Small quartz seams are innumerable. The seams of quartz run in size from an inch to several feet, and many of them are gold-bearing. The predominating minerals are copper ore, iron pyrites, galena, and sometimes zinc. No refractory ores are discovered. Tellurium has also been found in a trachitic greenstone, and it is reported from no other portion of this region.

The configuration of the surface of this field is attractive. The granites and traps sometimes rise to a great height, forming deep defiles, reminding one of the canyons of the west. The schists and softer rocks have been gouged out, making the surface very rugged, full of gulleys and corresponding hills. It certainly is an attractive region, and one that has not commanded the attention from gold hunters which it deserves.

Following the discovery of Mr. Ropes in this field, a company was organized that secured options on a large tract of land, and conducted explorations on Secs. 35, 49-27 under the title of

THE FIRE CENTRE MINING COMPANY.

Two shafts were sunk upon different veins in the granite, and were carried downward about 100 feet. At this depth there was a diminuation of gold in the rock and the company ceased operations much to the disappointment of the many who were interested. As in the case of other explorations in this region, those who undertook development work were unfamiliar with gold mining. They were too easily discouraged.

In the summer of 1892 a trial lot of rock was treated in the Ropes gold mine mill. This consisted of 254 tons, and from it were produced $2,063 worth of gold, about $8.12 per ton, a most gratifying result. The gold was 69.7 fine, and the percentage of saving in the mill, including concentrates, was 76.7, showing the free-milling qualities of the rock. The latter stamped very preely, much more readily that that of the Ropes mine. The Fire Centre Company ordered a Crawford mill, which was set up and proved an utter failure. In the fall of 1898, the shafts having changed from pay quartz to barren, work was stopped, and the place has been abandoned. I consider this the most promising of the several gold fields in this region, and believe if it had skilled men to direct operations a success would be achieved. The tract is a large one, and little or nothing has been done.

I have been shown rich specimens that are said to have been taken from Baraga county, and from near Lake Michigamme. Nothing is now being done in that section.

Two miles north and east of the Ropes, Edward Robbins, of Ishpeming, found gold in the summer of 1895, and obtained many fine specimens showing the native metal.

This gold is associated with the iron ore-bearing formation.

GROSS VALUE BULLION MICHIGAN GOLD MINES.

Ropes Gold and Silver Company	$605,056 95
Michigan Gold Company	17,699 36
Fire Centre Gold Mining Company	2,063 00
Other prospects	820 00
Total	$625,639 31

PLACER GOLD.

Placer gold from the fluvio-glacial deposits of the state has been reported from a number of localities, some of which are well authenticated. The source of the gold is doubtless in the gold-quartz veins which are known to occur widely distributed in the Archean rocks of the Lake Superior region.

What gold there is in the glacial drift of the Lower Peninsula has been transported from the north in the same manner as other materials of the glacial drift and should be put in the same category as "float" copper, and "float" iron ore, as being no indication whatever of the existence in this part of the state of the original source of the metal. Very lean placers may result from concentration by stream action of the gold particles in the glacial drift but we have no proof that any of the deposits reported have any value, commercially, nor is it thought that any of them either known or unknown are valuable. To produce a workable concentration from the widely scattered particles of gold which are in the glacial drift of the Southern Peninsula would require a sorting by water action of such magnitude and completeness as to be wholly beyond the probabilities.

Chances in favor of the occurrence of valuable gold placers in stream gravels of the pre-Cambrian area of the western half of the Upper Peninsula are decidedly greater than elsewhere in the Paleozoic areas of the state for the reason that in the pre-Cambrian rocks are the only known or even probable original sources of gold in this state and the drift in some parts of this area is mainly of local origin. Yet even in these areas the possibilities of the occurrence of placer "pay dirt" are sufficiently meagre to discourage prospecting with any hope of commercial reward.

In the Annual Report for 1906, Dr. A. C. Lane quotes a letter

from W. M. Courtis of Detroit giving localities from which placer gold has been reported. Some of these occurrences have been authenticated.

Mr. Courtis says: "At Lowell and along the Grand River there is gold in a certain channel that crosses the river near this place. This gravel is composed of a different kind of pebbles from the gravel found in the high banks along the river which rise in some places two or three hundred feet above. The gold in the Grand River begins at Maple River and was found down to Ada Creek and probably down to the lake, no gold being found in the most favorable bars above the former place.

These high bluffs are stratified in some places, at others irregular deposits. None of these strata would pan gold even taking the ferruginous seams, the most promising, except in the lower seams a few colors were found.

The gravel in the old river channel seems sufficiently rich to work with dredges in some parts where the land is not too valuable and as this old channel apparently comes from the northwest. There seemed to be a steady increase in the colors of gold as depth is gained—pans running from four to thirty colors. The total average of all our tests was about three cents per cubic yard, though very little digging was done, only taking up the mussels and panning the gravel. The estimate of three cents included all the barren dirt that was tested, barren gravel that overlays the old bed and is not any criterion of what the river channel would run, which should be tested with six holes. The gold was much coarser than I would suspect, some of it being like mustard seed.

I thought it had been "salted" but I walked out a rod or two from the shore, dug up the mussels and alone washed the dirt. Here I got but one to four colors to the pan. This gravel contains a large amount of black, magnetic sand, iron, garnets, zircons and is analogous to those deposits worked in Russia which in their richest parts yield from two to four dollars per cubic yard.

The following is a list of the places where gold is said to have been found in the gravel:

Washed by myself.

Maple River, Ionia County.
Lowell, Kent County.
Ada Creek, Kent County.
Grand River, below Lyons, Ionia County.
Flat River, Ontonagon County.

Iron River.
Ishpeming, Marquette County.

Reported discoveries.

Birmingham, Oakland County.
Union City Branch, to the S. E. and S. W. (?).
Marcellus, St. Joseph County.
Burr Oak, St. Joseph County (pyrites likely).
Grand Haven, Ottawa County.
Allegan, Allegan County.
Greenville, Montcalm County.
Howard City, Montcalm County.
County Line, Newaygo County.
Muskegon River, Newaygo County.
Whitehall, Oceana County.
White River, Oceana County.
Elbridge, Hart, June 7, 1906.
Little Sable River, Manistee County.
West Summit, Wexford County.
Manistee River, Manistee and Wexford Counties.
Walton, Kalkaska County.
Rapid River, Kalkaska, Kalkaska County.
Leelanau County, near Lake.
Antrim County, same river (nuggets, reliable).
Boyne River, Charlevoix County.
Little Traverse, Emmet County.
Victoria Copper Mine (large nugget).
Ishpeming district, near gold mines.
At points south of Gogebic Iron Range.

The following places were reported but believed to be only pyrites:

Cheboygan, Cheboygan County.[1]
Alpena, Presque Isle County.[1]
Caseville, Genesee County.[1]
Flushing, Genesee County.[1]
Caro, Tuscola County.[1]
Near Fargo, St. Clair County.
T. 8 N., R. 14 E., ($6.00 a ton?)
N. E. ½ S. E. ¼ Sec. 33, T. 49 N., R. 42 W., Tr. Au. 15c Ag.

[1] Iron pyrites, examined.

In addition to the above localities Dr. Lane reports the finding of a nugget on bed-rock at Williamston, Ingham County, by Mr. Taylor, and a statement that Mr. Jos. B. Seager has washed as many as 20 colors to a pan in the Huron Mts. where the drift is of local origin.

OIL AND GAS IN MICHIGAN.[1]

BY R. A. SMITH.

CONTENTS.

EXPLORATION FOR OIL AND GAS.

Much exploration for oil and gas has been done in many parts of Michigan, but the results have been, on the whole, meagre in extreme. Only at Port Huron and near Allegan has oil been discovered in quantities approaching commercial importance. A recent report, however, indicates a possible occurrence of oil in quantity at Osseo, in Hillsdale county. The scant success may not be entirely due to a general absence in Michigan of these mineral products in commercial quantities, but very possibly, it may be largely due to the manner in which such exploration has been carried on.

As a rule the drillings have been very scattered, haphazard, and relatively shallow when compared with the depth of the oil horizons as they exist in this state. A single drill hole, though deep, can hardly be considered a positive test, determining the presence or absence of oil or gas in any particular area, since a large majority of the drillings even in a proven territory are "dry holes." Most of the companies organized for oil exploration sell their stock at so low a figure that, after paying the necessary expenses of organizing, salaries, etc., there is little left for adequate development work. Drillers as a rule have known little or nothing of the

[1]Compiled largely from the writings of Dr. A. C. Lane, as found in Volume V, Part 2, 1895, and the annual reports of the Michigan Geological Survey for 1901, 1903, 1904 and 1908.

major structure of the Michigan basin, the formations, or the relative depths of the same. Often it has happened that the driller has gained his knowledge of oil conditions and occurrences from experience in other fields, as Ohio, etc., and begins operations with a false notion that similar conditions obtain in Michigan. Consequently, after drilling a few hundred feet without finding either the Trenton or Berea, the coveted goals of the Ohio drillers, he becomes discouraged and gives up the attempt. The money spent is wasted, as nothing definite either one way or the other, regarding existence of oil or gas, has been determined.

Anyone, contemplating development work for oil and gas in Michigan, should have a general knowledge of the usual conditions under which these mineral products occur and, as far as possible, a specific knowledge of the major geological structure of the Michigan basin, the nature, thickness, and depth of the formations, the possible oil horizons, and the location of minor structures, such as folds or anticlinals, which may be superimposed upon the major structure. The general and the specific facts most pertinent to any oil or gas exploration work in Michigan might be summarized as follows:

1. A general geological structure most favorable for the accumulation of large bodies of oil and gas is a broad *upward* fold, or anticline, with numerous minor folds, or anticlines, superimposed upon the major structure. The oil and gas being lighter than the waetr, make their way upward through porous layers and collect at the crests of the minor folds underneath impervious layers such as shales, etc., forming accumulations known as "pools." Obviously "dry" holes will be the general rule except near the crests of the anticlinals.

2. The above general conditions are idealized in the Nashville and Cincinnati anticline, the broad dome or rather arch running from Tennessee northward through Ohio into western Ontario. It is chiefly on the crests of the numerous minor folds of this great anticline that the oil pools of Ohio occur.

3. The major structure of the sedimentary rocks of Michigan is a broad *downward* fold in which the formations lie one upon another like a pile of gigantic shallow saucers, each successively higher saucer being smaller than the one next below.

4. The major structure is thus *diametically opposite* to that obtaining in Ohio and Tennessee and the minor flexures or anticlines are apparently not only much fewer but much less pronounced in Michigan. The general conditions are such that they

are more favorable for the escape of the oil and gas rather than for their accumulation.

5. Apparently, the main hope of finding oil and gas in commercial quantities in Michigan lies in the occurrence of the above mentioned minor folds or anticlinals, or of *other* structures serving the same purpose.

6. Eight possible or probable anticlinals (Fig. 19) have been approximately located and the chances for finding oil and gas are presumably much greater in their vicinity than elsewhere.

7. The formations as a whole becomes deeper toward the center of the basin, thus the Berea Grit coming to the rock surface beneath the drift near Harrisville, Alcona county, is found at more than 2,000 feet below the surface in the Saginaw valley. The Trenton outcropping in the channel of St. Mary's river and at Limestone Mountain in the southern part of the Keweenaw peninsula, is probably 5,000 feet or more beneath the surface in the central part of the Lower Peninsula.

8. A knowledge of the approximate depth at which any given horizon may be reached and the number of water-bearing horizons to be encountered is essential both from a practical and financial standpoint. Sometimes the drilling is a failure because the hole is too small to allow for casing off water the necessary number of times before the oil horizon is reached, or because the desired horizon is so deep that the capital is exhausted before the completion of a single hole, to say nothing of a number sufficient for an adequate testing of any given territory.

OIL FIELDS AND DISTRICTS.

Port Huron Field. Oil and gas in small quantities has been found almost everywhere in the state, but only at Port Huron has the quantity been deemed sufficient for exploitation on a commercial basis. The development of the Port Huron district, which extends for several miles along the St. Clair river above and below the city, has been due largely to the energy and enterprise of the late Mr. G. B. Stock of Port Huron. The Michigan Development Company, organized by him, has drilled many wells in the vicinity of Port Huron, and has, in the western part of the city, a group of 21 wells which yield altogether some 70 barrels of heavy oil per week. This production, though insignificant when compared with those of Ohio and other fields, is more than sufficient, under favorable conditions, to pay operating expenses, but,

of course, the net returns are disproportionately small in comparison with the original outlay made in putting down the wells.

The oil is very heavy and a natural lubricant and is used as a base in the manufacture of the superior lubricants made by the G. B. Stock Xylite Grease and Oil Company of Port Huron.

Almost all of the test holes in the Port Huron district give a show of gas and oil. Some wells, at first, yield two to three barrels per day, but, after a few weeks, the yield gradually decreases until an average yield of about a half a barrel a day is reached. According to report, several of the wells have been producing for about 15 years and show no positive signs of exhaustion. It is this constancy of production that forms the ground for a firm belief upon the part of the oil promoters at Port Huron that a pool of oil must exist somewhere in that district.

Gas is present in most of the wells and it is in sufficient quantity in the Michigan Development Company's wells that it is used as the motive power for a 25 H. P. gas engine which drives their pumping machinery. Many farmers, especially south and west of Port Huron, in Macomb, Oakland, and other counties, strike gas under impervious beds of clay in wells, in quantities sufficient for household purposes. In fact, there are several other places in the Lower Peninsula, especially in the southeastern and northern parts, in the Manistee district, and in Monroe county, where gas has been found either in drift or rock wells in quantities that warrant utilization for such purposes.

The oil horizon at Port Huron is the Dundee, which at Petrolia and Port Huron is a constant though often modest producer of oil and gas. The depths of most of the oil wells range from about 500 to 650 feet, though there are a few shallower or even deeper. Mr. Stock for many years entertained the idea of financing a project for sinking a well down to the Trenton, but his sudden death in 1910 put an end to further efforts in that direction. From the records of the salt wells at Port Huron, the first salt in the Salina appears to occur at about 1,500 feet. Judging from this, it would require a well probably more than 3,200 feet to reach the Trenton.

The numerous drillings at Port Huron and four or five miles north of the city along Black river, indicate the presence of a low anticlinal in the Dundee, running through the southern and western portions of the city and then veering to the northward along Black River. Some exploration on the northern extent of this anticlinal in 1910 and 1911 near Black river has resulted in the reported discovery of oil and gas in small quantities comparable to the flows found in the Port Huron wells. Possibly the oil is so distributed through the oil formation that only small flows of oil and gas will ever be found in the Port Huron district.

Southeastern District. The southeastern district, extending from Macomb county southwestward through Wayne and Monroe counties to Ohio, should really include the Port Huron district, which has been deemed worthy of separate discussion. In this district, oil in small and gas in considerable quantities have been encountered in numerous wells. Especially is this true in belts underlain by the Antrim, Traverse, and Dundee formations. As noted in the discussion of the Port Huron district, drift gas wells are numerous in St. Clair and Macomb counties. The same conditions obtain, though perhaps to a lesser degree, from Monroe county to the Ohio line.[2]

In the northeastern part of Monroe and in parts of Wayne county, oil impregnates the rocks, forms a scum over ponds and streams, in wells and around springs, and gives off an offensive odor to the water. Gas in bubbles or sometimes in continuous streams rises up through the water in many instances in quantities sufficient to be ignited. This is the so-called surface or shale gas, which usually has a relatively small volume, and no great pressure, but still it is often sufficient for utilization for household purposes. The gas is used mainly for heating as it is deficient in illuminants, and gives very little light. Though a well may last only a few years, another can be put down at small cost.

Monroe county, lying close to the Toledo oil fields, naturally has been well prospected, though with practically barren results. Small quantities of oil and gas, however, were found in all of the drillings. Ten or more deep wells, six to the Trenton, have been put down in the county, mainly in the southeastern part. The wells at Monroe, at Dundee, etc., showed that unfortunately Monroe county was too far down the western slope of the Cincinnati anticline, which extends from western Ohio into Ontario, to contain oil and gas in any great quantities. In the F. C. Potter well (N. W. ¼ of the N. W. ¼ of Section 22, Erie township), which was the nearest to the Toledo fields, the Trenton was struck at 1,555 feet and penetrated 112 feet. The gas, with an original pressure of 25 pounds, has been utilized for household purposes. The well also contains some oil and has been "bailed" out several times, yielding as much as 10 barrels in one case. None of the other wells were as productive and, significantly, the wells farthest

[2]Sherzer's report on Monroe county, Vol. VII, Part 1.

away from the Ohio fields were, in general, the more unproductive.

Well records of Monroe county and at Milan, Ypsilanti, Ann Arbor, etc., seem to indicate a uniform dip of 29 to 32 feet of the formations from Monroe county toward the northwest to Ann Arbor and beyond, with no indication whatever of a minor fold.

In Wayne county, however, near Wyandotte, there appears to be a low anticlinal (See Lane, Annual Report, 1901) coming across the Detroit river and dipping sharply to the northwestward. The strata in the Sibley quarries dip to the southwest instead of the northwest, the direction of the normal dip, and the Sylvania sandstone (See reference table of horizons) in the Solvay well No. 6 (Lane, Annual Report, 1901) at Detroit and in the Canadian Pacific R. R. well No. 11, Windsor, is some 30 feet or more deeper than in the Tecumseh Salt Company wells near River Rouge. The Ford (Michigan Alkali Co.) wells at Wyandotte, however have shown no noteworthy amounts of gas or oil.

North of Mt. Clemens the normal northwesterly dip of the formations suddenly becomes northerly, as shown by the records of the wells at New Baltimore, Mt. Clemens, etc. The change in dip is indicative of the presence of an anticlinal which probably runs from somewhere near Mt. Clemens toward the central basin.

Southwestern Part of the State. A number of deep wells have been sunk for oil or water at various places in the southwestern part of the state, as at Kalamazoo, Dowagiac, Berrien Springs, Bridgman, Benton Harbor, Niles, White Pigeon, Constantine, Allegan, etc., but, though oil and gas were encountered in many of the wells at one or more horizons, only at Allegan was oil reported in possibly commercial quantities. Several wells from 1,300 to 1,400 feet or more in depth, were bored, oil being found in every case. The No. 1 well of the Allegan Oil and Gas Co., according to Mr. J. C. Ellinger, president of the company, gave a yield of about 5 barrels of oil per day, which was not materially increased by shooting. For about 6 weeks or more their No. 1 well averaged a little more than 3 barrels per day of 24 hours and nearly enough gas to heat the boiler. These wells were abandoned at the end of the tests as not being worthy of further attempt at exploitation. If a group of such wells could be put down close enough together to be pumped from a central plant, as at Port Huron, their aggregate yield might possibly be sufficient to make a fair return upon the original investment in putting down the wells. It must be said, however, that the oil horizon at Allegan, which is apparently in the Dundee at approximately 1,250 feet,

is about twice as deep as at Port Huron, therefore the cost of sinking the wells would be much more. The numerous drillings in southwestern Michigan and in northern Indiana, indicate a prominent trough or synclinal, pitching slightly north of east from Bridgman in Berrien county and running through Berrien Springs and Dowagiac, and an anticlinal (Lane, Annual Report, 1903, p. 285) which comes in near Elkhart, Indiana (Fig. 19) passing a few miles east of Niles in a northeasterly direction. Obviously, the region of the Berrien Springs "trough" may be classed as unfavorable territory for oil exploration, while the territory a few miles east of Niles might be worthy of exploration not only to the Traverse and Dundee, but down to the Trenton, which, very doubtfully indeed, has been penetrated, anywhere in the southwestern part of the state, contrary to the many reports. It is in this part of the state that drillers have frequently mistaken the black Antrim shales just above the Traverse for the black shales above the Trenton, and have abandoned the field with a false notion that they had proven the Trenton to be a barren horizon.

Western Michigan. In the vicinity of Muskegon, a considerable number of deep wells, since the early 70's have been drilled at various times for a variety of purposes, most of which, however, were for salt. The Whitney and Truesdale, also called the Hacker (1,230-1,600? ft.) the Mason (2627 ft.) and the Ryerson hills (2,050-2,200 ft.) are some of the older and notably deep ones. In the latter two, some oil was found at about 1,200 ft., which, judging from the quality of the oil, seems to be the horizon of the Berea. The Ryerson, some years ago, according to reports, continually exuded oil to the amount, probably exaggerated, of half a barrel per day.

In 1900, two 1,500-foot wells, one near the Ryerson and the other, the Michigan Oil Company well, only about 40 feet from the Mason, were sunk for oil, which was encountered in small quantities at 1,227 feet and 1,275 feet respectively. The Central Paper Company in 1903 put down a 1,650-foot well (Muskegon No. 6, Lot 1, N. E. ¼, Sec. 34, T. 10 N., R. 17 W., about 4¼ miles westerly from the Ryerson) 35 feet, into the Traverse, finding little or no oil or gas.

The Ryerson, Central Paper Company, and Mason wells, though not exactly in line are near enough for a practical comparison of the relative positions of the corresponding strata as they occur in the respective wells. The easterly dip across the lake from Milwaukee to the center of the Michigan basin (See Annual Re-

port, 1901) appears to be about 20 feet per mile, and the strata should be deeper in the Ryerson well than in the Michigan Oil Company and Mason wells to the west, but this is not the case, as a red fossiliferous limestone, which comes in from 890 to 914 feet, and other corresponding strata in the Michigan Oil Company well appear at higher horizons in the Ryerson. Lane (Annual Report, 1903) thinks that if further attempts are made for oil, it would be well to drill further up the shore of Lake Muskegon in the region of Section 16 and 17, T. 10 N., R. 16 W., in the hope that the crest of the anticlinal might be in that direction. The fine grained character of the oil sand, however, would probably prevent a free flow of oil, unless an exceptionally coarse phase of the formation should be struck. Oil or gas might possibly be found at the same place by going down to the Dundee, which ought to be reached at about 2,100 feet.

In the Manistee district, the deep wells, some 30 or more, are scattered from the Canfield-Wheeler (Sec. 11, T. 20 N., R. 17 W.) well, near Lake Michigan, to Stronach and Filer City, a distance of 5 or 6 miles. The Canfield-Wheeler well, originally 1,947 feet in depth, was afterwards deepened some 500 feet to the white Guelph or Niagara dolomites. In most of the wells, oil and gas were found in very small quantities but in the R. G. Peters (Sec. 7, T. 21 N., R. 16 W.) quite a little oil and gas occurred at 1,905 feet. In fact, water and oil was blown 150 feet above the derrick, the top of which was blown off. Some gas was also noted at about 600 feet in some of the wells.

In the Buckley and Douglass No. 5 well and the R. G. Peters wells, the salt horizons occurred at practically the same depth, 2,015 and 2,026 feet respectively. To the southeast toward the head of the lake at Stronach, the salt is encountered from 1,930 to 1,964 feet. The base of the Traverse is also higher (See table of horizons) with signs of oil and gas just below. The normal eastward dip of the formations across Lake Michigan is apparently from 40 to 50 feet per mile and, according to this, corresponding horizons at Stronach and Filer City should be from 200 to 300 feet deeper than in the wells to the northwest in Manistee, but, in reality, the horizons are as high or higher in former wells than in the latter. From this, an anticlinal in the formations down to the salt beds must exist near Stronach, and might contain oil and gas in quantity. Since to the southeast of Stronach for several miles, there are no drillings deep enough to reach bed rock through the thick surface deposits, the position and direction of

the crest of the anticline can not be determined. Its crest apparently may run through Stronach or Filer City or it may lie considerably further east.

Central Part of the State. Hundreds of drillings have been made for coal, salt, or oil in Saginaw valley. The earlier deep drillings were mainly for salt, and little attention was given to the nature of the formations lying above the salt horizons or their possible economic products. From drillings in various places in Saginaw valley and around Saginaw Bay as at Bay City, Saginaw, Midland, and at Kawkawlin, Bay county, at Blackmar, Saginaw county, Caseville in Huron county, Tawas City, Iosco county, etc., the general average southwesterly dip from Bay City toward the center of the basin appears to be approximately 20 feet per mile. Drillings for salt or oil have shown, however, that the formations at least down to the Marshall brines, rise and occur at even considerably higher levels at Saginaw than at Bay City instead of being several hundred feet deeper as they should, according to the general average dip to the southwest.

At Bay City, the brines at Hargraves Mill on Middle Ground in the southern part of Bay City are struck at the depth of 1,040 feet, but to the north at Pitts and Cranages, near the Michigan Central railroad bridge, at the Detroit and Mackinaw bridge, at Boyces in Essexville, and at Kawkawlin, which is a little north of west from the city, the brine horizons occur from 40 to 300 feet higher. Going south from Middle Ground in Bay City toward Saginaw, the brine horizons of the Marshall rise. In the South Bay City well (North American Chemical Co.) the brines come in at 850 and 890 feet, in the Melbourne wells half way to Saginaw at 890 feet, in the old New York and Saginaw Salt and Lumber Co. wells two miles north of Zilwaukee at 760 and 867 feet, in the Bliss well at Zilwaukee at 665 feet, and in the old East Saginaw Salt Co. wells from 633 to 742 feet. At the Wylie well in central Saginaw, it is said to be but 715 feet to the bottom of the brine horizons, the brine being struck probably at about 620 feet. Southward and westward from the Wylie well the horizons deepen rapidly, occurring in the Saginaw Plate Glass Company wells from 820 to 900 feet, at Garfield over 800 feet and at St. Charles 800 to 900 feet. Westward from Bay City at Kawkawlin the brine horizons are higher than in Bay City, being encountered at depths from 700 to 800 feet.

In the Monitor Oil and Gas well and in the Ralston well (Sec. 4, T. 13 N., R. 4 E.), near Bay No. 2 mine, it appears that there

is a strong upward fold of the coal measures and that the indications point to the extension of this fold down into the underlying horizons. From the records of the Midland, Alma, St. Louis, and Mt. Pleasant wells, the Marshall occurs from 1,000 to 1,400 feet and thus indicates a decided dip westward from Kawkawlin.

From the foregoing facts, it appears that a pronounced anticlinal in the formations down to the Marshall must exist between Midland and Bay City. The data indicate that its crest probably passes through Saginaw near the Wylie well and run a little west of north, passing near the old Monitor mine, and through a point 3 or 4 miles west of Kawkawlin. It is no known, however, whether the formations below conform to this upward arching of the Marshall, although there are some indications which point to such a conclusion.

The many drillings down to the Marshall have shown that the possibilities for the occurrence of oil and gas in quantity in the Pottsville or Marshall formations in the region of Saginaw and Bay City are decidedly limited. The Berea is the next lower horizon with possibilities for carrying oil and gas in quantity. This formation, a coarse gray sandstone full of pure strong brine, was encountered in the South Bay City well at about 2,100 feet. Strong signs of oil and gas were observed at 2,080 feet in the Berea shale above. As none of the Saginaw wells, however, reach this horizon, it is very uncertain whether or not the Berea conforms to the minor folds of the overlying Marshall and Coldwater. Since the Berea is very variable in character, it may not be porous enough to contain gas in quantity or it may be too fine grained to yield a ready flow of oil. A redeeming feature that lends itself to prospective explorations down to the Berea is that the drilling from the Napoleon or Upper Marshall down, is very easy, requiring only 3 weeks in the case of the South Bay City well to go through the 1,100 feet or more shales and sandstones. If no oil was found in the Berea the brine might be of value, especially if it should contain a high percent of bromine, etc.

Elsewhere in the central basin of the state outside of the Saginaw valley drillings for oil have been made with the most barren of results, excepting possibly at Fowlerville. The record of a well near Morrice, Shiawassee county, seems to indicate the presence of an anticlinal down to the Berea. In the wells at Blackmar, Saginaw county (See table of horizons), Columbiaville, Lapeer county, and Flint, on the eastern side of the basin, Jackson, Assyria, and Charlotte in the southwestern, the Berea or its horizon

and the Marshall are apparently deeper than at points between. This anticlinal apparently runs from near Fowlerville in a northwest and southeast direction passing somewhere near Laingsburg, Shiawassee county, and may be a continuation of the one at Wyandotte, Wayne county. Northwest of Fowlerville, Livingston county, on the Grill farm on Sec. 17, T. 4 N., R. 3 E., a well was sunk to a depth of about 1,000 feet, oil and gas being found in small quantities at 120, 155, 380, and 600 feet. In the Fowlerville oil well, 2 miles south of Fowlerville (N. E. ¼ of Sec. 6, T. 3 N., R. 4 E.) oil and gas were struck at the shallow depth of 136 feet in a blue shale underlying sand rock. The flow of oil was very small, being possibly a half barrel a day. Another well, reported to be 2,300 feet deep, was put down on the Z. Lazell farm, some 6 miles west of Lansing, apparently without finding any marked signs of oil or gas whatever. On the whole, the central part of the state with its deeper lying horizons and almost wholly unknown minor structures, if such exist, does not appear to offer the same chances of success, meagre as they may be, as the regions nearer the margin of the state.

Northern Part of the Lower Peninsula. The black Devonian shales underlie the surface deposits in a broad belt extending across the northern part of the state from Manistee county through Antrim and Charlevoix to Alpena county. Almost anywhere in this belt abundant signs of oil and gas are found. The same is true where the more limited Berea outcrops beneath the drift, as in Alcona county. Numerous springs, as at Killmaster, and along Black river, etc., boil just from the abundance of gas given off, which is sufficient, it is said, to give a flame several feet high when lighted. Considerable bodies of gas are often encountered in the drift, as at Killmaster, and, since the drift is in most of the interior counties several hundred feet deep, it is quite possible that accumulations of gas underneath impervious beds of clay may be found of sufficient size and pressure to warrant utilization on a commercial scale wherever the Berea, as in the region of Harrisville, Atlantic, and Vanderbilt, or the Devonian formations form the underlying bedrock. But it must be said in this connection, that surface signs and occurrences of oil and gas are not necessarily favorable signs of more oil and gas below. Such signs and occurrences indicate, if anything at all, a leaky and therefore probably empty reservoir in the oil formation beneath.

In the deep Killmaster wells, oil and gas were found in small quantities in the Berea, but these wells together with the three

Oscoda wells seem to indicate that the Traverse is not only dry but without oil or gas. The drift in the interior counties is generally so deep that ordinary wells do not reach bed rock and the deeper drillings are so widely scattered that there is no positive evidence of an existence of an anticlinal in the oil and gas bearing formations. All of the formations, judging from the borings at Cheboygan, Killmaster, Alpena, Oscoda, Grayling and Alma indicate an undisturbed dip of 30 to 40 feet per mile to the south or toward the center of the central basin. On Little Traverse Bay, however, near Khagashewung Point (Fig. 19) the Traverse formation shows in its outcrop some minor folds which pitch gently toward the south. It is barely possible that the underlying Dundee might carry oil and gas in quantity in the region of these minor flexures.

Upper Peninsula. Wherever drillings in the Upper Peninsula have reached the Trenton, oil or signs of oil and gas have nearly always been encountered. In its outcrops, and also when struck in borings, the dried oil residue, or asphaltic gum is often found filling cavities and fissures in the limestone. Near Rapid River, between Whitefish and Rapid river there was such an abundance of this asphaltic material in the rocks that a serious attempt was made to discover a commercial deposit. In the Rapid River well oil was apparently struck in quantity at a depth of about 1,000 feet, but afterwards, it was found that the well was yielding comparatively little oil and much water. The oil seems to have come from vugs in the limestone at a much higher horizon than 1,000 feet, as such depth would be very probably down in the pre-Cambrian. The same might be said for the occurrence of the oil in the Marinette well just across the line in Wisconsin.

Wells on Neebish, Manitoulin, and Drummond islands, at Escanaba and St. Ignace showed little or no oil or gas and also indicate that the formations dip much more steeply toward the central basin than the formations in Lower Michigan. The dip of the Trenton from Neebish to Cheboygan appears to be over 60 feet to the mile and nowhere does there seem to be any marked evidence of a disturbance of the general average dip for a given region. Of course, the drillings in the Upper Peninsula are so scattered that minor flexures would hardly be discovered, should they exist.

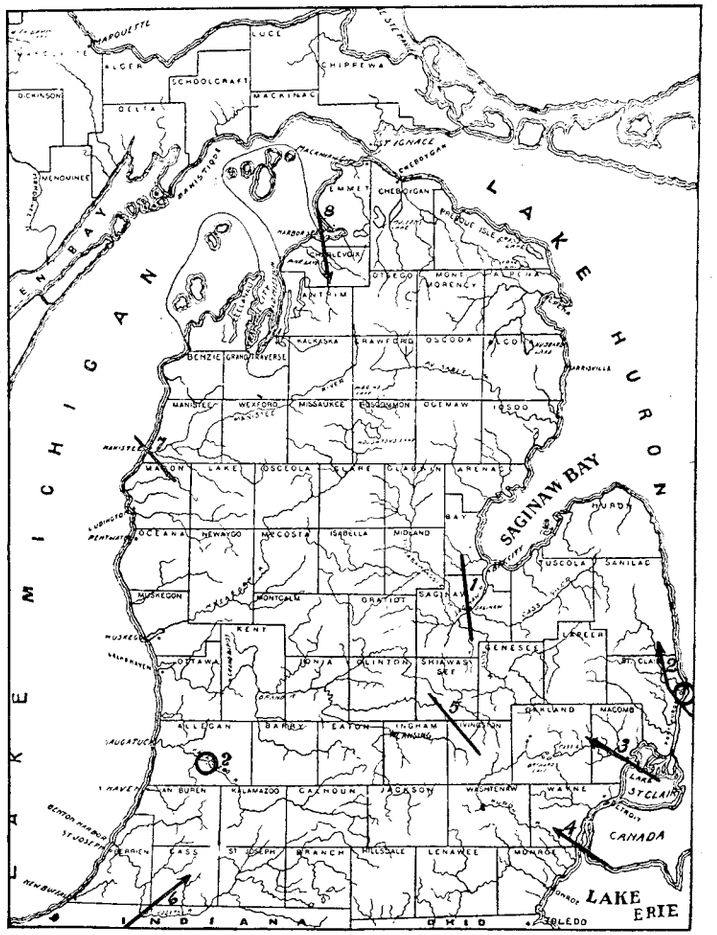

Fig. 19. Map showing the position, course, and pitch of the anticlinals which appear to exist in the underlying formations in Michigan.
~~1~~. Anticlinal running through the southern part of the city of Port Huron and then veering to the north along Black river.
~~2~~. Anticlinal of indefinite position near Mt. Clemens.
~~3~~. Anticlinal coming across Detroit river at Wyandotte and pitching sharply to the northwest.
~~4~~. Anticlinal in Livingston county, which may be a continuation of the Wyandotte.
~~5~~. Anticlinal coming up from Indiana near Elkhart and running northeast a few miles to the east of Niles.
~~6~~. Anticlinal crossing Saginaw river near the Wylie well in Saginaw and running slightly west of north and passing through a point 3 or 4 miles west of Kawkawlin.
7. Anticlinal of unknown direction and position in the region of Stronach, Manistee county.
8. Anticlinal near Kagashewung Point, Little Traverse Bay. Pitch is toward central basin.
0. Circle indicates occurrence of oil in commercial or possibly commercial quantities.

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS, AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

Southeastern District and Port Huron Field.	Glacial Drift—Sand, gravel and clay. Water.	Saginaw Coal Measures.—Sandstones, shales, coal seams. Water.	Parma Sandstone—White sandstone. "First brine."	Upper Grand Rapids—Limestones, sandstones, etc.	Lower Grand Rapids or Michigan Series—Limestones, shales, gypsum, sandstones.	Upper Marshall or Napoleon Sandstone—Coarse micaceous sandstone. "Second brine."	Lower Marshall—Sandstones and shales alternating. Shalier toward base and toward center of basin.	Coldwater Shales—Thick massive shales, calcareous toward western part of state. Dry.	Berea or Sunbury black shale.
Monroe, Monroe Co., A. T. 579, H. D. 1,765	40								
Moore Well.									
Blissfield, Lenawee Co., A. T. ...., D. 2,402	120								
Sec. 30, T. 7, S. R. 5 E.									
Adrian, Lenawee Co., A. T. 810, H. D. 1,650	180								
Adrian Gas Co.									
Dundee, Monroe Co., A. T. 670 ft. ±, D. 1,473	35 ±							514	554
Manchester, Washtenaw Co., A. T. 830±, D. 690	174								
Manchester Oil Co. 6 miles southeast of town.									
Britton, Lenawee Co., A. T. 700±, D. 1,603+	93							327	
Wyandotte, Wayne Co., A. T. 580, D. 2,502	75								
Milan, Washtenaw Co., A. T. 685, D. 1,643	130								
Ypsilanti, Washtenaw Co., A. T. 682, D. 1,210	90								
Banner Oil & Gas Co.									
Ann Arbor, Washtenaw Co., A. T. 875, D. 1,326	235							?	?
Romulus, Wayne Co., A. T. 620, D. 1,820	141							355	415
E. Twark well, 6 miles northeast of Ecorse.									
Detroit, Wayne Co., A. T. 587+, D. 2,097	154								
Stroh's Brewery.									
Ecorse, Wayne Co., A. T. 587±, D. 1,323	62								
Morton Salt Co.									

Algonac, St. Clair Co., A. T. 590, D. 1,727	208								
A. Miller, 5 miles below town.									
Marine City, St. Clair Co., A. T. 600, D. 1,630	200								
National Salt Co.									
Marine City, St. Clair Co., A. T. 600±, D. 1,641	230								
Lester & Roberts.									
Mt. Clemens, Macomb Co., A. T. 617, D. 1,060	123								
Romeo, Macomb Co., A. T. 755? D. 1,575	150						240 ?	1,050 ?	1,050 ?
Village well.									
Pontiac, Oakland Co., A. T. 934, D. 1,505	320							500	535
Pontiac Natural Gas and Oil Co.									
Royal Oak ,Oakland Co., A. T. ?, D. 2,502	164								
Royal Oak Manufacturing & Gas Co.									
New Baltimore, St. Clair Co., A. T. ?, D. 1,640	120								
St. Clair, St. Clair Co., A. T. 600±, D. 1,807	172								
Diamond Crystal Salt Co.									
St. Clair, St. Clair Co., A. T. 600?, D. 1,682?	105								
St. Clair Salt Works.									
Marysville, St. Clair Co., A. T. 600, D. 1,150	110								
Binic Farm.									
[1]Port Huron, St. Clair Co., A. T. 605, D. 668	100								
Bailey No. 1.									
[2]Port Huron, St. Clair Co., A. T. 605+, D. 680+	100								
Sec. 9, T. 6 N., R. 17 E. G. B. Stock wells.									
[3]Port Huron, St. Clair Co., A. T. 623, D. 772	124								
Grand Trunk Jc. well.									
Port Huron, St. Clair Co., A. T. 633-589, D. 1,685+	102								
F. L. Wells "Bore Hole."									
Imlay City, Lapeer Co., A. T. 830, D. 1,026	91							1,020	1,020 ?
Walker & Co.									
Port Huron, St. Clair Co., A. T. 655, D. 833	138								
Beard well, 10 miles northwest Port Huron.									
Valley Center, Sanilac Co., A. T. 805, D. 876	149							539	539
Petrolia, Ontario, A. T. 667, D. 1,505	104								
"Test Well."									
Wallaceburg, Ontario, D. 2,100	120								
Ten miles southeast Pt. Lambton.									
Southwestern District.									
[4]Bridgman, Berrien Co., A. T. 636, D. 768	258							308	
Bridgman Oil and Gas Co.									
Niles, Berrien Co., A. T. 681, D. 1,099 (1,140?)	139								

[1]Show of oil and gas in nearly all Port Huron wells.
[2]Oil and gas in commercial quantities.
[3]Oil and gas at 630 ft., show of oil at 710 ft.
[4]Oil from 985 ft. to 1,020 ft.

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS, AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

Southwestern District.	Glacial Drift—Sand, gravel and clay. Water.	Saginaw Coal Measures.—Sandstones, shales, coal seams. Water.	Parma Sandstone—White sandstone. "First brine."	Upper Grand Rapids—Limestones, sandstones, etc.	Lower Grand Rapids or Michigan Series—Limestones, shales, gypsum, sandstones.	Upper Marshall or Napoleon Sandstone—Coarse micaceous sandstone. "Second brine."	Lower Marshall—Sandstones and shales alternating. Shalier toward base and toward center of basin.	Coldwater Shales—Thick massive shales, calcareous toward western part of state. Dry.	Berea or Sunbury black shale.
Niles, Berrien Co., A. T. 681+, D. 592. Niles Oil and Gas Co.	265	.....	.....	.....	.....	.....	.....	.....	.....
Berrien Springs, Berrien Co., A. T. 650 ±, D. 700.	110	.....	.....	.....	.....	.....	.....	.....	.....
Dowagiac, Cass Co., A. T. 760, D. 1,760. Round Oak Gas & Fuel Co.	200	.....	.....	.....	.....	.....	.....	.....	.....
Benton Harbor, Berrien Co., A. T. 600, D. 1,205. Benton Harbor Natural Gas & Oil Co.	135	.....	.....	.....	.....	.....	.....	282 ?	282
[5]Allegan, Allegan Co., A. T. 708, D. 1,400. Allegan Oil & Gas Co.	255	.....	.....	.....	.....	.....	.....	.....	.....
Goshen, Ind., A. T. 789, D. 2,054.	162	.....	.....	.....	.....	.....	.....	990 ?	990
[6]South Bend, Ind., A. T. 725, D. 1,670.	137	.....	.....	.....	.....	.....	.....	.....	.....
Elkhart, Ind., A. T. 755 or 741, D. 615.	105	.....	.....	.....	.....	.....	.....	.....	.....
White Pigeon, St. Joseph Co., A. T. ?, D. 763. White Pigeon Oil & Gas Co.	182	.....	.....	.....	.....	.....	.....	.....	119 ?
Constantine, St. Joseph Co., A. T. 803, D. 1,080.	136	.....	.....	.....	.....	.....	.....	465	465
Coldwater, Branch Co., A. T. 983, D. 1,200.	115	.....	.....	.....	.....	.....	.....	286	301
Kalamazoo, Kalamazoo Co., A. T. 777, D. 2,250. Kalamazoo Natural Gas Co.	130	.....	.....	.....	.....	.....	.....	816	830
								920	.....

[5]Oil and gas.

[6]Gas at 280 ft.

Assyria, Barry Co., A. T. 917, D. 2,040+ ?	240 ?	.....	.....	.....	.....	320	500	.....	1,100
Western Michigan.									
[7]Muskegon, Muskegon Co., A. T. 594, D. 2,627. Mason well near Occidental Hotel.	210	.....	.....	.....	.....	325	625	1,200+	.....
Muskegon, Muskegon Co., A. T. 588, D. 2,050-2,200 (?). Ryerson Hill well.	298	.....	.....	.....	.....	.....	.....	1,427	.....
Muskegon, Muskegon Co., A. T. 592, D. 1,500. Michigan Oil Co. 40 ft. from Mason.	235	.....	.....	.....	.....	.....	340	1,500	.....
Muskegon, Muskegon Co., A. T. 592 ±, D. 1,650. Central Paper Co., N. E. ¼ Sec. 34, T. 10 N., R. 17 W.	233	.....	.....	.....	.....	.....	310	1,323+	.....
Ludington, Mason Co., A. T. 590?, D. 2,304. Stearns Lumber and Salt Co. Well.	576	.....	.....	.....	.....	.....	.....	.....	1,200
Ludington, Mason Co., A. T. 590?, D. 2,220. Pere Marquette Lumber Co.	528	.....	.....	.....	.....	.....	.....	.....	1,200 ±
Ludington, Mason Co., A. T. 600, D. 2,260. Butters & Peters well, 1 mile south of Pere Marquette well.	545 ±	.....	.....	.....	.....	.....	.....	.....	1,200 ±
Manistee, Manistee Co., A. T. 604, D. 1,947+500 ±. Canfield-Wheeler.	715 ±	.....	.....	.....	.....	.....	.....	.....	.....
[8]Manistee, Manistee Co., A. T. 590 ±, D. 2,026. R. G. Peters Well.	614	.....	.....	.....	.....	.....	.....	.....	.....
Manistee, Manistee, Co., A. T., 610 D. 2,015. Buckley & Douglass Lumber Co. No. 5.	616	.....	.....	.....	.....	.....	.....	.....	.....
Stronach, Manistee Co., A. T. 604, D. 1,972. Stronach Lumber Co.	570	.....	.....	.....	.....	.....	.....	.....	.....
Frankfort, Benzie Co., A. T. 600+, D. 1,800. A. G. Butler.	527 ±	.....	.....	.....	.....	.....	.....	.....	.....
Central Michigan.									
Caseville, Huron Co., A. T. 590?, D. 3,230.	100	175	.....	.....	422	722	982	1,878	1,980
Bay City, Bay Co., A. T. 590, D. 2,865. Atlantic Mill in North Bay City.	120	585	635 ?	.....	830	.....	920	1,600+	2,118
[9]South Bay City, Bay Co., A. T. 592 ±, D. 3,508. North American Chemical Co. "Rock Salt" Well.	105	490	540	620	840	970	1,290	2,060	2,100
Saginaw, Saginaw Co., A. T. 600, D. 900. Saginaw Plate Glass Co., Saginaw Town.	101	474	535	616	820	898	900+	.....	.....
East Saginaw, Saginaw Co., A. T. 588, D. 800. East Saginaw Salt & Mfg. Co.	92	292+	398 ?	.....	636	797	800+	.....	.....
Saginaw, Saginaw Co., A. T. 585 ±, D. 710+ ?. Wylie Well.	90 ±	.....	.....	.....	620 ±	710	710+	.....	.....
Midland, Midland Co., A. T. 590 ±, D. 1,200 ?.	155	.....	.....	.....	.....	1,050+	.....	.....	.....
Mt. Pleasant, Isabella Co., A. T. 770, D. 1,555.	400	810	840	1,050	1,408	.....	1,550 ±	.....	.....
Alma, Gratiot Co., A. T. 740 ±, D. 2,861.	500	710	790	.....	1,015	1,100 ?	1,500	2,250	2,300

[7]"Heavy" oil and gas at 1,200 ft.

[8]Water and oil blown 150 ft. above top of derrick, which was blown off.

[9]Signs of oil and gas at 2,070 ft.

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS, AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

	Glacial Drift—Sand, gravel and clay. Water.	Saginaw Coal Measures.—Sandstones, shales, coal seams. Water.	Parma Sandstone—White sandstone. "First brine."	Upper Grand Rapids—Limestones, sandstones, etc.	Lower Grand Rapids or Michigan Series—Limestones, shales, gypsum, sandstones.	Upper Marshall or Napoleon Sandstone—Coarse micaceous sandstone. "Second brine."	Lower Marshall—Sandstones and shales alternating. Shalier toward base and toward center of basin.	Coldwater Shales—Thick massive shales, calcareous toward western part of state. Dry.	Berea or Sunbury black shale.
Central Michigan.									
Ithaca, Gratiot Co., A. T. 680±, D. 613	330	525	613	613?+	.....	.....	.....	.....	.....
Owosso, Shiawassee Co., A. T. 745, D. 1,100+ G. W. Collyer Well, 4 miles west of city.	126	250	473	.....	556	.....	601+	1,000	.....
Corunna, Shiawassee Co., A. T. 776, D. 907 Corunna Coal Co.	40	238	649	.....	800	.....	907+	.....	.....
Grand Rapids, Kent Co., A. T. 605±, D. 2,220 Grand Rapids Artesian Water Co.	10	.....	.....	.....	128	420	712 ?	1,500	.....
Charlotte, A. T. 906, D. 2,209 E. Shepherd and F. W. Higby.	72	.....	.....	.....	370	.....	680	1,660	.....
Jackson, A. T. 928, D. 2,455 Worthington & Cooley Mtg. Co.	22	83	300 ?	.....	.....	.....	430	1,250 ?	1,400
Northern Part of Lower Peninsula.									
Cheboygan, Cheboygan Co., A. T. 590+, D. 2,725	380	.....	.....	.....	.....	.....	.....	.....	.....
Grayling, Crawford Co., A. T. 1,140, D. 2,750 Salling, Hanson & Co.	365	.....	.....	.....	.....	.....	540	.....	1,540
Alpena, Alpena Co., A. T. ....., D. 1,712 Alpena Land Co. No. 1 at Grand Lake.	50	.....	.....	.....	.....	.....	.....	.....	.....
Alpena, Alpena Co., A. T. ?, D. 1,638 U. S. Geol. Surv. Well.	375	.....	.....	.....	.....	.....	.....	.....	.....
Grayling, Crawford Co., A. T. 1,140, D. 2,280? Grayling No. 2.	350	.....	.....	.....	.....	.....	.....	.....	1,720
Harrisville, Alcona Co., A. T. 640, D. 506+? [10] Killmaster, Alcona Co., A. T. 670, D. 1,530	230 240	.....	.....	.....	.....	.....	.....	530	260 570
Upper Peninsula.									
[11] Rapid River, Delta Co., A. T. 650±, D. 800+200 A. E. Neff, 7 miles northeast Rapid River.	16	.....	.....	.....	.....	.....	.....	.....	.....
Gladstone, Delta Co., A. T., 605, D. 743 St. Paul, Sault Ste. Marie R. R.	87	.....	.....	.....	.....	.....	.....	.....	.....
Escanaba, Delta Co., A. T., 600, D Wagner Well opposite Escanaba, Sec. 8, T. 39 N., R. 21 W.	9	.....	.....	.....	.....	.....	.....	.....	.....
[11] Marinette, Wis., A. T. 600, D. 978 Marinette Water Works.	69	.....	.....	.....	.....	.....	.....	.....	.....
Neebish Island, Chippewa Co., A. T. 670±, D. 527+ American Alkali Co.	111	.....	.....	.....	.....	.....	.....	.....	.....
Pickford, Chippewa Co., A. T. 670, D. 1,425-1,500 Taylor, Holden & Van Campen.	132	.....	.....	.....	.....	.....	.....	.....	.....
St. Ignace, Mackinaw Co., A. T. 600±, D. 1,166	45	.....	.....	.....	.....	.....	.....	.....	.....

[10] Gas in top of Berea sandstone.
[11] Oil in small quantities.

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS, AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

Southeastern District and Port Huron Field.	Berea grit or sandstone, white or gray, coarse and full of pure strong brine. "Third brine." Oil and gas horizon.	Antrim Black Shale—Upper part blue; sandstone lenses. Signs of oil and gas.	Traverse Formation—Top generally limestone; middle, limestone and shale; bottom, blue or black shale.	Dundee Limestone—Consistently a limestone. Oil and gas horizon.	Upper Monroe—Dolomites or "limestones," Gypsum or anhydrite, celestite and sulphur.	Middle Monroe or Sylvania—Pure white sandstone, friable and passing into sand and limestone toward the north.	Lower Monroe or Bass Island—Dolomites or "limestones," often sandy, cherty; anhydrite and celestite.	Salina—Salt, anhydrite or "gypsum," dolomites or "limestones," red, green or black shales.	Guelph and Niagara—White dolomites or "limestones," often cherty.
Monroe, Monroe Co., A. T. 579, H. D. 1,765	.....	.....	.....	.....	.....	.....	.....	700	1,080
Moore Well.									
Blissfield, Lenawee Co., A. T. ...., D. 2,402	.....	.....	420±	.....	.....	.....	.....	.....	.....
Sec. 30, T. 7, S. R. 5 E.									
Adrian, Lenawee Co., A. T. 810, H. D. 1,650	584	800	900 ?	.....	.....	.....	.....	.....	.....
Adrian Gas Co.									
Dundee, Monroe Co., A. T. 670±, D. 1,473	.....	.....	.....	.....	.....	.....	.....	1,195	1,473
Manchester, Washtenaw Co., A. T. 830±, D. 690	329	600	690	.....	.....	.....	.....	.....	.....
Manchester Oil Co. 6 miles southeast of town.									
Britton, Lenawee Co., A. T. 700±, D. 1,603+	.....	210	400	500	750	1,000±	1,550 ?	1,550	1,603+
Wyandotte, Wayne Co., A. T. 580, D. 2,502	.....	.....	.....	125	230	290	730	1,510	1,860
Milan, Washtenaw Co., A. T. 685, D. 1,643	.....	.....	298	395	535	823	1,025	1,545 ?	1,643
Ypsilanti, Washtenaw Co., A. T. 682, D. 1,210	....?...	291	520	680	1,200 ?	1,210±	.....	.....	.....
Banner Oil & Gas Co.									
Ann Arbor, Washtenaw Co., A. T. 875, D. 1,326	520	680	930	1,040	1,240	1,326 ?	.....	.....	.....
Romulus, Wayne Co., A. T. 620, D. 1,820	.....	.....	182	298	385	545	925	1,820	.....
E. Twark well, 6 miles northeast of Ecorse.									
Detroit, Wayne Co., A. T. 587+, D. 2,097	.....	.....	300	.....	615	700	1,150	2,097	.....
Stroh's Brewery.									
Ecorse, Wayne Co., A. T. 587±, D. 1,323	.....	.....	.....	.....	197	362	792	1,323+	.....
Morton Salt Co.									

Algonac, St. Clair Co., A. T. 590, D. 1,727	.....	.....	513	700±	.....	.....	1,500	1,727	.....
A. Miller, 5 miles below town.									
Marine City, St. Clair Co., A. T. 600, D. 1,630	.....	.....	400	625	750	1,000	1,130	1,570	1,630
National Salt Co.									
Marine City, St. Clair Co., A. T. 600±, D. 1,641	.....	360	635	770	1,060	1,130	1,485	1,641	.....
Lester & Roberts.									
Mt. Clemens, Macomb Co., A. T. 617, D. 1,060	210	400±	610	985	1,060	.....	.....	.....	.....
Romeo, Macomb Co., A. T. 755? D. 1,575	....?...	.....	.....	1,300	....?...	....?...	.....	.....	.....
Village well									
Pontiac, Oakland Co., A. T. 934, D. 1,505	808	965	1,115	.....	1,505	.....	.....	.....	.....
Pontiac Natural Gas and Oil Co.									
Royal Oak, Oakland Co., A. T. ?, D. 2,502	.....	305	520	836	.....	.....	1,543	2,502+	.....
Royal Oak Manufacturing & Gas Co.									
New Baltimore, St. Clair Co., A. T. ?, D. 1,640	.....	460	690	820	.....	.....	1,600	1,640+	.....
St. Clair, St. Clair Co., A. T. 600±, D. 1,807	.....	530	790	910	1,270	1,370	1,610	1,807+	.....
Diamond Crystal Salt Co.									
St. Clair, St. Clair Co., A. T. 600?, D. 1,682?	.....	400±	700±	.....	.....	.....	.....	1,660	1,682 ?
St. Clair Salt Works.									
Marysville, St. Clair Co., A. T. 600, D. 1,150	.....	298	588	1,015	1,150	.....	.....	.....	.....
Binic Farm.									
Port Huron, St. Clair Co., A. T. 605, D. 668	.....	200	543	668+	.....	.....	.....	.....	.....
Bailey No. 1.									
Port Huron, St. Clair Co., A. T. 605+, D. 680+	.....	187	520	600+	.....	.....	.....	.....	.....
Sec. 9, T. 6 N., R. 17 E. G. B. Stock wells.									
Port Huron, St. Clair Co., A. T. 623, D. 772	.....	307	625	772+	.....	.....	.....	.....	.....
Grand Trunk Jc. well.									
Port Huron, St. Clair Co., A. T. 633-589, D. 1,685+	.....	200	555	648	980 ?	1,215	1,555	1,740+	.....
F. L. Wells "Bore Hole."									
Imlay City, Lapeer Co., A. T. 830, D. 1,026	.....	.....	.....	.....	.....	.....	.....	.....	.....
Walker & Co.									
Port Huron, St. Clair Co., A. T. 655, D. 833	.....	238	737	833+	.....	.....	.....	.....	.....
Beard well, 10 miles northwest Port Huron.									
Valley Center, Sanilac Co., A. T. 805, D. 876	569	876+	.....	.....	.....	.....	.....	.....	.....
Petrolia, Ontario, A. T. 667, D. 1,505	.....	.....	332	600	.....	1,100	1,505 ?	1,505	.....
"Test Well."									
Wallaceburg, Ontario, D. 2,100	.....	449	750	1,000	....?...	1,100	1,700	2,035	2,100+
Ten miles southeast Pt. Lambton.									
Southwestern District.									
Bridgman, Berrien Co., A. T. 636, D. 768	....?...	508	.....	763	768+	.....	.....	.....	.....
Bridgman Oil and Gas Co.									
Niles, Berrien Co., A. T. 681, D. 1,099 (1,140?)	.....	460	500	605	.....	.....	985	.....	1,145+

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS, AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

Southwestern District.	Berea grit or sandstone, white or gray, coarse and full of pure strong brine. "Third brine." Oil and gas horizon.	Antrim Black Shale—Upper part blue; sandstone lenses. Signs of oil and gas.	Traverse Formation—Top generally limestone; middle, limestone and shale; bottom, blue or black shale.	Dundee Limestone—Consistenly a limestone. Oil and gas horizon.	Upper Monroe—Dolomites or "limestones." Gypsum or anhydrite, celestite and sulphur.	Middle Monroe or Sylvania—Pure white sandstone, friable and passing into sand and limestone toward the north.	Lower Monroe or Bass Island—Dolomites or "limestones," often sandy, cherty; anhydrite and celestite.	Salina—Salt, anhydrite or "gypsum," dolomites or "limestones," red, green or black shales.	Guelph and Niagara—White dolomites or "limestones," often cherty.
Niles, Berrien Co., A. T. 681+, D. 592. Niles Oil and Gas Co.	.....	421	580	592+	.....	.....	.....	.....	.....
Berrien Springs, Berrien Co., A. T. 650 ±, D. 700	.....	620	700	.....	.....	.....	.....	.....	.....
Dowagiac, Cass Co., A. T. 760, D. 1,760. Round Oak Gas & Fuel Co.	305	765	875±	990+	.....	.....	1,325	.....?....	1,670
Benton Harbor, Berrien Co., A. T. 600, D. 1,205. Benton Harbor Natural Gas & Oil Co.	.....	475	665	788±	.....	.....	.....	.....?....	1,205+
Allegan, Allegan Co., A. T. 708, D. 1,400. Allegan Oil & Gas Co.	.....	1,195	1,275	1,400+	.....	.....	.....	.....	.....
Goshen, Ind., A. T. 789, D. 2,054	.....	.....	470	530	.....	.....?....	562	.....	1,290
South Bend, Ind., A. T. 725, D. 1,670	.....	350	555	800±	.....	.....?....	900	.....	1,180
Elkhart, Ind., A. T. 755 or 741, D. 615	....?...	550	615?	615?+	.....	.....	.....	.....	.....
White Pigeon, St. Joseph Co., A. T. ?, D. 763. White Pigeon Oil & Gas Co.	....?...	573	683	763	.....	.....	.....	.....	.....
Constantine, St. Joseph Co., A. T. 803, D. 1,080	....?...	703	1,080?	1,080?+	.....	.....	.....	.....	.....
Coldwater, Branch Co., A. T. 983, D. 1,200	....?...	1,085	1,200+	.....	.....	.....	.....	.....	.....
Kalamazoo, Kalamazoo Co., A. T. 777, D. 2,250. Kalamazoo Natural Gas Co.	.....	1,200	1,270	1,490	.....	.....	.....	1,730	2,000

Assyria, Barry Co., A. T. 917, D. 2,040+ ?	.....	1,755	1,875	2,040+	.....	.....	.....	.....	.....
Western Michigan.									
Muskegon, Muskegon Co., A. T. 594, D. 2,627. Mason well near Occidental Hotel.	....?...	1,700	.....	2,100	.....	.....	2,350	2,627	.....
Muskegon, Muskegon Co., A. T. 588, D. 2,050-2,200 (?). Ryerson Hill well.	....?...	.....	.....	.....	2,050±	.....	2,200?+	2,200+	.....
Muskegon, Muskegon Co., A. T. 592, D. 1,500. Michigan Oil Co. 40 ft. from Mason.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Muskegon, Muskegon Co., A. T. 592±, D. 1,650. Central Paper Co., N. E. ¼ Sec. 34, T. 10 N., R. 17 W.	1,480	1,615	1,650+	.....	.....	.....	.....	.....	.....
Ludington, Mason Co., A. T. 590?, D. 2,304. Stearns Lumber and Salt Co. Well.	.....	1,400	2,025?	2,025+	.....	.....	2,304?	2,304+	.....
Ludington, Mason Co., A. T. 590, D. 2,220. Pere Marquette Lumber Co.	.....	1,365	1,862	2,000	.....	.....	2,195	2,220+	.....
Ludington, Mason Co., A. T. 600, D. 2,260. Butters & Peters well, 1 mile south of Pere Marquette well.	.....	1,490	.....	.....	.....	.....	.....	2,260+	.....
Manistee, Manistee Co., A. T. 604, D. 1,947+500±. Canfield-Wheeler.	875	1,075±	1,575	1,705	.....	.....	1,947?	1,947+	2,447±
Manistee, Manistee Co., A. T. 590±, D. 2,206. R. G. Peters Well.	.....	960	1,595	1,645±	.....	.....	1,905±	2,026+	.....
Manistee, Manistee Co., A. T. 610, D. 2015. Buckley & Douglass Lumber Co. No. 5.	.....	.....	.....	1,680	.....	.....	.....	2,015+	.....
Stronach, Manistee Co., A. T. 604, D. 1,972. Stronach Lumber Co.	.....	950	1,625	.....	.....	.....	1,930	1,972+	.....
Frankfort, Benzie Co., A. T. 600+, D. 1,800. A. G. Butler.	.....	.....	1,230	1,380+	....?...	.....	.....	.....	.....
Central Michigan.									
Caseville, Huron Co., A. T. 590?, D. 3,230	2,050	2,506	3,110	3,230+	.....	.....	.....	.....	.....
Bay City, Bay Co., A. T. 590, D. 2,865. Atlantic Mill in North Bay City.	2,306	2,585	2,822	2,865+	.....	.....	.....	.....	.....
South Bay City, Bay Co., A. T. 592±, D. 3,508. North American Lumber Co. "Rock Salt" Well.	2,270	2,580	3,270	3,508+	.....	.....	.....	.....	.....
Saginaw, Saginaw Co., A. T. 600, D. 900. Saginaw Plate Glass Co., Saginaw Town.	.....	.....	.....	.....	.....	.....	.....	.....	.....
East Saginaw, Saginaw Co., A. T. 588, D. 800. East Saginaw Salt & Mfg. Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Saginaw, Saginaw Co., A. T. 585±, D. 710+ ?. Wylie Well.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Midland, Midland Co., A. T. 590±, D. 1,200 ?	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mt. Pleasant, Isabella Co., A. T. 770, D. 1,555	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alma, Gratiot Co., A. T. 740±, D. 2,861	.....	2,620	2,861+	.....	.....	.....	.....	.....	.....

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

	Berea grit or sandstone, white or gray, coarse and full of pure strong brine. "Third brine." Oil and gas horizon.	Antrim Black Shale—Upper part blue; sandstone lenses. Signs of oil and gas.	Traverse Formation—Top generally limestone; middle, limestone and shale; bottom, blue or black shale.	Dundee Limestone—Consistently a limestone. Oil and gas horizon.	Upper Monroe—Dolomites or "limestones." Gypsum or anhydrite, celestite and sulphur.	Middle Monroe or Sylvania—Pure white sandstone, friable and passing into sand and limestone toward the north.	Lower Monroe or Bass Island—Dolomites or "limestones," often sandy, cherty; anhydrite and celestite.	Salina—Salt, anhydrite or "gypsum," dolomites or "limestones," red, green or black shales.	Guelph and Niagara—White dolomites or "limestones," often cherty.
Central Michigan.									
Ithaca, Gratiot Co., A. T. 680±, D. 613	.....	.....	.....	.....	.....	.....	.....	.....	.....
Owosso, Shiawassee Co., A. T. 745, D. 1,100+ G. W. Collyer Well, 4 miles west of city.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corunna, Shiawassee Co., A. T. 776, D. 907 Corunna Coal Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand Rapids, Kent Co., A. T. 605±, D. 2,220 Grand Rapids Artesian Water Co.	.....	1,708	1,885	.....	.....	.....	2,220 ?	2,220 ?	.....
Charlotte, A. T. 906, D. 2,209 E. Shepherd and F. W. Higby.	1,700	1,930	1,985	2,105	2,209+	.....	.....	.....	.....
Jackson, A. T. 928, D. 2,455 Worthington & Cooley Mfg. Co.	1,465	1,655	1,770	1,870	.....	.....	2,485+	.....	.....
Northern Part of Lower Peninsula.									
Cheboygan, Cheboygan Co., A. T. 590+, D. 2,725	.....	.....	.....	.....	.....	.....	1,550	1,550 ?	2,050
Grayling, Crawford Co., A. T. 1,140, D. 2,750 Salling, Hanson & Co.	.....	2,165	2,750	.....	.....	.....	.....	.....	.....
Alpena, Alpena Co., A. T. ...., D. 1,712 Alpena Land Co. No. 1 at Grand Lake.	.....	.....	100	265	700	800	1,352	1,712	.....
Alpena, Alpena Co., A. T. ?, D. 1,638 U. S. Geol. Surv. Well.	.....	.....	.....	.....	450	535 ?	1,315±	1,638+	.....
Grayling, Crawford Co., A. T. 1,140, D. 2,280? Grayling No. 2.	.....	2,280	.....	.....	.....	.....	.....	.....	.....
Harrisville, Alcona Co., A. T. 640, D. 506+?.	506	.....	.....	.....	.....	.....	.....	.....	.....

Killmaster, Alcona Co., A. T. 670, D. 1,530	610	1,000 ?	1,530?+	.....	.....	.....	.....	.....	.....
Upper Peninsula.									
Rapid River, Delta Co., A. T. 650±, D. 800+200 A. E. Neff, 7 miles northeast Rapid River.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gladstone, Delta Co., A. T., 605, D. 743 St. Paul, Sault Ste. Marie R. R.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Escanaba, Delta Co., A. T., 600, D Wagner Well opposite Escanaba, Sec. 8, T. 39 N., R. 21 W.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marinette, Wis., A. T. 600, D. 978 Marinette Water Works.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Neebish Island, Chippewa Co., A. T. 670±, D. 527+ American Alkali Co.	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pickford, Chippewa Co., A. T. 670, D. 1,425-1,500 Taylor, Holden & Van Campen.	.....	.....	.....	.....	.....	.....	.....	.....	260
St. Ignace, Mackinaw Co., A. T. 600±, D. 1,166	.....	.....	.....	.....	.....	.....	.....	510	1,020

REFERENCE TABLE OF DEEP BORINGS IN MICHIGAN BY DISTRICTS, SHOWING DEPTH, THICKNESS, AND PROVISIONAL CORRELATIONS OF THE VARIOUS FORMATIONS.

Southeastern District and Port Huron Field.	Rochester shale; Clinton—Limestone and red shales. Medina—Red shales, sometimes sandy or green shales.	Richmond—Red and blue shales, sandy. Lorraine—Blue shales with black streaks toward base.	Utica—Black shales.	Trenton—Dolomite and limestone, blue and shaly for solid shale at base.	St. Peters—White friable sandstone, often represented by red clay.	Calciferous or Lower Magnesian sandy lime-rock.	Potsdam or Lake Superior sandstone. Red, brown, and striped sandstones. White upper strata. Water.	Pre-Cambrian.	
Monroe, Monroe Co., A. T. 579±, H. D. 1,765 Moore Well.	1,150	1,570	1,734	1,765					
Blissfield, Lenawee Co., A. T. ...., D. 2,402 Sec. 30, T. 7, S. R. 5 E.			2,340	2,402+					
Adrian, Lenawee Co., A. T. 810, H. D. 1,650 Adrian Gas Co.		1,650							
Dundee, Monroe Co., A. T. 670±, D. 1,473	1,503								
Manchester, Washtenaw Co., A. T. 830 ±, D. 690 Manchester Oil Co. 6 miles southeast of town.									
Britton, Lenawee Co., A. T. 700±, D. 1,603+									
Wyandotte, Wayne Co., A. T. 580, D. 2,502	2,210	2,500+							
Milan, Washtenaw Co., A. T. 685, D. 1,643									
Ypsilanti, Washtenaw Co., A. T. 682, D. 1,210 Banner Oil & Gas Co.									
Ann Arbor, Washtenaw Co., A. T. 875, D. 1,326									
Romulus, Wayne Co., A. T. 620, D. 1,820 E. Twark well, 6 miles northeast of Ecorse.									
Detroit, Wayne Co., A. T. 587+, D. 2,097 Stroh's Brewery.									
Ecorse, Wayne Co., A. T. 587±, D. 1,323 Morton Salt Co.									
Algonac, St. Clair Co., A. T. 590, D. 1,727 A. Miller, 5 miles below town.									
Marine City, St. Clair Co., A. T. 600, D. 1,630 National Salt Co.									
Marine City, St. Clair Co., A. T. 600±, D. 1,641 Lester & Roberts.									
Mt. Clemens, Macomb Co., A. T. 617, D. 1,060									
Romeo, Macomb Co., A. T. 755? D. 1,575 Village well.									
Pontiac, Oakland Co., A. T. 934, D. 1,505 Pontiac Natural Gas and Oil Co.									
Royal Oak, Oakland Co., A. T. ?, D. 2,502 Royal Oak Manufacturing & Gas Co.									
New Baltimore, St. Clair Co., A. T. ?, D. 1,640									
St. Clair, St. Clair Co., A. T. 600±, D. 1,807 Diamond Crystal Salt Co.									
St. Clair, St. Clair Co., A. T. 600?, D. 1,682? St. Clair Salt Works.									
Marysville, St. Clair Co., A. T. 600, D. 1,150 Binic Farm.									
Port Huron, St. Clair Co., A. T. 605, D. 668 Bailey No. 1.									
Port Huron, St. Clair Co., A. T. 605+, D. 680+ Sec. 9, T. 6 N., R. 17 E. G. B. Stock wells.									
Port Huron, St. Clair Co., A. T. 623, D. 772 Grand Trunk Jc. well.									
Port Huron, St. Clair Co., A. T. 633-589, D. 1,685+ F. L. Wells "Bore Hole."									
Imlay City, Lapeer Co., A. T. 830, D. 1,026 Walker & Co.									
Port Huron, St. Clair Co., A. T. 655, D. 833 Beard well, 10 miles northwest Port Huron.									
Valley Center, Sanilac Co., A. T. 805, D. 876									
Petrolia, Ontario, A. T. 667, D. 1,505 "Test Well."									
Wallaceburg, Ontario, D. 2,100 Ten miles southeast Pt. Lambton.									
Southwestern District.									
Bridgman, Berrien Co., A. T. 636, D. 768 Bridgman Oil and Gas Co.									
Niles, Berrien Co., A. T. 681, D. 1,099 (1,140?)									

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Southeastern District.	Rochester shale; Clinton—Limestone and red shales. Medina—Red shales, sometimes sandy or green shales.	Richmond—Red and blue shales, sandy. Lorraine—Blue shales with black streaks toward base.	Utica—Black shales.	Trenton—Dolomite and limestone, blue and shaly, or solid shale at base.	St. Peters—White friable sandstone, often represented by red clay.	Caliciferous or Lower Magnesian sandy lime-rock.	Potsdam or Lake Superior sandstone. Red, brown, and striped sandstones. White upper strata. Water.	Pre-Cambrian.	
Niles, Berrien Co., A. T. 681+, D. 592									
Niles Oil and Gas Co.									
Berrien Springs, Berrien Co., A. T. 650 ±, D. 700									
Dowagiac, Cass Co., A. T. 760, D. 1,760	1,760	....?							
Round Oak Gas & Fuel Co.									
Benton Harbor, Berrien Co., A. T. 600, D. 1,205									
Benton Harbor Natural Gas & Oil Co.									
Allegan, Allegan Co., A. T. 708, D. 1,400									
Allegan Oil & Gas Co.									
Goshen, Ind., A. T. 789, D. 2,054		1,597	1,812	2,054 ?					
South Bend, Ind., A. T. 725, D. 1,670		1,400	1,585	1,670+					
Elkhart, Ind., A. T. 755 or 741, D. 615									
White Pigeon, St. Joseph Co., A. T. ?, D. 763									
White Pigeon Oil & Gas Co.									
Constantine, St. Joseph Co., A. T. 803, D. 1,080									
Coldwater, Branch Co., A. T. 983, D. 1,200									
Kalamazoo, Kalamazoo Co., A. T. 777, D. 2,250	2,250+								
Kalamazoo Natural Gas Co.									

Assyria, Barry Co., A. T. 917, D. 2,040+ ?									
Western Michigan.									
Muskegon, Muskegon Co., A. T. 594, D. 2,627									
Mason well near Occidental Hotel.									
Muskegon, Muskegon Co., A. T. 588, D. 2,050-2,200 (?)									
Ryerson Hill well.									
Muskegon, Muskegon Co., A. T. 592, D. 1,500									
Michigan Oil Co. 40 ft. from Mason.									
Muskegon, Muskegon Co., A. T. 592±, D. 1,650									
Central Paper Co., N. E. ¼ Sec. 34, T. 10 N., R. 17 W.									
Ludington, Mason Co., A. T. 590, D. 2,304									
Stearns Lumber and Salt Co. Well.									
Ludington, Mason Co., A. T. 590, D. 2.220									
Pere Marquette Lumber Co.									
Ludington, Mason Co., A. T. 600, D. 2,260									
Butters & Peters well, 1 mile south of Pere Marquette well.									
Manistee, Manistee Co., A. T. 604, D. 1,947+500±									
Canfield-Wheeler.									
Manistee, Manistee Co., A. T. 590±, D. 2,206									
R. G. Peters Well.									
Manistee, Manistee Co., A. T. 610 D. 2015									
Buckley & Douglass Lumber Co. No. 5.									
Stronach, Manistee Co., A. T. 604, D. 1,972									
Stronach Lumber Co.									
Frankfort, Benzie Co., A. T. 600+, D. 1,800									
A. G. Butler.									
Central Michigan.									
Caseville, Huron Co., A. T. 590?, D. 3,230									
Bay City, Bay Co., A. T. 590, D. 2,865									
Atlantic Mill in North Bay City.									
South Bay City, Bay Co., A. T. 592±, D. 3,508									
North American Chemical Co. "Rock Salt" Well.									
Saginaw, Saginaw Co., A. T. 600, D. 900									
Saginaw Plate Glass Co., Saginaw Town.									
East Saginaw, Saginaw Co., A. T. 588, D. 800									
East Saginaw Salt & Mfg. Co.									
Saginaw, Saginaw Co., A. T. 585±, D. 710+ ?									
Wylie Well.									
Midland, Midland Co., A. T. 590±, D. 1,200 ?									
Mt. Pleasant, Isabella Co., A. T. 770, D. 1,555									
Alma, Gratiot Co., A. T. 740±, D. 2,861									

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Central Michigan.									
Ithaca, Gratiot Co., A. T. 680±, D. 613									
Owosso, Shiawassee Co., A. T. 745, D. 1,100+ G. W. Collyer Well, 4 miles west of city.									
Corunna, Shiawassee Co., A. T. 776, D. 907 Corunna Coal Co.									
Grand Rapids, Kent Co., A. T. 605±, D. 2,220 Grand Rapids Artesian Water Co.									
Charlotte, A. T. 906, D. 2,209 E. Shepherd and F. W. Higby.									
Jackson, A. T. 928, D. 2,455 Worthington & Cooley Mfg. Co.									
Northern Part of Lower Peninsula.									
Cheboygan, Cheboygan Co., A. T. 590+, D. 2,725	2,725	2,725 ?							
Grayling, Crawford Co., A. T. 1,140, D. 2,750 Salling, Hanson & Co.									
Alpena, Alpena Co., A. T. ....., D. 1,712 Alpena Land Co. No. 1 at Grand Lake.									
Alpena, Alpena Co., A. T. ?, D. 1,638 U. S. Geol. Surv. Well.									
Grayling, Crawford Co., A. T. 1,140, D. 2,280? Grayling No. 2.									
Harrisville, Alcona Co., A. T. 640, D. 506+?									
Killmaster, Alcona Co., A. T. 670, D. 1,530									
Upper Peninsula.									
Rapid River, Delta Co., A. T. 650±, D. 800+200 A. E. Neff, 7 miles northeast Rapid River.				290 ?	320	555	830	1,000+	
Gladstone, Delta Co., A. T., 605, D. 743 St. Paul, Sault Ste. Marie R. R.				326	404	642	743	743 ?	
Escanaba, Delta Co., A. T., 600, D Wagner Well opposite Escanaba, Sec. 8, T. 39 N., R. 21 W.		201	251	640					
Marinette, Wis., A. T. 600, D. 978 Marinette Water Works.				325	400	580	870±	978+	
Neebish Island, Chippewa Co., A. T. 670±, D. 527+ American Alkali Co.				158	211 ?	223 ?	527+		
Pickford, Chippewa Co., A. T. 670, D. 1,425-1,500 Taylor, Holden & Van Campen.		475	525	600–700	800–900	....?....	1,500		
St. Ignace, Mackinaw Co., A. T. 600±, D. 1,166	1,166+								

DIRECTORY OF THE MINERAL PRODUCERS OF MICHIGAN

Compiled by the Michigan Geological and Biological Survey in cooperation with the United States Geological Survey, Division of Mineral Resources.

LIST OF COPPER MINING COMPANIES, ADDRESS OF HEAD OFFICE AND NAME OF PERSON IN CHARGE OF PROPERTY.

Adventure Consolidated Copper Co., 32 Broadway, N. Y., Chas. L. Lawton, General Superintendent.

Ahmeek Mining Company, 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.

Agate Harbor Mine, care of Mrs. Anna Scott Block, 100 Washington St., Chicago.

Algomah Mining Co., 60 State St., Boston, Mass., R. M. Edwards, General Manager.

Allouez Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.

Arnold Mining Co., 64-50 State St., Boston, Mass., Capt. Wesley Clark, Superintendent.

Ashbed Mining Co., 64-50 State St., Boston, Mass., Capt. Wesley Clark, Superintendent.

Atlantic Mining Co., 82 Devonshire Place, Boston, Mass., F. W. Denton, General Manager.

Baltic Mining Co., 82 Devonshire Place, Boston, Mass., F. W. Denton, General Manager.

Bohemia Mining Co., 85 Devonshire Place, Boston, Mass., R. M. Edwards, Superintendent.

Boston & Lake Superior Mineral Land Co., Houghton, F. W. Nichols, Agent.

Calumet & Hecla Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.

Carp Lake Mining Co., Ontonagon, H. L. Payne, General Manager.

Centennial Copper Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.

Champion Copper Co., 82 Devonshire St., Boston, Mass., F. W. Denton, General Manager.

Cherokee Copper Co., Houghton, R. M. Edwards, H. W. Fesing.

Clark Mine, Dr. Leon Estivant, 47 Ave. de' Alma, Paris, France, F. W. Nichols, Agent.

Cliff Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.

Contact Copper Co., 70 State St., Boston, Mass., Geo. Goodale, Superintendent.

Copper Crown Mining Co. of Michigan, 1013 Eastern Ave., St. Louis, Jacob Maurer, President.

Copper Range Co., 82 Devonshire St., Boston, F. W. Denton, General Manager.
Dakota Heights Co., Hancock, H. L. Baer, President.
Dana Copper Co., 68 Devonshire St., Boston, James MacNaughton, General Manager.
Elm River Copper Co., 70 State St., Boston, Geo. S. Goodale, Superintendent.
Franklin Mining Co., 60 Congress St., Boston, R. M. Edwards, Superintendent.
Frontenac Copper Co., 12 Ashburton Place, Boston, James MacNaughton, General Manager.
Globe Mine, care of J. R. Stanton, 15 William St., N. Y., Thos. Dengler, Superintendent, Painesdale.
Gratiot Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Hancock Consolidated Mining Co., Hancock, John L. Harris, Superintendent.
Home Copper Mining Co., Copper Falls, Mich.
Houghton Copper Company, 713-199 Washington St., Boston, L. L. Hubbard, General Manager.
Hulbert Mining Co., 199 Washington St., Boston, Mass., F. W. Nichols, Agent.
Humboldt Copper Co., 64-50 State St., Boston, Capt. Wesley Clark, Superintendent.
Indiana Mining Co., 60 Congress St., Boston, R. M. Edwards, General Manager.
Island Copper Co., 1400 Alworth Bldg., Duluth, Minn., F. W. Nichols, Secretary.
Isle Royale Copper Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Keweenaw Association, 33-87 Milk St., Boston, Mass., J. M. Longyear, Agent.
Keweenaw Copper Co., Hancock, Mich., Capt. Thos. Hoatson, Mining Director.
King Phillip Copper Co., 701-199 Washington St., Boston, L. L. Hubbard, Manager.
Lake Copper Co., 85 Devonshire St., Boston, Mass., C. K. Hitchcock, Superintendent.
Lake Milling, Smelting and Refining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Lake Shore Mining Co., 990 West Kensington Road, Los Angeles, W. H. Garlick, President.
Lake Superior Copper Co., Rockland, Mich.
Lake Superior Development Co., Houghton, Mich., Jos. Croze, President.
Lake Superior Smelting Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
LaSalle Copper Company, 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Laurium Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Manitou Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Mass Consolidated Mining Co., 804-79 Milk St., Boston, Mass., E. W. Walker, Superintendent.
Mayflower Mining Co., 70 State St., Boston, Mass., Geo. Goodale, Superintendent.
Meadow Mining Co., 50 State St., Boston, Mass., Capt. Wesley Clark, Agent.
Michigan Copper Mining Co., 15 William St., N. Y., Samuel Brady, Superintendent.
Michigan Smelting Co., 82 Devonshire Place, Boston, Mass., F. I. Cairns, Superintendent.
Mohawk Mining Co., 15 William St., N. Y., A. J. Smith, Superintendent.
Mulock Mine, care of R. P. Mulock, Colfax, Ia., J. F. Dreis, Superintendent.
Natick Copper Co., Houghton, F. W. Nichols, Resident Agent.
National Mining Co., 6 Beacon St., Boston, Mass., B. T. Morrison, President.
Native Copper Co., 68 Devonshire Place, Boston, Mass., M. A. O'Neil, President.
New Arcadian Copper Co., Houghton, Robert H. Shields, General Manager.

New Baltic Copper Co., 87 Milk St., Boston, Robt. H. Shields, General Manager.
New York Consolidated Mining Co., Houghton, F. W. Nichols, Resident Agent.
Nonesuch Mine, 78 Prospect Ave., Milwaukee, Wis., A. K. Camp, Owner.
North Lake Mining Co., 60 Congress St., Boston, R. M. Edwards, Superintendent.
Ojibway Mining Co., 14 Alworth Bldg., Duluth, L. L. Hubbard, President.
Old Colony Copper Co., 70 State St., Boston, Mass., Geo. S. Goodale, Superintendent.
Oneco Copper Co., 64-50 State St., Boston, J. L. Harris, General Manager.
Osceola Consolidated Mining Co., 12 Ashburton Place, Boston, Mass., James MacNaughton, General Manager.
Pacific Copper Co., 705-199 Washington St., Boston, F. W. Nichols, Agent.
Phoenix Consolidated Copper Co., Hancock, Capt. Thos. Hoatson, Director.
Quincy Mining Co., 1000-32 Broadway, N. Y., Chas. L. Lawton, General Manager.
Rhode Island Copper Co., 60 Congress St., Boston, R. M. Edwards, Superintendent.
St. Louis Copper Co., 12 Ashburton Place, Boston, Jas. MacNaughton, General Manager.
St. Mary's Canal Mineral Land Co., 705-199 Washington St., Boston, F. W. Nichols, Resident Agent.
Section Twelve Exploration Co., Hancock, W. A. Burritt, Manager.
Seneca Mining Co., 12 Ashburton Place, Boston, James MacNaughton, General Manager.
Senter-Dupee Development Co., Calumet, Capt. Thos. Hoatson, Manager.
Shelden & Columbian Mine, Houghton, J. H. Rice.
South Lake Mining Co., 68 Devonshire St., Boston, L. L. Hubbard, Manager.
South Range Mining Co., 199 Washington St., Boston, F. W. Nichols, Agent.
South Side Mining Co., 14-68 Devonshire Place, Boston, F. W. Nichols, Agent.
Superior Copper Co., 12 Ashburton Place, Boston, Jas. MacNaughton, General Manager.
Tamarack Mining Co., 12 Ashburton Place, Boston, Jas. MacNaughton, General Manager.
Toltec Mine, care Alfred Meads & Sons, Marquette, Mich.
Torch Lake Mining Co., 5-19 Exchange Place, Boston, F. W. Nichols, Agent.
Tremont & Devon Mining Co., Ltd., Hancock, Hon. Chas. Smith, President.
Trimountain Mining Co., 82 Devonshire St., Boston, F. W. Denton, General Manager.
Union Copper Land and Mining Co., 70 State St., Boston, Geo. Goodale, Superintendent.
Victoria Copper Mining Co., 512-60 Congress St., Boston, Geo. Hooper, Superintendent.
Washington Copper Mining Co., Hancock, Capt. Thos. Hoatson, Director.
West Minnesota Mining Co., 14-68 Devonshire St., Boston, F. H. Whitman, President.
Whealkate Mining Co., Houghton, N. F. Leopold, President.
White Pine Copper Co., 12 Ashburton Place, Boston, Jas. MacNaughton, General Manager.
Wilmot Mining Co., Calumet, W. H. Garlick, President.
Winona Copper Co., 713-199 Washington St., Boston, L. L. Hubbard, General Manager.
Wolverine Copper Mining Co., 15 William St., N. Y., Fred Smith, Superintendent.
Wyandot Copper Co., 68 Devonshire St., Boston, F. L. Van Orden, Manager.

PRODUCERS OF IRON ORE.

Operator.	Office.	Name of mine.	Location of mine.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Michigan...	Amasa.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Champion..	Beacon.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Tilden.....	Bessemer.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Columbia...	Bessemer.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Hilltop.....	Bessemer.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Hope.....	Bessemer.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Mansfield...	Bessemer.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Chapin & Cuff.....	Crystal Falls.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Cottrell.....	Iron Mt.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Isabella....	Iron Mt.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Riverton Grp.....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Dober....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Iron River	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Stambaugh..	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Aurora.....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Davis.....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Geneva.....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Puritan.....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Royal.....	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Vaughn (part of Aurora)..	Iron River.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Norrie Grp..	Ironwood.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Norrie E..	Ironwood.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Norrie N...	Ironwood.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Norrie.....	Ironwood.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Pabst....	Ironwood.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Lake Superior & Winthrop....	Ishpeming
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Hartford	
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Queen Grp...	Negaunee.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Blue.....	Negaunee.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Buffalo...	Negaunee.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Prince of Wales...	Negaunee.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	S. Buffalo.	Negaunee.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Aragon & Forest.....	Norway.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Moore.....	Palmer.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Cundy.....	Quinnesec.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Stegmiller..	Swanzy.
Oliver Iron Mining Co..	Wolvin Bldg., Duluth, Minn.	Chicago....	Wakefield.
Pickands, Mather & Co.....	Cleveland, O.....	.....	.....
Hemlock River Mining Co.....	.....	Hemlock...	Amasa.
Verona Mining Co....	.....	Mikado.....	Bessemer.
Verona Mining Co....	.....	Vivian.....	Quinnesec.
Verona Mining Co....	.....	Baltic & Caspian..	Stambaugh.
Calumet Ore Co.....	.....	Calumet....	Felch.

PRODUCERS OF IRON ORE—*Continued.*

Operator.	Office.	Name of mine.	Location of mine.
Brotherton Iron Min-Mining Co.....	.....	Brotherton & Pike...	Wakefield.
Sunday Lake Iron Co...	.....	Sunday Lake.....	Wakefield.
Roger-Brown Ore Co..	1515 Corn Exchange Bank Bldg., Chicago, Ill.....	Gibson.....	Amasa.
Corrigan, McKinney & Co., Agts.....	Cleveland, O.....	.....	.....
Colby Iron Mining Co..	Wickliffe, O.....	Colby & Ironton...	Bessemer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Armenia....	Bessemer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Crystal Falls	Bessemer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Dunn.....	Bessemer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Fairbanks..	Bessemer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Kimball....	Crystal Falls.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Star West..	Palmer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Baker.....	Palmer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Blair.....	Palmer.
Crystal Falls Iron Mining Co.....	Wickliffe, O.....	Michaels & Tully.....	Stambaugh.
Genesee Iron Mining Co	.....	Genesee....	Crystal Falls.
Great Western Mining Co.....	Wickliffe, O.....	Great Western.....	Crystal Falls.
Lincoln Iron Mining Co	.....	Lincoln....	Crystal Falls.
Tobin Iron Mining Co..	Wickliffe, O.....	Tobin.....	Crystal Falls.
Quinnesec Iron Mining Co.....	.....	Quinnesec..	Quinnesec.
E. N. Breitung & Co...	.....	Lamont....	Crystal Falls.
Dunn Iron Mining Co.	Colby-Abbot Bldg., Milwaukee, Wis.....	Palms.....	Bessemer.
Lake Superior Iron & Chem. Co.....	Penobscot Bldg., Detroit....	Yale.....	Bessemer.
Newport Mining Co...	Colby-Abbot Bldg., Milwaukee, Wis.....	Anvil.....	Bessemer.
Newport Mining Co...	Colby-Abbot Bldg., Milwaukee, Wis.....	Newport....	Ironwood.
Hollister Mining Co...	Perry-Payne Bldg., Cleveland, O.....	Hollister....	Crystal Falls.
M. A. Hanna & Co....	Perry-Payne Bldg., Cleveland, O.....	Hollister....	Crystal Falls.
Oglebay, Norton & Co.	Wade Bldg., Cleveland, O...	Hollister....	Crystal Falls.
Bristol Mining Co.....	Wade Bldg., Cleveland, O...	Bristol.....	Crystal Falls.
Antoine Ore Co.....	Wade Bldg., Cleveland, O...	Clifford & Traders...	Crystal Falls.
Antoine Ore Co.....	Wade Bldg., Cleveland, O...	Keel Ridge..	Iron Mt.

PRODUCERS OF IRON ORE—*Continued.*

Operator.	Office.	Name of mine.	Location of mine.
Brule Mining Co.	Wade Bldg., Cleveland, O.	Chatham	Iron River.
Brule Mining Co.	Wade Bldg., Cleveland, O.	Berkshire	Stambaugh.
Empire Iron Co	Chicago, Ill.	Empire	Palmer.
Castile Mining Co.	Chicago, Ill.	Asteroid & Eureka	Ramsey.
Castile Mining Co.	Chicago, Ill.	Castile	Wakefield.
Wisconsin Steel Co.	Harvester Bldg., Chicago, Ill.	Lot No. 3	Crystal Falls.
American-Boston Mining Co.	Cleveland, O.	American-Boston	Diorite.
M. A. Hanna & Co.	Cleveland, O.	American-Boston	Diorite.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Northwestern	Gwinn.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Smith	Gwinn.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Austin	Gwinn.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Princeton	Gwinn.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Stephenson	Gwinn.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Ashland	Ironwood.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Cleveland	Ironwood.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Lake	Ironwood.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Cliff Shaft	Ironwood.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Moro	Ironwood.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Ogden.	
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Salisbury	Ishpeming.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Imperial & Webster	Michigamme.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Jackson	Negaunee.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Maas	Negaunee.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Lucy	Negaunee.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Negaunee	Negaunee.
Washington Iron Co	Savings Bank Bldg., Marquette.	Barron & Franklin	Humboldt.
Dessau Mining Co.	Iron Mountain	Millie	Iron Mt.

PRODUCERS OF IRON ORE—*Continued.*

Operator.	Office.	Name of mine.	Location of mine.
Pewabic Company	912 Wells Bldg., Milwaukee, Wis.	Pewabic & Walpole	Iron Mt.
Bates Iron Co.	25 Broad St., New York, N. Y.	Bates	Iron River.
Davidson Ore Mining Co.	Buffalo, N. Y.	Davidson No. 1	Iron River.
Davidson Ore Mining Co.	Buffalo, N. Y.	Davidson No 2.	Iron River.
Huron Iron Mining Co.	1314 Rockefeller Bldg., Cleveland, O.	Youngs.	Iron River.
Mineral Mining Co.	912 Wells Bldg., Milwaukee, Wis.	Osana.	Iron River.
Mineral Mining Co.	912 Wells Bldg., Milwaukee, Wis.	Wauseca.	
Mineral Mining Co.	912 Wells Bldg., Milwaukee, Wis.	Nanaimo	Iron River.
Mineral Mining Co.	912 Wells Bldg., Milwaukee, Wis.	Breen	Waucedah.
Munro Iron Mining Co.	57 Erie County Bank Bldg., Buffalo, N. Y.	Chicagon	Iron River.
Munro Iron Mining Co.	57 Erie County Bank Bldg., Buffalo, N. Y.	Hiawatha	Iron River.
Munro Iron Mining Co.	57 Erie County Bank Bldg., Buffalo, N. Y.	Saginaw	Ishpeming.
Munro Iron Mining Co.	57 Erie County Bank Bldg., Buffalo, N. Y.	Munro	Norway.
Spring Valley Iron Co.	Wellston, O. (or Iron River).	Zimmerman	Iron River.
Pittsburg & Lake Angeline Iron Co.	Cleveland, O.	Lake Angeline.	
Pittsburg & Lake Angeline Iron Co.	Cleveland, O.	Mitchell	Ishpeming.
Loretto Iron Co	1400 Fulton St., Chicago, Ill.	Appleton (or Eleanor).	Loretto.
Loretto Iron Co	1400 Fulton St., Chicago, Ill.	Loretto	Loretto.
Niagara Iron Mining Co.	Iron River.	Ohio & Portland	Michigamme.
Breitung Hematite Mining Co., Ltd.	Savings Bank Bldg., Marquette.	Breitung	Negaunee.
Breitung Hematite Mining Co	Savings Bank Bldg., Marquette.	Hematite No. 1 & 2.	Negaunee.
Jones & Laughlin Ore Co.	3rd Ave. & Ross St., Pittsburgh, Pa.	Rolling Mill.	Negaunee.
Mary Charlotte Mining Co.	Savings Bank Bldg., Marquette.	Mary Charlotte No. 1 & No. 2.	Negaunee.

PRODUCERS OF IRON ORE—*Concluded.*

Operator.	Office.	Name of mine.	Location of mine.
Republic Iron & Steel Co.	Oliver Bldg., Pittsburgh, Pa	Cambria & Lillie	Negaunee.
Richmond Iron Co.	Perry-Payne Bldg., Cleveland, O.	Richmond	Palmer.
Volunteer Ore Co.	1400 Alworth Bldg., Duluth, Minn.	Volunteer	Palmer.
Michigan Iron Mining Co.	Iron River.	Corry	Palatka.
Michigan Iron Mining Co.	Iron River.	Cyr	Stambaugh.
Republic Iron Co.	1703 Morris Bldg., Phila, Pa.	Republic & W. Republic	Republic.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Penn Mines	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Brier Hill	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Cyclops	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Curry	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Norway	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila,. Pa	Vulcan	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Vulcan E.	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Vulcan S. E.	Vulcan.
Penn Iron Mining Co	1703 Morris Bldg., Phila., Pa	Vulcan W.	Vulcan.
Catherine Mining & Exploration Co.	Michigamme; Pittsburg, Pa.		Spurr Twp.
McGreevy Iron Co.	Iron River.		Iron County.
Wickwire Mining Co	Iron River.	Wickwire	Iron River.
Iron River Steel Co.	Iron River.	Michigan & Lennox	Iron River.
Iron River Ore Co.	Iron River.		Iron River.
McDonald Mining Co.		McDonald	Crystal Falls.

PRODUCERS OF MANGANIFEROUS IRON ORE.

Operator.	Office.	Name of mine.	Location of mine.
Oglebay, Norton & Co.	Wade Bldg., Cleveland, O.	Bristol	Crystal Falls.
Bristol Mining Co.	Wade Bldg., Cleveland, O.	Bristol	Crystal Falls.
Newport Mining Co.	Colby-Abbot Bldg., Milwaukee, Wis.	Newport	Ironwood.
Cleveland Cliffs Iron Co	Rockefeller Bldg., Cleveland, O.	Jackson & Lucy	Negaunee.

PRODUCERS OF MINERAL PAINTS, 1911.

Pigment.	Operator.	Office.	Location of plant.
Met. paint	Huron Valley Consolidated Paint & Oil Co., A. J. Boatwright, Sec. (Not yet operative. Operates in 1912).	24-26 S. Huron St., Ypsilanti.	Belleville.
White lead	Acme White Lead & Color Works	Detroit	Detroit.
Met. paint	Pickands, Mather & Co. (Hemlock Mine)	Cleveland, Ohio.	Iron county.

BLAST FURNACES IN MICHIGAN.

Name of furnace.	Name of company.	Location of furnace.
Antrim	Antrim Iron Company	Antrim.
Cadillac	Mitchell-Diggins Iron Co.	Cadillac.
Carp	Pioneer Iron Company	Near Marquette.
Chocolay	Lake Superior Iron & Chem. Co	Harvey.
Detroit	Detroit Furnace Company	Detroit.
East Jordan	East Jordan Furnace Company	East Jordan.
Elk Rapids	Lake Superior Iron & Chem. Co	Elk Rapids.
Gladstone	Pioneer Iron Company	Gladstone.
Manistique	Lake Superior Iron & Chem. Co	Manistique.
Marquette	Pioneer Iron Company	Marquette.
Newberry	Lake Superior Iron & Chem. Co	Newberry.
Pine Lake	Lake Superior Iron & Chem. Co	Boyne City.
Spring Lake	Spring Lake Iron Company	Fruitport.
Stevenson	Stevenson Charcoal Iron Co.	Wells.
Zug Island A	Detroit Iron & Steel Company	Detroit.
Zug Island B	Detroit Iron & Steel Company	Detroit.

LOCAL COMMERCIAL COAL MINES, 1911.

Operator.	Office.	Name of mine.	County.
Beaver Coal Co.	Bay City	Beaver	Bay.
Handy Bros. Mining Co	Bay City	Monitor	Bay.
Michigan Coal & Mining Co	Bay City	Michigan	Bay.
Robert Gage Coal Co.	Bay City	Nos. 5, 6 & 7	Bay.
What Cheer Coal Mining Co	Bay City	What Cheer	Bay.
Central Coal Mining Co.	Saginaw	Central	Bay.
Wolverine, Nos. 2 and 3	Saginaw	Wolverine Nos. 2 & 3	Bay.
Royal Coal Co.	Bay City		Bay.
A. B. Schumaker	Grand Ledge	Schumaker	Eaton.
American Sewer Pipe Co.	Akron, Ohio		Eaton.
Genesee Coal Mining Co	Flint	Genesee	Genesee.
Robert Gage Coal Co.	Bay City	Nos. 1, 2, 3 & 4	Saginaw.
Barnard Coal Co.	Saginaw	Barnard	Saginaw.
Buena Vista Coal Co.	Saginaw	Buena Vista	Saginaw.
Caledonia Coal Co. (Ltd.)	Saginaw	Caledonia No. 2	Saginaw.
Consumers Coal Co.	Saginaw		Saginaw.
The Northern Coal & Transportation Co	Saginaw	Northern	Saginaw.
Pere Marquette Coal Co	Saginaw	Pere Marquette No. 3	Saginaw.
Riverside Coal Co.	Saginaw	Riverside	Saginaw.
Saginaw Coal Co.	Saginaw	Saginaw	Saginaw.
Shiawassee Coal Co	Saginaw	Shiawassee	Saginaw.
Uncle Henry Coal Co.	Saginaw	Uncle Henry	Saginaw.
Bliss Coal Co.	Swan Creek	Swan Creek	Saginaw.
Nond Kean Coal Mining Co.	Owosso		Saginaw.
Detroit Vitrified Brick Co.	Corunna	Peak	Shiawassee.
Handy Bros. Mining Co	Bay City	Akron	Tuscola.

(Mines producing less than 3000 and more than 1000 tons per annum, or employing less than 10 men.)

Operator.	Office.	County.
F. L. Reed (Frank Hazel)	Grand Ledge	Clinton.
Grand Ledge Clay Product Co	Grand Ledge	Eaton.
C. H. Pickens	Grand Ledge	Eaton.
T. W. Jenkins	Williamston	Ingham.
Carbon Coal Co	Saginaw	Saginaw.

COKE PRODUCERS, 1911.

Operators.	Address.	Location or name of mine.	No. of oven.	County.
Michigan Alkali Co	Wyandotte	Plant No. 2	a30	Wayne.
Solvay Process Co. (Semet-Solvay Co.)	Syracuse, N. Y.	Detroit	b132	Wayne.

PRODUCERS OF GYPSUM PRODUCTS, 1911.

Operator.	Office.	Name of plant.	Location of mine.
United States Gypsum Co.	Chicago, Ill	Alabaster	Alabaster.
United States Gypsum Co.	Chicago, Ill	Midland	Grand Rapids.
Acme Cement Plaster Co	St. Louis, Mo	Mill No. 5	Beverly.
Michigan Gypsum Co.	Grand Rapids		Grand Rapids.
American Cement Plaster Co.	Lawrence, Kans.	Grand Rapids	Grand Rapids.
Grand Rapids Plaster Co	429 Mich. Trust Bldg., Grand Rapids	Eagle Mill	Grand Rapids.
Grand Rapids Plaster Co	429 Mich. Trust Bldg., Grand Rapids	Grandville	Grandville.
Gypsum Products Mfg. Co.	44 Powers Theater Bldg., Grand Rapids.	Powers Plaster Mill	Grand Rapids.

SALT PRODUCERS, 1911.

Operators.	Office.	Works.
Bay County:		
The Mershon-Bacon Co	Bay City	Bay City.
Hine Lumber Co	Sta. A., Bay City, W. S.	West Bay City.
Gratiot County:		
St. Louis Chem. Co. (Also Bromine).	St. Louis	St. Louis.
Manistee County:		
The R. G. Peters Salt & Lumber Co.	East Lake	East Lake.
Filer & Sons, Vacuum Pan Salt Works	Filer City	Filer ity.
The Buckley & Douglass Lumber Co	381 River St., Manistee	Manistee.
Louis Sands Salt & Lumber Co	Manistee	Manistee.
Mason County:		
Anchor Salt Co	Ludington	Ludington.
The Stearns Salt & Lumber Co	Washington Ave., Ludington	Ludington.
Saginaw County:		
Mershon, Eddy, Parker & Co	Saginaw	Carrollton.
Bliss & Van Auken	Saginaw, W. S	Saginaw.
S. L. Eastman Flooring Co	Saginaw, W. S	Saginaw.
Edward Germain	Saginaw, E. S	Saginaw.
Saginaw Plate Glass Co. (Also Calcium Chloride).	Saginaw, W. S	Saginaw.
Saginaw Salt Co	430 Shearer Bldg., Bay City	St. Charles.
Van Schaack Calcium Works (Also Calcium Chloride).	140 Lake St.	Mt. Pleasant.
St. Clair County:		
Davidson-Wonsey Co	Marine City	Marine City.
Michigan Salt Works	Marine City	Marine City.
Sicken Salt & Stave Co	Marine City	Marine City.
Port Huron Salt Co	717 Ry. Ex., Chicago, Ill. (Port Huron)	Port Huron.
Port Huron Salt Co	717 Ry. Ex., Chicago, Ill. (Port Huron)	St. Clair.
Diamond Crystal Salt Co	St. Clair	St. Clair.
Wayne County:		
Delray Salt Co	Detroit	Delray.
Solvay Process Co	Syracuse, N. Y	Delray.
Detroit Salt Co	Detroit	Detroit.
Peninsular Salt Co	Ecorse	Ecorse.
Worcester Salt Co	168 Duane St., New York City, N. Y	Ecorse.
Michigan Alkali Co	Wyandotte	Wyandotte.
Pennsylvania Salt Mfg. Co	115 Chestnut St., Philadelphia, Pa	Wyandotte.

CEMENT PRODUCERS.

Operator.	Office.	Works.
Alpena Portland Cement Co	Alpena	Alpena.
El Cajou Portland Cement Co	Au Sable	Alpena.
Huron Portland Cement Co	Detroit (1525 Ford Bldg.)	Alpena.
The Hecla Co	Penobscot Bldg., Detroit	Bay City.
Burt Portland Cement Co	Bellevue	Bellevue.
Chanute Cement & Clay Products Co.	Bronson	Bronson.
Peninsular Portland Cement Co	Cooley Blk., Jackson	Cement City.
Michigan Portland Cement Co	Chelsea	Chelsea.
Wolverine Portland Cement Co	Coldwater	Coldwater and Quincy.
New Aetna Portland Cement Co	412 Union Tr. Bldg., Detroit	Fenton.
Egyptian Portland Cement Co	712 Union Tr. Bldg., Detroit	Fenton & Holly.
Logan Portland Cement Co	Fenton	Fenton.
Omega Portland Cement Co	Jonesville	Mosherville.
Newaygo Portland Cement Co	Newaygo	Newaygo.
Elk Cement & Lime Co	Elk Rapids	Elk Rapids.
Peerless Portland Cement Co	Union City	Union City.
Wyandotte Portland Cement Co	Wyandotte	Wyandotte.

NATURAL GAS PRODUCERS, 1911.

Operator.	No. of wells.	Address.
Hillsdale County:		
C. M. DeWitt		Osseo.
Macomb County:		
Brozowski, August		Warren, Mich.
Dobberousky, J		Halfway.
Elwart, Frank		Warren, R. F. D. 2.
Elwart, Jos		Warren, R. F. D. 2.
Hartsig, Wm. L		Warren, R. F. D. 2.
Jacob, Otto		Warren, R. F. D. 2.
Jacob, Edw		Warren, R. F. D. 2.
Mielka, August		Warren, R. F. D. 2.
Haneker, Wm		Warren, R. F. D. 2.
Peters, Alfred		Warren, R. F. D. 2.
Schemue, Louis		North Detroit, R. F. D. 1, Box 47.
Shaak, Chas		Halfway.
Smith, Alex		Warren, R. F. D. 2.
Vohs, Henry		Warren, R. F. D. 2.
Wolgast, Max		Warren, R. F. D. 2.
Muskegon County:		
Boozer, Lawrence		Ravenna, Mich., R. F. D. 2.
Jackson, Robert		Ravenna, R. F. D. 3.
Oakland County:		
N. E. Springsteen		Royal Oak, Mich., R. F. D.
Edwin Starr		Royal Oak, Mich., R. F. D.
Wm. Purdy	4	Redford, Mich., R. F. D.
J. R. McKinley		Redford, Mich., R. F. D.
Henry Langer	2	Redford, Mich., R. F. D.
Edw. McCue? (McHugh)	1	Redford, Mich., R. F. D.
Grank Grosjean	1	Redford, Mich., R. F. D.
Louis Granzow	1	Redford, Mich., R. F. D.
Edw. Landan	1	Redford, Mich., R. F. D.
Wilkinson, Mr. ?	1	Redford, Mich., R. F. D.
St. Clair County:		
Gillett, Lawrence		Port Huron.
Michigan Development Co		Port Huron.
Wayne County:		
Desgrandchamp, John		No. Detroit.

LIMESTONE PRODUCERS, 1911.

Operators.	Office.	Quarry.
Alpena County:		
R. Collins	151 Water St., Alpena	Alpena.
Also lime.		
Michigan Alkali Co	Wyandotte (or Detroit)	Alpena.
Arenac County:		
Thos. P. Burt	6001 Gilmore St., Appleton, Wis.	Omer.
Also lime.		
M. J. Griffin	169 Stanton Ave., Detroit, Mich.	Omer.
Bay County:		
Boutell Bros. & Co	1201 Water St., Bay City.	Bay City.
Also lime.		
C. M. Clute	Bay City	Bay City.
Also lime.		
Charlevoix County:		
Elk Cement & Lime Co. Operated by the Northern Lime Co. of Grand Rapids.	Elk Rapids	Bayshore.
Superior Lime Co	2 First Ave., Grand Rapids	Bayshore.
Also lime.		
City of Charlevoix Street Commissioner	Charlevoix	Charlevoix.
Charlevoix Rock Product Co	Charlevoix	Charlevoix.
Also lime.		
Cheboygan County:		
Campbell Stone Co	Afton	Afton.
Chippewa County:		
Drummond Island Stone Co. Ludlow Seaman.	Drummond	Drummond.
Delta County:		
Delta Contracting Co	108 N. Charlotte St., Escanaba	Escanaba (Hyde)
A. T. Garland	Escanaba	Escanaba (Hyde)
John Bichler	Groos	Groos.
Emmet County:		
Antrim Lime Co	912 Mich. Trust Bldg., Grand Rapids	Petoskey.
Also lime.		
Michigan Lime Co	Petoskey	Petoskey.
Also lime.		
The Petcskey Stone & Lime Co., L. G. Grimes	Emmet St., Petoskey	Petoskey.
Also lime.		
Huron County:		
Wallace Stone Co	Bayport	Bayport.
Kent County:		
City of Grand Rapids	Grand Rapids	Grand Rapids.

LIMESTONE PRODUCERS—*Concluded.*

Operators.	Office.	Quarry.
Mackinac County:		
Ozark Quarry Co.	Ozark	Ozark.
Union Carbide Co *Also lime.*	79 Wall St., New York, N. Y.	Rexton.
S. B. Martin Co.	Fiborn Quarry	Fiborn Quarry.
Marquette County:		
F. B. Spear & Sons.	Marquette	Marquette.
Menominee County:		
Menominee Stone Crusher, Robert Rick, Prop	2401 Broadway, Menominee	Menominee.
Lyon Bros. & Co *Also lime.*	1106 Main St., Menominee.	Menominee.
Monroe County:		
B. E. Bullock	Samaria	Dundee.
Shore Line Stone Co.	Monroe	Frenchtown.
Smith Thatcher Quarry Co	R. D., Maybee	Ida.
Chas. Augerer, Jr.	R. D., Maybee	Maybee (near Shofield).
Monroe Stone Co.	12 Washington St., Monroe	Monroe.
S. J. Morris.	201 Laplaisance St., Monroe.	Monroe.
Detroit, Monroe & Toledo Short Line & Electric R. R	Newport	Newport.
R. H. Nogar.	Samaria	Samaria.
Morris Cummins	R. D. No. 1, Samaria	Temperance.
Oakland County:		
The Henry Merdian Co.	616 Moffat Bldg., Detroit.	Clarkston.
Presque Isle County:		
Michigan Limestone & Chem. Co.	55 Liberty St., New York, N. Y.	Calcite.
Onaway Limestone Co.	Onaway	Onaway.
Schoolcraft County:		
The White Marble Lime Co.	Manistique	Blaney.
The White Marble Lime Co. *Also lime.*	Manistique	Manistique.
The White Marble Lime Co. *Also lime.*	Manistique	Marblehead.
Wayne County:		
Church Quarry Co. *Also lime.*	Sibley	Trenton & Sibley.
Dunbar Stone Co.	Detroit	Mouth of Detroit River (Quarry for Gov't work.)
Charlevoix Cement Co	Charlevoix	Stone is dredged. Charlevoix.

MARBLE PRODUCERS, 1911.

Operators.	Office.	Quarry.
Marquette County:		
Michigan Marble Co	Detroit	Ishpeming.

SANDSTONE PRODUCERS, 1911.

Operators.	Office.	Quarry.
Eaton County:		
J. W. Willis	Grand Ledge	Grand Ledge.
Houghton County:		
The Portage Entry Quarries Co.	206 So. La Salle St., Chicago, Ill	Jacobsville.
Portage Entry Redstone Co., Ltd.	Jacobsville	Jacobsville.
Huron County:		
John Holland	207-8 The Arcade, Cleveland, Ohio	Caseville.
Cleveland Stone Co.	Cleveland, Ohio	Grindstone City & Port Austin.
Wallace & Sons	Port Austin	Port Austin.
Ionia County:		
David Meginnity	68 Selden Ave., Detroit	Lyons.
Marquette County:		
Furst-Neu Co.	620-218 La Salle St., Chicago, Ill	Marquette.
Otsego County:		
Francis Cain	R. D. No. 2, Riga	Ottawa Lake.

GRINDSTONE PRODUCERS, 1911.

Operators.	Office.	Quarry.
Huron County:		
Eureka Grindstone Co	Ubly	Austin.
Jno. Holland	207 The Arcade, Cleveland, Ohio	Caseville.
Cleveland Stone Co.	Cleveland, Ohio	Grindstone City.
The Wallace Co	Port Austin	Grindstone City.
Cleveland Stone Co.	Cleveland, Ohio	Port Austin.

OILSTONE, WHETSTONE & SCYTHESTONE PRODUCERS, 1911.

Operators.	Office.	Quarry.
Huron County:		
Cleveland Stone Co.	Cleveland, Ohio	Grindstone City.
Cleveland Stone Co.	Cleveland, Ohio	Port Austin.
The Wallace Co	Port Austin	Port Austin.

TRAP ROCK PRODUCERS, 1911.

Operators.	Office.	Quarry.
Marquette County:		
Lipsett & Sinclair	Marquette	Marquette.
Marquette Stone Co	Marquette	Marquette.
Powell & Mitchell	Marquette	Marquette.

QUARTZ PRODUCERS, 1911.

Name.	Office.	Mine.
Michigan Quartz Silica Co	Ishpeming	Ishpeming.

GRAPHITE PRODUCERS, 1911.

Name.	Office.	Mine.
Northern Graphite Works, Jan. 1911	L'Anse	L'Anse.
Detroit Graphite Co	10 12th St., Detroit	L'Anse.

BRICK & TILE MANUFACTURERS, 1911.

Operators.	Office.	Works.
Alger County:		
Nathaniel Lobb	Munising	Hallston.
Shaw Brick Works, Geo. W. Shaw, Prop.	Marquette	Shaw.
Allegan County:		
Allegan Brick Works, Fidus E. Fish & Son, Props.	Allegan	Allegan.
L. Y. Cady	289 Thomas St., Allegan	Allegan.
Zeeland Brick Co.	Zeeland	Hamilton.
Alpena County:		
Richard Collins	151 Water St., Alpena	Alpena.
Michigan Enameled Brick & Tile Co.	Alpena	Alpena.
Arenac County:		
Michigan Paving Brick Co.	Saginaw	Omer.
M. K. Perlberg	Standish	Standish.
Cook Brick & Tile Co	Harrisville	Twining.
Barry County:		
Zeeland Brick Co.	Zeeland	Cloverdale.
Wm. Leonard	Delton	Delton.
Bay County:		
Michigan Vitrified Brick Co.	Bay City	Bay City.
Berrien County:		
Benton Harbor Brick & Tile Co.	Benton Harbor	Benton Harbor.
Branch County:		
Lorenzo D. Reynolds & Son	Quincy	Algansee.
Charlevoix County:		
Boyne City Brick Co.	Boyne City	Boyne City.
Northern Brick Co., Inc.	Boyne Falls	Boyne Falls.
Price Brick Co	East Jordan	East Jordan.
Chippewa County:		
Rudyard Brick Works	Rudyard	Rudyard.
Clinton County:		
C. F. Pulfrey	St. Johns	St. Johns.
Dickinson County:		
Vulcan Brick Works	Vulcan	Vulcan.
Eaton County:		
American Sewer Pipe Co	Bessemer Bldg., Pittsburg, Pa. (Akron, Ohio, Broad St.)	Grand Ledge.
Grand Ledge Clay Product Co	Grand Ledge	Grand Ledge.
Olivet Brick & Tile Co., Ltd	Olivet	Olivet.
Emmet County:		
A. J. De Arment & Son	Petoskey	Petoskey.

BRICK & TILE MANUFACTURERS, 1911—*Continued.*

Operators.	Office.	Works.
Genesee County:		
Gale Bros	Atlas	Atlas.
Thomas Oliff	Clio	Clio.
Uptegraff Bros. & Co	Davison	Davison.
Duffield Brick & Tile Works	Duffield	Duffield.
Haas & McCann	Gaines	Gaines.
Brick & Drain Tile Co	Grand Blanc	Grand Blanc.
Otter Lake Brick & Tile Co., Stewart & Kerby	Otter Lake	Otter Lake.
Frank Sharp	R. D. No. 1, Linden	South Mundy.
Gladwin County:		
Christ Korkaske	Gladwin	Gladwin.
Grand Traverse County:		
Traverse City Brick Co	Traverse City	Keystone.
Gratiot County:		
Ashley Tile Co., Wm. Fietehenbiner	Ithaca	Ashley.
David Stevenson & Sons	Ashley	Ashley.
Ithaca Brick & Tile Yards, Redman & Thomas, Props	Ithaca	Ithaca.
Batroff & Snyder	Ithaca	North Star.
C. D. Peet	North Star	North Star.
W. H. H. Smith & Son	St. Louis	St. Louis.
Riverside Brick & Tile Works, (R. E.) Duffield Bros	Sumner	Sumner.
Hillsdale County:		
Michigan Southern Brick & Tile Co., Lee Wade, et. al., January, 1912	Jackson	Jerome.
J. B. Keiser & Son	Prattville	Prattville.
Hills & Co., (Otis E.) Hills & (Roscoe) Woolan, Props	Waldron	Waldron.
Huron County:		
Wyers & O'Connell	Ubly	Ubly.
John Lecht	Warren	Elkton.
Ernst Reinhold	Sebewaing	Sebewaing.
Ingham County:		
Clippert, Spaulding & Co	Michigan Ave., Lansing	Lansing.
Ionia County:		
Albert Brown	Saranac	Saranac.
Fred H. Van der Heyden	Ionia	Ionia.
Isabella County:		
Kane Bros	Mt. Pleasant	Mt. Pleasant.
T. Thompson & Son, (W. J. Thompson)	Mt. Pleasant	Mt. Pleasant.
Jackson County:		
American Sewer Pipe Co	Bessemer Bldg., Pittsburg, Pa. or (Akron, Ohio, Broad St.)	Jackson. (No. 34)

BRICK & TILE MANUFACTURERS, 1911—*Continued.*

Operators.	Office.	Works.
Kalamazoo County:		
Zeeland Brick Co	Zeeland	Kalamazoo.
Kent County:		
Grand Rapids Consolidated Brick & Tiling Co	Cor. Fuller St. & Innes Ave., Grand Rapids	Grand Rapids.
Grand Rapids Brick Co., Wm. J. Clark, Sec	Cor. Michigan Ave. & Fuller Sts., Grand Rapids	Grand Rapids.
Sparta Clay Works, H. B. Fox, Prop	Sparta	Sparta.
Leelanau County:		
James W. Markham	Traverse City	Traverse City.
Lenawee County:		
Laurenson & Sanders	Addison	Addison.
Michigan Southern Brick & Tile Co., Lee Wade, et. al., Props	Jackson	Addison Junction.
Wilt & Wotring	Ogden Center	Blissfield.
Britton Pressed Brick Co	216 E. Washington St., Ann Arbor	Britton.
Wm. T. Atkins	Deerfield	Deerfield.
B. F. Woodford & Son	Jasper	Jasper.
G. D. Ellis	Macon	Macon.
American Brick & Tile Co	Morenci	Morenci.
Morenci Brick & Tile Works, L. V. Lee, Prop	Morenci	Morenci.
Saxton Brick & Tile Works, J. S. Saxton & Son, Props	R. D., Blissfield	Riga.
Albert A. Comfort	R. D., Tecumseh	Tecumseh.
Mackinac County:		
Northern Michigan Brick & Tile Co.	St. Ignace	Reavie.
Macomb County:		
Jacob Hartsig	Warren	Centerline.
Frank G. Hacker	Mt. Clemens	Clinton.
East Gass	Washington, R. D. No. 2.	Davis.
Mt. Clemens Brick & Tile Co	Mt. Clemens	Mt. Clemens.
Warren Brick & Tile Works, Schulte, Hennes & Evans, Props	Warren	Warren.
Manistee County:		
Joseph Kujawske	Oakhill	Oakhill.
William H. Kline & Son	Onekama	Onekama.
Mason County:		
A. A. Keiser	105 Ludington Ave., Ludington	Ludington.
Mecosta County:		
Wm. F. Nehmer	Milton Ave., Big Rapids	Big Rapids.

BRICK & TILE MANUFACTURERS, 1911—*Continued.*

Operators.	Office.	Works.
Midland County:		
Midland Brick & Tile Co., Olmstead & Ryal, Props	Midland	Midland.
Missaukee County:		
J. A. Smith	Cadillac	McBain.
Monroe County:		
Meyers Bros	Azalia	Azalia.
Linenfelser Brick & Tile Co., Fred Linenfelser	Maybee	Maybee.
John Strong & Son	South Rockwood	So. Rockwood.
Gerhard Rehn	Strasburg	Strasburg.
Muskegon County:		
Holton Brick Co., F. J. Connoll, Pres	Muskegon	Holton.
E. M. Ruggles	Whitehall	Whitehall.
Newaygo County:		
C. Schrier	R. D., Grant	Grant.
Oakland County:		
William H. Osmun	Cor. Auburn Ave. & Sanford St., Pontiac	Pontiac.
Oceana County:		
Walkerville Brick & Tile Co., Alton J. Walker, Prop	Walkerville	Walkerville.
Ottawa County:		
Zeeland Brick Co	Zeeland	Zeeland.
Saginaw County:		
Parker-Lohmann Brick & Tile Co.	Saginaw, W. Side, R. D. No. 10	Paines.
Peter Robie	Saginaw, W. Side, R. D. No. 10	Paines.
Sperry Bros., (Chas. E. Sperry)	Paines, via Saginaw, W. Side	Paines.
James Day	Saginaw, R. D. No. 8	Saginaw.
Thomas Day	Saginaw, R. D. No. 3	Saginaw.
Saginaw Paving Brick Co	1850 South Jefferson St., Saginaw, E. Side	Saginaw.
St. Clair County:		
Frederick A. Beard	Atkins, R. D. No. 2	Ruby.
Belknap & Phillips	Bell River Road, St. Clair	St. Clair.
Sanilac County:		
John Large	Brown City	Brown City.
Croswell Brick Co	Croswell	Croswell.
Minden City Brick & Tile Works, A. H. Jones, Prop	Minden City	Minden City.
Dawson & Bissett	Sandusky	Sandusky.

BRICK & TILE MANUFACTURERS, 1911—*Concluded.*

Operators.	Office.	Works.
Shiawassee County:		
Detroit Vitrified Brick Co	Corunna, Box 289	Corunna.
M. L. Parker	822 South Cedar St., Owosso	Owosso.
Reliance Motor Truck Co	Owosso	Owosso.
Tuscola County:		
Charles Hall	Cass City	Cass City.
John Thompson & Son	Tuscola	Tuscola.
Van Buren County:		
James Stewart	R. D. No. 2, Bangor	Bangor.
L. P. Walker	Hartford	Hartford.
Wayne County:		
Charles F. Frank, (lessee) Estate of Anthony Wagner, Prop	1254 Dix Ave., Detroit	Dearborn.
Burke Bros	2296 Michigan Ave., Detroit	Detroit.
Jacob Daniel & Bros. Brick Co	1955 Michigan Ave., Detroit	Detroit.
John S. Haggerty	312 Hammond Bldg., Detroit	Detroit.
John C. McDonald & Son	15 McGraw Bldg., Detroit	Springwells.
Schneider Brick Co	605 Dix Ave., Detroit	Detroit.
Wolf & Dei	40 29th St., Detroit	Detroit.
Bunte Bros	Flat Rock	Flat Rock.
Beardslee Bros	Redford	Redford.
Geo. H. Clippert & Bros. Brick Co.	1960 Michigan Ave., Detroit	Springwells.
Wm. Clippert	1950 Michigan Ave., Detroit	Springwells.
Detroit Roofing Tile Co	304 Bamlet Bldg., Springwells-Detroit	Springwells.
Combination Brick Co	1427 Majestic Bldg., Detroit	Springwells.
Michael Downey	699 Campbell Ave	Springwells? 1977 Michigan Ave., Detroit.
Lonyo Brick Co	Michigan Ave. & Lonyo Road, Detroit	Springwells.
Lonyo Bros	Michigan Ave., Springwells-Detroit	Springwells.
Porath Bros	12 Peninsula Bank Bldg., Detroit	Springwells.
Sass Bros. & Steve	32 29th St., Detroit	Springwells.
Springwells Brick Co., Walker & Frank, Props	324 Hammond, Detroit	Springwells.
F. H. Wolk Brick Co	1476 Central Ave., Detroit	Springwells.
Wexford County:		
Estate of Robt. Wilson	Cadillac	Harriette.

PRODUCERS OF SAND-LIME BRICK, 1911.

Operators.	Office.	Works.
Genesee County:		
Flint Sandstone Brick Co.	Box 191, Flint	Flint.
Houghton County:		
Lake Superior Stone Brick Co.	Calumet	Hancock.
Huron County:		
Sebewaing Sandstone Brick Co.	Sebewaing	Sebewaing.
Jackson County:		
Jackson Pressed Brick Co	1401 Francis St., Jackson	Jackson.
Kalamazoo County:		
South Michigan Brick Co.	Kalamazoo	Kalamazoo.
Kent County:		
Grande Brick Co., Wm. Joseph, Supt.	Kalamazoo Ave., Grand Rapids	Grand Rapids.
Manistee County:		
Manistee Brick Co.	Manistee	Manistee.
Menominee County:		
Menominee Brick Co.	Broadway & Saxton Ave., Menominee	Menominee.
Ottawa County:		
Holland Manistee Brick Co	Holland	Holland.
Saginaw County:		
Saginaw Sandstone Brick Co.	321 N. Hamilton St., Saginaw	Saginaw.
Wayne County:		
Michigan Pressed Brick Co	Cor. Lawton Ave. M. C. R. R., Detroit	Detroit.
Church Brick Co	Sibley	Sibley.

PRODUCERS OF POTTERY, 1911.

Operators.	Office.	Works.
Ionia County:		
Ionia Pottery Co.	Ionia	Ionia.
Washtenaw County:		
Markham Pottery, Harman C. & Kenneth S. Markham, Props	562 S. 7th St., Ann Arbor	Ann Arbor.
Wayne County:		
Detroit Flowerpot Co., T. S. Balsley & Son	490 Howard St., Detroit	Detroit.
Anton Hupprich	83 Otis St., Detroit	Detroit.
Jeffery-Dewitt Co	Detroit	Detroit.
Pewabic Pottery & Tile Co., Mary Chase Perry (Miss) & H. J. Caulkins, Props	2161 Jefferson St., Detroit.	Detroit.

CLAY MINERS, 1911.

Operators.	Office.	Mine.
Allegan County:		
Allegan Brick Works	Allegan	Allegan.
Barry County:		
Wm. Leonard	Delton	Delton.
Bay County:		
Daniel H. Shawl	1308 Stanton St., Bay City	Bay City.
Calhoun County:		
George D. Baltz & Co	209 S. Kendall St., Battle Creek	Battle Creek.
Genesee County:		
New Aetna Portland Cement Co	412 Union Trust Bldg., Detroit	Fenton.
Lenawee County:		
A. A. Comfort	Tecumseh	Tecumseh.
Mackinac County:		
Northern Brick Co	St. Ignace	"Reavie."
Ontonagon County:		
Wm. F. Emmond	Rockland	Rockland.
Jeffs Land Co., Ltd., W. B. Jeffs, Prop.	Rockland	Rockland.
Robinson Clay Product Co	1010 E. Market St., Akron, Ohio	Rockland.
W. P. Vogtlin	Box 36, Rockland	Rockland.
Wexford County:		
J. Z. Stanley & Son	Harriette	Harriette.
Shiawassee County:		
New Haven Coal Mining Co. Props., Noud Kean Coal Mining Co., Lessees	Owosso	Six Mile Creek.

SAND AND GRAVEL PRODUCERS, 1911.

Operators.	Office.	Mine.
Alpena County:		
Riley & Monkman	501 State St., Alpena	Alpena.
Bay County:		
R. Hayward	R. F. D. 3, Bay City	Bay City.
Berrien County:		
Benton Harbor Sand Co	Benton Harbor	Benton Harbor.
Ed. E. Squier Co	1520 Bank of Com. Bldg., St. Louis, Mo	Benton Harbor.
Kerlikowske Bros	St. Joseph	St. Joseph.
Calhoun County:		
John Adrian	323 Hamblin Ave., Battle Creek	Battle Creek.
Geo. D. Baltz	209 Kendall St., Battle Creek	Battle Creek.
Crystal Sand & Gravel Co	Battle Creek	Battle Creek.
Chippewa County:		
Hatton Bros.	Sault Ste. Marie	Sault Ste. Marie.
Jas. Rye	409 Maple St., Sault Ste. Marie	Sault Ste. Marie.
Clinton County:		
Chas. Lerg	DeWitt	DeWitt Twp.
Noah Wilhelm	Bath	Bath Twp.
Delta County:		
Chicago & N. W. R. R. Co	Chicago, Ill	Escanaba.
Escanaba Stone & Gravel Co	Escanaba	Escanaba (Flat Rock).
Dickinson County:		
Chicago & N. W. R. R. Co	Chicago, Ill	Iron Mountain.
Chicago & N. W. R. R. Co	Chicago, Ill	Loretto.
Vulcan Brick Works	Vulcan	Vulcan.
Eaton County:		
Beach Mfg. Co	Charlotte	Charlotte.
Wm. Divine & Co	Grand Ledge	Grand Ledge.
C. A. Frost	Grand Ledge	Grand Ledge.
Mrs. Hattie L. Gibbs	Grand Ledge	Grand Ledge.
V. M. Kent	Grand Ledge	Grand Ledge.
Valley City Stone & Gravel Co	19 W. Broadway, Grand Rapids	Grand Ledge.
Herman Sawyer	Grand Ledge	Delta Twp.
Washington Fultz	Grand Ledge	Mulliken.
Genesee County:		
E. Bowles	Linden	Linden.
City of Linden	Linden	Linden.
Seward Fletcher	Linden	Linden.
Geo. Sansan	Linden	Linden.
Robt. Orr	Linden	Linden.
Gogebic County:		
Chicago & N. W. R. R. Co	Chicago, Ill	Blenners.

SAND AND GRAVEL PRODUCERS, 1911—*Continued.*

Operators.	Office.	Mine.
Hillsdale County:		
Lake Shore & Mich. So. R. R. Co.	Chicago, Ill.	Jonesville.
C. Nelson E. Wolcott	Hillsdale.	Hillsdale.
C. J. Stevens	Hillsdale.	Hillsdale.
Huron County:		
The Cleveland Stone Co.	Cleveland.	Grindstone City.
The Wallace Co	Port Austin.	Port Austin.
Miss Elizabeth A. Haskell	Port Austin.	Port Austin.
Ingham County:		
Lewis Breitenwischer	512 Oakland Blk., Lansing	Lansing.
Hugh Campbell	1516 6th St., Bay City	Lansing.
Est. of Peter Malcolm	Saginaw (or Mason).	Mason.
Ionia County:		
Geo. W. Crawford	R. F. D. 3, Ionia	Ionia.
E. J. Emmons	Ionia.	Ionia.
John Gardner	346 Division St., Ionia	Ionia.
Henry Miller	East Main St., Ionia	Ionia.
Ionia Cement Product Co.	R. F. D. 3, Ionia	Ionia.
Jas. M. Fellows	Lake Odessa	Lake Odessa.
Iron County:		
Chicago & N. W. R. R. Co	Chicago, Ill.	Iron River.
Jackson County:		
Wm. Blake	R. F. D. 6, Jackson	Jackson.
Wm. P. Emmons	123 Clinton St., Jackson	Jackson.
Michigan Central R. R. Co	Detroit.	Leoni.
Kalamazoo County:		
Wm. A. Balch	1425 Forbes St., Kalamazoo	Kalamazoo.
Uriel K. Balch	1317 Summit Ave., Kalamazoo	Kalamazoo.
Samuel H. Buwrma	315-317 E. Frank St., Kalamazoo	Kalamazoo.
Chas. Ferguson	612 Forest St., Kalamazoo	Kalamazoo.
I. W. Gunn	Watervliet.	Williams.
M. Haas & Son	R. D. No. 10, Kalamazoo.	Kalamazoo.
G. D. B. Hall	1204 Merrill St., Kalamazoo	Kalamazoo.
Richard Hinga	Kalamazoo	Kalamazoo.
Archie Huff	109 E. Ranson St., Kalamazoo	Kalamazoo.
Jacob Klepper	1711 N. West St., Kalamazoo	Kalamazoo.
Lane & Lay	Kalamazoo	Kalamazoo (Portage St.)
Peter Molhark	Kalamazoo	Kalamazoo.
Jacob Newhouse	210 Maple St., Kalamazoo.	Kalamazoo.
Michael Owens	833 Reed St., Kalamazoo.	Kalamazoo.
Jas. T. Russell	602 Maple St., Kalamazoo	Kalamazoo.
Saml. O. Spier	Wheaton Ave., Kalamazoo	Kalamazoo.
Fred Myers	Williams.	Williams.

SAND AND GRAVEL PRODUCERS, 1911—*Continued.*

Operators.	Office.	Mine.
Kent County:		
Anchor Bldg. Stone & Gravel Co.	1035 So. Div. St., Grand Rapids	Grand Rapids.
Battjes Fuel & Bldg. Mat. Co.	Grand Rapids	Grand Rapids.
G. W. Bunker & Co	Grand Rapids	Grand Rapids.
Harrison Land Co., Ltd	Cor. Pine & 4th Sts., Grand Rapids	Grand Rapids.
Fred Jansma, Walker Ave. Gravel Co.	426 Walker Ave	Grand Rapids.
Michigan Sand & Gravel Co	16 Hawkins Bldg., Grand Rapids	Grand Rapids.
Van Der Veer & Kloote Gravel Co.	Grand Rapids	Grand Rapids.
Livingston County:		
The Ohio & Mich. Sand & Gravel Co.	1019 Nichols Bldg., Toledo, Ohio	Chilson.
Macomb County:		
The Henderson Gravel Co.	412 So. Weadock Bldg., Saginaw	Armada.
Lake Side Ice & Coal Co	Mt. Clemens	Mt. Clemens.
H. Jacob Wacker	Rose St., Mt. Clemens.	Mt. Clemens.
Detroit Sand & Gravel Co	34 McGraw Bldg., Detroit.	Utica.
Manistee County:		
Consumers Coal & Ice Co.	424 River St., Manistee	Manistee.
Hubbell Sand Co.	Manistee.	Manistee.
R. M. Hoffman	Manistee.	Manistee.
Porter M. Summerfield	290 No. Water St., Manistee	Manistee.
Marquette County:		
Chicago & N. W. R. R. Co	Chicago, Ill.	Michigamme.
Menominee County:		
Chicago & N. W. R. R. Co	Chicago, Ill.	Daggett.
Monroe County:		
Wm. Stoeckert	Monroe.	Monroe.
National Silica Co	Steiner (or 1009 Union Trust Bldg., Detroit)	Steiner.
Oakland County:		
The Henry Merdian Co.	616 Moffat Bldg., Detroit.	Clarkston.
Michigan Portland Cement Pav. Co.	Room 92, Griswold St., Detroit.	Clarkston
Frank B. Anderson	Pontiac.	Pontiac.
S. Bartlett	Pontiac.	Pontiac.
W. H. Kemp	Pontiac.	Pontiac.
C. L. Rockwell	180 Franklin Road, Pontiac.	Pontiac.
Henry C. Ward	Pontiac.	Pontiac.
Geo. Heal	669 Baker St., Detroit.	Rochester.
Michigan Builders Supply Co., I. E. Boomer	520 Forest St. E., Detroit.	Rochester.
Brown & Brown Coal Co	Detroit.	Waterford.

SAND AND GRAVEL PRODUCERS, 1911—*Concluded.*

Operators.	Office.	Mine.
Calhoun County:		
Elbert I. Fish	15 Grove St., Battle Creek.	Battle Creek.
Roscommon County:		
Campbell Gravel Co	Roscommon	Roscommon.
Saginaw County:		
Christian Schlatterer	327 S. Water St., Saginaw.	Saginaw.
Thos. B. Cresswell	Saginaw	River bend, Saginaw.
C. B. Moiles	336 Howard St., Saginaw.	Saginaw River.
St. Clair County:		
C. A. Cadwell	Windsor, Ont	Port Huron.
E. Jaques & Sons	Foot of First St., Duluth, Minn.	Port Huron.
Knisley & Co	333 River St., Port Huron	Port Huron.
Marine Contracting Co	211 Quay St., Port Huron	Port Huron.
Reliance Sand & Gravel Co	Port Huron	Port Huron.
Sanilac County:		
Dawson & Son	Sandusky	Sandusky.
Washtenaw County:		
S. A. Elsifor	117 No. 1st St., Ann Arbor	Ann Arbor.
Concrete Supply Co	Toledo, Ohio	Geddes.
Lake Shore & Mich. R. R	Cleveland, Ohio	Manchester.
Wayne County:		
The C. H. Little Co	320 Penobscot Bldg., Detroit	Detroit.
John M. McKershey	Room 2, Anchor Line Bldg., Detroit	Detroit.
American Silica Co	Rockwood	Rockwood.
C. H. Little & Co	Detroit, Dec., 1911	Algonac.
H. Houghten	806 Hammond Bldg., Detroit	Utica.
COUNTY, (?)		
Chicago, Milwaukee & St. Paul R. R	Chicago, Ill	

UNVERIFIED NAMES OF SAND AND GRAVEL PRODUCERS, 1911.

Name.	Address.
Herman Eckert	Grand Ledge.
Chas. Garlock	Grand Ledge.
Jas. Gibbs	Grand Ledge.
Paul Livingback, (or Irvingback)	Manistee.
Albert Myers	R. D. 6, Jackson.
Wm. Sipley	Bath.
The Superior Sand & Gravel Co	Detroit, (or Utica).
Williams Coal Co	Lansing.
Nelson E. Wolcott	Hillsdale.

PRODUCERS OF MINERAL WATERS, 1911.

Spring.	Company.	Address.
Arctic	Arctic Spring Water Co., Cornelius Van Rossum	250 N. Ottawa St., Grand Rapids.
Bromo-Hygeia Well	Bromo-Hygeia Mineral Water Co., Ltd	Coldwater.
Cooper Farm	Walker Gordon	Birmingham.
Crystal	Crystal Springs Water, Fuel & Northern Ice Co	97 Ottawa St., Grand Rapids.
Eastman Springs	Eastman Springs Co., W. H. Woodruff	Benton Harbor.
Harrison Springs	Geo. A. Ford	380 W. Bridge St., Grand Rapids.
Lake Superior Mineral Springs	Polaris Water Co	Marquette.
Panthurst Spring	Panthurst Spring Water Co	Grand Rapids.
Lansingwald	Panthurst Spring Water Co	Grand Rapids.
Maple Leaf Springs	Jno. H. Charbeneau	Mt. Clemens.
Midland Mineral	W. L. Stearne	Midland.
Moorman	Ypsilanti Mineral Bath & Water Co	Ypsilanti.
No-Che-Mo	No-Che-Mo Mineral Spring Co	Reed City.
Ogemaw	J. W. Kinney	Bay City.
Osseo	C. M. DeWitt	Hillsdale.
Pagoda	Pagoda Water Co	Mt. Clemens.
Ponce-de-Leon	Ponce de Leon Co	98 S. Div. St., Grand Rapids.
Royal Oak Lithia	Royal Oak Lithia Water Co	Detroit (Royal Oak).
St. Louis Magnetic Mineral	Magnetic Spring Water Co	Saginaw, W. S.
Salutaris	Salutaris Water Co	411 Hammond Bldg., Detroit.
Sanitas	Lute H. Pike	Topinabee.
Silver Springs	Silver Springs Water Co	40 W. Leonard St., Grand Rapids.
Sprudel	P. H. Irish	Mt. Clemens.
Sterling	Jackson Bros	Crystal Falls.
Victory	Charles Shorkey	Mt. Clemens.
White Oak	Alden Bros	Battle Creek.

PETROLEUM PRODUCERS, 1911.

St. Clair County:	
Michigan Developing Co	130 Huron Ave., Port Huron.

MISCELLANEOUS STATISTICAL TABLES.

Compiled from reports of the United States Geological Survey, Division of Mineral Resources. Statistics for 1910 collected by Michigan Geological Survey and United States Geological Survey in coöperation.

VALUE OF THE PRODUCTION OF POTTERY IN MICHIGAN, 1899-1910.

Year.	Rank of state.	Firms.	Red earthenware value.	Porcelain electrical supplies value.	C. C. ware value.	Miscellaneous value.	Total value.	Per cent of total product in U. S.
1899	18	4	29,641	.....	100	.....	29,741	.17
1900	17	4	34,317	.....	.....	.....	34,317	.17
1901	16	5	42,465	.....	.....	2,400	44,865	.20
1902	14	4	44,098	.....	.....	39,000	83,098	.41
1903	19	4	42,007	.....	.....	6,000	48,007	.19
1904	.....	.....	40,621	.....	.....	3,000	43,621	.....
1905	17	5	a	.....	a	7,000	45,961	.16
1906	17	6	43,510	.....	.....	7,600	51,110	.16
1907	16	6	54,474	.....	.....	7,100	61,574	.20
1908	16	6	54,659	.....	.....	7,750	62,409	.25
1909	13	5	60,939	.....	.....	34,500	95,439	.31
1910	13	6	90,450	a	.....	13,300	112,697	.33
Totals	.....	.....	.....	.....	.....	127,650	712,839	.....

a Included in the total.

OUTPUT OF MINERAL WATERS IN MICHIGAN, 1900-1910.

Year.	No. of springs.	Total.		Medicinal Value.	Table Value.	Price per gal.
		Quantity, gal.	Value.			
1900	28	3,398,996	411,935	.....	.....	.....
1901	28	7,019,168	1,195,614	.....	.....	.....
1902	28	8,653,690	275,763	.....	.....	.....
1903	19	6,919,107	200,668	.....	.....	.....
1904	19	3,385,675	118,422	.....	.....	.....
1905	17	2,684,800	277,188	38,900	238,288	$ 10
1906	19	902,528	73,357	.....	.....	.....
1907	19	1,472,679	127,133	35,091	92,042	9
1908	24	2,004,433	88,910	5,995	82,915	4
1909	19	2,760,604	104,454	6,099	98,355	4
1910	17	1,454,020	69,538	100	69,438	5
.....	.....	40,655,700	2,942,982	86,185	581,038	.....

PRODUCTION OF CLAY IN MICHIGAN FOR 1910.

Slip clay.		Brick clay.		Miscellaneous clay.		Total.	
Quantity, tons.	Value.	Quantity, tons.	Value.	Quantity, tons.	Value.	Quantity, tons.	Value.
1,363	3,889	60	105	1	400	1,424	4,394

*VALUE OF THE PRODUCTION OF SANDSTONE IN MICHIGAN, 1899-1910.

Year.	Rough building value.	Dressed building value.	Curbing value.	Flagging value.	Rubble value.	Riprap value.	Crushed stone.		Other value.	Total value.
							Road making value.	Concrete value.		
1899	102,447	51,682	109	a	.....	.....	.....	.....	23,800	178,038
1900	73,850	58,800	.....	.....	.....	.....	.....	.....	19,000	132,650
1901	128,909	.....	.....	.....	26,519	b	.....	.....	.....	174,428
1902	136,280	23,600	.....	.....	27,393	800	.....	.....	19,000	188,073
1903	89,931	10,365	.....	.....	15,554	.....	2,050	3,450	.....	121,350
1904	47,593	14,818	.....	.....	10,657	.....	1,400	400	12,700	74,868
1905	64,056	36,035	.....	.....	10,332	.....	.....	.....	.....	123,123
1906	35,272	18,950	.....	528	10,403	770	.....	.....	.....	65,395
1907	33,561	10,918	.....	.....	7,900	96	.....	.....	.....	52,003
1908	15,100	18,813	.....	.....	5,190	.....	.....	.....	.....	39,103
1909	12,985	16,805	.....	.....	6,294	.....	.....	.....	.....	36,084
1910	13,312	15,416	.....	.....	2,505	.....	.....	.....	.....	31,233
Totals	753,296	276,202	109	.....	122,747	.....	3,450	3,850	55,500	1,217,348

a. Included under curbing.
b. Included under rubble.
* Exclusive of sandstone made into grindstones and whetstones.

PRODUCTION AND VALUE OF LIME IN MICHIGAN, 1904-1910.

Year.	Lime burned.		Average price per ton.	No. of plants operating.	Rank of state.
	Quantity, tons.	Value.			
1904	63,601	256,955	$4 04	.....	.....
1905	48,089	192,844	4 01	.....	.....
1906	68,133	281,465	4 13	.....	.....
1907	65,822	276,534	4 20	13	.....
1908	68,050	282,023	4 14	12	.....
1909	83,108	354,135	4 26	10	15
1910	72,345	303,377	4 19	12	13
				10	14
Total	469,148	1,947,333	.....	.....	.....

VALUE OF THE PRODUCTION OF LIMESTONE IN MICHIGAN, 1899-1910.

Year.	Rough building value.	Dressed building value.	Paving value.	Curbing value.	Flagging value.	Rubble value.	Riprap value.	Crushed stone.			Flux value.	Sugar factories value.	Sold to lime burners value.	Other value.	Total value.
								Road making value.	Railroad ballast value.	Concrete value.					
1899	30,299	a	62,815	.....	.....	.....	1,111	.....	.....	.....	27,512	.....	157,657	2,375	281,769
1900	32,382	a	105,266	.....	.....	.....	799	.....	.....	.....	3,200	.....	65,000	124,220	330,847
1901	47,785	a	.....	b	380	5,098	c	31,605	18,200	75,643	13,488	.....	136,173	101,399	429,771
1902	58,707	a	.....	489	200	3,101	5,740	56,261	40,810	49,430	32,246	.....	98,000	68,164	413,148
1903	36,528	a	49,000	250	5,150	710	800	61,342	35,340	48,504	15,502	.....	132,600	4,747	390,473
1904	32,941	805	37,665	.....	.....	2,800	2,405	58,655	57,100	60,745	62,586	.....	180,683	5,323	501,708
1905	17,071	.....	.....	160	.....	744	1,568	112,113	43,649	107,396	109,883	.....	9,380	142,790	544,754
1906	9,368	641	90,723	75	.....	4,654	1,204	78,437	103,442	61,852	81,517	224,356	.....	.....	656,269
1907	15,120	100	56,500	.....	.....	1,433	1,234	131,708	46,516	97,762	109,429	22,234	.....	278,297	760,333
1908	7,276	.....	10,825	300	100	15,907	1,574	182,510	33,900	73,200	56,841	32,594	.....	253,990	669,017
1909	4,450	7,445	.....	.....	.....	1,572	3,615	132,902	42,445	112,829	91,915	25,845	.....	327,571	750,589
1910	3,552	.....	35,500	.....	.....	2,205	908	110,184	42,358	178,318	100,149	69,647	.....	299,305	842,126
Total	295,459	.....	448,294	.....	5,730	38,224	20,958	955,717	463,760	865,679	704,268	374,676	779,493	1,608,181	6,570,804

a Included under rough building.
b Included under flagging.
c Included under rubble.

PRODUCTION OF VALUE OF SAND AND GRAVEL IN MICHIGAN, 1904-1910.

Year.	Glass sand.		Molding sand.		Building sand.		Fire sand.		Engine sand.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value
1903	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1904	.....	.....	167,147	76,299	69,656	30,898	.....	.....	.....	.....
1905	.....	.....	19,382	13,247	263,315	148,065	5,000	2,500	.....	.....
1906	600	3,000	61,387	26,108	403,199	127,937	.....	.....	4,000	400
1907	4,300	8,600	54,172	24,190	451,646	157,150	6,000	3,000	1,534	153
1908	17,000	34,000	4,584	2,892	474,238	228,395	.....	.....	1,991	319
1909	65,000	79,000	53,226	20,756	1,090,419	327,247	4,000	2,000	12,415	1,493
1910	16,212	25,675	93,812	24,004	1,151,588	334,336	5,000	3,000	22,270	2,172
Totals..	103,112	150,275	453,710	187,496	3,904,061	1,354,028	20,000	10,500	42,210	4,537

PRODUCTION OF VALUE OF SAND AND GRAVEL IN MICHIGAN, 1904-1910.

Year.	Furnace sand.		Other sand.		Gravel.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
1903	.....	.....	.....	.....	.....	.....	.....	.....
1904	.....	.....	.....	.....	.....	.....	.....	.....
1905	.....	.....	50,187	14,476	76,625	32,321	236,803	107,197
1906	5,000	2,500	51,005	12,140	72,598	25,614	597,789	197,699
1907	3,858	3,133	173,724	12,187	329,407	81,182	1,024,641	289,595
1908	3,329	3,828	29,187	6,850	312,262	94,081	842,591	370,365
1909	3,183	3,660	295,612	50,953	695,902	200,523	2,219,757	685,632
1910	3,185	4,924	372,880	57,385	1,197,791	364,841	2,862,738	816,337
Totals..	18,555	18,045	972,595	153,991	2,684,585	798,562	8,198,828	2,677,434

ANNUAL PRODUCTION AND VALUE OF SAND-LIME BRICK IN MICHIGAN, 1904-1910.

Year.	Number of operating plants.	Common brick.		Front brick.		Fancy brick.		Total value.
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
1904	10	9,886,000	64,034	580,000	5,234	19,000*	497	69,765
1905	12	24,841,000	155,883	1,577,000	12,893	24,000*	526	169,302
1906	11	27,281,000	162,879	1,796,000	12,022	700*	20	174,921
1907	13	25,488,000	158,606	2,000,000*	14,234	.....	.....	172,840
1908	10	21,997,000	131,827	900,000*	6,982	.....	.....	138,809
1909	11	34,217,000	207,082	1,600,000*	11,144	.....	.....	218,226
1910	10	37,648,337	218,627	3,255,890	22,022	.....	.....	240,649
	Grand total..	181,358,337	1,098,938	11,708,890	84,531	43,700	1,043	1,184,512

*Estimated.

ANNUAL PRODUCTION OF BRICK AND TILE PRODUCTS IN MICHIGAN, 1899-1910.

Year.	Common brick.		Average price per M.	Front brick.		Average price per M.	Vitrified brick.		Average price per M.	Fancy or ornamental brick.	Fire brick.		Average price per M.
	Quantity.	Value.		Quantity.	Value.		Quantity.	Value.			Quantity.	Value.	
1899	200,144,000	933,176	$4 66	4,290,000	58,920	$13 73	a	a	.....	.....	.....	.....	.....
1900	180,892,000	863,250	4 77	8,421,000	48,411	5 75	a	a	$12 42	.....	.....	.....	.....
1901	215,836,000	1,095,254	5 07	9,476,000	64,031	6 76	a	a	12 30	.....	.....	.....	.....
1902	237,254,000	1,331,752	5 61	5,684,000	42,792	7 53	a	a	12 26	.....	.....	.....	.....
1903	215,791,000	1,251,572	5 80	2,225,000	19,000	8 54	a	a	13 27	.....	.....	.....	.....
1904	205,196,000	1,116,714	5 44	1,080,000	7,500	6 94	a	a	13 28	.....	.....	.....	.....
1905	211,558,000	1,152,505	5 45	693,000	5,995	8 65	6,112,000	81,706	13 37	.....	.....	.....	$13 00
1906	206,583,000	1,178,202	5 70	1,474,000	14,162	9 61	6,229,000	81,814	13 13	.....	.....	.....	19 37
1907	200,817,000	1,181,015	5 88	3,956,000	32,116	8 12	7,911,000	94,601	11 96	.....	.....	.....	10 05
1908	181,049,000	994,525	5 49	1,896,000	19,496	10 28	6,165,000	76,630	12 43	.....	.....	.....	12 00
1909	219,820,000	1,250,787	5 69	2,379,000	18,654	7 84	10,473,000	129,283	12 34	.....	.....	.....	.....
1910	232,551,000	1,363,316	5 86	2,209,000	27,533	12 46	9,080,000	116,446	12 82	.....	.....	.....	.....
Totals	2,507,491,000	13,712,068	.....	43,783,000	358,610	.....	45,970,000	580,480(b)	.....	.....	.....	.....	.....

a Concealed, less than three producers. b Totals for five years only.

ANNUAL PRODUCTION OF BRICK AND TILE PRODUCTS IN MICHIGAN, 1899-1910.

Year.	Stove linings.	Drain tile.		Sewer pipe.	Fire-proofing.	Tile (not drain).	Miscellaneous.	Hollow building tile or blocks.	Per cent of total product in U. S.	Rank of state.	No. of firms operating.	Total value.
	Value.	Quantity.	Value.	Value.	Value.	Value.	Value.					
1899	.....	.....	140,171	50,300	5,900	.....	22,709	.....	1.68	13	196	1,254,256
1900	.....	.....	114,747	57,916	2,350	.....	406	.....	1.50	17	189	1,147,378
1901	.....	.....	98,972	a	1,880	.....	637	.....	1.71	14	180	1,497,169
1902	.....	.....	96,645	a	3,290	.....	.....	.....	1.69	13	182	1,660,942
1903	.....	.....	129,028	a	.....	.....	.....	19,138	1.58	14	178	1,662,414
1904	.....	.....	208,088	a	.....	.....	.....	8,080	1.58	14	168	1,670,892
1905	.....	.....	205,445	a	a	.....	.....	3,585	1.41	16	154	1,719,746
1906	.....	.....	314,098	a	.....	.....	.....	4,290	1.38	16	142	1,793,367
1907	.....	.....	289,868	a	.....	.....	1,500	6,386	1.39	17	136	1,786,190
1908	.....	.....	327,630	a	4,100	.....	40,100	.....	1.54	16	132	1,666,381
1909	.....	.....	364,006	a	a	.....	66,128	.....	1.44	16	122	1,947,059
1910	.....	.....	348,205	a	.....	.....	a	.....	1.53	15	118	2,083,525
Totals	.....	.....	2,636,903	.....	.....	.....	.....	41,479	.....	.....	.....	19,889,319

a Concealed, less than three producers. b Totals for five years only.

SUMMARY OF MINERAL PRODUCTS OF MICHIGAN FOR 1910.

Product.	Quantity.	Value.
Iron ore, long tons	13,303,906	$41,393,585
Copper, pounds	221,462,984	28,125,799
Pig iron (c), long tons	1,250,103	19,464,104
Cement, barrels	3,687,719	3,378,940
Coal, short tons	1,534,967	2,930,771
Salt, barrels	9,452,022	2,231,262
Brick and tile	.....	2,083,525
Coke, short tons	392,516	1,427,963
Limestone	.....	842,126
Sand and gravel, short tons	2,862,738	816,337
Gypsum and gypsum products, short tons	357,174	668,201
Lime burned, short tons	72,345	303,377
Sand lime brick	.....	240,649
Silver, fine ounces (Troy)	262,200	141,600
Grindstones (d)	a	a
Pottery	.....	112,697
Mineral paints	a	a
Mineral waters, gallons sold	1,454,020	69,538
Traprock	a	a
Sandstone	.....	31,233
Glass sand, short tons	.....	b
Graphite	.....	a
Whetstones and scythe stones	.....	a
Quartz	.....	a
Clay	.....	4,394
Petroleum (d)	.....	a
Gems and precious stones	.....	2,500
Miscellaneous	.....	278,442
Grand total	.....	$104,547,043

a Included under miscellaneous.
b Included with sand and gravel.
c Calculated from the total production and the average price per ton of pig iron in the United States for 1910. The value obtained is considerably too low as Michigan pig iron is chiefly charcoal pig which commands a higher price than coke pig iron.
d Estimated.

APPENDIX

REPORT OF THE PRODUCTION OF MINERALS AND MINERAL PRODUCTS IN MICHIGAN FOR 1911

These figures were received and compiled after transmission of manuscript of this volume to the press.

PRODUCTION OF IRON ORE IN 1911.

GOGEBIC RANGE.

Mines.	*Shipments, long tons.	‡Sales, long tons.	Value at mines.	Stocks on hand Dec. 31, long tons.	Average of iron dried at 212° F.
Anvil	310	310	$208	41,036	59.21
Ashland	151,478	151,478	436,256	64,138	58.01
Asteroid	20,570	20,570	66,030	28,580	59.31
Aurora (Includes Vaughn)	.....	181,859	636,748	107,488	61.62
Brotherton	65,015	65,015	257,485	59,928	57.62
Castile	23,598	23,598	56,635	47,491	59.10
Chicago	.....	.....	.....	32,610	.....
Colby	41,630	41,630	120,727	3,642	59.00
Davis	.....	.....	.....	1,140	.....
Eureka (Wisconsin)	98,609	98,609	274,233	22,797	60.68
Geneva	.....	.....	.....	4,555	.....
Ironton (Includes Ada)	63,359	63,402	158,505	37,925	59.00
Mikado	.....	.....	.....	15,358	49.98
Newport	560,760	555,853	1,821,416	251,981	61.47
Norrie Group *b*	883,910	*a* 702,051	*a* 2,332,178	*a* 543,571	61.38
Palms	.....	.....	.....	14,814	62.66
Puritan (Ruby)	.....	.....	.....	87,232	.....
Royal	.....	.....	.....	1,238	.....
Sunday Lake	56,096	56,096	213,400	41,558	56.85
Tilden	138,387	138,387	415,226	43,337	60.09
Yale (West Colby)	154,944	155,487	416,705	6,168	59.53
Total	2,258,666	2,254,345	$7,205,752	1,456,587	.....

MARQUETTE RANGE.

American-Boston	194,979	174,723	$621,531	9,028	57.70
Austin	105,078	105,078	*h*	104,545	61.18
Barron	.....	60,731	*e* 208,915	32,336	59.85
Beaufort	.....	.....	.....	1,200	47.00
Breitung Hematite No. 1	139,582	64,643	*e* 222,372	20,770	60.02
Breitung Hematite No. 2		74,933	*e* 206,066	4,611	56.43
Cambria (Includes Hartford)	90,316	67,869	195,463	105,981	51.276
Champion	.....	.....	.....	143,760	.....
Cleveland Cliffs Group *c*	344,950	.....	.....	.....	.....
Cleveland Lake (Under Cleveland Cliffs Group)	.....	166,850	*h*	231,623	58.57
Cliff Shaft (Under Cleveland Cliffs Group)	.....	86,766	*h*	199,914	59.74
Empire	17,117	17,117	14,549	28,447	39.91
Franklin	.....	1,860	*e* 6,398	1,455	59.85
Gwinn	197	197	232	307	49.05
Hartford (Under Cambria)	.....	.....	.....	.....	.....
Imperial	84,843	84,843	*h*	96,730	51.80
Jackson	52,615	52,615	*h*	.....	39.78
Lake Angeline	188,645	167,258	518,500	24,731	66.10
Lake Superior	174,959	174,874	523,173	281,662	56.59
Lillie	844	23,863	68,725	62,937	51.233
Lloyd	28,033	28,003	*h*	43,937	54.04
Lucy (McOmber)	16,677	16,677	*h*	71,675	45.40
Maas	24,927	24,927	*h*	2,300	58.00
Mary Charlotte	343,434	343,434	*e* 944,444	20,106	56.43
Milwaukee-Davis	7,781	7,781	*e* 21,398	2,171	56.43

*From Iron Trade Review, March 7, 1912.
‡In cooperation with U. S. Geol. Surv. Dept. of Mineral Resources.
a Exclusive of Aurora.
b Includes Norrie, E. Norrie, N. Norrie, Pabst, Aurora.
c Includes Salisbury, Michigamme, Cliff Shaft (Iron Cliffs), Foster, Barnum, Cleveland Lake.
e Estimated.
h Included in totals.

PRODUCTION OF IRON ORE IN 1911.

MARQUETTE RANGE.—*Continued.*

Mines.	*Shipments, long tons.	‡Sales, long tons.	Value at mines.	Stocks on hand Dec. 31, long tons.	Average of iron dried at 212° F.
Mitchell		21,387	$57,750	3,499	63.95
Moore				15,910	
Moro				191,417	56.66
Negaunee	140,406	140,406	*h*	263,565	59.12
Ohio (Beaufort)	2,684	2,684	6,441	21,662	47.40
Princeton	27,962	27,962	*h*	300,356	60.62
Queen Group *f*	297,675	297,675	821,881	160,831	58.73
Republic	113,012	120,089	356,911	41,978	65.12
Richmond	47,586	47,294	34,744		40.92
Rolling Mill	96,585	96,585	154,536	18,326	59.21
Salisbury (Under Cleveland Cliffs Group)		91,334	*h*	128,631	54.23
Star West	4,466	4,466	6,699		
Stegmiller	45,122	45,122	127,154	15,146	60.42
Stephenson	128,839	128,839	*h*	185,792	60.11
Volunteer		51,864	178,282	45,011	60.00
Total	2,719,284	2,820,749	$7,881,283	2,882,350	

MENOMINEE RANGE.

Antoine (Clifford-Traders)					
Appleton (Eleanor)					
Aragon	201,187	201,269	$475,699	202,000	53.34
Armenia	51,862	51,862	129,655	86,843	57.00
Baker	3,290	3,289	8,223	40,431	57.00
Baltic (Includes Fogarty)	*d* 66,502	134,118	352,744		50.31
Bates				240	54.60
Berkshire	22,273	22,273	49,001	32,850	51.83
Bristol		322,647	589,083	25,730	55.69
Calumet				57,255	
Caspian	165,660	165,660	462,075	25,390	50.88
Chapin	357,598	357,598	980,154	179,469	55.50
Chatham	58,056	58,056	159,073	13,792	56.61
Chicagon	108,947	108,947	239,683		
Clifford-Traders (Antoine)	74,138	74,138	59,310		40.00
Crystal Falls	710	710	*e* 1,775	6,946	
Cuff				10,441	
Cundy				3,253	
Cyclops (Under Penn Group)					60.71
Davidson No. 1 and No. 2	45,434	45,434	100,405	9,121	55.65
Dober (Under Riverton)					58.41
Dunn	232,093	232,092	464,184	71,788	56.00
Eleanor (Appleton)					
Fairbanks				1,691	
Fogarty (Under Baltic)	67,616				
Genesee (Ethel)(Under Tobin)					
Gibson	57,100	57,099	68,576		45.42
Great Western (Includes Lincoln)	84,339	84,338	164,459	230,998	
Groveland	31,907				
Harpes (Under Penn Group)					58.82
Hemlock	107,752	105,320	292,804	33,913	50.72
Hiawatha	116,736	116,736	256,819	73,906	
Hollister	5,021	4,971	*e* 5,319	30,085	52.45
Iron River (Under Riverton)					48.39
Isabella (Under Riverton)				8,100	

* From Iron Trade Review, March 7, 1912.
‡ In co-operation with U.-S. Geol. Surv. Dept. of Mineral Resources.
d Exclusive of Fogarty.
e Estimated.
f Buffalo, Prince of Wales, So. Buffalo.
h Included in totals.

PRODUCTION OF IRON ORE IN 1911.

MENOMINEE RANGE.—*Concluded.*

Mines.	*Shipments, long tons.	‡Sales, long tons.	Value at mines.	Stocks on hand Dec. 31, long tons.	Average of iron dried at 212° F.
Jupiter (Under Penn Group)					40.37
James (Osana)	50,439	49,689	$99,378	34,912	*i* 52.28
Kimball				13,061	
Kowinsky (Wauseca)		749	1,498		*i* 52.00±
Lincoln (Under Gt. Western)					
Loretto	18,655	18,655	31,113	105,409	53.00
Mansfield	54,646	54,646	145,796	68,191	56.92
Mars (Under Penn Group)					43.56
McDonald	5,240	5,240	2,620		54.00
Michigan				69,708	
Millie	17,040	18,567	58,412		
Munro	9,303	9,302	10,232		
Nanaimo				20,000	
Penn Group *f*	377,026	431,200	1,071,199	141,426	
Pewabic (Includes Walpole)	352,603	352,297	547,000		38.00 56.00
Quinnesec				5,814	
Riverton (Includes Dober, Iron River, etc)	198,589	200,142	567,803	43,800	56.08
Tobin (Includes Genesee)	308,457	333,798	834,495	29,923	57.00
Tully	8,324	8,324	20,810	8,229	57.00
Vivian	5,971	5,971	7,454	26,393	37.15
Vulcan (Under Penn Group)					57.98
Walpole (Under Pewabic)					
Wickwire	1,919	1,900	4,370	6,500	56.50
Youngs	89,451	89,130	206,000	2,527	48.39
Zimmerman	112,029	110,084	253,954	9,953	
Total	3,467,913	3,836,251	$8,715,175	1,730,088	
Grand total	8,445,863	8,911,345	$23,802,210	6,069,025	

* From Iron Trade Review, March 7, 1912.
‡ In co-operation with U. S. Geol. Surv. Dept. of Mineral Resources.
f Buffalo, Prince of Wales, So. Buffalo.
i Natural.

COAL PRODUCTION OF MICHIGAN IN 1911, BY COUNTIES AND MINES.

Colliery.	Operator.	Office.	Distribution of total products.				Total value.	Average price per ton.	Average number of days active.	Average number of employes.
			Loaded at mines for shipment.	Sold to local trade and employes.	Used at mines for steam and heat.	Total quantity.				
Bay County:										
Beaver	Beaver Coal Co	Bay City	11,303	.....	600	11,903	$21,078	.....	211	10
Monitor	Handy Bros. Mining Co	Bay City	52,527	629	4,358	57,514	112,993	2.03	190	125
Michigan	Michigan Coal and Mining Co	Bay City	.....	.....	.....	.....	.....	.....	.....	.....
No. 5	Robt. Gage Coal Co	Bay City	245,430	1,770	19,440	266,640	464,736	1.88	231	546
No. 6	Robt. Gage Coal Co		.....	.....	.....	.....	.....	.....	.....	.....
No. 7	Robt. Gage Coal Co		98,437	5,000	8,500	111,937	226,091	2.18	230	190
United City	United City Coal Mining Co	Bay City	8,425	.....	.....	8,425	17,938	.....	125	60
What Cheer	What Cheer Coal Mining Co	Bay City	58,336	.....	.....	58,336	116,962	.....	150	255
Central	Central Coal Mining Co	Saginaw	202,329	.....	.....	202,329	360,686	.....	235	400
Wolverine No. 2	Wolverine Coal Co	Saginaw								
Wolverine No. 3	Wolverine Coal Co	Saginaw								
County total			676,787	7,399	32,898	717,084	$1,320,484	1.84	211	1,586
Clinton County:										
Eagle	F. L. Reed	Grand Ledge	.....	600	.....	600	$1,800	3.00	150	5
County total			.....	600	.....	600	$1,800	3.00	150	5
Eaton County:										
Schumaker	A. B. Schumaker	Grand Ledge								
	American Sewer Pipe Co	Akron, Ohio								
	Grand Ledge Clay Products Co	Grand Ledge								
	Grand Ledge Coal Co		.....	1,000	.....	1,000	$2,500	2.50	.....	.....
County total			.....	1,000	.....	1,000	$2,500	2.50	.....	.....
Genesee County:										
Genesee	Burton Coal Mining Co	Flint	.....	.....	.....	.....	.....	.....	.....	.....
	Genesee Coal Mining Co	Flint	8,911	.....	.....	8,911	$20,050	2.25	282	75
County total			8,911	.....	.....	8,911	$20,050	2.25	282	75
Ingham County:										
	T. W. Jenkins	Williamston	.....	1,800	180	1,980	$4,860	2.70	247	12
County total			.....	1,800	180	1,980	$4,860	2.70	247	12
Saginaw County:										
No. 1	Robert Gage Coal Co	Bay City								
No. 2	Robert Gage Coal Co									
No. 3	Robert Gage Coal Co									
No. 4	Robert Gage Coal Co									
Barnard	Barnard Coal Co	Saginaw	163,620	1,180	12,960	177,760	$309,824	1.88	231	364
Buena Vista	Buena Vista Coal Co	Saginaw	.....	.....	.....	.....	.....	.....	.....	.....
Caledonia No. 2	Caledonia Coal Co., Ltd	Saginaw	.....	16,833	800	17,633	29,271	1.66	225	40
	Consumers' Coal Co	Saginaw	.....	34,393	1,000	35,393	68,215	1.98	252	72
Northern	Northern Coal Co	Saginaw	.....	.....	.....	.....	.....	.....	.....	.....
Pere Marquette No. 3	Pere Marquette Coal Co	Saginaw	71,311	.....	.....	71,311	140,904	.....	225	170
Riverside	Riverside Coal Co	Saginaw	.....	.....	.....	.....	.....	.....	.....	.....
Saginaw	Saginaw Coal Co	Saginaw	72,397	.....	.....	72,397	144,958	.....	200	210
Shiawassee	Shiawassee Coal Co	Saginaw	78,762	.....	.....	78,762	157,073	.....	250	120
Uncle Henry	Uncle Henry Coal Co	Saginaw	120,670	.....	.....	120,670	236,596	.....	250	260
Swan Creek	Bliss Coal Co	Swan Creek	11,050	.....	.....	11,050	23,153	.....	125	70
	Carbon Coal Co	Saginaw	77,853	.....	5,125	82,978	157,658	.....	219	145
County total			.....	.....	.....	.....	.....	.....	.....	.....
Shiawassee County:			595,663	52,406	19,885	667,954	$1,267,652	1.66	225	1,451
New Haven	New Haven Coal Mining Co	Calumet								
	Noud Kean Coal Mining Co	Owosso	547	94	.....	641	$2,102	3.28	20	
Peak	Detroit Vitrified Brick Co	Corunna	8,588	1,516	.....	10,104	33,142	3.28	220	40
			.....	2,175	.....	2,175	7,134	3.28	240	4
County total			9,135	3,785	.....	12,920	$42,378	3.28	240	44
Tuscola County:										
Akron	Handy Bros. Mining Co	Bay City	56,648	2,798	5,840	65,286	$130,855	2.12	187	150
County total			56,648	2,798	5,840	65,286	$130,855	2.12	187	150
	Small Mines		.....	339	.....	339	882	.....	.....	.....
State total			1,347,144	70,127	58,803	1,476,074	$2,791,461	1.78	218	3323

CEMENT.

	Quantity. (Barrels.)	Value.
Portland cement	3,686,716	$3,024,676 00
Stock on hand December 31st	506,756	.....
Daily capacity of plants operating	22,400	.....

Plants operating, 8.
Plants idle or gone out of business during year, 2.

SALT.

	Quantity.		Value.
	Barrels.	Tons.	
Table and dairy	817,486	114,448	$742,702
Common fine	2,362,075	330,691	698,203
Common coarse	2,070,745	289,904	745,720
Packers	105,401	14,756	45,421
Other (including rock salt)	576,595	80,723	181,865
Brine	4,387,772	614,288	219,244
Total	10,320,074	1,444,810	$2,633,155

Bromine, calcium chloride, etc., $129,632.
Plants operating, 35.
Plants idle or gone out of business during the year, 2.

BRICK AND TILE.

	Quantity.	Value.
Common brick	198,251,589	$1,053,822
Vetrified paving brick and block	5,196,700	72,736
Front brick	2,498,275	31,572
Drain tile	.....	346,848
Sewer pipe	.....	109,175
Fireproofing	.....	50,125
Stove lining	.....	3,971
Fire brick	66,300	1,193
Total	.....	$1,633,401

PRODUCTION OF LIMESTONE.

	Quantity. (Tons.)	Value.
Building purposes (rough)	6,941	$4,926
Building purposes (sawed or cut)	1,600	1,550
Paving	.....	.....
Curbing	.....	.....
Rubble	220	165
Riprap	.....	.....
Crushed stone for road making	228,865	99,628
Railroad ballast	80,073	34,998
Concrete	197,265	85,727
Blast furnace	366,515	172,596
Alkali works	724,529	414,434
Sugar factories	74,451	62,241
Glass factories	622	964
Paper mills	11,130	9,758
Agricultural purposes	3,554	1,677
Other purposes	139,442	63,697
Total	1,835,197	$952,471

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PRODUCTION OF GYPSUM AND GYPSUM PRODUCTS.

	Quantity. (Tons.)	Value.
Quantity mined	347,296	
Quantity sold crude—		
To Portland cement plants	63,489	$69,497
As land plaster	15,548	15,706
For other purposes	13	52
Total sold crude	79,050	$85,255
Quantity sold calcined—		
As hard wall plaster	146,920	$381,362
As Plaster Paris, etc	47,989	88,168
As dental plaster	20	110
To plate glass works	11,370	19,031
Total sold calcined	206,299	$488,671
Total value		$573,926

Number of mines and quarries, 8.
Total number of kettles in mills, 29.
Total daily capacity (est.), 2400.
Material used, Rock gypsum.
Fuel, Coal.

PRODUCTION OF SAND AND GRAVEL.

	Quantity. (Tons.)	Value.
Glass sand	145,107	$70,331
Molding sand	70,302	15,914
Building sand	850,595	237,625
Stone sand	675	125
Fire sand	1,200	3,000
Engine sand	18,750	
Furnace sand	4,269	4,800
Other sand	18,853	3,281
Concrete	161,781	29,887
Gravel	560,069	158,876
Total	1,831,601	$523,839

SAND LIME BRICK.

	Quantity.	Value.
Common brick	32,889,000	$192,224 00
Front brick	2,726,000	17,777 00
Total	35,615,000	$210,001 00

Plants operating, 10.
Plants idle or gone out of business during year, 2.

PRODUCTION OF LIME.

	Quantity. (Bbls.)	Value.
Lime sold (For building and whitewashing)	166,362	$69,139
Alkali works		
Chemical works	170,441	80,167
Paper mills	5,300	2,239
Sugar factories	5,000	1,500
Tanneries	7,000	2,951
Agricultural purposes (fertilizer)	5,743	2,089
Dealers	76,108	34,757
Other purposes	4,018	1,763
Total	414,622	$188,246

POTTERY.

	Value.
Red earthenware	$80,580 00
Miscellaneous	49,910 00
Total	$130,490 00

Plants operating, 6.

PRODUCTION OF MINERAL WATER.

	Quantity. (Gallons.)	Value.
Medicinal use	1,560	$356
Table use	1,270,570	27,696
Other purposes	7,240	362
Total	1,801,652	$75,457

PRODUCTION OF TRAP ROCK.

	Quantity. (Tons.)	Value.
Crushed stone	22,000	$21,571
Concrete	34,000	29,429
Total	56,000	$51,000

CLAY PRODUCTION.

	Quantity. (Tons.)	Value.
Slip clay	1,744	$5,090
Fire clay	18	32
Brick clay	440	315
Total	2,202	$5,437

PRODUCTION OF GRINDSTONES.

	Value.
Total	$153,292

PRODUCTION OF SANDSTONE.

	Quantity. (Tons.)	Value.
Total	126,635	$12,985

PRODUCTION OF NATURAL GAS.

	Value.
Total	$1,005

MISCELLANEOUS.

	Value.
Miscellaneous products of Michigan, including mineral paints graphite, petroleum, oil stones, whet stones, sc thestones, coke, graphite and quartz	$1,502,630

TABLE SHOWING QUANTITY AND VALUE OF MINERALS AND MINERAL PRODUCTS IN MICHIGAN, 1911.

	Quantity.	Value.
Iron ore, tons	8,911,345	$23,802,210 00
*Copper, pounds	218,185,236	
Coal, tons	1,476,074	2,791,461 00
Portland cement, barrels	3,686,716	3,024,676 00
†Salt, barrels	10,320,074	2,633,155 00
Brick and tile		1,633,401 00
Limestone, tons	1,835,197	952,471 00
Gypsum and gypsum products		573,926 00
Sand and gravel, tons	1,831,601	523,839 00
Sand lime brick	35,615,000	210,001 00
Lime, barrels	414,622	188,246 00
Pottery		130,490 00
Mineral water, gallons	1,801,652	75,457 00
Trap rock, tons	56,000	51,000 00
Clay, tons	2,202	5,437 00
Grindstones		153,292 00
Sandstone, tons	126,635	12,985 00
Natural gas		1,005 00
§Miscellaneous		1,502,630 00
¶Total		$38,165,682 00

* See pages 106-115 of this report.
† Value of bromine, calcium chloride, etc., $129,632.00.
§ Mineral paints, graphite, petroleum, oil stones, whet stones, scythe stones, coke, graphite and quartz.
¶ Value of copper, pig iron, glass sand, gems and precious stones is not included in this total.

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