaw Bay and, extending southwest ward through St. Charles, Owosso, Lansing, and Jackson. Sebewaing, 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 80 inches thick is generally not profitable, although some very small mines work seams as thin as 16 or 20 inches.

CLAY PRODUCTS

Brick and tile

Brick 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.

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	68,030	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	60,507	287,648	10	14
1915	81,359	340,979	10	15
1916	86,467	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	48,104	445,386	6	15
1922	53,635	484,945	7	16
1923	50,629	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	43,950	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

Production and Value of Lime in Michigan, 1904-1938

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	343,500	.....	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	3,747,526	.....	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	.....	2,619,250	0.815	.....	7
1910	12	3,687,719	.....	3,378,940	0.916	.....	8
1911	11	3,695,716	.....	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	509,919	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	4,442,455	10,939,633	2.46	666,389	7
1921	11	5,777,533	5,680,136	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	1,807,474	3
1927	15	13,965,241	13,708,259	20,858,202	1.52	2,305,284	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

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	343,560	.....	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	538,848	7
1915	11	4,765,294	4,727,768	4,454,608	0.942	509,919	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	4,442,455	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	7,619,793	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	13,325,737	18,916,711	1.42	2,403,185	3
1930	14	11,510,895	10,817,994	14,807,439	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

*For annual production prior to 1900 see Publication 37, Michigan Geological Survey.

**Value of crude gypsum only.

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 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 4,270,000 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 porcelainware

Several million dollars worth of porcelain arid 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.

Coal mine

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	1,784,682	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	990,545	3,804,228	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	4,698,376	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.

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.

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	1,602,414
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	2,775,935	337,833	3,723,018
1924	261,614	2,927,133	381,411	6,912,135
1925	260,280	3,030,809	361,130	4,287,422
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)

Production of Clay Products in Michigan, 1899-1937

(a) Separate figures not available.

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

(c) Included in summary table under “miscellaneous.”

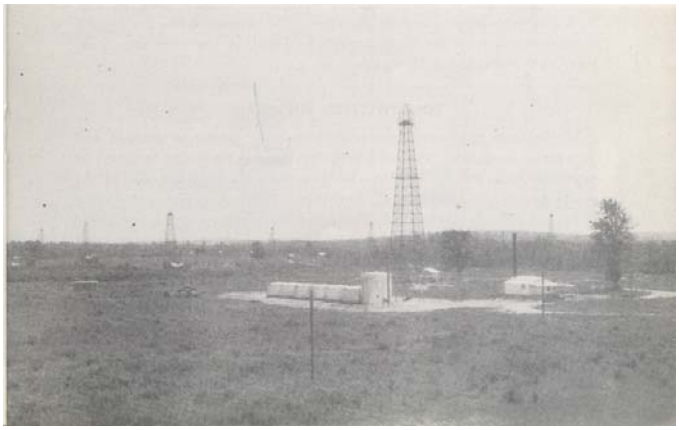
Year	Number of Firms Reporting		Quantity Thousands	Value	Total Value U. S.	Rank	
	Mich.	U. S.				Production	Value
1904	10	57	9,886	$64,034	$463,128	1	1
1905	12	84	24,841	155,883	972,064	1	1
1906	11	87	27,281	162,879	1,170,005	1	2
1907	13	94	25,488	158,606	1,225,769	1	1
1908	10	57	21,997	131,827	1,029,699	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	2,490,253	1	1
1921		26	33,658		1,268,502		
1922	8		46,558	557,647			
1923	9	33	64,650	777,693	2,471,536		
1924	11	37	89,239	1,052,435	3,334,503	1	1
1925		42	97,328	1,175,776	3,780,639	1	1
1926	13	42	108,434	1,341,284	2,981,492	1	1
1927	12	45	112,181	1,402,647	3,645,842	1	1
1928	12	41	103,056	1,270,778	3,654,590	1	1
1929	12	40	96,511	1,107,708	2,909,635	1	1
1930	13	37	45,391	551,187	1,950,709	1	1
1931	11	31	28,819	222,223	1,236,825		
1932	10	21	8,429	75,717	433,118		
1933	2	10	(a)	(a)	195,318		
1934	4	16	5,575	45,129	355,560		
1935	4	20	10,084	91,409	554,631	1	1
1936	5	23	25,191	226,651	922,662	1	1
1937			16,107	222,990			

Production of Sand Lime Brick in Michigan and the United States, 1904-1937

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

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 Traverse 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

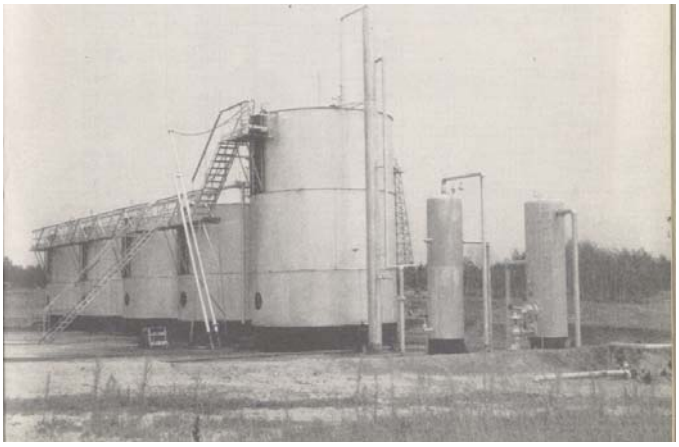
Other oil pools which have not been developed are located in Bay, Tuscola, and Kent counties[1]. A complete record of all fields and pools and their total production through 1938 is given in the accompanying table.

PRODUCTION AND MARKETS

In 1938 Michigan produced 18,774,709 barrels of crude oil valued at 119,213,320. 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 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 125,000 barrels daily and additional Michigan crude is shipped 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.



Model oil storage plant with gas separators and fire wall, Clare County

Field or Pool	County	First Production Year	Total Production to Jan. 1, 1939
Saginaw	Saginaw	1925	1,303,182
Muskegon	Muskegon	1927	6,509,200
Mt. Pleasant	Isabella—Midland	1928	20,254,050
Loxton	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	3,059,747
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	6,865,205
Geneva	Midland	1935	52,672
Larkin	Midland	1935	6,248
Deerfield	Monroe	1935	24,071
Bushnell	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
Bloomingdale	Van Buren	1938	514,108
Overisel	Allegan	1938	142,956
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

Oil Fields of Michigan

STONE

Limestone and dolomite

Limestone 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.

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	592,020	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	2,796,022	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	15,772,989	7,167,000	838,893
1937	16,628,344	21,678,930	9,310,844	1,255,258
1938	18,744,709	19,213,320	9,232,509	1,229,770

Production and Value of Petroleum and Natural Gas in Michigan, 1925-1938

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.

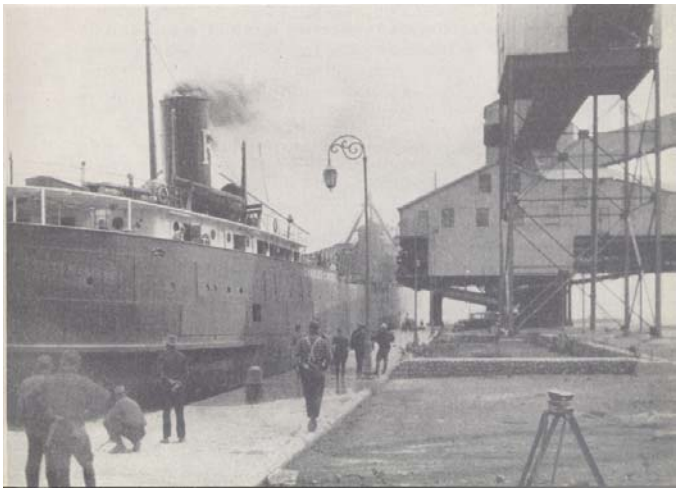
[1]In 1939 Kent County became one of the most important oil producing-areas in the State.

A modern limestone plant, Rogers City, Michigan

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, port land 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 1987 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.



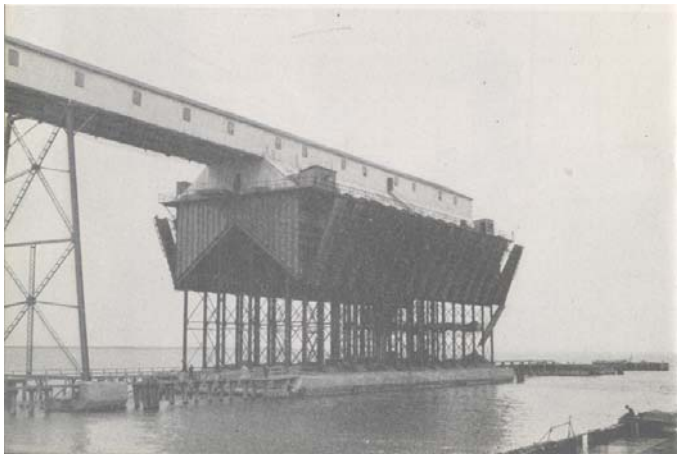
Self unloading limestone freighter

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.



Bins and chutes for loading lake freighters, Rockport, Michigan

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 Gogebic 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 rooting 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 tiller. The stone is generally pure white and coarsely crystalling 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.

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	1,876,801	2,679,232	1,300,382
1936	1,418,750	768,141	5,459,410	2,683,096	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	964,868

Year	Agriculture		Other Uses*		Total Stone	
	Tons	Value	Tons	Value	Tons	Value
1934	35,260	$29,545	793,904	$607,985	6,514,500	$3,608,543
1935	67,340	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	403,320	12,103,970	6,265,005
1938	108,130	71,454	479,180	337,653	7,522,830	3,626,473

Year	Rank of State	
	Tons	Value
1933	3	6
1934		
1935	1	4
1936	2	6
1937	2	5
1938	5	6

Production and Value of Limestone in Michigan, 1934-1938 (By Uses)

*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.

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	5,943,220
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		541,754	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	12,481,240	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	3,592,920	1,918,556
1913		1,408,703	1933	5,434,520	2,972,761
1914		1,457,961	1934	6,514,500	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		3,320,805	1937	12,103,970	6,265,005
1918		5,186,867	1938	7,522,830	3,626,473

Production and Value of Limestone in Michigan, 1899-1938

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.

MISCELLANEOUS MINERALS AND MINERAL PRODUCTS

Miscellaneous minerals and mineral products regularly or intermittently produced in Michigan are graphite, iron ore for paint, manganiferous 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.[1] 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.

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	310,291
1936	1,318,607	472,728	891,283	299,670	1,063,454	401,270	389,558	315,584
1937	1,304,393	513,169	897,512	274,803	1,098,886	366,043	393,560	312,539
1938	471,680	166,880	899,556	282,616	1,320,311	465,098	257,410	294,539

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	$297,435	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	278,195	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	698,181	5,709,734	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

Production and Value of Sand and Gravel in Michigan, 1934-1938 (By Uses)

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

Year	Total Sand and Gravel		Rank	
	Quantity Tons	Value	Quantity Tons	Value
1905	414,509	$210,609	10	11
1906	597,789	197,609	12	13
1907	1,024,641	289,595	10	11
1908	842,591	370,365	8	9
1909	2,219,757	685,632	8	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	8	7
1915	4,776,726	1,036,739	8	7
1916	4,407,475	1,295,717	7	7
1917	3,814,445	1,641,748	7	6
1918	2,837,371	1,239,874	8	9
1919	3,772,535	1,944,143	6	7
1920	4,386,582	2,867,466	8	6
1921	5,515,234	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	11,380,119	5,161,176	6	7
1931	8,164,571	3,361,729	7	9
1932	5,408,663	2,291,106	6	8
1933	4,619,223	1,805,360	5	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

Production and Value of Sand and Gravel in Michigan, 1905-1938

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.

[1]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		b		a5,946,042		b		b
Coal, tons	621,741	1,940,000	628,384	2,017,000	c626,145	2,118,000	c562,262	1,557,476	c453,605	1,631,997
Coke, tons	2,547,747	d11,340,536	2,882,302	d14,125,500	2,793,653	d13,738,700	2,285,518	d11,816,401	1,742,787	d10,135,722
Copper, pounds	88,215,859	3,857,260	64,108,689	3,321,021	95,968,019	8,829,058	94,920,000	11,386,288	91,075,588	9,310,765
Gold, ounces	59	2,019					51	1,800		
Gypsum, tons	281,033	2,369,222	342,989	h339,659	496,641	h479,375	553,242	h686,947	483,321	h773,908
Iron ore, long tons shipped	5,997,953	15,646,165	7,235,998	20,788,153	10,891,270	30,721,075	12,628,935	41,136,202	4,992,262	13,139,823
Iron, pig, long tons sold	644,895	d9,987,451	781,458	d12,225,499	873,341	d13,585,519	886,602	d15,064,083	558,762	d9,806,904
Lime, tons sold	32,844	230,181	55,501	260,097	80,000	286,348	68,350	351,681	45,856	339,324
Limestone, tons	6,514,590	3,008,543	8,175,430	1,159,915	10,303,830	5,144,606	12,103,970	6,265,005	7,522,836	3,629,175
Magnesium, pounds	4,249,838	b	1,241,218	b	3,903,312	b	4,539,980	b	1,819,617	b
Manganiferous ore, tons	395	b	5,802	16,140	9,627	29,275	9,739	32,442	10,057	b
Natural Gas, M cu. ft.	3,008,685	327,091	1,201,000	547,695	7,167,000	838,893	9,310,841	1,255,258	9,232,509	1,229,770
Natural gasoline, gallons			1,350,000	d71,000	2,815,000	d106,000	2,408,081	d102,599	2,408,000	103,000
Peat, tons		b	5,000	10,997	5,489	10,295	5,276	28,832	5,117	28,138
Petroleum, barrels	10,602,759	10,818,053	15,776,237	16,327,183	11,918,013	15,722,939	16,628,341	21,678,936	18,774,709	19,211,264
Salt, barrels	15,088,357	5,170,681	15,201,221	5,337,536	16,816,300	5,882,718	17,488,611	6,506,120	14,817,229	6,154,154
Sand and gravel, tons	5,452,071	2,297,858	6,591,748	2,784,851	10,862,851	4,310,931	10,987,148	4,430,584	9,821,208	3,733,012
Sand lime brick, number	5,575,000	45,129	10,684,000	91,409	25,191,000	226,851		222,990		b
Silver, ounces	529	342	4,219	3,052			25,454	19,609	93,634	60,531
Stone other than limestone	107,113	119,363	60,390	e168,687	286,980	e247,093	248,170	e300,829	380,130	e438,049
Miscellaneous		14,073,077		18,560,825		16,462,687		12,101,434		10,264,739
Total Value		$60,021,605		$72,655,100		$97,819,381		$118,099,512		$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.	1326 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., 1109 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
Certainteed 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	Bichler Bros.	703 Ludington, Escanaba	Gross
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
Ingo	County Road Commission	Tawas City	Whittemore
Jackson	Agricultural Limestone Co.	Jackson	Jackson
Mackinac	Fiborn Limestone Co.	Sault Ste. Marie, Ont.	Ozark
Mackinac	Inland Lime and Stone Co.	Manistique	Hunt Spur
Menominee	Limestone Products Co. (lime only)	Menominee	Nose (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. (dolmite)	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
Therminsol 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	F. W. Ritter Sons Co.	South Rockwood	So. Rockwood
Wayne	Powahie 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
Sutony 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	Manistee
Midland	Dow Chemical Company	Midland	Midland
Saginaw	Saginaw Salt Products Co.	Saginaw	Carrollton
Saginaw	Straible 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	Filer 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	Gross
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. Brown	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	R. Detroit	Roseville
Macomb	Ray Sand & Gravel Co.	Detroit, 2588 Book Bldg.	Washington
Manistee	Sand Prods. Co.(molding sand)	Detroit, 2489 1st Nat.Bk. Bl.	Manistee
Manistee	Bridgeport Core Sand Co.	Saginaw	Manistee
Manistee	Farr & Company	Chicago, 140 So. Dearborn	Onekama
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. Fons	Royal Oak	Royal Oak
Oakland	Ray E. Walker Co.	Birmingham	Birmingham
Osceola	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.	Juniata
Tuscola	Anderson Sand & Gravel Co.	Saginaw, 207 Eddy Bldg.	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. Washington Blvd.	Negaunee Twp.