

- Felch Twp., C W $\frac{1}{2}$ sec. 31, T42N, R28W. On steep slope S of ridge. Hermansville: Oneota, Cambrian: Jordan.
- Felch Twp., NW NW sec. 32, T42N, R28W. Along W side of hill, along NE-SW road, just N of RR crossing. Cambrian: Jordan.
- Felch Twp., NW NW sec. 33, T42N, R28W. Sandstone on both sides of road, about $\frac{1}{4}$ mi. SE of Felch. Cambrian: Jordan.
- Felch Twp., SE SW sec. 25, T42N, R29W. At intersection with N-S road; also in low E-W ridge along N-line NE sec. 25. Cambrian: Jordan.
- Felch Twp., N $\frac{1}{2}$ sec. 31, T42N, R29W. Sandstone exposures. Also in places in sec. 34, 35, and 36 of the same township. Cambrian: Jordan.
- Felch Twp., NE NW sec. 36, T42N, R29W. Along N-line. "Lake Superior sandstone" or Hermansville?
- Felch Twp., NW sec. 4, T42N, R30W. Highway cut. Cambrian: Jordan.
- Felch Twp., sec. 29, T43N, R28W. Sandstone exposures. Cambrian: Jordan.

GOGEBIC COUNTY

- Wakefield Twp., C sec. 13, T46N, R41W. Bed of Ontonagon River and downstream (Huronian in NW SW sec 13, T46N, R41W and Keweenawan SE, sec 11, T46N, R41W). Cambrian.

HOUGHTON COUNTY

- Laird Twp., NW NE sec. 17, T49N, R35W. Sturgeon Falls. Cambrian. Lake Superior Sandstone: Jacobsville.
- Laird Twp., sec. 13, 14, 23 and 24, T51N, R35W. Limestone Mountain. Niagaran: Mayville. Richmond. Trenton. Black River. Jacobsville.
- Chassell Twp., NE SW sec. 8, T53N, R32W. Aband. quarry. Jacobsville. **Type locality of Jacobsville.**
- Chassell Twp., sec. 8 and 17, T53N, R32W. Along shore. Jacobsville.
- Chassell Twp., SW sec. 18, T53N, R32W. Aband. quarry. Jacobsville.
- Chassell Twp., NE SW sec. 26, T53N, R33W. Small aband. sandstone quarry. Jacobsville.
- Chassell Twp., sec. 35, T53N, R33W. Along shore. Jacobsville.
- Torch Lake Twp., sec. 10 and 11, T54N, R33W. Along shore of Portage Lake. Jacobsville.
- Torch Lake Twp., sec. 21 and 26, T55N, R31W. Along shore at Traverse Point. Jacobsville.
- Osceola Twp., sec. 1, T55N, R33W. Torch Lake quarry. Jacobsville.
- Osceola Twp., SE SE SE sec. 11, T55N, R33W. Hungarian Falls on Hungarian River (called Dover Creek on latest U.S.G.S. map). Jacobsville.
- Osceola Twp., NE sec. 27, T55N, R33W. Along road. Jacobsville.
- Osceola Twp., SW SW NW sec. 16, T56N, R32W. Small exposures in stream. Jacobsville.
- Schoolcraft Twp., sec. 20, T56N, R32W. Walled Ravine. Jacobsville.
- Schoolcraft Twp., sec. 19, 20, 29, T56N, R32W. St. Louis Ravine. Jacobsville.
- Calumet Twp., sec. 31, T56N, R32W and SE SE NE sec. 36, T56N, R33W. Douglass Houghton Ravine and Douglass Houghton Falls. Jacobsville.

IRON COUNTY

- Stambaugh Twp., NE sec. 20, T42N, R35W. Conglomerate on Sheridan Hill. Sandstone and conglomerate in aband. pit. Ordovician.
- Stambaugh Twp., SW sec. 27, T42N, R35W. Limestone exposures in river bed. Black River.
- The Stambaugh Twp. exposures were named the Sheridan fm. by R. C. Allen.
- Iron River Twp., SE sec. 24, T44N, R35W. Sandstone exposure. Ordovician.

- Iron River Twp., N $\frac{1}{2}$ sec. 24, T44N, R35W. Red sandstone.
- Iron River Twp., SE sec. 24, T44N, R35W. Coal. Upper Huronian Michigamme.

KEWEENAW COUNTY

- Sherman Twp., sec. 20, T56N, R30W. At mouth of Tobacco River. Jacobsville.
- Sherman Twp., NE sec. 6, T56N, R31W. Aband. sandstone quarry. Jacobsville.
- Sherman Twp., NE NW NW sec. 6, T56N, R31W. Aband. Hebard quarry near Hebards. Jacobsville.
- Grant Twp., sec. 14, T57N, R29W. Along shore at Point Isabelle. Jacobsville.
- Eagle Harbor Twp., C W $\frac{1}{2}$ SE SW sec. 5, T57N, R30W. Along road. Jacobsville.
- Eagle Harbor Twp., NW SE NE sec. 7, T57N, R30W. Along intermittent stream valley. Jacobsville.
- Eagle Harbor Twp., NW NW NW and C NW sec. 18, T57N, R30W. Along intermittent stream valley. Jacobsville.
- Houghton Twp., C NE NE, NE SE NW, and NW SE NW sec. 13, T57N, R31W. Jacobsville.
- Houghton Twp., SE NE NW sec. 13, T57N, R31W. Contact, Jacobsville and Keweenawan.
- Houghton Twp., NW sec. 14, T57N, R31W. Altered sandstone in stream bed. Jacobsville.
- Houghton Twp., NW SE SE sec. 20, T57N, R31W. Two separate outcrops. Jacobsville.
- Houghton Twp., NW SE sec. 21, T57N, R31W. In intermittent stream valley. Jacobsville.
- Houghton Twp., NW NW NE, SE NE NW, SE SE NW and SW SE NW sec. 22, T57N, R31W. Scattered exposures along trails and in stream valley. Jacobsville.
- Grant Twp., C E $\frac{1}{2}$ sec. 29, T58N, R28W. Along shore. Jacobsville.
- Grant Twp., C S $\frac{1}{2}$ sec. 30, T58N, R28W. Along shore. Jacobsville.
- Grant Twp., SW SW sec. 25, T58N, R29W. Along shore. Jacobsville.
- Grand Twp., SE SE SE sec. 26, T58N, R29W. Along shore. Jacobsville.

LUCE COUNTY

- Pentland Twp., sec. 35, 36, T45N, R9W, McCloud Lumber Co. quarry. Burnt Bluff: Hendricks. Fiborn.
- Lakefield Twp., SE SE sec. 19, T45N, R12W. Dolomite on E side of small brook. Mayville?
- Lakefield Twp., SW sec. 29, NE NE sec. 30, T45N, R12W. Shore Manistique Lake. Mayville.
- McMillan Twp., NE SE NE sec. 11, T48N, R8W. Upper Falls of the Tahquamenon. Lake Superior Sandstone.
- McMillan Twp., NW sec. 9, T48N, R10W. Red sandstone in pit under shallow drift cover. Lake Superior Sandstone.
- McMillan Twp., W $\frac{1}{2}$ SW sec. 18, T49N, R11W. N-S ledge. "Lake Superior Sandstone"?

MACKINAC COUNTY

- St. Ignace Twp., sec. 18, T40N, R3W. Strata in contact with indurated breccia of small hill approx. 200 ft. W of Mich. State Police substation at St. Ignace. St. Ignace.
- St. Ignace Twp., NE sec. 19, T40N, R3W. In ditches along Church St., W boundary of St. Ignace State Park. St. Ignace.

- St. Ignace Twp., sec. 20, T40N, R3W. Hombach quarry, aband., 500 ft. S-SE of intersection Hombach and Pero St., St. Ignace. St. Ignace. In type area St. Ignace fm.
- Moran Twp., T40N, R4W. In E wall of approach to proposed ferry terminal, 1 mi. W of St. Ignace. St. Ignace.
- Moran Twp., SW NW sec. 5, T40N, R4W. Old gypsum quarry opened in 1850's. Pointe aux Chenes.
- Moran Twp., SE sec. 8, T40N, R4W. Along wagon road from a point $\frac{1}{8}$ mi. NE of Catholic church in Gros Cap to US-2. St. Ignace, Pointe aux Chenes.
- Moran Twp., E part NW sec. 9, T40N, R4W. Along private road. St. Ignace. Pointe aux Chenes. Also, in knoll about $\frac{1}{8}$ mi. SW.
- Moran Twp., SE SW sec. 9, T40N, R4W. In road cut along US-2. Pointe aux Chenes. In type area Pointe aux Chenes.
- Moran Twp., Near C NW sec. 15, T40N, R4W. In road cut along US-2. Pointe aux Chenes.
- Marquette Twp., T41N, R2E. Many exposures of Engadine along Lake Huron shore.
- St. Ignace Twp., SE SW sec. 4, T41N, R3W. SE shore of Grosse Point. Gypsum exposure. Pointe aux Chenes.
- St. Ignace Twp., sec. 30, T41N, R3W. Above aband. lime kiln on S side of narrow ridge, approx. $\frac{1}{8}$ mi. SE of highest point on Rabbit's Back. St. Ignace. Also in sec. 30, along S shore Rabbit's Back Point, gypsum near water's edge and under water. Pointe aux Chenes.
- Moran Twp., SW and NW SE sec. 31, T41N, R4W. Aband. gypsum pits. Also, shale exposures in SW SE sec. 31. Pointe aux Chenes.
- Moran Twp., NW NE sec. 36, T41N, R4W. At and in the vicinity of Castle Rock. St. Ignace. Pointe aux Chenes.
- Moran Twp., SW sec. 23, T41N, R5W. Along US-2, a few hundred yds. W of crossroad to N. Pointe aux Chenes. SE sec. 23, and in SE SW slightly less than $\frac{1}{4}$ mi. W of C sec. 23, (shale pit, Round Lake CCC Camp). Pointe aux Chenes. SW NW sec. 23. St. Ignace? Pointe aux Chenes.
- Moran Twp., sec. 36, T41N, R5W. Along lake shore. Pointe aux Chenes.
- Clark Twp., T42N, R1E. Many exposures along Lake Huron shore. Engadine.
- Clark Twp., sec. 10, T42N, R1E. Port Dolomite quarry, Michigan Limestone Div. Engadine.
- Clark Twp., Many exposures in sec. 1, 2, 3, 4, 5, 10, 11, 20, 21, 28, and 29, T42N, R1E. Engadine.
- Clark Twp., sec. 21 and 22, T42N, R1W. Approx. $\frac{3}{4}$ mi. N of Hessel, prominent E-W trending ridge. Engadine.
- Marquette Twp., S-line sec. 3, T42N, R2W. Along highway. Engadine.
- Marquette Twp., S-line sec. 6, T42N, R2W. Along highway. Engadine.
- Marquette Twp., sec. 15, T42N, R2W. Low S-facing bluff nearly $\frac{3}{4}$ mi. long. Engadine.
- Marquette Twp., NE sec. 34, T42N, R2W. Along shore of St. Martin Bay. Pointe aux Chenes.
- St. Ignace Twp., T42N, R3W. Low bluff along shore of Lake Huron, extending from S-central part sec. 11 to NW sec. 13; a second higher bluff farther inland in sec. 11, and also in E part sec. 11 and W part sec. 12. Engadine.
- St. Ignace Twp., NW NE sec. 20, T42N, R3W. On S bank of Carp River, approx. $\frac{1}{2}$ mi. from its mouth. Pointe aux Chenes.
- St. Ignace Twp., S-line sec. 30, T42N, R3W. Approx. $\frac{1}{2}$ mi. W of US-2, in roadside ditches. Pointe aux Chenes.
- St. Ignace Twp., sec. 29, 30 and 31, T42N, R3W. Along US-2 in ditches where highway crosses ridge between 1 and 2 mi. S of Carp River. Pointe aux Chenes.
- St. Ignace Twp., sec. 12, T42N, R4W. S of C of sec., in Forest Service road at the crossings of two minor tributaries to Carp River. Pointe aux Chenes.

- Brevoort Twp., S-line sec. 32, T42N, R4W. Roadside ditches between Allen-ville and a point $\frac{1}{2}$ mi. to W. Pointe aux Chenes.
- Brevoort Twp., SE SW sec. 35, T42N, R5W. In path leading to small wharf, S shore Brevoort Lake, about 100 yds. E of Massey's Hotel. Pointe aux Chenes.
- Moran Twp., sec. 3, T42N, R6W. South side of a marsh. Manitoulin?
- Moran Twp., NE SE sec. 9, T42N, R6W. Mayville.
- Hendricks Twp., sec. 9, T42N, R7W. Along E shore of Epoufette Point. Engadine.
- Hendricks Twp., sec. 10 and 11, T42N, R7W. Along lake shore, approx. 1 mi. SE of Epoufette. Engadine.
- Newton Twp., sec. 5, 8, and 17, T42N, R11W. Along road on E side of sec. Manistique: Cordell. Contact, Manistique and Engadine crosses road near SE corner sec. 17.
- Newton Twp., sec. 12, 14, and 22, T42N, R11W. Many exposures over large area, approx. $\frac{3}{4}$ mi. wide extending from NE sec. 22 to W part of sec. 12. Engadine.
- Newton Twp., W $\frac{1}{2}$ sec. 20, T42N, R11W. Engadine at or near surface. Also, SE sec. 20, several sinks formed in dolomite.
- Newton Twp., E $\frac{1}{2}$ sec. 21, T42N, R11W. Engadine dolomite at or near surface.
- Newton Twp., NW sec. 28, T42N, R11W. Engadine dolomite at or near surface.
- Newton Twp., NE sec. 29, T42N, R11W. Engadine dolomite at or near surface.
- Newton Twp., sec. 5 and 6, T42N, R12W. Many exposures in most of sec. 6 and SE sec. 5. Burnt Bluff: Hendricks. Also, in sec. 6, Inland Lime & Stone Co. quarry.
- Newton Twp., sec. 7, T42N, R12W. In fields near W-line sec. 7 at points $\frac{1}{4}$ and $\frac{1}{2}$ mi. N of Hunt Spur. Manistique: Cordell.
- Marquette Twp., sec. 3, T43N, R2W. High N-facing escarpment in W part of sec. Engadine, Manistique.
- Marquette Twp., NE NE sec. 11, T43N, R2W. In and along road, in aband. quarry W of road, and in low ridge crossing road. Manistique, Burnt Bluff.
- St. Ignace Twp., sec. 8 and 9, T43N, R3W. Along both sides of N-S road. Manistique.
- Brevoort Twp., NE SW sec. 27, T43N, R4W. In ditches of Moran-East Lake road. Engadine. Contact with Pointe aux Chenes probably just south of these exposures.
- Brevoort Twp., sec. 28 and 29, T43N, R4W. N-line sec. 28 and 29, extensive pavement-like exposures on both sides of road. Engadine. (Guelph fossils in top.)
- Moran Twp., NE NW sec. 8, T43N, R5W. Ozark quarry. Engadine.
- Moran Twp., SW NE sec. 17, T43N, R5W. In RR cut; at surface on both sides of cut; in Marstone quarry E of RR. Engadine.
- Moran Twp., sec. 19 and 30, T43N, R5W. In E part sec. 19 and 30. Engadine.
- Moran Twp., NE sec. 28, T43N, R5W. In RR cut just S of Kenneth, and in small aband. quarry E of cut. Engadine.
- Moran Twp., sec. 29, T43N, R5W. Many exposures over large part of sec. Engadine.
- Moran Twp., SE SW sec. 30, T43N, R5W. Along banks of Carp River in vicinity of small dam. Engadine.
- Garfield Twp., southern $\frac{2}{3}$ of T43N, R10W. Engadine. Type locality.
- Garfield Twp., sec. 4 and 9, T43N, R10W. Along roads on sides of and through sections. Manistique.
- Newton Twp., NE sec. 5, T43N, R11W. Along roadside approx. 4 mi. N of Gould City. Burnt Bluff: Hendricks.
- Newton Twp., SW sec. 13 and NW sec. 24, T43N, R11W. In low bluff approx. 1 mi. NE of Hazelmere. Engadine, Manistique. Also, in fields W of bluff.

- Newton Twp., sec. 19, 20, 29, and 30, T43N, R11W. S parts of sec. 19 and 20, and N parts of sec. 29 and 30. Burnt Bluff: Hendricks.
- Newton Twp., SE sec. 29, T43N, R11W. In ridge $\frac{1}{4}$ mi. N of S sec. line. Manistique. Cordell. Ridge continues S through E part of sec. 32 and crosses road into sec. 33 approx. $1\frac{1}{2}$ mi. S of Gould City.
- Newton Twp., SW NW sec. 35, T43N, R11W. McEachern quarry. Manistique.
- Newton Twp., E part sec. 25, 36, S part sec. 30, 31 and SW sec. 32, T43N, R12W. Many exposures. Burnt Bluff: Hendricks.
- Hendricks Twp., SE sec. 16, T44N, R7W. Fiborn quarry. Exposures in Sec. 15, 16, 20, 21, 24. Burnt Bluff: Hendricks. Mayville. Type locality of Fiborn beds.
- Hudson Twp., NW sec. 6, T44N, R8W. Hendricks quarry. Quarry extends into NE sec. 1, T44N, R9W. Burnt Bluff: Hendricks. Mayville. Type locality Hendricks.
- Garfield Twp., sec. 29, T44N, R10W. Under thin drift, in shallow wells. Fiborn.
- Bois Blanc Island: Type area Bois Blanc fm.
- Sec. 1. Poor exposures along shore at LaFayette Point. Bois Blanc.
- Sec. 7. Along shore in NW part of sec. Bois Blanc, St. Ignace.
- Sec. 8. Between point on N shore near aband. house and dock and point on little-used road approx. 600 ft. inland. Bois Blanc, St. Ignace.
- NE sec. 9. In cliffs along shore. Bois Blanc, St. Ignace.
- Sec. 14. In cliff along shore, approx. 500 ft. S of W point of island. St. Ignace.
- Sec. 17. Zela Point, approx. 3 mi. NW of Point aux Pins. Bois Blanc.
- Sec. 27. Along shore between Rosie and Packard points. Bois Blanc.
- Sec. 33. Along shore approx. $1\frac{1}{2}$ mi. NW of Point aux Pins. Bois Blanc.
- Goose Island:
T41N, R1W. Gypsum at depths of 8 to 10 ft. in bottom of Lake Huron, adjacent to Goose Island. Pointe aux Chenes.
- Mackinac Island:
In ravine just E of reservoir, approx. 200 ft. N of Fort Holmes. Bois Blanc, St. Ignace.
- In old quarry, 750 ft. E of old lime kiln on E side of Fort Mackinac-Sugarloaf road. St. Ignace.
- In cliff S of Dwightwood Spring. St. Ignace, Pointe aux Chenes.
- Along road approx. $\frac{1}{2}$ mi. S of British Landing. Pointe aux Chenes.
- Approx. 800 ft. N of Dwightwood Spring and 200 ft. N of base of Arch Rock. Pointe aux Chenes.
- Round Island:
Cliff on NE side of island, approx. $\frac{1}{4}$ mi. NW of NE point of island. St. Ignace.
- St. Martin Island:
Sec. 12, T41N, R3W. In low lands adjacent to S shore. Pointe aux Chenes.

MARQUETTE COUNTY

- Wells Twp., sec. 23, T42N, R25W. Shallow roadside ditch. Maclurites zone. Trenton.
- Wells Twp., SW SW sec. 29, T42N, 25W. On both sides of road. Hermansville.
- Wells Twp., NW sec. 5, T42N, R26W. Just N of road on E edge of Northland. Hermansville.
- Wells Twp., SE NE sec. 6, T42N, R26W. Hermansville.
- Wells Twp., E $\frac{1}{2}$ sec. 24, T43N, R26W. Escanaba River. Hermansville.
- Turin Twp., SW NE sec. 3, T44N, R24W. Cambrian.
- Turin Twp., SW SW sec. 13, T44N, R24W. Along E side of road. Hermansville.
- Turin Twp., C E $\frac{1}{2}$ sec. 25, T44N, R24W. On E side of M-35. Black River. U. Decorah. Abandoned quarry near McFarland. Trenton: Chandler Falls.

- Forsyth Twp., NE SE sec. 7 and SW SW sec. 8, T45N, R24W. Lake Superior Sandstone?
- Forsyth Twp., SE SW SE sec. 10, T45N, R24W. Along trail. Lake Superior Sandstone.
- Forsyth Twp., NW SE NW and C N $\frac{1}{2}$ N $\frac{1}{2}$ sec. 15, T45N, R24W. NW of trail. Lake Superior Sandstone.
- Forsyth Twp., C N $\frac{1}{2}$ NE sec. 19, T45N, R24W. 250 yds. N of road. Hermansville? Lake Superior Sandstone. Jordan.
- Forsyth Twp., NW SW sec. 21, T45N, R24W. Along road. 1 mi. SE of Little Lake. Lake Superior Sandstone?
- Forsyth Twp., SE SE NE sec. 19, T45N, R25W. Hermansville.
- Forsyth Twp., C S $\frac{1}{2}$ NW sec. 20, T45N, R25W. On both sides of road just W of RR and for $\frac{1}{4}$ mi. S of road. Hermansville.
- Skandia Twp., SW SW SW sec. 29, T46N, R23W. On W side of road Skandia to Chatham in ditch. Lake Superior Sandstone?
- Skandia Twp., NW NE sec. 34, T46N, R23W. In shallow ditches along road for 200 yds. Hermansville?
- West Branch Twp., NW sec. 36, T46N, R24W. Upper Falls Chocolay River. Lake Superior Sandstone.
- West Branch Twp., NW SE NE sec. 36, T46N, R24W. Road exposure?
- Chocolay Twp., SW SE sec. 25, T47N, R24W. Rapids in Chocolay River. Jacobsville.
- Marquette Twp., NW sec. 1, T48N, R25W. Along W side Presque Isle Point. Jacobsville contact with pre-Cambrian.
- Marquette Twp., NW sec. 26, T48N, R25W. Quarry. Jacobsville?
- Marquette Twp., NE sec. 36, T48N, R25W. Along road, and along lake shore. Contact with Huronian. Jacobsville?
- Marquette Twp., sec. 17, T49N, R25W. On SE side of Little Presque Isle. Jacobsville.
- Marquette Twp., SE sec. 19, and sec. 20, and NW sec. 29, T49N, R25W. Along shore. Jacobsville.
- Marquette Twp., sec. 20, T49N, R25W. Along shore at Granite Point. Jacobsville.
- Marquette Twp., SE and NW sec. 2, NE sec. 11, and NE sec. 13, T49N, R26W. Cliffs along shore. Jacobsville.
- Marquette Twp., sec. 19, T49N, R26W. Along County Highway 550. Jacobsville.
- Powell Twp., W $\frac{1}{2}$ sec. 8, E $\frac{1}{2}$ sec. 21, NW sec. 27, and W $\frac{1}{2}$ sec. 35, T50N, R26W. Cliffs along shore. Jacobsville.
- Powell Twp., sec. 17, 20, 21, SW sec. 27, and E part sec. 34, T51N, R26W. Along shore and inland. Jacobsville.
- Powell Twp., sec. 1 and 12, T51N, R27W. Along shore on both sides of Big Bay Point. Jacobsville.
- Powell Twp., SE sec. 4 and NE sec. 9, T51N, R27W. Along shore. Jacobsville.
- Powell Twp., C E $\frac{1}{2}$ sec. 30, T52N, R27W. Quarry. Jacobsville.
- Powell Twp., N and E parts sec. 30 and 33, N $\frac{1}{2}$ sec. 32, T52N, R27W. Along shore, Salmon Trout Point. Jacobsville.
- Powell Twp., sec. 21, shore Pine Lake and sec. 19, S shore Rush Lake, T52N, R28W. Cambrian.
- Powell Twp., NW sec. 21, T52N, R28W to NE sec. 15, T52N, R29W. Along shore. Jacobsville.
- Powell Twp., NE sec. 22, N $\frac{1}{2}$ sec. 23, and S $\frac{1}{2}$ sec. 24, T52N, R28W. Along shore N side of Pine River Point. Jacobsville.
- Powell Twp., NW sec. 17, T52N, R29W. Along shore. Jacobsville.
- Garlic Island:
NW sec. 27, T50N, R26W. Cliffs along shore. Jacobsville.
- Partridge Island:
SE sec. 34, T49N, R25W. Along SE shore. Jacobsville.

MENOMINEE COUNTY

Menominee City, sec. 5, T31N, R27W. Menominee River. Trenton.
 Menominee City, NW sec. 14, T32N, R27W. Quarry. Trenton.
 Menominee City, C NW sec. 24, T32N, R28W. Chappee Falls, Menominee River. Black River.
 Mellon Twp., NE NW sec. 2, T34N, R27W. Little Cedar River. Trenton.
 Mellon Twp., sec. 5 and NW sec. 9, T34N, R27W. Menominee River. Trenton.
 Grand Rapids of Menominee. 3 mi. long. **Type locality of Hermansville**, below Black River (Rominger).
 Mellon Twp., E½ SW sec. 21, T34N, R27W. Roadway. Trenton.
 Cedarville Twp., W½ W½ SW sec. 2, T35N, R25W. Cedar River. Trenton.
 Stephenson Twp., NW sec. 20, T35N, R26W. East of roadway. Trenton.
 Lake Twp., NE sec. 18, T35N, R27W. Four exposures crossing N-line of sec. Hermansville.
 Stephenson Twp., NE sec. 24, T35N, R27W. Near roads. Trenton.
 Stephenson Twp., NW sec. 25, T35N, R27W. Across W-line. Trenton.
 Lake Twp., C SE sec. 32, T35N, R27W. Crosses road. Trenton.
 Lake Twp., near C S ¼-line sec. 1, T35N, R28W. Roadway. Hermansville.
 Lake Twp., NE sec. 13, T35N, R28W. Three exposures crossing road on N-line. Hermansville.
 Lake Twp., near C sec. 14, T35N, R28W. Crossing road. Hermansville.
 Lake Twp., S½ sec. 23, T35N, R28W. Hermansville.
 Lake Twp., SE corner sec. 23, T35N, R28W. Cross road. Hermansville.
 Cedarville Twp., NW sec. 18, T36N, R24W. Trenton.
 Cedarville Twp., S½ sec. 21, T36N, R25W. Cedar River. Trenton.
 Cedarville Twp., NE corner sec. 28, T36N, R25W. Cedar River. Trenton.
 Nadeau Twp., SW sec. 5, T36N, R26W. Trenton.
 Nadeau Twp., NW sec. 1, T36N, R27W. Along Little Cedar River. Hermansville.
 Nadeau Twp., SW sec. 12, T36N, R27W. Trenton.
 Holmes Twp., NW sec. 19, T36N, R27W. Hermansville.
 Daggett Twp., S½ sec. 26, T36N, R27W. Cross RR. Trenton.
 Holmes Twp., SW sec. 32, T36N, R27W. Hay Creek and also along roadside. Also, C NE sec. 32. Hermansville.
 Holmes Twp., N½ sec. 35, T36N, R27W. Cross RR. Trenton.
 Holmes Twp., NE NW sec. 12, T36N, R28W. Along both sides of road, approx. 3.6 mi. S of Nathan. Hermansville.
 Holmes Twp., SE sec. 23, T36N, R28W. Escarpment E into sec. 24 and S into sec. 26. Hermansville.
 Holmes Twp., SW sec. 24, T36N, R28W. Hermansville.
 Holmes Twp., NE NE sec. 24, T36N, R28W. Along road for approx. ¾ mi. Hermansville. Also, SE SE sec. 24.
 Holmes Twp., sec. 25, T36N, R28W. Goes N-S in W½ of sec. Hermansville.
 Holmes Twp., SE and NE sec. 26, T36N, R28W. Hermansville.
 Holmes Twp., C SE and C S ¼-line sec. 36, T36N, R28W. Two exposures in roadway. Hermansville.
 Holmes Twp., NW sec. 36, T36N, R28W. Circular depression—outcrop? Hermansville.
 Gouley Twp., SE sec. 3, T37N, R25W. Cedar River. Trenton.
 Nadeau Twp., W½ sec. 6, T37N, R26W. Along stream. Hermansville.
 Nadeau Twp., N½ sec. 20, T37N, R26W. Approx. ½ mi. E of Carney. Trenton.
 Faithorn Twp., S½ sec. 8, T37N, R27W. Hermansville.
 Nadeau Twp., near N-line sec. 13, T37N, R27W. Hermansville.
 Nadeau Twp., near N-line sec. 15, T37N, R27W. Little Cedar River. Hermansville.
 Holmes Twp., NW sec. 17, T37N, R27W. Hermansville.

Holmes Twp., W-line sec. 18, T37N, R27W. Hermansville.
 Holmes Twp., S-line SE sec. 19, T37N, R27W. Along road. Hermansville.
 Nadeau Twp., SE SW and SE SE sec. 23, T37N, R27W. Along N side of road. Hermansville.
 Nadeau Twp., NW SE sec. 24, T37N, R27W. Along S side of road for approx. 40 yds. Hermansville.
 Nadeau Twp., NW SE sec. 25, T37N, R27W. Along road, approx. 7.5 mi. S of Nathan. Hermansville.
 Holmes Twp., NE NE sec. 30, T37N, R27W. Along S side of road. Hermansville.
 Nadeau Twp., SW sec. 36, T37N, R27W. Little Cedar River. Also, NW sec. 36, stream. Hermansville.
 Holmes Twp., SE SW sec. 24, T37N, R28W. Along road. Hermansville. Also, SE corner sec. 24.
 Holmes Twp., NW SE sec. 36, T37N, R28W. Along road, approx. 1.6 mi. S of Nathan. Hermansville.
 Harris Twp., NW and C sec. 2, T38N, R25W. Trenton.
 Harris Twp., W½ sec. 7, T38N, R25W. Trenton.
 Harris Twp., sec. 9, T38N, R25W. Along road, 2 mi. E and 1 mi. S of Wilson. Trenton: Chandler Falls, Maclurites zone.
 Harris Twp., SW NE and SW NW sec. 11, T38N, R25W. Trenton.
 Harris Twp., SE NW sec. 12, T38N, R25W. Along highway. Trenton: Groos Quarry.
 Harris Twp., NW sec. 15, T38N, R25W. Trenton.
 Harris Twp., C N½ sec. 16, T38N, R25W. Roadside. Trenton: Chandler Falls.
 Harris Twp., S½ sec. 21, T38N, R25W. Stream bed. Trenton.
 Harris Twp., SE sec. 29, T38N, R25W. Trenton.
 Spalding Twp., S½ sec. 3, T38N, R26W. Trenton.
 Spalding Twp., N-S ¼-line sec. 5, T38N, R26W. On both sides of road. Hermansville.
 Spalding Twp., NW sec. 7, T38N, R26W. Hermansville.
 Spalding Twp., NW NW sec. 9, T38N, R26W. E of road. SE NW sec. 9, and NW SW sec. 9 in shallow ditch along road. Black River.
 Spalding Twp., S½ sec. 10, T38N, R26W. In ditch along US-2 approx. ¼ mi. E of Spalding. Black River.
 Spalding Twp., C sec. 11, T38N, R26W. Along RR. Black River.
 Spalding Twp., S½ sec. 24, T38N, R26W. Trenton.
 Spalding Twp., NW sec. 27, T38N, R26W. Also, sec. 22 and 28. Trenton.
 Meyer Twp., NW NW sec. 2, T38N, R27W. On both sides of road for approx. 100 yds. Hermansville: Oneota.
 Meyer Twp., N-line sec. 4, T38N, R27W. Hermansville: Oneota.
 Meyer Twp., E-line sec. 5, T38N, R27W. Hermansville: Oneota.
 Meyer Twp., sec. 8, T38N, R27W. Four exposures—2 in C part of sec. and 2 on W-line. Hermansville: Oneota.
 Meyer Twp., SE sec. 14, T38N, R27W. Hermansville: Oneota.
 Meyer Twp., NW sec. 16, T38N, R27W. Also, 2 exposures on S-line and 1 on E-line. Hermansville.
 Meyer Twp., SW sec. 17, T38N, R27W. Also, N-line of sec. Hermansville.
 Meyer Twp., S½ SE sec. 23, T38N, R27W. Hermansville.
 Meyer Twp., SW sec. 25, T38N, R27W. Hermansville.
 Meyer Twp., NE sec. 28, T38N, R27W. Hermansville.
 Meyer Twp., NE sec. 33, T38N, R27W. Hermansville.
 Meyer Twp., NE sec. 35, T38N, R27W. Hermansville.
 T38N, R27W and T39N, R28W are **type areas of Hermansville** (Van Hise and Bayley).
 Faithorn Twp., SE SW sec. 1, T38N, R28W. Along road. Hermansville.
 Harris Twp., E½ sec. 3, T39N, R25W. Along Ten Mile Creek. Trenton.

Harris Twp., S½ sec. 15, T39N, R25W. Along stream. Also, NW sec. 15. Trenton.

Harris Twp., C sec. 25, T39N, R25W. Trenton.

Spalding Twp., C line sec. 4 and 9, T39N, R26W. Hermansville.

Spalding Twp., NE sec. 12, T39N, R26W. Hermansville.

Spalding Twp., N½ sec. 32, T39N, R26W. Hermansville.

Meyer Twp., sec. 8, T39N, R27W. Hermansville.

Meyer Twp., N-line sec. 10, T39N, R27W. Hermansville.

Meyer Twp., sec. 18, T39N, R27W. Hermansville.

Meyer Twp., SW NW and SW SE sec. 29, T39N, R27W. On N side of road. Hermansville: Oneota.

Meyer Twp., S½ sec. 35, T39N, R27W. Hermansville.

Harris Twp., SE sec. 23 and SW sec. 24, T40N, R25W. Trenton.

Harris Twp., sec. 34, T40N, R25W. In roadside ditch 1 mi. E of Whitney. Black River: Bony Falls.

Spalding Twp., NE NW sec. 4, T40N, R26W. Along W side of road for 25 yds. Probably basal Black River at top of Hermansville: Oneota.

Spalding Twp., sec. 4, T40N, R26W. Along N-line of sec. 4. Also in sec. 35, T41N, R26W. Hermansville.

Harris Twp., sec. 2, T41N, R25W. Ford River. Hermansville.

Harris Twp., sec. 4, T41N, R25W. Ford River. Hermansville.

Harris Twp., sec. 11, T41N, R25W. Along river. Hermansville.

Harris Twp., sec. 14, T41N, R25W. Ford River. Hermansville.

Spalding Twp., SW sec. 30, T41N, R26W. Hermansville.

Along Highway 69, .8 mi. northwest of Faunus.

Spalding Twp., S½ sec. 35, T41N, R26W. Also, sec. 5, T40N, R26W, near river. Black River.

ONTONAGON COUNTY

Haight Twp., NW SW sec. 1, T46N, R39W. Bond Falls. Cambrian Sandstone.

Interior Twp., C SW sec. 8, T47N, R38W. Agate Falls. Cambrian.

Rockland Twp., C S-line SW sec. 11, T49N, R39W. Okundekin Falls (?) on Baltimore River. Cambrian.

Matchwood Twp., sec. 2, T49N, R40W. Along Ontonagon River, Cambrian sandstone.

Matchwood Twp., SW SW SW sec. 9, T49N, R41W. Cascade Falls. Cambrian. Keweenawan?

Rockland Twp., sec. 23 and 24, T50N, R39W. Along small stream. Cambrian.

Rockland Twp., sec. 31, T50N, R39W. Falls of the Ontonagon. Victoria Dam. Cambrian.

SCHOOLCRAFT COUNTY

Mueller Twp., T41N, R13W. Along side of Seul Choix Point Peninsula, and along lake shore NE of Seul Choix Point. Engadine.

Mueller Twp., sec. 2, T41N, R13W. Inland Lime and Stone Co. quarry. Engadine.

Mueller Twp., sec. 6, T41N, R13W. Along S and SW shore of McDonald Lake. Manistique: Cordell.

Doyle Twp., NW sec. 1, T41N, R14W. In NW-SE trending ridge approx. 1 mi. SE of Whitedale. Manistique: Cordell.

Manistique Twp., SW SW sec. 1, T41N, R15W. Baker quarry. Manistique.

Hiawatha Twp., SW NE sec. 2, T41N, R16W. In area of 3 to 4 acres immediately N of Indian River and E of road. Burnt Bluff: Hendricks.

Hiawatha Twp., NE SW sec. 2, T41N, R16W. Along Shingleton-Manistique highway, less than ¼ mi. S of Indian River. Manistique.

Hiawatha Twp., sec. 2, T41N, R16W, and sec. 34 and 35, T42N, R16W. In bottom of Indian River between Indian Lake and Shingleton-Manistique highway. Burnt Bluff: Hendricks.

Hiawatha Twp., sec. 12, T41N, R16W. Aband. Inland Lime and Stone Co. quarry at Manistique. Manistique.

Hiawatha Twp., sec. 13, T41N, R16W. Along Manistique River between mouth and plant of Charcoal Iron Co., and along Lake Michigan shore S and SE of Manistique. Manistique.

City of Manistique, T41N, R16W. Aband. White Marble Lime Co. quarry north edge of town. Manistique. **Type locality with other exposures in area.**

Thompson Twp., SW SW sec. 8, T41N, R17W. In road approx. 100 ft. E of SW corner sec. 8. Burnt Bluff: Hendricks.

Thompson Twp., SW sec. 8 and NW sec. 17, T41N, R17W. In low ridge which crosses E-W road. Burnt Bluff.

Thompson Twp., SW SW sec. 9, T41N, R17W. Along road just E of sec. corner and in nearby fields on both sides of road N of SW sec. corner. Burnt Bluff: Hendricks.

Thompson Twp., SE SW sec. 9, T41N, R17W. In small quarry approx. 100 yds. N of road. Burnt Bluff: Hendricks.

Thompson Twp., SW SW sec. 17, T41N, R17W. Holbin quarry. Manistique.

Thompson Twp., SW sec. 17, SE sec. 18, NE sec. 19, and NW sec. 20, T41N, R17W. At or near surface over much of this area. Manistique.

Thompson Twp., NW SW sec. 18, T41N, R17W. In low NE-SW bluff which crosses road approx. ½ mi. N or SW sec. corner. Manistique.

Thompson Twp., S-central sec. 20 and N-central sec. 29, T41N, R17W. Manistique.

Mueller Twp., T42N, R13W. Many exposures in N part sec. 1, N sec. 2, all of sec. 3, E and S sec. 4, SE sec. 5, SE sec. 6, N sec. 8, and N part sec. 9. Burnt Bluff: Hendricks, Fiborn.

Mueller Twp., sec. 3, T42N, R13W. Nicholsonville quarry (also known as Calspar quarry, Blaney quarry, Inland Lime and Stone Co. quarry). Burnt Bluff: Hendricks, Fiborn.

Mueller Twp., SE sec. 6, T42N, R13W. In small quarry in ridge. Burnt Bluff.

Mueller Twp., sec. 30 and 31, T42N, R13W. Along N shore of McDonald Lake. Manistique: Cordell.

Doyle Twp., sec. 4, 9, and 17, T42N, R14W. In escarpment extending from the NE sec. 17 to SW sec. 4. Burnt Bluff: Hendricks.

Doyle Twp., SW sec. 8, T42N, R14W. In upper part of "Ninety-foot Bluff" escarpment. Burnt Bluff: Hendricks.

Doyle Twp., S½ sec. 8, T42N, R14W. Natural rock pavement over much of the area. Burnt Bluff: Hendricks.

Doyle Twp., W¼ sec. 9, T42N, R14W. "Sixty-foot Bluff" escarpment. Burnt Bluff.

Doyle Twp., NE sec. 11, T42N, R14W. In road, approx. 40 rods W of NE sec. corner. Burnt Bluff: Hendricks, Fiborn. Manistique in fields at higher level and in shallow quarry 60 rods SE.

Doyle Twp., SE SE sec. 12, T42N, R14W. Along road approx. ½ mi. N of SE sec. corner. Burnt Bluff: Hendricks.

Doyle Twp., E-line sec. 28, T42N, R14W. On both sides of low ridge crossing road near NE corner of sec. Manistique.

Doyle Twp., S½ sec. 31, T42N, R14W. Along road. Manistique: Cordell, Schoolcraft.

Doyle Twp., NW SE sec. 33, T42N, R14W. Stewart quarry. Manistique.

Doyle Twp., E½ sec. 33 and W½ sec. 34, T42N, R14W. Exposures over much of the area. Manistique.

Doyle Twp., sec. 35, T42N, R14W. At Gulliver (Whitedale). Manistique: Cordell. At or near surface of land adjacent to two outliers of Engadine.

- Manistique Twp., sec. 22, T42N, R15W, to sec. 34, T43N, R14W. N and NW facing escarpment $\frac{1}{4}$ to $\frac{3}{4}$ mi. S and SE of Manistique River. Burnt Bluff: Hendricks.
- Manistique Twp., NE SE sec. 27, T42N, R15W. Along road in small low ridge which crosses road, and in aband. quarry on E side of ridge and S of road. Burnt Bluff: Hendricks.
- Manistique Twp., SE sec. 35, T42N, R15W. Aband. Marblehead Quarry and fields north and east. Manistique.
- Manistique Twp., sec. 36, T42N, R15W. Inland Lime and Stone Co. quarry at Marblehead. Manistique: Cordell, Schoolcraft (Lower and Upper Pentamerus) **Type locality Schoolcraft.**
- Manistique Twp., SE sec. 36, T42N, R15W. On S side of road. Manistique (contact Cordell and Schoolcraft).
- Hiawatha Twp., SE SW sec. 14, T42N, R16W. Sawheidle quarry. In road cut approx. $\frac{1}{4}$ mi. S of C sec. 14. Burnt Bluff: Hendricks.
- Hiawatha Twp., T42N, R16W. "Big Hill Bluff". Burnt Bluff.
- Hiawatha Twp., SW SW sec. 26, T42N, R16W. Quarry? Burnt Bluff.
- Hiawatha Twp., sec. 27 and 34, T42N, R16W. Along NE shore of Indian Lake, and in low cliff E of shore between outlet to Indian River and point 1 mi. NE. Burnt Bluff.
- Thompson Twp., SW sec. 28, T42N, R17W. Small road metal quarry in side of low E-W ridge. Burnt Bluff: Hendricks.
- Mueller Twp., SW NE sec. 29, T43N, R13W. Blaney quarry. Burnt Bluff.
- Mueller Twp., SE sec. 34, T43N, R13W. At base of very low bluff. Burnt Bluff: Hendricks.
- Mueller Twp., sec. 34, 35, and 36, T43N, R13W. Many exposures in S parts of these sections. Burnt Bluff: Hendricks.

SOUTHERN PENINSULA

ALPENA COUNTY

- Green Twp., E-line NE sec. 20, T30N, R6E. Roadside. Antrim.
- Alpena Twp., SE sec. 11, T30N, R8E. Traverse: Thunder Bay. **Type locality Thunder Bay.**
- Alpena Twp., sec. 10, 11, and 14, T30N, R8E. Along shore of Partridge Point. Traverse: Squaw Bay, Thunder Bay. **Type locality Squaw Bay, ledges on beach, Sec. 10. Type locality Thunder Bay, cliff Sec. 11, 14.**
- Alpena Twp., NE sec. 22, T30N, R8E. Ledges along road and lake shore. Antrim.
- Long Rapids Twp., NE sec. 4, T31N, R6E. South Branch Thunder Bay River. Also along river into sec. 12. Traverse: Thunder Bay.
- Long Rapids Twp., sec. 15, T31N, R6E. Antrim.
- Green Twp., NW NW sec. 21, T31N, R6E. In ditch along road approx. $\frac{1}{4}$ mi. S of Lachine. Antrim.
- Green Twp., SE sec. 36, T31N, R6E. Dump by old "gold mine" shaft. Traverse: Squaw Bay. Antrim.
- Maple Ridge Twp., C S-line sec. 1, T31N, R7E. In low cuts and ditches along road, approx. $\frac{1}{2}$ mi. NW of Seven Mile or Norway Point Dam. Traverse: Norway Point. Four Mile Dam.
- Maple Ridge Twp., C S-line sec. 9, T31N, R7E. Extends south into sec. 16, along lower South Branch Thunder Bay River. Traverse: Thunder Bay.
- Maple Ridge Twp., NE sec. 12, T31N, R7E. In banks and bed of Thunder Bay River below Norway Point or Seven Mile Dam. Traverse: Norway Point.

- Maple Ridge Twp., C N $\frac{1}{2}$ NE sec. 16, T31N, R7E. In bed of river. Traverse: Thunder Bay.
- Maple Ridge Twp., C sec. 17, T31N, R7E. Traverse: Squaw Bay; SE NW sec. 17, Thunder Bay; and NE SE sec. 17 Squaw Bay drift. Thunder Bay. Good collecting in stone piles $\frac{1}{8}$ mi. S of center sec. 17, Antrim. Contact Antrim and Squaw Bay in vicinity.
- Wilson Twp., SE NE sec. 19, T31N, R7E. Antrim.
- Wilson Twp., E $\frac{1}{2}$ SW sec. 21, T31N, R7E. In bed of Thunder Bay River. Traverse: Alpena.
- Wilson Twp., NE sec. 30, T31N, R7E. Paxton quarry (Huron Portland Cement Co. quarry), and roadside north of quarry. Antrim.
- Wilson Twp., SW NE sec. 31, T31N, R7E. Antrim.
- Alpena Twp., SE sec. 1, T31N, R8E. Aband. Collins quarry. Traverse: Alpena?
- Alpena Twp., E sec. corner sec. 1 and 12, T31N, R8E. Traverse: Alpena.
- Alpena Twp., E-line sec. 3, T31N, R8E. N from $\frac{1}{4}$ corner. Traverse: Alpena. Bioherm.
- Alpena Twp., NW sec. 3, T31N, R8E. Bioherm on W side of highway. Traverse: Alpena.
- Alpena Twp., S $\frac{1}{2}$ SE sec. 4, T31N, R8E. Road cut 2 $\frac{1}{2}$ mi. N of Chisholm St. Bridge on US-23. Traverse: Alpena. Bioherm and flank beds.
- Alpena Twp., NW sec. 4, T31N, R8E. Traverse: Alpena.
- Alpena Twp., SE NW sec. 5, T31N, R8E. Traverse: Alpena.
- Alpena Twp., NE NE sec. 6, T31N, R8E. Traverse: Alpena.
- Alpena Twp., sec. 7, T31N, R8E. $\frac{1}{4}$ mi. S of C sec. 7 in river bed and along banks. Traverse: Norway Point. Four Mile Dam. **Type locality Four Mile Dam fm. foot of at Four Mile Dam, and Potter Farm fm. lower beds.**
- Alpena Twp., sec. 7, 17, 18, T31N, R8E. Terrace along Thunder Bay River. Traverse: Thunder Bay.
- Alpena Twp., SE sec. 8, T31N, R8E. Traverse: Thunder Bay.
- Alpena Twp., sec. 9 and 16, T31N, R8E. In ditches along US-23 and French Road extending NW from SE sec. 16. Traverse: Norway Point.
- Alpena Twp., sec. 13, T31N, R8E. Huron Portland Cement Co. quarry (Mich. Alkali Co. quarry). Traverse: Four Mile Dam. Alpena, Newton Creek. Genshaw. **Type locality Newton Creek, of Genshaw beds 15-16, and of Alpena.**
- Alpena Twp., NW sec. 13, T31N, R8E. Quarry Michigan Alkali Co. Traverse: Genshaw, Newton Creek, Alpena. **Type locality Newton Creek.**
- Alpena Twp., NE sec. 14, T31N, R8E. Aband. quarries. Traverse. Also SE sec. 14, Thunder Bay quarry. Traverse: Four Mile Dam. Alpena incl. Dock Street Clay member. **Type locality Dock Street Clay.**
- Alpena Twp., SE NW sec. 15, T31N, R8E. S of RR. Traverse: Alpena incl. Dock Street Clay member.
- Alpena Twp., N $\frac{1}{2}$ SE sec. 16, T31N, R8E. Cut along aband. RR, and field outcrops to N and W side of US-23. Traverse: Norway Point.
- Alpena Twp., NW sec. 17, T31N, R8E. NW sec. 17, E $\frac{1}{2}$ sec. 18, E $\frac{1}{2}$ sec. 19, all but NE sec. 20. Exposure on hills. Traverse: Potter Farm, Norway Point. **Type locality Potter Farm.**
- Alpena Twp., N-S line through C sec. 18, T31N, R8E. Shale bank S side Thunder Bay River 1 mi. below Four Mile Dam. Road cuts and ledges on and near N-S road. Traverse: Potter Farm Norway Point. Also E $\frac{1}{2}$ sec. 18, especially C E-line. Traverse: Potter Farm. Norway Point. **Type locality lower Potter Farm.**
- Alpena Twp., SE SW sec. 19, T31N, R8E. Aband. quarry approx. 2 mi. W Alpena Cemetery. Traverse: Potter Farm. Also C N $\frac{1}{2}$ N $\frac{1}{2}$ sec. 19, roadside exposure Potter Farm and E $\frac{1}{2}$ sec. 19. Potter Farm. Norway Point.
- Alpena Twp., SE SW sec. 19, T31N, R8E. Aband. quarry on Alpena-Hillman highway. Traverse: Potter Farm.

Alpena Twp., NW sec. 20, T31N, R8E. Cut along aband. RR and nearby field exposures; SE sec. 20, on E slope of hill just W of Alpena Cemetery "Silo Terrace" of Ver Wiebe; S-line sec. 20, road cuts on Alpena-Hillman road ½ to 1 mi. W of Alpena Cemetery. Traverse: Potter Farm.

Alpena Twp., SW sec. 21, T31N, R8E. Small shale pit at NW corner of cemetery. Traverse: Potter Farm. **Type locality upper beds of Potter Farm.**

Alpena Twp., SW SW sec. 27, T31N, R8E. Traverse: Potter Farm.

Alpena Twp., SE NE sec. 28, T31N, R8E. Aband. Warner's Brick Yard. Traverse: Potter Farm.

Alpena Twp., NW sec. 29, T31N, R8E, and C S½ NE sec. 29. Aband. Nicholson quarry. Traverse: Potter Farm.

Alpena Twp., SE sec. 33, T31N, R8E. Shore terraces. Traverse: Thunder Bay.

Alpena Twp., NW sec. 34, T31N, R8E. Excavations at Alpena City Waterworks and ledges along beach at Stony Point. Traverse: Potter Farm.

Alpena Twp., C sec. 4, T31N, R9E, and along N-S sec. line, sec. 4 and 5. Traverse: Genshaw.

Alpena Twp., C W½ NE sec. 10, T31N, R9E. Aband. quarry, El Cajon Cement Co. Traverse: Genshaw lower beds.

Alpena Twp., NW SW sec. 15, T31N, R9E. Sinkhole, El Cajon Bay a small inlet at head of Misery Bay, and above Killians in SE SW sec. 15. Traverse: Genshaw.

Wellington Twp., C NW sec. 25, T32N, R5E. Along W side of road; also W½ NE sec. 25. Traverse: Genshaw, Killians.

Wellington Twp., C N½ NE sec. 35, T32N, R5E. Traverse.

Wellington Twp., S½ NW sec. 36, T32N, R5E. Along N-S road just N of schoolhouse. Traverse.

Long Rapids Twp., C E½ sec. 5, T32N, R6E; also C W½ sec. 5, and S½ corner of sec. line, sec. 4 and 5. Traverse: Alpena.

Long Rapids Twp., S½ NW sec. 9, T32N, R6E. Traverse: Alpena.

Long Rapids Twp., NW sec. 16, T32N, R6E. Sinkholes. Traverse: Alpena.

Long Rapids Twp., NW sec. 21, T32N, R6E. On S side of road. Traverse: Alpena? Potter Farm?

Long Rapids Twp., NW SE sec. 25, T32N, R6E. Traverse: Potter Farm.

Long Rapids Twp., NE NW sec. 27 and NE sec. 28, T32N, R6E. Along sec. line N of school. Traverse.

Long Rapids Twp., E½ sec. 34, T32N, R6E. Sinkhole on Marston farm. Traverse.

Long Rapids Twp., SW SW SW sec. 34, T32N, R6E. Thunder Bay River near road. Traverse.

Maple Ridge Twp., S½ sec. 1, T32N, R7E. Traverse: Genshaw?

Maple Ridge Twp., SE sec. 2, T32N, R7E. Traverse.

Maple Ridge Twp., N-line sec. 3, T32N, R7E. Traverse.

Maple Ridge Twp., NE NE sec. 4 and SE SW sec. 4, T32N, R7E. Traverse.

Maple Ridge Twp., SE SW sec. 5, T32N, R7E. Aband. Griffin or Balton quarry, and adjacent field outcrops, SW side of RR, 1¼ mi. NW of Bolton. Traverse: Alpena.

Maple Ridge Twp., S½ corner sec. 9 and 10, and E½ corner sec. 9 and 16, T32N, R7E. Traverse.

Maple Ridge Twp., NW sec. 11, T32N, R7E. Sinkhole SE of Polish School. Traverse: Genshaw incl. Killians member.

Maple Ridge Twp., sec. 14, T32N, R7E. In sinkhole. Traverse.

Maple Ridge Twp., sec. 17, T32N, R7E. Traverse: Alpena.

Maple Ridge Twp., S-line SE sec. 16, T32N, R7E, and SW NW sec. 16. Traverse.

Maple Ridge Twp., SW NE sec. 20, T32N, R7E. Traverse.

Maple Ridge Twp., NE SW sec. 23, T32N, R7E. Traverse.

Maple Ridge Twp., near C sec. 29, T32N, R7E. On bank of river. Traverse: Norway Point, Four Mile Dam.

Maple Ridge Twp., E-line SE SW sec. 30, T32N, R7E. Along N-S road extend-

ing N for ¼ mi. from corner. Traverse: Potter Farm. Norway Point.

Maple Ridge Twp., near C S½ NW sec. 31, T32N, R7E. On hillside on N side of Alpena-Long Rapids Road, and S½ NE sec. 31. Traverse: Potter Farm. Gastropod beds, N line sec. 31 compound *Cystiphyllum* beds.

Maple Ridge Twp., N½ sec. line, sec. 33 and 34, T32N, R7E, and SE SW sec. 34. Traverse.

Maple Ridge Twp., SE SE sec. 35, T32N, R7E. Traverse.

Alpena Twp., NE½, T32N, R8E. Traverse: Genshaw. **Type locality Genshaw.**

Alpena Twp., NE NE sec. 2, T32N, R8E. Test pit 1½ mi. NE of Lakewood. Traverse: Genshaw.

Alpena Twp., SE sec. 3, T32N, R8E. Traverse.

Alpena Twp., SW SW sec. 5, T32N, R8E. Road cut on county road. Traverse: Genshaw.

Alpena Twp., N½ sec. line, sec. 5 and 6, C S½ sec. 7, T32N, R8E. Traverse. Four Mile Dam?

Alpena Twp., C E-line sec. 8 (French Road), T32N, R8E. Road cut ½ to ¼ mi. S of Killians Resort on Long Lake. Traverse: Alpena ls., Genshaw, incl. Killians member. Also E sec. corner, sec. 8 and 17. Traverse. **Type locality of Genshaw beds 9-14. Type locality Killians.**

Alpena Twp., E-W ¼-line, sec. 12, T32N, R8E. Along road. Traverse.

Alpena Twp., SW NE sec. 14, T32N, R8E. Traverse.

Alpena Twp., Long Lake Road, sec. 15 and 22, T32N, R8E. Genshaw, beds 5-9.

Alpena Twp., NE sec. 16, T32N, R8E, and E½ corner sec. 16 and 21. Traverse: Genshaw.

Alpena Twp., E sec. 17, T32N, R8E. Drift on sides of French Road. Newton Creek.

Alpena Twp., NW NW sec. 19, T32N, R8E, and at sec. corner sec. 17, 18, 19 and 20. Traverse: Alpena?

Alpena Twp., S¼ corner sec. 20 and 21, T32N, R8E, and E of W sec. corner, sec. 20 and 29. Traverse: Alpena? NE sec. 21 Genshaw.

Alpena Twp., NE sec. 22, T32N, R8E. In ditches along Long Lake Road. Traverse: Genshaw. **Type locality Genshaw beds 6-11.**

Alpena Twp., SW SE sec. 23, T32N, R8E. Sinkhole and outcrops along shore, S end of Devils Lake, approx. ½ mi. S of "The Narrows". Traverse: Genshaw.

Alpena Twp., NE sec. 24, T32N, R8E. Bank on S side Long Lake Creek (Hell Creek) at private bridge. Traverse: Genshaw.

Alpena Twp., NW SW sec. 25, T32N, R8E. Along Wessel road, approx. 1¼ mi. S of bridge at "The Narrows". Traverse: Genshaw incl. Killians member. Also SW SE sec. 25, aband. quarry. Traverse.

Alpena Twp., along sec. line, sec. 26 and 27, T32N, R8E. Traverse. Locality of Long Lake shales and limestones of Grabau.

Alpena Twp., along sec. line, sec. 28 and 29, T32N, R8E. Traverse: Alpena?

Alpena Twp., E½ corner sec. 29 and 32, T32N, R8E. Reef limestone. Traverse: Alpena?

Alpena Twp., SE SW sec. 31, T32N, R8E. Traverse: Alpena.

Alpena Twp., SW sec. 34, T32N, R8E. Road cut and field exposures, approx. 3½ mi. N of Chisholm St. Bridge. Traverse: Alpena. Bioherm.

Alpena Twp., SW SW sec. 35, NE sec. 35, and NW sec. 35, T32N, R8E. Traverse: Alpena.

Alpena Twp., NE SE sec. 36, T32N, R8E. Traverse: Alpena?

Alpena Twp., sec. 6, T32N, R9E. Aband. Rockport Stone Quarry. Traverse: Ferron Point, Rockport Quarry, Bell shale. **Type locality of Rockport Quarry and Ferron Point.**

Alpena Twp., SE SE sec. 18, T32N, R9E. Alpena Portland Cement Co. quarry. Traverse: Genshaw, Ferron Point. Also E½ of S-line, sec. 18, roadside exposures; and SW NW sec. 18. Traverse. **Type locality Genshaw beds 1-7.**

Alpena Twp., SW sec. 19, T32N, R9E. Traverse: Genshaw.

Alpena Twp., NW SE sec. 27, T32N, R9E. Shore south of Nine Mile Point. Traverse.
 Alpena Twp., C N½ sec. 31, T32N, R9E. Traverse: contact Genshaw-Alpena.
 Alpena Twp., N½ sec. 32, T32N, R9E. Two exposures. Traverse: Genshaw.
 Alpena Twp., sec. 3, 4, 9 and 10, T32N, R9E. Along N, E, and S shores of Middle Island. Rogers City.
 Sulphur Island, SW sec. 13, T30N, R8E. Antrim.
 Thunder Bay Island. Approx. 4 mi. 1 of North Point. Killians or Rockport.

ANTRIM COUNTY

Kearney Twp., NW, NE, and N½ SE sec. 6, T30N, R7W. Ellsworth.
 Kearney Twp., NE SE sec. 21, T30N, R7W. Shale, RR cut. Ellsworth.
 Kearney Twp., NE SW sec. 22, T30N, R7W. Shale, stream cut? Ellsworth.
 Kearney Twp., W½ sec. 32, T30N, R7W. Shale, road cut N-S. Ellsworth.
 Forest Home Twp., NE NE sec. 3, T30N, R8W. Shale, road cut. Ellsworth.
 Forest Home Twp., NW NW SW and NE SW sec. 13, T30N, R8W. Shale. Ellsworth.
 Jordan Twp., SW sec. 9, T31N, R6W. Shale overlaps into sec. 16. Ellsworth.
 Jordan Twp., W½ sec. 18, T31N, R6W. Shale overlaps into sec. 19. Ellsworth.
 Jordan Twp., C N½ sec. 30, T31N, R6W. Ellsworth.
 Echo Twp., on N-line NW sec. 2, T31N, R7W. Shale in drumlin. Ellsworth.
 Echo Twp., C NE sec. 10, T31N, R7W. Shale in drumlin. Ellsworth.
 Echo Twp., C SW sec. 17, T31N, R7W. West of road. Ellsworth.
 Echo Twp., NE NE sec. 27, T31N, R7W. Shale NE side of road. Ellsworth.
 Central Lake Twp., sec. 7, T31N, R8W. Along shore of Torch Lake. Ellsworth.
 Central Lake Twp., C N-line sec. 22, T31N, R8W. Shale in bottom of gravel pit in village of Central Lake; extends into sec. 16. Ellsworth.
 Torch Lake Twp., sec. 12, T31N, R9W. Along shore, approx. 1 mi. SW of Eastport. Ellsworth.
 Torch Lake Twp., SE sec. 3, T32N, R9W. Shore and bluffs along bay. Antrim.
 Banks Twp., SW NE sec. 13 and SW NE sec. 14, T32N, R8W. Antrim.
 Banks Twp., SE sec. 23, T32N, R8W. Along Ellsworth Lake, approx. 1 mi. S of Ellsworth, Petoskey Portland Cement Co. quarry. Ellsworth.
 Banks Twp., NE NE sec. 26, T32N, R8W. Quarry Petoskey Portland Cement Co. Type locality Ellsworth.
 Banks Twp., W½ W½ sec. 25; E½ E½ sec. 35; sec. 26 and sec. 36, T32N, R8W. Several exposures. Antrim.

ARENAC COUNTY

Standish Twp., T18N, R5E. Along Lake Huron shore; sinkholes apparently produced by dissolving out of gypsum. Also exposures of gypsum in lake bed.
 Au Gres Twp., NE sec. 1, T18N, R6E. Bayport.
 Au Gres Twp., sec. 6, T18N, R7E. Along E side of Point au Gres extending approx. ½ mi.; also NW NW NW sec. 6. Bayport. Type locality Point aux Gres limestone.
 Deep River Twp., SE NE NE sec. 2, T19N, R4E. Small exposure E-line of sec., N bank of Rifle River; also NW sec. 2, scattered outcrops near bridge and ¼ mi. E of bridge on S bank of river. Saginaw.
 Deep River Twp., sec. 3, T19N, R4E. In bed and banks of Rifle River; SW NE sec. 3, on N bank of river; and old mine shaft on S side of river. Saginaw.
 Deep River Twp., sec. 3 and 4, T19N, R4E. Along S bank of Rifle River, near sec. line. Saginaw.
 Deep River Twp., sec. 33, T19N, R4E. In bed of creek for more than ¼ mi. Saginaw.

Deep River Twp., NE sec. 34 and N½ N½ sec. 35, T19N, R4E. Along North Branch Pine River. Saginaw.
 Arenac Twp., NE sec. 1, T19N, R5E. Approx. ¼ mi. S of Big Creek along W side of M-65. Michigan.
 Arenac Twp., NW sec. 1, T19N, R5E. Griffin quarry; and SE sec. 1, Burt quarry. Bayport.
 Arenac Twp., NE sec. 3, T19N, R5E. Bayport.
 Arenac Twp., NE sec. 8, T19N, R5E. Aband. shale pit along S bank of Rifle River. Saginaw.
 Arenac Twp., NE sec. 8 and NW sec. 9, T19N, R5E. Shale and sandstone beds in banks and bed of Rifle River. Saginaw.
 Arenac Twp., NW SE sec. 15, T 19N, R5E. Bed Rifle River. Bayport, Michigan. Saginaw 100 yds. downstream.
 Arenac Twp., S½ sec. 15, T19N, R5E. Along Rifle River at Omer. Saginaw.
 Arenac Twp., sec. 22, T19N, R5E. Sandstone in drainage ditch S of Rifle River. Exposures in Saverine Creek to SW sec. 22. Saginaw.
 Arenac Twp., NW sec. 25, T19N, R5E. In bed of Rifle River. Saginaw.
 Au Gres Twp., NE NE sec. 16, T19N, R6E. Dug from roadside ditch N side of road. Bayport.
 Au Gres Twp., near E¼ corner sec. 17, T19N, R6E. Vaughn's quarry. Bayport.
 Au Gres Twp., approx. C sec. 26, T19N, R6E. Bayport.
 Au Gres Twp., C E-line sec. 27, T19N, R6E. Bayport.
 Au Gres Twp., N½ NW sec. 27, T19N, R6E. Short distance W of school; also S½ E-line sec. 27. Bayport.
 Au Gres Twp., S½ sec. 30, T19N, R6E. Along creek at low water. Bayport.
 Au Gres Twp., SE SE SE sec. 36, T19N, R6E; C N½ sec. 36; and N½ W-line sec. 36. Bayport.
 Sims Twp., NW NE sec. 5, T19N, R7E; and C NW sec. 5. Arenac County quarry. Bayport.
 Sims Twp., SW SW SW sec. 31, T19N, R7E. Bayport.
 Clayton Twp., SW sec. 7, T20N, R4E. In bed of Rifle River. Marshall. Also exposure in NE SE sec. 12, T20N, R3E.
 Mason Twp., SW SE sec. 23, T20N, R5E. Several small test pits dug for gypsum. Michigan.
 Mason Twp., sec. 30, T20N, R5E. Bayport.
 Mason Twp., SE sec. 34, T20N, R5E. Kaven's quarry, near E sec. line just N of fire tower. Bayport.
 Mason Twp., S½ sec. 35, T20N, R5E. Bayport.
 Turner Twp., SE SE SE sec. 8, T20N, R6E. Exploratory pit for gypsum. Michigan.
 Turner Twp., SW NW sec. 14, T20N, R6E, and SE NE sec. 15. Michigan.
 Turner Twp., SE SW sec. 20, T20N, R6E. Michigan.
 Turner Twp., SE SE sec. 21, T20N, R6E. Michigan.
 Turner Twp., SW SW sec. 22, T20N, R6E. Michigan.
 Turner Twp., N½ N½ sec. 27, T20N, R6E. Michigan.
 Turner Twp., NW SW sec. 29, T20N, R6E. Michigan?
 Whitney Twp., SW SW sec. 11, T20N, R7E. In dredged roadside ditch. Michigan.
 Whitney Twp., sec. 13, T20N, R7E. Several exposures along shore. Bayport, Michigan.
 Whitney Twp., NE SE sec. 13, T20N, R7E (near E¼ post). Aband. Chas. Whittemore gypsum quarry opened in 1870. Bayport, Michigan.
 Whitney Twp., SE SE sec. 14, T20N, R7E. Aband. Harmon City quarry; and along small creek near E-line sec. 14. Bayport.
 Whitney Twp., sec. 24, T20N, R7E. Along lake shore. Bayport.
 Whitney Twp., SW sec. 23 and SE sec. 24, T20N, R7E. Several exposures along ridge. Bayport.

- Whitney Twp., sec. 25, T20N, R7E. Along shore from N sec. line S $\frac{3}{4}$ mi. to Whitestone Point. Bayport.
 Whitney Twp., NW SW sec. 27, T20N, R7E. Iosco County limestone quarry. Bayport.
 Whitney Twp., N $\frac{1}{2}$ SW sec. 28, T20N, R7E. Bayport.
 Whitney Twp., SW SE sec. 29, T20N, R7E; and NE SE sec. 29. Bayport.
 Whitney Twp., C W-line sec. 33, T20N, R7E. Bayport.

BRANCH COUNTY

- Union Twp., SW SW sec. 10, T5S, R7W. Aband. quarry of Peerless Portland Cement Co., W bank of Coldwater River. Coldwater. **Type locality Coldwater in banks of Coldwater River sec. 10 and 15.**
 Union Twp., NE sec. 16, T5S, R7W. Peerless Portland Cement Co. shale quarry, approx. 2 mi. S of Union City. Coldwater.
 Coldwater Twp., NE sec. 24, T6S, R6W. Aband. quarry on N side of small stream. Coldwater.
 Coldwater Twp., SW sec. 29, T6S, R6W. Aband. brickyard pit, badly weathered and slumped. Coldwater.
 Coldwater Twp., NW sec. 30, T6S, R6W. Aband. brickyard and shale quarry on W side of road; also aband. cement company quarry immediately N of brickyard quarry. Coldwater.
 Coldwater Twp., NW sec. 32, T6S, R6W. Wolverine Portland Cement Co. shale quarry. Coldwater.
 Batavia Twp., SE NE sec. 33, T6S, R7W. In NE angle made by intersection of road and RR, aband. shaft of Bronson Portland Cement Co. Coldwater.
 Alganssee Twp., NE NE sec. 16 and SE SE sec. 9, T7S, R5W. Along drainage ditch, Fisher Creek. Coldwater.
 Alganssee Twp., approx. C sec. 10, T7S, R5W. Along Pencil Creek between C sec. 10 and point $\frac{1}{4}$ mi. W. Coldwater.
 Alganssee Twp., NW sec. 14, T7S, R5W. Along brook, near N sec. line. Coldwater.
 Alganssee Twp., SE SW sec. 23, T7S, R5W. In banks of small creek near S sec. line. Coldwater.
 Alganssee Twp., NW SW sec. 24, T7S, R5W. Along brook, just S of E-W $\frac{1}{4}$ -line and in vicinity of W sec. line. Coldwater.
 Alganssee Twp., N $\frac{1}{2}$ sec. 25, T7S, R5W. Along brook which was dug deeper for drainage purposes. Coldwater.

CALHOUN COUNTY

- Sheridan Twp., cor. sec. 1, 2, 11, 12, T2S, R4W. Parma.
 Sheridan Twp., SE SE sec. 2, T2S, R4W. Parma.
 Sheridan Twp., near C sec. 30, T2S, R4W. On S bank of Kalamazoo River. Marshall.
 Sheridan Twp., N $\frac{1}{2}$ sec. 32, T2S, R4W. In road cut (1 mi. SE of exposure in sec. 30). Marshall.
 Marengo Twp., sec. 13, T2S, R5W. Along Rice Creek, Marshall. Sandstone blasted from creekbed.
 Marengo Twp., SW SE sec. 26, SE SW sec. 25, T2S, R5W. "Indian Mills". Marshall.
 Marshall Twp., NE SW sec. 25, T2S, R6W. Quarry at Marshall. Marshall. **Type locality.**
 Emmett Twp., sec. 5, T2S, R7W. Approx. 100 ft. upstream from Emmett St. Bridge in Battle Creek. Marshall. This is the locality Winchell originally named the type locality and from which many of his type fossils were obtained.

- Emmett Twp., SW SE sec. 15, T2S, R7W. Aband. Clark quarry, N side of Kalamazoo River. Marshall.
 Emmett Twp., NW NW sec. 18, T2S, R7W. Marshall.
 Emmett Twp., NE NW sec. 22, T2S, R7W. Craft Stone quarry (Beard quarry), N bank of Kalamazoo River. Marshall.
 Emmett Twp., SE SW sec. 23, T2S, R7W. Quarry Park quarry, S side of Kalamazoo River. Marshall. Also NW SW (?) sec. 23, Ground Stone Co. quarry (Acme), N side of river. Marshall.
 Emmett Twp., SW SW sec. 24, T2S, R7W. Quarry on N side of Kalamazoo River, 1 mi. W of Ceresco. Marshall.
 Emmett Twp., SE NE sec. 25, T2S, R7W. In small test pit dug into S river bank, about $\frac{1}{4}$ mi. downstream from bridge. Marshall.
 Albion Twp., NE sec. 20, T3S, R4W. Aband. quarry on W bank of river. Marshall.
 Athens Twp., NE corner of SW SW sec. 24, T4S, R8W. On N side of Nottawassepee Creek. Coldwater.
 Athens Twp., NE NE sec. 26, (?) T4S, R8W. Along N side of Nottawassepee Creek. Coldwater.

CHARLEVOIX COUNTY

- Boyne Valley Twp., SW SE sec. 21, T32N, R5W. Shale exposures. Ellsworth.
 Boyne Valley Twp., SE SE sec. 22, T32N, R5W. Shale exposures. Also, SE NW sec. 22, aband. brickyard. Ellsworth.
 Boyne Valley Twp., NE NE sec. 24, T32N, R5W. Shale exposures. Also, NE NW sec. 24, aband. shale pit. Ellsworth.
 Wilson Twp., NW NW sec. 14, T32N, R6W. Antrim.
 South Arm Twp., C W $\frac{1}{2}$ sec. 18, T32N, R7W. Antrim.
 South Arm Twp., NW sec. 24, T32N, R7W. Ellsworth.
 South Arm Twp., SE NE sec. 27, T32N, R7W. Shale exposures. Antrim.
 Melrose Twp., SE sec. 4, T33N, R5W. In RR cut. Antrim.
 Melrose Twp., NE SE sec. 9, T33N, R5W. Shale exposures. Antrim.
 Melrose Twp., SW SW sec. 10, T33N, R5W. In road cut. Antrim.
 Melrose Twp., SW SW sec. 15 and NW NW sec. 22, T33N, R5W. In ditch beside N-S road parallel to RR. Antrim.
 Melrose Twp., NE SE sec. 16, T33N, R5W. Shale exposure. Antrim.
 Melrose Twp., SE SE sec. 21, T33N, R5W. Antrim.
 Evangeline Twp., SW sec. 6, T33N, R6W. Along lake shore. Traverse: Petoskey, upper part.
 Evangeline Twp., SW sec. 25, T33N, R6W. Aband. shale pit, Boyne City Brick Co. Ellsworth.
 Evangeline Twp., NE SE sec. 30, T33N, R6W. On both sides of road, along Lake Charlevoix. Antrim.
 Evangeline Twp., SW NW sec. 3, T33N, R7W. Aband. quarry at Kamp Kairphree on shore of Lake Charlevoix; also SE NW (?) sec. 3, in ravine. Antrim. (Norwood).
 Norwood Twp., SE sec. 22 to NE sec. 28, T33N, R9W. Road cut and ledges and bluffs along Lake Michigan. Traverse: Gravel Point. Petoskey beds at south with anthracolite concretions weathered from succeeding Antrim shale.
 Norwood Twp., N $\frac{1}{2}$ sec. 26, T33N, R9W. Small pits near C N-line. Traverse-Antrim contact.
 Norwood Twp., near center N-line sec. 26, T33N, R9W. Traverse: Petoskey, upper part.
 Norwood Twp., NE sec. 27, T33N, R9W. Scenic road near Lake Michigan. **Norwood. Type locality.**
 Hayes Twp., SE sec. 1, T34N, R7W. Aband. Northern Lime Company Quarry. Shore bluffs near village of Bayshore. Traverse: Charlevoix, Petoskey.

- Hayes Twp., SE sec. 2, T34N, R7W. Aband. Superior quarry of Northern Lime Co. at 9 Mile Point. Traverse: Charlevoix, Petoskey.
- Hayes Twp., sec. 3, 4, and 9, T34N, R7W. Along shore, from Nine Mile Point for 2½ mi. W. Traverse: Charlevoix, Petoskey, Gravel Point.
- Hayes Twp., sec. 7, T34N, R7W. Along shore, Big Rock Point. Traverse: Charlevoix.
- Hayes Twp., SW SW sec. 10, T34N, R7W. Traverse: Charlevoix.
- Charlevoix Twp., SE SE sec. 28, T34N, R8W. Aband. No. 1 quarry Charlevoix Rock Products Co. quarries. Traverse: Gravel Point and Charlevoix.
- Charlevoix Twp., N of S center line, sec. 28, T34N, R8W. Aband. No. 2 quarry Charlevoix Rock Products Co. Traverse: Petoskey.
- Charlevoix Twp., sec. 28 and 29, T34N, R8W. Ledges and bluffs along shore from South Point SW for approx. 1 mi. Traverse: Gravel Point. "Emmetensis Zone," "Large Atrypa" Zone. Type locality Gravel Point.
- Charlevoix Twp., S½ SE sec. 29, T34N, R8W. Aband. Wolverine Lime Co. quarry. Traverse: Gravel Point.
- Charlevoix Twp., NW NW NE sec. 33, T34N, R8W. Aband. Charlevoix City quarry. City Dump. Traverse: Petoskey, possibly upper part Charlevoix fm.
- Beaver Island, sec. 23, T39N, R10W. Along shore approx. 2/3 mi. NE of Beaver Island Coast Guard Station. Bois Blanc.
- Garden Island, sec. 7, T39N, R9W. Along E shore, approx. ½ mi. NW of SE point of island. Bois Blanc.
- Garden Island, SW sec. 3, T39N, R10W. Along N cape of Indian Bay. Garden Island. Type locality Garden Island.
- Garden Island, NW sec. 13 and NE sec. 14, T39N, R10W. Just above lake level, and on lake bottom. Bois Blanc.
- Garden Island, sec. 27, T40N, R10W. Along shore, northernmost point. St. Ignace.
- Gull Island, T38N, R10W. Along W shore about ½ mi. S of N end. Bois Blanc.
- Squaw Island, T40N, R10W. Several pavement-like exposures. St. Ignace.
- Trout Island, T39N, R11W. Along S shore. Bois Blanc.
- Whiskey Island, T40N, R11W. Along S and W shores. St. Ignace.

CHEBOYGAN COUNTY

- Forest Twp., E½ sec. line, sec. 1 and 12, T34N, R1E. Discontinuous exposures along M-33, on both sides of road. Traverse: Alpena. Genshaw, Killians.
- Forest Twp., sec. 3, T34N, R1E. Along Black River below Tower Dam. SE NE sec. 3, along road. Traverse: Genshaw.
- Forest Twp., SW NW NW sec. 5, T34N, R1E. In upper part of bluff. Traverse: Afton. Koehler.
- Forest Twp., SW sec. 6, T34N, R1E. Below water level of Milligan Creek where M-33 crosses, and along roadside to E. Traverse: Genshaw, Killians member. Also, SE sec. 6. Koehler.
- Forest Twp., NW NE sec. 8, T34N, R1E. In ditch S side of M-33, opposite dead end road. Traverse: Genshaw, Afton.
- Forest Twp., NW corner sec. 9, T34N, R1E. In roadside ditch. Traverse: Genshaw. Killians member.
- Forest Twp., SE sec. 13, T34N, R1E. Below water level of Black River. Traverse: Genshaw, Killians member.
- Walker Twp., NW NE sec. 3, T34N, R1W. In road bed of M-33, approx. ¾ mi. E of SE corner sec. 33, T35N, R1W. Traverse: Gravel Point, Koehler.
- Walker Twp., SE sec. 6, T34N, R1W. Along NE trending scarp. Traverse: Gravel Point.
- Walker Twp., NE sec. 7, T34N, R1W. Marvin quarry; also along N sec. line, sec. 7 as far E as the school. Traverse: Gravel Point, Koehler.

- Walker Twp., ¼ mi. S of ¼-line sec. 17 and 18, T34N, R1W. In bottom of ravine which crosses sec. line. Traverse: Gravel Point.
- Walker Twp., SE sec. 18, T34N, R1W. Along roadside and in fields ¼ mi. to N. Traverse: Gravel Point, Gorbud member.
- Walker Twp., SW NW SW sec. 29, T34N, R1W. Near crossing of aband. RR with sec. line between sec. 29 and 30. Traverse: Gravel Point.
- Ellis Twp., SW SW sec. 1, T34N, R2W. Discontinuous exposures for 1,500 ft. below old Elmer Dam. Traverse: Genshaw.
- Ellis Twp., NE sec. 2, T34N, R2W. Along N bank Pigeon River. Traverse: Genshaw. Also SE sec. 2, Sorenson's quarry on W side of road. Traverse: Koehler.
- Ellis Twp., S½ (?) sec. 6, T34N, R2W. On hillside by twin pines, Hatch farm. Antrim.
- Ellis Twp., T34N, R2W. Sorenson quarries and along highway ¼ to ¾ mile of NW corner, sec. 12. Traverse: Genshaw.
- Ellis Twp., sec. line, sec. 13 and 14, T34N, R2W. Along road, especially on W side. Traverse: Beebe School, Gravel Point.
- Ellis Twp., SE NE and E-W¼ sec. line, sec. 14, T34N, R2W. Exposure Beebe school yard and 550 ft. along road W of school. Traverse: Beebe School. Includes Norway Point fm. Along road 1,050 ft. W of school. Antrim. Type area Beebe School fm.
- Mentor Twp., SW sec. 1, T34N, R3W. In bed of small stream in ravine, White farm. Antrim.
- Waverly Twp., NE SE SE sec. 21, T35N, R1E. On E-W bluff locally known as Limestone Hill. Best exposure along sec. line between sec. 21 and 22. Traverse: Genshaw.
- Waverly Twp., C sec. 22, T35N, R1E. In bed of intermittent creek in glacial lake plain N of bluff. Traverse: Rockport Quarry.
- Waverly Twp., SW SW sec. 23, T35N, R1E. Traverse: Ferron Point.
- Waverly Twp., SE sec. 25, T35N, R1E. In E-W trending escarpment. Traverse: Genshaw.
- Waverly Twp., SE NE NE sec. 26, T35N, R1E. In excavation. Traverse: Ferron Point?
- Waverly Twp., sec. 28 and 33, T35N, R1E. In bed and along banks of Black River for approx. 1 mi., Shanty Rapids. Traverse: Genshaw. Rockport Quarry.
- Waverly Twp., sec. 29, 31, and 32, T35N, R1E. Along bed and banks, and in places along valley walls of Milligan Creek. Traverse: Genshaw. Ferron Point. Also, exposure where RR crosses bridge, sec. 29. Rockport Quarry.
- Waverly Twp., SW SW sec. 30, T35N, R1E. Small exposure in miniature sinkhole on N side of road, 900 ft. E of school. Traverse: Genshaw. Ferron Point.
- Waverly Twp., C and NE SW sec. 34, T35N, R1E. Road cut. Traverse: Gravel Point.
- Waverly Twp., E½ SE sec. 36, T35N, R1E. Along roadside ¼ mi. S of NE corner sec. 34. Traverse: Genshaw, Killians.
- Koehler Twp., S-line sec. 19, T35N, R1W. In road cuts. Traverse: Lower Genshaw-Killians contact.
- Koehler Twp., NW SE sec. 28, T35N, R1W. Legrand quarry. Traverse: Gravel Point, Koehler.
- Koehler Twp., sec. 28, 29, and 33, T35N, R1W. Along escarpment S of Legrand extending from just S of Legrand to nearly ¼ mi. S of Gorbud school. Traverse: Gravel Point, Koehler.
- Koehler Twp., NW NW sec. 30, T35N, R1W. Approx. 100 ft. S of NW corner in low ridge. Traverse: Genshaw, Killians member. Also ¼ mi. E of NW corner sec. 30. Genshaw.
- Koehler Twp., SE and NW sec. 33, T35N, R1W. Along banks and in bed of small stream. Traverse: Gravel Point, Koehler.

- Koehler Twp., C N $\frac{1}{2}$ N $\frac{1}{2}$ sec. 33, T35N, R1W. In aband. RR cut. Traverse: Gravel Point.
- Koehler Twp., W-line sec. 24, T35N, R2W. Where S branch of Little Pigeon River crosses sec. line. Traverse: Genshaw. Also, S-line sec. 24, in road cuts. Traverse: Genshaw-Killians contact.
- Koehler Twp., N-line, NE sec. 25, T35N, R2W. Road cut. Traverse: Genshaw, Killians member.
- Koehler Twp., sec. 25 and 36, T35N, R2W. Afton limestone quarry. Traverse: Gravel Point.
- Koehler Twp., SE SE sec. 35, T35N, R2W. Approx. 1,000 ft. N and 50 ft. W of SE sec. corner. Traverse: Genshaw, Killians member.
- Koehler Twp., E $\frac{1}{2}$ sec. 36, T35N, R2W. On slope of valley which cuts diagonally across E $\frac{1}{2}$ of sec. Traverse: Koehler.
- Koehler Twp., NE sec. 36, T35N, R2W. Campbell Stone Quarry. Traverse: Mackinaw Twp., SW SW sec. 19, T39N, R3W. In road cut on E side of highway. Bois Blanc.
- Mackinaw Twp., sec. 27 and 28, T39N, R3W. (In Private Claim No. 334). In Mill Creek between mouth and top of quarry $\frac{1}{10}$ mi. upstream. Bois Blanc. Also, along creek into SE sec. 28.
- Mackinaw Twp., C E $\frac{1}{2}$ sec. 29, T39N, R3W. In shallow trench. Bois Blanc. Test pit at top of upland approx. $\frac{1}{8}$ mi. S of trench in C E $\frac{1}{2}$ sec. 29. Detroit River?
- Mackinaw Twp., NE NE sec. 30, T39N, R3W. In ditch on W side of road, approx. $\frac{1}{4}$ mi. S of NE corner sec. 30. In low ridges and mounds NW of roadside exposure. Detroit River.

CLINTON COUNTY

- Eagle Twp., SW SE sec. 14, T5N, R4W. Small exposure in bed of creek discharging into Looking Glass River. Eaton.
- Eagle Twp., SE NE sec. 32, T5N, R4W. On SW bank of Grand River, 12 ft. above level, close to where river crosses sec. line. Saginaw: ss, sh, and Verne ls.
- Eagle Twp., SE sec. 33, T5N, R4W. Along S bank Grand River. Saginaw.
- Eagle Twp., approx. C sec. 34 and SW sec. 34, T5N, R4W. Shale quarries. Exposures along S bank of Grand River. Saginaw.

EATON COUNTY

- Bellevue Twp., NE sec. 22, T1N, R6W. Holden quarry. Bayport.
- Bellevue Twp., SE sec. 28, and S $\frac{1}{2}$ sec. 28, T1N, R6W. Bayport limestone quarries. Exposure at dam on Battle Creek, in the NE SE NE sec. 28 and the SE SW NW sec. 28. Bayport.
- Bellevue Twp., NW SE sec. 29, T1N, R6W. Cheney Limestone Co. quarry. Bayport.
- Bellevue Twp., SW SE NE sec. 32, T1N, R6W. Aband. road-stone quarry. NW SE sec. 32. NE SW NE sec. 32, in aband. quarry on S side of RR. Bayport.
- Bellevue Twp., NE SW sec. 33, T1N, R6W. Aband. quarry on White farm. Bayport.
- Eaton Rapids Twp., NW NW sec. 2, T2N, R3W. Saginaw.
- Benton Twp., sec. 22, T3N, R4W. Near mouth of Grindstone Creek, coal? Saginaw.
- Chester Twp., SE SW sec. 14, T3N, R5W. Coal stripping pit. Saginaw.

- Chester Twp., W $\frac{1}{2}$ corner sec. 14 and 23, T3N, R5W. Coal, along road. Saginaw.
- Chester Twp., NE SE sec. 28, T3N, R5W. Coal stripping pit. Saginaw.
- Oneida Twp., sec. 2 and 3, T4N, R4W. Many exposures along both sides of Grand River. Saginaw. Grand River. Type locality Eaton.
- Oneida Twp., sec. 2, 11, T4N, R4W. Valley of creek tributary to Grand River. Eaton. Saginaw.
- Oneida Twp., NE sec. 3, T4N, R4W. Grand Ledge Face Brick Co. quarry on N side of Grand River. Eaton. Saginaw.
- Oneida Twp., sec. 3, T4N, R4W. Grand Ledge Clay Products Co. quarry, American Vitrified Products Co. quarry, and several aband. quarries on S side of Grand River. Eaton. Saginaw.

EMMET COUNTY

- Resort Twp., sec. 1 and 2, T33N, R6W. On N side of Walloon Lake. Antrim.
- Bear Creek Twp., sec. 6, T34N, R5W. Antrim Lime Co. quarry. Traverse.
- Resort Twp., SE sec. 1, T34N, R6W. Aband. Antrim Lime Co. quarry. Traverse: Charlevoix, Gravel Point in pit. Charlevoix.
- Resort Twp., sec. 1 and 2, T34N, R6W. Along shore. Traverse: Gravel Point.
- Resort Twp., SE SE sec. 2, T34N, R6W. Roadside Walloon Lake Road. Traverse: basal Charlevoix.
- Resort Twp., SE SW sec. 2, T34N, R6W. Petoskey Crushed Stone Co. quarry. Also exposures along road. Traverse: Basal beds Charlevoix.
- Resort Twp., SW sec. 2 and SE sec. 3, T34N, R6W. Petoskey Portland Cement Co. quarry. Traverse: Petoskey, Charlevoix. "Emmetensis Zone" "Large Atrypa zone".
- Resort Twp., SW sec. 6, T34N, R6W. "Bay Shore Quarries," shore bluffs. Traverse: Petoskey, Charlevoix. "Fenestella zone" "Cyrtina-Gypidula zone"; Charlevoix: "Brown Bed," "Pelecypod-Gastropod Bed," "Dumose Favosites Bed", "Blue Shale." Type locality Petoskey.
- Resort Twp., NE sec. 8 and NW sec. 9, T34N, R6W. Aband. Bell quarry and ledges about 2 mi. E of Bayshore. Traverse: Charlevoix. "Dumose Favosites bed", "Laminated Bed"; Gravel Point, "Blue Shale".
- Resort Twp., NW NE sec. 9, T34N, R6W. Aband. quarry. Traverse: Gravel Point "Lower Blue Shale".
- Resort Twp., NW NE sec. 10, T34N, R6W. Aband. quarry, Petoskey Stone and Lime Co. Traverse.
- Resort Twp., S line sec. 36, T34N, R6W. Pit along road west from Lake Garden. Antrim (Norwood).
- Bear Creek Twp., SE SW sec. 27, T35N, R5W. Kegomic quarry on S shore of Mud Lake, just E of Harbor Springs road (M-131). Traverse: Petoskey. *G. petoskeyensis* zone and Potter Farm fauna.
- Bear Creek Twp., sec. 32, T35N, R5W. Northern Lime Co. quarries, along shore in Petoskey. Traverse: Petoskey, Charlevoix. Type locality.
- Bear Creek Twp., near C E-line sec. 32, T35N, R5W. Section exposed in 1932 in ditch on E side Encampment Ave., Bay View, but paved over in 1938. Section extended from end of Encampment Ave. on US-31 to point approx. 50 yds. to S. Traverse: Petoskey 35-45' above Gravel Point. Near center E line sec. 32. Petoskey. *G. petoskeyensis* zone and Potter Farm fauna.
- Bear Creek Twp., NW sec. 32, 33, T35N, R5W. Ledges along shore of Little Traverse Bay at Penn. RR station. Exposures SW NE sec. 33. "Pelecypod-Gastropod Bed", "Dumose Favosites Bed", "Laminated Bed"; Traverse: Charlevoix. Gravel Point, Blue Shale, "Conocardium Bed".
- Bear Creek Twp., sec. 34, T35N, R5W. Highway shoulder and creek bed on S side of US-31, 200 ft. E of junction with M-131. Traverse: Petoskey. "Gypidula Bed". *G. petoskeyensis* zone.

Carp Lake Twp., NE NW sec. 2, T38N, R4W. Poor exposures in small low mounds and a few test pits approx. $\frac{1}{4}$ mi. S of N sec. line. Detroit River.

Wa-watam Twp., sec. 10, 11, 14, and 15, T39N, R4W. McGulpin Point. Small disconnected exposures at lake level between NE SW sec. 11 and NW NW sec. 15. Bois Blanc.

Wa-watam Twp., SW SE sec. 11, T39N, R4W. Just N of house on Pierce and Son dairy farm. Bois Blanc.

Wa-watam Twp., SW SW sec. 14, T39N, R4W. Along N-S road close to sec. corner. Bois Blanc.

Wa-watam Twp., NW NW sec. 15, T39N, R4W. Bois Blanc.

Wa-watam Twp., NE SE sec. 24, T39N, R4W. Bioherm in road cut W side of US-31, .75 mile south of Mackinaw City. Exposure approx. 150 ft. S in ditch on W side of highway. Bois Blanc.

Bliss Twp., sec. 21, T39N, R5W. Along shore $\frac{5}{8}$ mi. NW of Laway's pier, and in E half of sec. Bois Blanc.

Bliss Twp., sec. 31, T39N, R5W. Limestone rubble probably from lake bed ledges. Bois Blanc.

Waugoshance Island, T39N, R6W. Along S shore. Bois Blanc.

Ile aux Galets, T38N, R7W. Limestone of storm beaches and lake bed ledges along north side of Island. Detroit River.

GENESEE COUNTY

Mount Morris Twp., NE corner sec. 4, T8N, R5E. Along river. Saginaw.

Mount Morris Twp., sec. 15, T8N, R5E. Along Flint River near S sec. line. Saginaw.

Mount Morris Twp., near C sec. 22, T8N, R5E. Aband. pit of Saginaw Clay Manufacturing Co. on right bank of Flint River. Saginaw.

Mount Morris Twp., SW sec. 24, T8N, R5E. Saginaw.

Mount Morris Twp., NW sec. 36, T8N, R5E. Along banks of small creek joining Flint River. Saginaw.

HILLSDALE COUNTY

Somerset Twp., NW NW SE sec. 7, T5S, R1W. In new pipeline ditch. Marshall.

Scipio Twp., sec. 2, T5S, R3W. In road cuts near Mosherville Station. Marshall.

Scipio Twp., N-line NE sec. 10, T5S, R3W. Road cuts near top of hill. Marshall.

Scipio Twp., SW sec. 18, T5S, R3W. In road cut 3 mi. E of Litchfield. Marshall.

Fayette Twp., sec. 4, T6S, R3W. Aband. quarry at S edge of Jonesville city limits on E bank of old mill race, approx. 200 ft. N of mill pond. Marshall.

Fayette Twp., SW sec. 22, T6S, R3W. Aband. quarry within Hillsdale city limits. Marshall.

Jefferson Twp., NW corner sec. 4, T7S, R2W. Marshall.

Reading Twp., SE NE sec. 8, T7S, R4W. Along brook between E sec. line and point 50 paces W. Coldwater.

Reading Twp., NW SW sec. 9, T7S, R4W. Along road, in road cut, just S of where brook crosses road. Coldwater.

Reading Twp., SW NW sec. 9, T7S, R4W. Along brook between W sec. line and point $\frac{1}{4}$ mi. E. Coldwater.

Reading Twp., N $\frac{1}{2}$ sec. 15, T7S, R4W. Along brook, between points 800 and 1,200 paces W of where brook crosses E-line sec. 15. Coldwater.

Reading Twp., SE SE sec. 15, T7S, R4W. Along road immediately south of brook crossing. SE SW sec. 15, along brook; N bank of brook, about $\frac{1}{2}$ mi. E of W sec. line and $\frac{1}{8}$ mi. N of S sec. line; approx. 10 paces upstream from 36 ft. bank, exposure on S side of valley in meander. Coldwater.

Reading Twp., NE SE sec. 16, T7S, R4W. S bank of brook about $\frac{1}{8}$ mi. W of E sec. line; NW sec. 16 along brook between W sec. line and $\frac{1}{4}$ mi. upstream (E); S-line sec. 16, along E-W road on S sec. line. Coldwater.

Reading Twp., sec. 21, T7S, R4W. Along brook which flows through NW and SE of sec. Coldwater.

Reading Twp., NE and NW sec. 31, T7S, R4W. Along brook immediately S of N sec. line. Coldwater.

Reading Twp., NE SW sec. 32, T7S, R4W. Along road approx. $\frac{1}{3}$ mi. N of S sec. line, and along brook which crosses road approx. $\frac{1}{2}$ mi. N of S sec. line. Coldwater.

HURON COUNTY

Brigham Twp., SE SW sec. 34, T15N, R13E. Marshall.

Sherman Twp., sec. 32, T15N, R16E. In bed of stream, E of highway; also shore Lake Huron. Coldwater.

Fairhaven Twp., W $\frac{1}{2}$ sec. 14, T16N, R9E. Slabby pavement in valley of Shebeon Creek. Bayport.

Fairhaven, McKinley, and Caseville Twps., T 16, 17 and 18 N, R9E. Along S shore Wildfowl Bay and along shores of Stony and North islands, and Charity Islands. Bayport.

Fairhaven Twp., sec. 23 and 24, T16N, R9E. Sandstone reported in bed of Shebeon Creek. Michigan.

Winsor Twp., SW NE sec. 5, T16N, R10E. Wallace Stone Co. quarry. Bayport. Type locality of Bayport.

Winsor Twp., C SE sec. 9, T16N, R10E. Bayport.

Winsor Twp., NE NW sec. 15, T16N, R10E. Aband. quarry. Bayport.

Sand Beach Twp., sec. 18 and 19, T16N, R16E; also C E-line sec. 30. Along shore. Coldwater.

Fairhaven Twp., NE SE NE and NE SE sec. 35, T17N, R9E. Shore. Bayport.

Fairhaven Twp., NW SW NW sec. 36, T17N, R9E. Along shore. C N $\frac{1}{2}$, SW SE NE, and SE NE SE sec. 36. Bayport.

Chandler Twp., C N $\frac{1}{2}$ NW and C S $\frac{1}{2}$ NE sec. 24, T17N, R11E. Along creek. Michigan.

Meade Twp., near C sec. 5, T17N, R12E. In bed of small creek. Marshall.

Meade Twp., C NW sec. 15, T17N, R12E. Marshall.

Meade Twp., N-line NW sec. 16, T17N, R12E. Marshall.

Meade Twp., SW SE and NE SE SW sec. 18, T17N, R12E. Michigan.

Meade Twp., NE SW sec. 19, T17N, R12E. Along creek. Michigan.

Sand Beach Twp., sec. 35, T17N, R15E. North of Harbor Beach, W of Highway 23 in fields. Marshall.

Caseville Twp., sec. 24, T18N, R10E. Along shore at Oak Point. Michigan.

Lake Twp., sec. 16, T18N, R11E. Aband. Babbitt quarry between old E-W road and present highway. Marshall.

Lake Twp., sec. 22, 23 and 27, T18N, R11E. Along N and S shores of Rush Lake. Marshall.

Hume Twp., sec. 2, T18N, R12E. Aband. grindstone quarry on both sides of present highway. Marshall.

Hume Twp., sec. 7, T18N, R12E. Along shore at Hat Point. Marshall.

Hume Twp., NE sec. 20, T18N, R12E. Along Taft Drain. Marshall.

Dwight Twp., NW NW sec. 1, T18N, R13E. Marshall.

Dwight Twp., C N $\frac{1}{2}$ SE sec. 24, T18N, R13E. Marshall.

Dwight Twp., N-line NE sec. 35, T18N, R13E. Marshall.

Huron Twp., sec. 2, T18N, R14E. At old lighthouse near shore. Coldwater.

Huron Twp., SW sec. 2, T18N, R14E. Contact Marshall and Coldwater?

Huron Twp., C E $\frac{1}{2}$ sec. 3, T18N, R14E. Marshall.

Huron Twp., sec. 4, 8 and 9, T18N, R14E. Along Willow Creek, upstream from Huron City. Marshall. Coldwater.

Huron Twp., NW SW SW sec. 19, T18N, R14E. Marshall.

Huron Twp., NW sec. 27, T18N, R14E. Willow Creek. Coldwater.

Huron Twp., SE sec. 32, T18N, R14E. Willow Creek. Coldwater.
 Port Austin Twp., sec. 25, T19N, R12E. Along shore from Flat Rock Point to Port Austin. Marshall.
 Port Austin Twp., sec. 35, T19N, R12E. At Hardwood Point. Marshall.
 Port Austin Twp., NE SE sec. 35, T19N, R12E. One mile south of Flat Rock Point. Marshall.
 Port Austin Twp., NE NW sec. 36, T19N, R12E. Marshall.
 Port Austin Twp., sec. 21, T19N, R13E. Sandstone cliffs at Pointe aux Barques. Marshall.
 Port Austin Twp., SE SE sec. 22, T19N, R13E. Several exposures. Marshall.
 Port Austin Twp., C SE sec. 23, T19N, R13E. Abandoned quarry. Marshall.
 Port Austin Twp., sec. 23 and 24, T19N, R13E, and sec. 30, T19N, R14E. Along shore. Marshall. Coldwater.
 Port Austin Twp., NW NW sec. 25, T19N, R13E. Abandoned quarry. Marshall.
 Port Austin Twp., SW NE sec. 26, T19N, R13E. On N side of road 200 ft. E of intersection with N-S road. Marshall.
 Port Austin Twp., C sec. 31, T19N, R13E. Several small exposures. Marshall.
 Port Austin Twp., sec. 30 and 32, T19N, R14E. Aband. Johnson, Pier and Wallace quarry along shore. Coldwater.

INGHAM COUNTY

Onondaga Twp., NE SE SE sec. 29, T1N, R2W. Bed of creek tributary to the Grand River. Saginaw.
 Alaiedon Twp., SE NE sec. 33, T3N, R1W. Coal strip pit. Drainage ditch. Saginaw.
 Delhi Twp., NE SW sec. 2, T3N, R2W. On W side of Sycamore Creek. Along creek in SE SW sec. 2. Grand River.
 Wheatfield Twp., NW NE sec. 1, T3N, R1E. Michigan Clay Products Co. shale pit. Saginaw.
 Williamston Twp., SW SE sec. 36, T4N, R1E. Stripping pit of Cedar River strip coal mine. Saginaw.

IONIA COUNTY

Keene Twp., W $\frac{1}{2}$ sec. 22 and SE SE sec. 23, T7N, R6W. Exposures in a number of quarries. Grand River: Ionia. Type locality Ionia.

IOSCO COUNTY

Burleigh Twp., sec. 1, T21N, R5E. Gypsum along Au Gres River. Also SW sec. 1, in road cut down to Au Gres River 1 $\frac{1}{2}$ mi. E of Whittemore. Michigan.
 Burleigh Twp., SW NE sec. 1, T21N, R5E. Limestone quarry. Also NE NW sec. 1, limestone quarry; SE NW sec. 1, limestone quarry. Bayport. Michigan.
 Burleigh Twp., SE SW sec. 20, T21N, R5E. In bed of Craner Creek, just W of junction with Johnson Creek; also exposure at aband. lumber dam, just below junction of creeks. Michigan.
 Burleigh Twp., SE NW (?) sec. 30, T21N, R5E. At Keystone Dam on Johnson Creek. Bayport.
 Burleigh Twp., SW SE sec. 36, T21N, R5E. Approx. $\frac{1}{4}$ mi. NE of county line, along D & M RR. Gypsum in NW NW sec. 36. Michigan.
 Sherman Twp., SW sec. 16, NE sec. 20 and NW sec. 21, T21N, R6E. National Gypsum Co. quarry. Michigan.
 Sherman Twp., W $\frac{1}{2}$ sec. 31, T21N, R6E. Michigan.
 Alabaster Twp., SW sec. 22, 26, and NW sec. 27, T21N, R7E. U. S. Gypsum Co. quarry. Michigan.

Reno Twp., SE part T22N, R5E. Along Au Gres River. Michigan.
 Reno Twp., sec. 12, T22N, R5E. Michigan.
 Reno Twp., sec. 24, T22N, R5E. Michigan.
 Reno Twp., SE SE sec. 27, T22N, R5E. In bank of Au Gres River, $\frac{1}{4}$ mi. from SE sec. corner. Michigan.
 Grant Twp., NE SW sec. 28, T22N, R6E. Approx. $\frac{1}{8}$ mi. N of Glendon Dam on E bank of Au Gres River. Michigan.

JACKSON COUNTY

Henrietta Twp., C NW SW sec. 6, T2S, R1E. Aband. quarry. Bayport.
 Blackman Twp., C SW SE sec. 1, T2S, R1W. Aband. quarries. Bayport.
 Blackman Twp., NE SE SE sec. 2, T2S, R1W. Peck quarry. Bayport.
 Blackman Twp., C S $\frac{1}{2}$ S $\frac{1}{2}$ sec. 10, T2S, R1W. Along US-127 N of small creek in road cut. Parma.
 Blackman Twp., SE SE and NW SE NE sec. 11, T2S, R1W. Aband. shale pits. Saginaw. NE NE sec. 11, NW SE sec. 13. Limestone at surface. Bayport.
 Blackman Twp., NW NE SE sec. 21, T2S, R1W. Shale and sandstone in bed of stream. Saginaw.
 Blackman Twp., NE NE SW sec. 22, T2S, R1W. Stream bed. Rapids in Grand River north of Sewage Disposal Plant. Bayport.
 Blackman Twp., SE SW SE sec. 27, T2S, R1W. Sandstone bluff on Grand River north of West North St., Jackson, E side of RR near aband. coal mine. Saginaw.
 Blackman Twp., SE SE SW sec. 31, T2S, R1W. Intersection Eaton Rapids and Eve Roads. Saginaw.
 Blackman Twp., SW NE SW sec. 34, T2S, R1W. Jackson and W. Trail St. and Ganson St. bridge, shale. Saginaw.
 Sandstone Twp., SE NE SW sec. 8, T2S, R2W. Road cut. Saginaw.
 Sandstone Twp., NE SW NW sec. 9, T2S, R2W. Sandstone exposure on Wilcox farm. Saginaw.
 Sandstone Twp., NE SW and SE SW NW sec. 14, T2S, R2W. Sandstone along bank of Well's Creek. NE SW NW valley for Wolverine pipeline. Saginaw.
 Sandstone Twp., NE sec. 22, T2S, R2W. Bed of Grand River. Bayport.
 Sandstone Twp., NE sec. 25, T2S, R2W. Old mine and dump. Woodville.
 Sandstone Twp., SW sec. 27, T2S, R2W. Along N-S road intermittently for approx. $\frac{1}{2}$ mi. NW SE SW sec. 27. Old quarry near Sandstone Cr. Parma.
 Sandstone Twp., NE NW sec. 29, T2S, R2W. Aband. Titus quarry NE of Parma. Parma.
 Sandstone Twp., NE NE sec. 30, T2S, R2W. Jeffery quarry. Bayport.
 Sandstone Twp., NW NE sec. 30, T2S, R2W. Limestone in road cut. Bayport.
 Sandstone Twp., NW NW sec. 31, T2S, R2W. Old mine. Woodville. Type locality of Winchell for Woodville s.s.
 Sandstone Twp., N $\frac{1}{2}$ NE NW NW sec. 33, T2S, R2W. Quarries and exposures. Parma.
 Sandstone Twp., SW NE NW sec. 34, T2S, R2W. In small stream. SW NE NW sec. 34, in Sandstone Creek. Bayport. C SE NW sec. 34, sandstone in RR cut; N $\frac{1}{2}$ NE NW sec. 34, sandstone along Sandstone Creek; NW NW sec. 34, west side of road; SW SE NW sec. 34, near barn; SE NW SW sec. 34, road cut. Also, SE NE NE sec. 34. Aband. sandstone quarries N of Sandstone Creek. Parma. Type locality Parma. Saginaw?
 Sandstone Twp., W $\frac{1}{2}$ SE SW NW sec. 35, T2S, R2W. Bayport limestone and Saginaw sandstone S of river NW of aband. coal mine. S $\frac{1}{2}$ NW SW sec. 35. Strip coal mine. Saginaw. Bayport.
 Parma Twp., sec. 6, T2S, R3W. S of Devereaux. Parma?
 Parma Twp., SW SW sec. 17, T2S, R3W. Along roadside. Parma.

Parma Twp., C sec. 18, T2S, R3W. Along roadside 150 ft. SW of bridge across Rice Creek. Parma. NE sec. 18. Road cut. Saginaw?

Parma Twp., SW NW NE sec. 19, T2S, R3W. Fisk quarry; also, C N½ sec. 19, in road cut on both sides of road. Saginaw.

Parma Twp., NW SE NE sec. 19, T2S, R3W. In ditch. Saginaw.

Parma Twp., NW NW sec. 20, T2S, R3W. Roadside. Saginaw.

Parma Twp., NE SE NE and SE SE NE sec. 20, T2S, R3W. Aband. sandstone quarries. Saginaw.

Parma Twp., NW NE sec. 21, T2S, R3W. Road cut. Saginaw.

Parma Twp., SE SW NW sec. 22, T2S, R3W. Roadside exposure. Saginaw.

Summit Twp., SW NW sec. 2, T3S, R1W. NW corner Milwaukee and Franklin Sts., Jackson; shale and sandstone. Saginaw.

Summit Twp., NW SE sec. 13, T3S, R1W. RR cut, (aband. quarry filled). Bayport.

Summit Twp., NE NW SE sec. 24, T3S, R1W. US-127 road cut. Napoleon.

Grass Lake Twp., sec. 31, T3S, R2E. Quarries at Napoleon. Aband. quarry east edge of town. Type locality Napoleon.

Grass Lake Twp., C NW SW SE sec. 31, T3S, R2E. Stave quarry. Napoleon.

Spring Arbor Twp., C SW SE sec. 1, T3S, R2W. First coal mine. Original description of "Coal Measures". Saginaw.

Spring Arbor Twp., NW SE NW sec. 17, T3S, R2W. Roberts quarry. Bayport.

Concord Twp., SW NE NE sec. 11, T3S, R3W. Bayport.

Columbia Twp., NW NE SW sec. 7, T4S, R1E. Road cut. Marshall.

Columbia Twp., SE SE NW sec. 24, T4S, R1E. North gully of Goose Creek. Napoleon.

Columbia Twp., C W-line sec. 29, T4S, R1E. Road cut. Marshall.

Napoleon Twp., NE NW sec. 6, T4S, R2E. Wood and Rays quarries. Napoleon. Marshall.

Hanover Twp., sec 27 and SE NE sec. 19, T4S, R2W. Marshall.

Hanover Twp., SE NW sec. 31, T4S, R2W. Aband. Stony Point quarry and nearby old road cuts. Marshall.

C NW SW SE sec. 31, T3S, R2E. Stave quarry. Marshall.

Hanover Twp., C NW sec. 33, T4S, R2W. Sandstone road cut. Marshall.

Pulaski Twp., NW NW NW sec. 2, and NE NE NE sec. 3, T4S, R3W. Aband. Sanusker quarries. Napoleon.

KENT COUNTY

Wyoming Twp., T6N, R12W. Gypsum quarry, at Plaster Creek, S side Grand River. Michigan.

Wyoming Twp., NW NE NW sec. 2, T6N, R12W. Alabastine Co. gypsum quarry; also SW NE SE sec. 2, aband. gypsum quarry on Plaster Creek. Michigan.

Wyoming Twp., sec. 3, T6N, R12W. Extensive gypsum quarries on N side of river. Michigan.

Wyoming Twp., SE sec. 7, T6N, R12W. Sandstone exposure on right bank of Grand River, 1 mi. N of Grandville. Marshall.

Wyoming Twp., SW SW sec. 17, T6N, R12W. Durr quarry. Michigan.

Wyoming Twp., SE SE sec. 18, T6N, R12W. Durr quarry; also NW SE sec. 18, Durr mine shaft. Michigan.

Wyoming Twp., NE NE NE sec. 19, T6N, R12W. Aband. Redmill gypsum quarry. Michigan.

Wyoming Twp., NW NW NW sec. 20, T6N, R12W. White Mill gypsum quarry. Michigan.

Grand Rapids Twp., SW NE sec. 25, T7N, R12W. On W bank of Grand River, approx. midway between Pearl and Fulton St.; near W end of G.R. & I. RR bridge. Michigan.

Grand Rapids Twp., NE NE SE sec. 32, T7N, R12W. Godfrey gypsum quarry. Michigan.

Grand Rapids Twp., NE sec. 34, T7N, R12W. Grand Rapids Plaster Co. mine—shaft No. 1 SE NE NE; shaft No. 2 SW SE NE. Michigan.

Grand Rapids Twp., NE NW SE sec. 34, T7N, R12W. Shaft of English gypsum mine (U.S. Gypsum Co.). Michigan.

Grand Rapids Twp., NW NE SE sec. 34, T7N, R12W. Aband. quarry, Midland Plaster Co. Michigan.

LEELANAU COUNTY

North Fox Island, sec. 11, T35N, R13W. Northeast shore of island. Bois Blanc.

MONROE COUNTY

Exeter Twp., NE SE sec. 29, T5S, R8E. Woolmith quarry. Detroit River.

Ash Twp., SE SE sec. 34, T5S, R9E. L. Smith quarry. Bass Island.

Dundee Twp., sec. 13, T6S, R6E. Dundee quarry on N bank of Raisin River. Dundee.

Dundee Twp., SW SW sec. 5, T6S, R7E. Macon quarry. Dundee. Type locality, Dundee.

Dundee Twp., NE sec. 8, T6S, R7E. Aband. Christiancy Quarry. Dundee.

Raisinville Twp., SW NE sec. 13, T6S, R7E. Claim 516, excavations on both sides of highway; SW NE sec. 13, Claim 428 just W of claim 516 on S side of highway; and claim 685, Fritz Rath quarry S of Raisin River. Detroit River.

Raisinville Twp., SE SW sec. 13 and NE NW sec. 24, T6S, R7E. Natural exposure with three small excavations. Detroit River.

Raisinville Twp., SW NW sec. 24, T6S, R7E. Small quarry on lower portion of claim 685 and also in claim 683. Detroit River.

Raisinville Twp., SW sec. 2, T6S, R8E. Sylvania exposed, or very lightly covered-over area of 8-10 acres to N and W of "Blue Bush Cemetery". Detroit River: Sylvania.

Raisinville Twp., SE SE SW sec. 21, T6S, R8E. Detroit River: Sylvania.

Raisinville Twp., SW SW sec. 22, T6S, R8E. Detroit River: Sylvania.

Frenchtown Twp., SW SE NE sec. 27, T6S, R8E. At mouth of Willow Run. Detroit River.

Frenchtown Twp., NW NW sec. 36, T6S, R8E. Opposite claim 88 in Raisin River. Detroit River.

Berlin Twp., NE sec. 1, T6S, R9E. In bed and banks of Swan Creek in village of Newport; also, NE SE sec. 1, quarry just S of Newport, W side of M.C. RR. Bass Island: Raisin River.

Frenchtown Twp., sec. 24 and 25, T6S, R9E. Along Stony Creek at Brest, claim 532. Bass Island: Raisin River.

Frenchtown Twp., NE sec. 25, T6S, R9E. In bed and along banks of Stony Creek at Brest, small quarry. Bass Island: Raisin River.

Frenchtown Twp., NE SW sec. 33, T6S, R9E. Monroe Stone Co. quarry; and SW NE sec. 33, approx. 1 mi. N of Monroe near Shoreline RR, Shoreline Stone Co. Bass Island: Raisin River. Type locality Raisin River, (also quarry NE sec. 7, T7S, R9E).

Frenchtown Twp., NW SE sec. 19, T6S, R10E. SW of Sissung quarry, claim 529. Bass Island.

Frenchtown Twp., NW NW sec. 20, T6S, R10E. Sissung quarry, S of Swan Creek, claim 529. Bass Island: Raisin River.

Ida Twp., SW NE sec. 4, T7S, R7E. North Davis quarry, S of RR and E of N-S ¼-line; NE NW sec. 4, Voight quarry; and SE NW sec. 4, Wilcox quarry. Detroit River.

Ida Twp., NW NW sec. 16, T7S, R7E. Lulu quarry. Detroit River.

- La Salle Twp., SE SE sec. 15, T7S, R8E. In bed of Otter Creek, just W of P.M. RR bridge; NE SW sec. 15, in Otter Creek; and NW SE sec. 15 (16?), claim 436, small amount of stone removed from S bank of creek. Bass Island.
- La Salle Twp., sec. 20, T7S, R8E. In S branch of Otter Creek; and NW NE sec. 20, J. Clock quarry along S branch Otter Creek. Bass Island.
- La Salle Twp., S½ sec. 29, and N½ N½ sec. 32, T7S, R8E. Along Muddy Creek, rock blasted in deepening stream. Bass Island.
- La Salle Twp., NW SE sec. 32, T7S, R8E. West Green quarry; SW SE sec. 32, East Green quarry; and NW SW sec. 32, South Cousino quarry. Bass Island.
- La Salle Twp., SW SW sec. 33, T7S, R8E. East Cousino quarry. Bass Island.
- Monroe Twp., sec. 5 and 6, T7S, R9E. Rock quarried in bed of Raisin River at Monroe and for 3-4 mi. above at intervals. Bass Island.
- Monroe Twp., NE NE sec. 6, T7S, R9E. In Raisin River, opposite claim 65. Bass Island.
- Monroe Twp., NE sec. 7, T7S, R9E. France Stone Co. quarry, S side of Plum Creek; A. T. Navarre quarry, 200 paces S of Plum Creek quarries, on claim 498; D. Navarre quarry 100 paces SW of A. T. Navarre quarry; along Tamarack Creek; SW NE sec. 7, on banks of Tamarack Creek, claim 498; NE NE sec. 7, A. & M. Navarre quarry, N side of Plum Creek; and SE NW sec. 7, claim 230. Bass Island. Type locality Raisin River (also quarry NE SW sec. 33, T6S, R9E).
- Monroe Twp., SW NW sec. 8, T7S, R9E. Mich. Stone & Supply Co. quarry, S side of Plum Creek between 2 RR tracks. Bass Island.
- Whiteford Twp., SE SE sec. 2, T8S, R6E. Little Sink quarry. Detroit River: Amherstberg.
- Whiteford Twp., SE SE sec. 7, T8S, R6E. Exposure at high water level, small quarry; and Daniels and Kane quarries. Detroit River.
- Whiteford Twp., C W½ sec. 8, T8S, R6E. Quarries. Detroit River.
- Whiteford Twp., SW NE sec. 10, T8S, R6E. Rabideau quarry; also small sink. Detroit River.
- Whiteford Twp., SE SE sec. 19, T8S, R6E. Inlet quarry. Detroit River.
- Whiteford Twp., SW SE sec. 25, T8S, R6E. Michigan Stone Co. quarry. Bass Island: Raisin River.
- Whiteford Twp., sec. 25, T8S, R6E. Rock blasted from Halfway Creek E of Bush quarry. Bass Island.
- Bedford Twp., SE SE sec. 1, T8S, R7E. C. L. Osgood quarry. Bass Island.
- Bedford Twp., SW SW sec. 10, T8S, R7E. W. Dunbar quarry. Bass Island.
- Bedford Twp., NE NE sec. 12, T8S, R7E. T. Blouch quarry, and in Bay Creek ditch. Bass Island.
- Bedford Twp., SW NE sec. 12, T8S, R7E. M. Butler quarry. Bass Island.
- Bedford Twp., C NW sec. 15, T8S, R7E. Ferguson quarry; Willis quarry; and White quarry. Bass Island.
- Bedford Twp., NE NE sec. 16, T8S, R7E. Elisha Sorter quarry, on ridge. Bass Island.
- Bedford Twp., NE sec. 21, T8S, R7E. George Carr quarry. Bass Island.
- Whiteford Twp., NE NE sec. 4, T9S, R6E. S. Young quarry. Bass Island.

OGEMAW COUNTY

- Mills Twp., SE SE sec. 9, T21N, R3E. In Rifle River at bridge on S sec. line. Sandstone exposed for approx. ½ mi. Marshall.
- Mills Twp., NE sec. 16, T21N, R3E. In bed of Rifle River. Marshall.
- Mills Twp., SW SE sec. 28 and 33, T21N, R3E. In bed of Rifle River at "Limestone Rapids" along S sec. line. Bayport?
- Mills Twp., C SE sec. 28, T21N, R3E. Along banks of Rifle River at West Branch bridge. Marshall?
- Mills Twp., NE sec. 33, T21N, R3E. In Rifle River. Bayport.

OTTAWA COUNTY

- Holland Twp., NW NE sec. 21, T5N, R15W. Aband. water-filled quarry approx. 700 paces W from E-line sec. 21. Marshall.
- Holland Twp., SW SE and NE SE sec. 21, T5N, R15W. Sandstone in bed of small stream. Marshall.
- Holland Twp., sec. 22, T5N, R15W. Aband. quarry. Marshall.
- Holland Twp., C W½ SW sec. 22, T5N, R15W. Aband. sandstone quarry. Marshall.
- Tallmadge Twp., sec. 15 (?), T7N, R13W. Sandstone fragments along wagon road Grand Haven to Grand Rapids where it crosses Sand Creek 4 mi. E of Lamont. Marshall.
- Allendale Twp., sec. 12 (?), T7N, R14W. In cut in wagon road, Grand Haven to Grand Rapids where it crosses Deer Creek valley. Marshall.

PRESQUE ISLE COUNTY

- Metz Twp., SE SE sec. 12, T33N, R5E. Traverse.
- Posen Twp., E½ NW sec. 3, T33N, R6E. Traverse.
- Posen Twp., E½ SE sec. 7, T33N, R6E. Traverse.
- Posen Twp., N½ NW sec. 14, T33N, R6E. Traverse.
- Posen Twp., NE SE sec. 31, T33N, R6E. Traverse.
- Posen Twp., NW SW sec. 32, T33N, R6E. Sinkhole at W end of Sunken Lake. Fletcher State Park. Traverse: Alpena.
- Presque Isle Twp., sec. 1 and 2, T33N, R8E. Along Lake Huron shore. Rogers City.
- Krakow Twp., SE SE sec. 4, T33N, R7E. Limestone bluff. Traverse.
- Krakow Twp., S½ SE sec. 30, T33N, R7E. Traverse.
- Presque Isle Twp., E½ sec. 2, T33N, R8E. Presque Isle Corp. quarry (Lake of the Woods quarry). Rogers City.
- Presque Isle Twp., SW NW sec. 8, T33N, R8E. In bluff W side Grand Lake. Genshaw.
- Presque Isle Twp., S line sec. 8, T33N, R8E. Road cut. Rockport Quarry.
- Presque Isle Twp., SW sec. 11, T33N, R8E. Shallow aband. pits on E side of Co. Road 405, 1½ mi. SE Fireside Inn; and SE sec. 11. Bell shale. Type locality.
- Presque Isle Twp., C line sec. 10 and 11. Hill capped by Rockport Quarry. Bell sh. on logging road down hill.
- Presque Isle Twp., NE SE sec. 13, T33N, R8E. Along shore. Rogers City.
- Presque Isle Twp., C E line sec. 19, T33N, R8E. Rockport Quarry over green shale, Bell?
- Presque Isle Twp., N½ S½ sec. 20, T33N, R8E. Genshaw?
- Presque Isle Twp., SW SW sec. 24, T33N, R8E. Cut along RR approx. 1 mi. S of Bell. Bell shale.
- Presque Isle Twp., NW sec. 25, T33N, R8E. Cut along RR. Bell shale (middle of fm.)
- Presque Isle Twp., NW sec. 28, T33N, R8E. Road cut and ditches. Genshaw.
- Presque Isle Twp., S½ NE sec. 31, T33N, R8E. Small exposure on SW side of Co. Road 634, approx. ¼ mi. W of LeRoy resort. Traverse: Genshaw.
- Presque Isle Twp., W¼ sec. 32, T33N, R8E. Traverse: Genshaw.
- Presque Isle Twp., E-line SE sec. 34, T33N, R8E. Cut along Co. Road 405, approx. ¾ mi. N of S line of Presque Isle Co. Traverse: Genshaw. Exposures of Ferron Point reported along road.
- Presque Isle Twp., sec. 36, T33N, R8E. Along lake shore approx. ⅛ to ½ mi. N of county line to Ferron Point; and near sec. line sec. 36, and sec. 31, T33N, R9E. Rogers City.
- Presque Isle Twp., NW sec. 36, T33N, R8E. Test pit in clearing. Traverse: Genshaw.

Presque Isle Twp., W½ E½ sec. 7, T33N, R9E. Along lake shore. Rogers City, Dundee.

Presque Isle Twp., N½ SW sec. 18, T33N, R9E. Along lake shore. Rogers City.

Presque Isle Twp., sec. 31, T33N, R9E. Along lake shore and near W sec. line north of Rockport Quarry. Rogers City.

Allis Twp., sec. 6, T34N, R2E. In RR cut, 300 ft. E of C W-line sec. 6. Traverse: Gravel Point.

Allis Twp., SW NE sec. 14, T34N, R2E. RR bridge over stream on limestone. Genshaw?

Belknap Twp., NE SE sec. 8, T34N, R5E. Road cut County Road 451. Genshaw.

Belknap Twp., W-line SW NW sec. 9, T34N, R5E. Road cut. Traverse: Genshaw.

Belknap Twp., NE sec. 21, T34N, R5E. Traverse.

Belknap Twp., SW SW sec. 22, T34N, R5E. Traverse.

Pulawski Twp., sec. 1, T34N, R6E. Along lake shore. SE NW sec. 1, rock turned up by fallen tree. Dundee.

Pulawski Twp., N½ sec. 3, T34N, R6E. Rock near surface exposed by fallen trees. Dundee.

Pulawski Twp., NW NE sec. 4, T34N, R6E. In bluff at W end of swale. Rogers City.

Pulawski Twp., SW sec. 5 and SE sec. 6, T34N, R6E. A 20-30 ft. bluff. Traverse.

Pulawski Twp., S-line SE sec. 14, T34N, R6E. Road cut on US-23, 1 mi. E of Trout River and 4 mi. E of Liske. Traverse: Rockport Quarry.

Pulawski Twp., E½ SE sec. 15, T34N, R6E. Road cut ½ mi. W of Trout Creek and 10 mi. SE of Rogers City. Traverse: Rockport Quarry, black coral beds.

Pulawski Twp., ¼ mi. E of C sec. 16, T34N, R6E. Road cut and ditch on US-23, 1 mi. W of Trout Creek. Traverse: Ferron Point.

Pulawski Twp., NE NW sec. 17. Ledges on bank of Swan Creek and near W-line NE sec. 17, T34N, R6E. Road cut and ditch on US-23. Traverse: Genshaw.

Pulawski Twp., NE NE sec. 23 and NW NW sec. 24, T34N, R6E. Traverse: Rockport Quarry. Black shaly bryozoan beds.

Pulawski Twp., sec. 34, 35 and 36, T34N, R6E. Limestone bluff trending NW-SE. Rockport Quarry.

Krakow Twp., sec. 6, 7 and 8, T34N, R7E. Along lake shore from Observatory Point for 2 mi. to the NW. Rogers City, Dundee. Also, in small syncline NW sec. 8. Rogers City.

Krakow Twp., sec. 8 and 9, T34N, R7E. Along shore on W side of Thompson's Harbor. Rogers City.

Krakow Twp., NE SW sec. 9, T34N, R7E. Along shore on point of land extending into Thompson's Harbor. Dundee.

Krakow Twp., sec. 10, 11, 14 and 15, T34N, R7E. Rock bluff and ledge along shore. Dundee.

Krakow Twp., E½ SW sec. 11, T34N, R7E. Submerged ledges approx. 2 ft. below lake level and 15 ft. from shore. Dundee.

Krakow Twp., sec. 11 and 12, T34N, R7E. Along shore at Black Point. Dundee.

Krakow Twp., C sec. line, sec. 19 and 20, T34N, R7E. Limestone bluff 80 ft. high. Traverse: Rockport Quarry.

Krakow Twp., SW sec. 34, T34N, R7E. Traverse: Rockport Quarry?

Presque Isle Twp., sec. 8 and 17, T34N, R8E. Along shore of Lake Huron. Pollock Bay, Presque Isle Pt. Rogers City, Dundee.

Presque Isle Twp., NW sec. 18, T34N, R8E. Along shore. Rogers City.

Presque Isle Twp., sec. 27 and 35, T34N, R8E. Along shore for approx. 4 mi. in vicinity of Wreck Point. Rogers City.

Presque Isle Twp., SW SW sec. 31, T34N, R8E. Bluffs and ledges W shore Grand Lake. Traverse: Rockport Quarry.

North Allis Twp., NW sec. 7, T35N, R2E. Aband. quarry of Onaway Limestone Co., shore of Black Lake. Traverse: Genshaw, Ferron Point, Rockport Quarry. Poor exposures of Traverse, Ferron Point, along E-W road through C sec. 7. Genshaw in slope above quarry.

North Allis Twp., N of ¼ post sec. 13 and 14, T35N, R2E. Traverse: Genshaw.

North Allis Twp., SW sec. 16, T35N, R2E. Traverse: Genshaw.

North Allis Twp., NW sec. 16 and NE sec. 17, T35N, R2E. Traverse: Genshaw.

North Allis Twp., sec. 17 and 20, T35N, R2E. In valley near ¼ corner. Traverse: Genshaw.

North Allis Twp., sec. 21, T35N, R2E. Road cut. Traverse: Genshaw.

North Allis Twp., sec. 22 and 27, T35N, R2E. Near ¼ corner. Traverse: Genshaw.

North Allis Twp., sec. 23 and 24, T35N, R2E. In valley near ¼ corner. Traverse: Genshaw.

North Allis Twp., sec. 26 and 35, T35N, R2E. Along Rainy River. Traverse: Genshaw, Ferron Point, Rockport Quarry.

North Allis Twp., at sec. corner, sec. 26 and 36, T35N, R2E. Traverse: Genshaw.

North Allis Twp., sec. 28 and 33, T35N, R2E. Near E ¼ corner. Traverse: Genshaw, Killians.

North Allis Twp., sec. 29, T35N, R2E. Along banks of small stream and in road ditches at culvert. Traverse: Genshaw, Killians.

North Allis Twp., sec. 29, T35N, R2E. W side of Stoney Creek valley, N of Rowe School. Traverse: Genshaw.

North Allis Twp., sec. 30, T35N, R2E. Intermittent exposures along E-W escarpment extending from SE sec. 25, T35N, R1E to E ¼-corner sec. 30, T35N, R2E. Traverse: Genshaw.

North Allis Twp., NE NE NE sec. 31, T35N, R2E. Traverse: Genshaw, Killians member.

North Allis Twp., NW SW sec. 32, T35N, R2E. Along M-211. Traverse: Genshaw, Killians.

North Allis Twp., NW NE sec. 34, T35N, R2E. In ditch. Traverse: Genshaw.

North Allis Twp., NE NW NW sec. 35, T35N, R2E. Rainy River Falls. Traverse: Genshaw.

Ocqueoc Twp., SE sec. 20, T35N, R3E. Traverse: Genshaw.

Ocqueoc Twp., SW SW sec. 21, T35N, R3E. Traverse: Rockport Quarry.

Ocqueoc Twp., SW sec. 22, T35N, R3E. Traverse. Also C S-line sec. 22, along Ocqueoc River-Ocqueoc Falls. Traverse: Rockport Quarry.

Ocqueoc Twp., C S½ sec. 24, T35N, R3E and NW sec. 24, along, and highway east of, Little Ocqueoc River. Traverse: Genshaw.

Ocqueoc Twp., SW sec. 27, T35N, R3E. Along Ocqueoc River. Traverse.

Ocqueoc Twp., SE SE sec. 29, T35N, R3E. Traverse.

Ocqueoc Twp., NW NW sec. 33, T35N, R3E. Road cut. Traverse: Genshaw.

Rogers Twp., SE SW sec. 16, T35N, R5E. Aband. logging road 0.4 mi. W of US-23. Dundee. Rubble of Dundee bedrock near surface.

Rogers Twp., SE SE sec. 21, T35N, R5E. In ditches and fields along M-68. Dundee. Rogers City.

Rogers Twp., sec. 23, 25 and 26, T35N, R5E. Michigan Limestone and Chemical Co. Quarry. Bell shale, Rogers City, Dundee, Detroit River. Type locality Rogers City.

Rogers Twp., NW NW, SW NW sec. 29, T35N, R5E. Road cut on M-68 approx. 2½ mi. W of Rogers City. Bell shale.

Rogers Twp., SE NE sec. 31, T35N, R5E. In bank of creek. Bell shale.

Rogers Twp., C W½ sec. 32, T35N, R5E. Traverse. Bell shale?

Rogers Twp., SW sec. 35, T35N, R5E. Along M-65. Traverse: Rockport Quarry.

Rogers Twp., sec. 36, T35N, R5E, and sec. 31, T35N, R6E. Michigan Limestone and Chemical Co. quarry. Rogers City. Dundee.

Pulawski Twp., SW SE sec. 19, T35N, R6E. Bluff along Swan Bay. Dundee.
 Pulawski Twp., sec. 20 and 21, T35N, R6E. Along shore of Adams Point. Rogers City. Dundee.
 Pulawski Twp., sec. 27, 34 and 35, T35N, R6E. Along shore between outlet of Little Trout Lake and point 1½ mi. NW. Dundee.
 Pulawski Twp., NW sec. 32, T35N, R6E. On W side of RR. Dundee.
 Pulawski Twp., SE NW and SW NE sec. 34, T35N, R6E. In rock ledge near top of bluff. Also in SE SW sec. 34? Dundee.
 Pulawski Twp., NE SE sec. 35, T35N, R6E. Ledges in bed of Trout Creek. Dundee.

SAGINAW COUNTY

Chesaning and St. Charles Twps., T 9 and 10 N, R3E (?). Exposures at several points along river. Saginaw.
 Type locality for Saginaw fm., originally named Jackson, in aband. coal mines of Jackson County.
 Albee Twp., sec. 23, T10N, R4E. Aband. Verne mine. Type locality Verne limestone.

ST. JOSEPH COUNTY

Leonidas Twp., SW NW sec. 12, T5S, R9W. Hillside on W side N-S road, shale near surface—indicated by clay which seems to be weathered product of grayish-green shale. Coldwater?

SANILAC COUNTY

Evergreen Twp., sec. 7, T13N, R12E. In bluffs along side of Cass River, Indian Rapids. Marshall.
 Evergreen Twp., SE sec. 7, T13N, R12E. Marshall.
 Argyle Twp., NE corner sec. 19, T13N, R13E. Marshall.
 Argyle Twp., NE corner sec. 28, T13N, R13E. Rocks dredged out and dumped along the banks of a small stream at this locality consist of blue-gray shale and fine-grained, greenish-brown sandstone. Marshall.
 Greenleaf Twp., C sec. 11, T14N, R12E. On bank of stream. Marshall.
 Greenleaf Twp., NW corner sec. 13, T14N, R12E. Along N bank of small stream. Marshall.
 Austin Twp., sec. 1, T14N, R13E. Village of Tyre. Marshall.
 Austin Twp., NW sec. 17, T14N, R13E. Aband. sandstone quarry. Marshall.

SHIAWASSEE COUNTY

Caledonia Twp., NE SE sec. 22, T7N, R3E. Shale pit, Michigan Vitrified Tile Co.; SE NW sec. 22, aband. York pit; and W½ NE sec. 22, aband. Barry pit. Saginaw.
 Caledonia Twp., SE sec. 22, T7N, R3E. Sandstone along river at crossing of RR bridge. Saginaw.
 Caledonia Twp., NW NW sec. 23, T7N, R3E. Aband. pit. Saginaw.
 Caledonia Twp., approx. C E½ E½ sec. 26, T7N, R3E. Sandstone along Shiawassee River. Saginaw.
 Caledonia Twp., sec. 36, T7N, R3E. Along banks of Shiawassee River. Saginaw.
 New Haven Twp., sec. 18, T8N, R3E. Along Six Mile Creek. Saginaw.

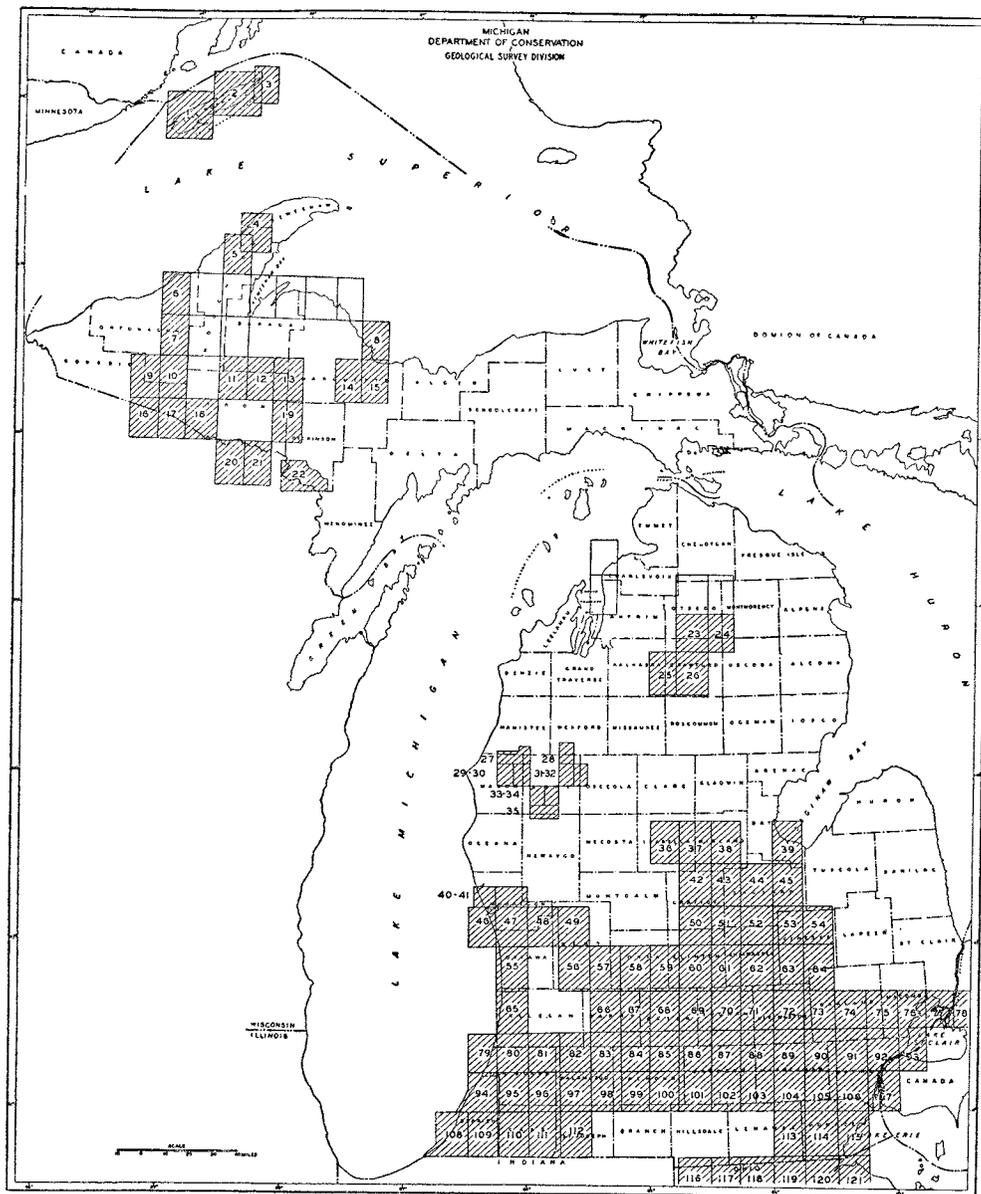
TUSCOLA COUNTY

Tuscola Twp., SW sec. 29, T11N, R7E. On left bank of Cass River approx. ½ mi. below bridge at Tuscola. Saginaw.
 Novesta Twp., SW sec. 1, T13N, R11E. Along banks of Cass River. Marshall.
 Novesta Twp., sec. 6, T13N, R11E. Along Cass River. Marshall.
 Novesta Twp., sec. 12, T13N, R11E. On county line on E side of sec. 12 where road crosses the river. Marshall.

WAYNE COUNTY

Huron Twp., SE sec. 36, T4S, R9E. Huron River Quarry Corp. quarry. Detroit River and Sylvania sandstone.
 Monguagon Twp., sec. 31, T4S, R10E. Along Huron River just W of Flat Rock. Detroit River?
 Monguagon Twp., SW SE sec. 35, T4S, R10E. Gibraltar quarry, approx. 1 mi. NW of Gibraltar. Detroit River.
 Grosse Isle Twp., T4S, R11E. Aband. quarry S end of Grosse Isle. Detroit River.
 Grosse Isle Twp., T4S, R11E. On Stony Island. Detroit River.
 Grosse Isle Twp., W½ sec. 7, T4S, R11E. Aband. Sibley quarry, Solvay Process Co. Dundee, Detroit River.
 Brownstown Twp., SE NE sec. 15, T5S, R10E. Michigan Silica Co. quarry. Sylvania.

**PROGRESS OF
TOPOGRAPHIC MAPPING
IN
MICHIGAN
15-MINUTE QUADRANGLES**



Index Map of 15-Minute Quadrangles

Enumeration plan for convenience only.

PROGRESS OF TOPOGRAPHIC MAPPING
IN MICHIGAN
15-MINUTE QUADRANGLES

ISLE ROYALE:

1. Isle Royale, sheet 1: 1930¹.
2. Isle Royale, sheet 2: 1930¹.
3. Passage Island: 1895.

NORTHERN PENINSULA:

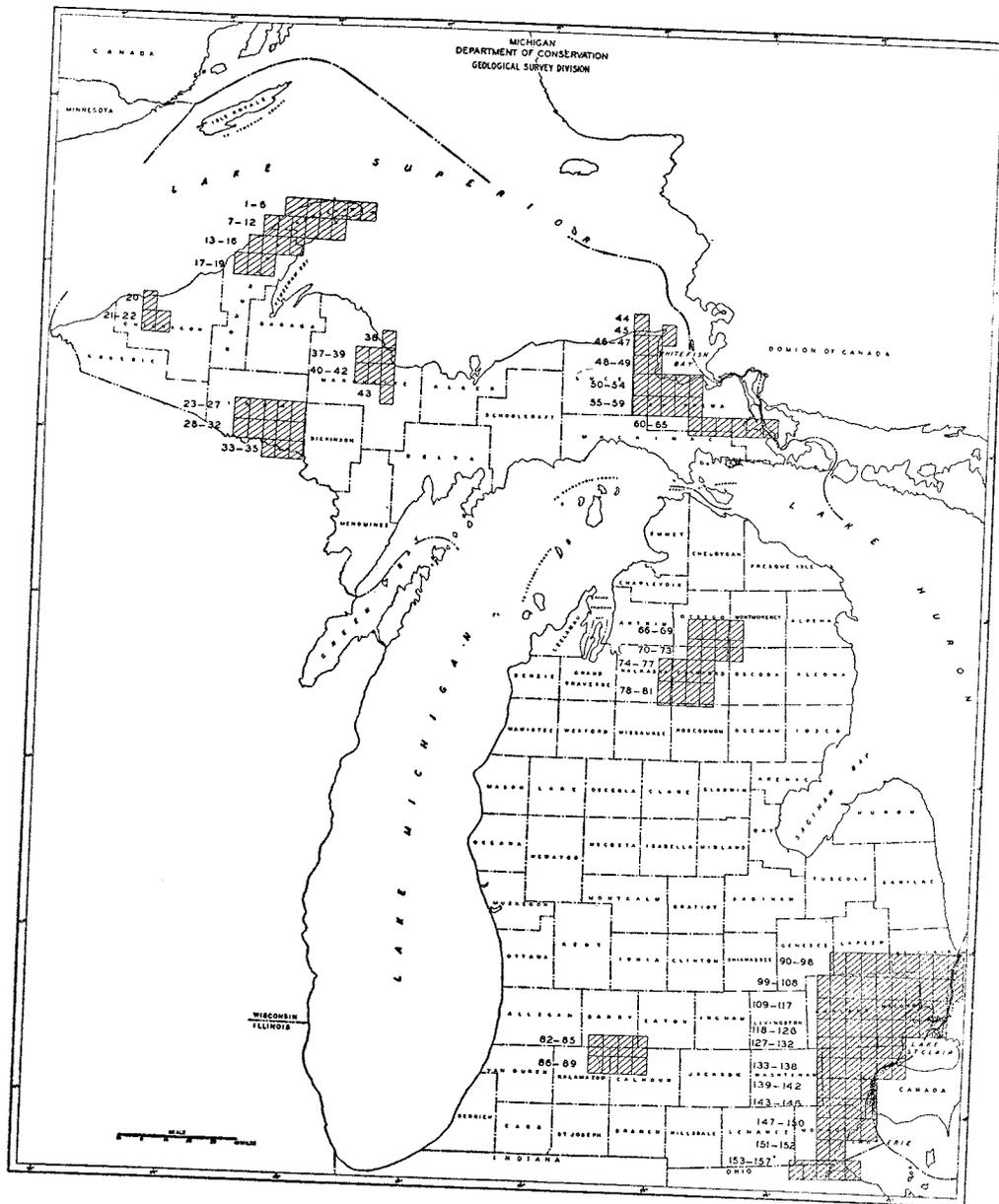
4. Calumet: 1909.
5. Houghton: 1912.
6. Greenland: 1950.
7. Rockland: 1949.
8. Marquette: 1905.
9. Thayer: 1952.
10. Watersmeet: 1952.
11. Perch Lake: 1895.
12. Ned Lake: 1895.
13. Witbeck: 1896.
14. Ishpeming: 1952.
15. Gwinn: 1952.
16. Star Lake: 1938¹.
17. Phelps: 1938¹.
18. Beechwood: 1938¹.
19. Sagola: 1895.
20. Long Lake: 1939¹.
21. Florence: 1939¹.
22. Menominee Iron Range: 1898.

SOUTHERN PENINSULA:

23. Otsego Lake: 1950.
24. Lewiston: 1950.
25. Fletcher: 1950.
26. Grayling: 1950.
27. Freesoil NW and NE: 1931¹.
28. Luther NW: 1937¹.
29. Freesoil SW: 1931¹.
30. Freesoil SE: 1931¹.
31. Luther SW: 1933¹.
32. Luther SE: 1933¹.
33. Baldwin NW: 1931¹.
34. Baldwin NE: 1931¹.
35. Baldwin SE and SW: 1931¹.
36. Mt. Pleasant: 1916.
37. Shepherd: 1930.
38. Sanford: 1934.
39. Bay City: 1916.
40. Montague: 1929.

41. Twin Lake: 1929.
42. Alma: 1935.
43. Merrill: 1934.
44. St. Charles: 1914.
45. Saginaw: 1916.
46. Lake Harbor: 1930.
47. Muskegon: 1930.
48. Ravenna: 1945.
49. Cedar Springs: 1916.
50. Perrinton: 1916.
51. Elsie: 1916.
52. Chesaning: 1915.
53. Burt: 1919.
54. Flint: 1920.
55. Holland: 1929.
56. Grand Rapids: 1912.
57. Lowell: 1916.
58. Ionia: 1916.
59. Portland: 1945.
60. Dewitt: 1925.
61. Laingsburg: 1925.
62. Corunna: 1926.
63. Durand: 1920.
64. Holly: 1920.
65. Fennville: 1928.
66. Hastings: 1951.
67. Nashville: 1950.
68. Charlotte: 1946.
69. Lansing: 1910.
70. Mason: 1909.
71. Fowlerville: 1908.
72. Howell: 1907.
73. Milford: 1908, 1954.
74. Pontiac: 1916².
75. Rochester: 1916.
76. Mt. Clemens: 1929.
77. Algonac².
78. Marine City.
79. South Haven: 1928.
80. Bangor: 1927.
81. Gobles: 1946.
82. Kalamazoo: 1916.
83. Galesburg: 1917, 1947.
84. Battle Creek: 1917, 1947.
85. Marshall: 1921.
86. Springport: 1919.
87. Rives Junction: 1919.
88. Stockbridge: 1912, 1919.

¹Planimetric.
²Out of print.
^{*}Ann Arbor Folio.
^{**}Detroit Folio.



Index Map of 7 1/2-Minute Quadrangles

Enumeration plan for convenience only.

89. Dexter: 1902*.
90. South Lyon: 1902*.
91. Plymouth: 1905**.
92. Detroit: 19052**.
93. Grossepoint: 1905**.
94. Benton Harbor: 1927.
95. Hartford: 1927.
96. Marcellus: 1944.
97. Schoolcraft: 1920.
98. Leonidas: 1918, 1947.
99. Union City: 1918, 1947.
100. Homer: 1948.
101. Spring Arbor: 1948.
102. Jackson: 1935.
103. Manchester: 1948.
104. Saline: 1902*.
105. Ypsilanti: 1902*.
106. Romulus: 1906**.

107. Wyandotte: 19052**.
108. Three Oaks: 1927.
109. Niles: 1927.
110. Cassopolis: 1945.
111. Vandalia: 1945.
112. Three Rivers: 1914.
113. Blissfield: 1939.
114. Dundee: 1939.
115. Wyandotte.

OHIO-MICHIGAN:

116. Pioneer: 1911.
117. Alvordton: 1911.
118. Wauseon: 1911.
119. Swanton: 1911.
120. Toledo: 1952.
121. Maumee: 1951.

PROGRESS OF TOPOGRAPHIC MAPPING IN MICHIGAN

7 1/2-MINUTE QUADRANGLES

NORTHERN PENINSULA:

1. Phoenix: 1946.
2. Eagle Harbor: 1946.
3. Delaware: 1948.
4. Lake Medora: 1948.
5. Fort Wilkins: 1948.
6. Manitou Island: 1948.
7. Muggins Creek: 1946.
8. Ahmeek: 1946.
9. Mohawk: 1946.
10. Bruneau Creek: 1946.
11. Deer Lake: 1948.
12. Point Isabelle: 1948.
13. Oskar: 1954.
14. Hancock: 1946.
15. Laurium: 1946.
16. Rice Lake: 1954.
17. Graveraet River: 1954.
18. South Range: 1948.
19. Chassell: 1948.
20. White Pine: 1948.
21. Bergland: 1948.
22. Matchwood: 1948.
23. Gibbs City: 1945.
24. Sunset Lake: 1945.
25. Amasa: 1945.
26. Kelso Junction: 1945.
27. Kiernan: 1945.
28. Iron River: 1944.
29. Gaastra: 1944.
30. Fortune Lakes: 1944.
31. Crystal Falls: 1944.
32. Lake Mary: 1945.

33. Naults: 1945.
34. Stager: 1945.
35. Commonwealth: 1945.
36. Marquette NW: 1953.
37. Negaunee SW: 1954.
38. Negaunee: 1953.
39. Marquette: 1954.
40. Ishpeming: 1952.
41. Palmer: 1952.
42. Sands: 1952.
43. Gwinn: 1952.
44. Vermilion: 1951.
45. Whitefish Point: 1951.
46. Sheephead Lake: 1951.
47. Shelldrake: 1951.
48. Timberlost: 1951.
49. Emerson: 1951.
50. Big Beaver Creek: 1951.
51. Piatt Lake: 1951.
52. McNearney Lake: 1951.
53. Pendills Lake: 1951.
54. Dollar Settlement: 1951.
55. Hulbert: 1951.
56. Eckerman: 1951.
57. Strongs: 1951.
58. Sullivan Creek: 1951.
59. Raco: 1951.
60. Fibre, 1953.
61. Rudyard: 1953.
62. Pickford NW: 1953.
63. Pickford: 1953.
64. Munuscong: 1953.
65. Munuscong NE: 1953.

SOUTHERN PENINSULA:

66. Otsego Lake: 1950.
 67. Turtle Lake: 1950.
 68. Johannesburg: 1950.
 69. Lewiston: 1950.
 70. Big Bradford Lake: 1950.
 71. K.P. Lake: 1950.
 72. Lovells: 1950.
 73. Comstock Hills: 1950.
 74. Black Creek: 1950.
 75. Lake Margrethe: 1950.
 76. Grayling: 1950.
 77. Wakeley Lake: 1950.
 78. Fletcher: 1950.
 79. Cote Dame Marie: 1950.
 80. Pere Cheney: 1950.
 81. Roscommon N: 1950.
 82. Delton: 1947.
 83. Banfield: 1947.
 84. Bedford: 1947.
 85. Bellevue: 1947.
 86. Galesburg: 1947.
 87. Augusta: 1947.
 88. Battle Creek: 1947.
 89. Ceresco: 1947.
 90. Hadley: 1943.
 91. Metamora: 1943.
 92. Thornville: 1943.
 93. Almont: 1943.
 94. Allenton: 1943, 1952.
 95. Memphis: 1943, 1952.
 96. Goodells: 1937, 1952.
 97. Smith Creek: 1937, 1952.
 98. Port Huron: 1937, 1952.
 99. Davisburg: 1942.
 100. Ortonville: 1943.
 101. Oxford: 1943.
 102. Lake Orion: 1943.
 103. Romeo: 1943.
 104. Armada: 1942, 1952.
 105. Richmond: 1942, 1952.
 106. Adair: 1937, 1952.
 107. Rattle Run: 1939, 1952.
 108. St. Clair: 1937, 1952.
 109. Highland: 1942.
 110. Clarkston: 1941, 1952.
 111. Pontiac N: 1941, 1952.
 112. Rochester: 1943, 1952.
 113. Utica: 1944, 1952.
 114. Waldenburg: 1952.
 115. New Haven: 1952.
 116. New Baltimore: 1937, 1952.
 117. Marine City: 1937, 1952.
 118. Wixom: 1945.
 119. Walled Lake: 1942, 1952.
 120. Pontiac S: 1941, 1952.
 121. Birmingham: 1948, 1952.
 122. Warren: 1944, 1952.
 123. Mt. Clemens W: 1952.
 124. Mt. Clemens E: 1952.
 125. St. Clair Flats: 1937, 1952.
 126. Algonac: 1937, 1952.
 127. Salem: 1942, 1953.
 128. Northville: 1942, 1952.
 129. Redford: 1939, 1952.
 130. Royal Oak: 1939, 1952.
 131. Highland Park: 1933, 1952.
 132. Grosse Pointe: 1939, 1952.
 133. Denton: 1940, 1953.
 134. Wayne: 1941, 1952.
 135. Inkster: 1940, 1952.
 136. Dearborn: 1939, 1952.
 137. Detroit: 1938, 1952.
 138. Belle Isle: 1938, 1952.
 139. Ypsilanti E: 1940, 1953.
 140. Belleville: 1940, 1952.
 141. Wayne County Airport: 1940, 1952.
 142. Wyandotte: 1940, 1952.
 143. Maybee: 1940.
 144. Carleton: 1940, 1952.
 145. Flat Rock: 1940, 1952.
 146. Rockwood: 1941, 1952.
 147. Ida: 1939.
 148. Monroe: 1940, 1952.
 149. Stony Point: 1940, 1952.
 150. Estral Beach: 1940, 1952.
 151. Samaria: 1939.
 152. Erie: 1940, 1952.

OHIO-MICHIGAN:

153. Berkey: 1951.
 154. Sylvania: 1934, 1951.
 155. Toledo: 1934, 1952.
 156. Point Place: 1934, 1952.
 157. Maumee: 1934, 1951.

MISCELLANEOUS CONTRIBUTIONS

TO

MICHIGAN GEOLOGY

MISCELLANEOUS CONTRIBUTIONS TO MICHIGAN GEOLOGY

in Department of Conservation Reports

LAND ECONOMIC SURVEY

Reports and maps of the Land Economic Survey have not been issued as formal publications. Blue line prints and mimeographed copies of the reports may be obtained from the Lands Division of the Department of Conservation or may be consulted in the Open File of the Geological Survey and Lands Divisions.

Alger County, Field Work 1923.

Soils, cover. Map.
Surface geology. Map. S. G. Bergquist.
Surface and hardrock formations. Map.

Alpena County, Field Work 1924.

Geological resources of Alpena County, W. A. Ver Wiebe, S. G. Bergquist.
Geology of Alpena County, Frank Leverett, L. R. Schoenman.
Soils, cover. Map.
Surface and hardrock formations. Map.
Surface formations. Map.
Water resources of the Thunder Bay region, C. O. Wisler.

Antrim County, Field Work 1923.

Geology of Antrim County, Frank Leverett.
Lake Survey. Map.
Soils, cover. Map.
Water resources of Antrim County, C. O. Wisler.

Charlevoix County, Field Work 1922.

Geology of Charlevoix County, Frank Leverett.
Surface geology. Map.
Water power of Charlevoix County, C. O. Wisler.

Chippewa County, Field Work 1925.

Geology, W. A. Ver Wiebe.
Lakes of. Map.
Surface and hardrock formations. Map.
Surface formations. Map.
Water resources of the Carp River, C. O. Wisler.
Water resources of the Munuscong and Waiska Rivers, C. O. Wisler.
Water resources of the Pine River, C. O. Wisler.
Water resources of the Tahquamenon River, C. O. Wisler.

Crawford County, Field Work 1927.

Geological resources of, W. A. Ver Wiebe and S. G. Bergquist.
Geology of, W. A. Ver Wiebe.
Lakes. Map.
Soils, cover. Maps.
Water power of, C. O. Wisler.

Iron County, Field Work 1930.

Soils, cover. Map.
Surface and hardrock formations. Map.
Surface formations. Map.

Kalkaska County, Field Work 1927.

Geological resources of Kalkaska County, W. A. Ver Wiebe and S. G. Bergquist.
Geology of Kalkaska County, W. A. Ver Wiebe.
Soils, cover. Map.
Surface formations. Map.
Water power, C. O. Wisler.

Luce County, Field Work 1929.

Soils, cover. Map.
Surface formations. Map.

Menominee County, Field Work 1925.

Geology of, W. A. Ver Wiebe.
Surface and hardrock formations. Map.
Surface formations. Map.
Water power, C. O. Wisler.

Montmorency County, Field Work 1930.

Lakes. Map.
Soils, cover. Map.
Surface and hardrock formations. Map.
(The L.E.S. geological report on Montmorency County by S. G. Bergquist was published in Papers, Mich. Acad. Sci., Arts and Lett. (1939), Vol. 25.)

Ogemaw County, Field Work 1936-37.

Geology of, Frank Leverett.
Lakes. Map.
Surface formations. Map.
Water resources of Ogemaw County, C. O. Wisler.
Water resources of the Manistee River above Sherman, C. O. Wisler.

Roscommon County, Field Work 1924.

Geology of, W. A. Ver Wiebe.
Lakes. Map.
Soils, cover. Map.
Surface formations. Map.

Schoolcraft County, Field Work 1932.

Geology of, O. F. Poindexter.
Surface formations. Map.

Wexford County

Water resources of the Manistee River above Sherman, C. O. Wisler.

The Land Economic Survey, its history, purpose, scope: Open File Report.

SECTION ENGINEERING AND ARCHITECTURE
PRELIMINARY ENGINEERING INVESTIGATIONS

Geologic and hydrologic data pertinent to the study are included in the reports of the following lakes.

Au Gres Trout Pond, Iosco and Arenac counties.	Kaiser, St. Joseph County.
Barroh, Cass County.	Lake of the Woods, Van Buren County.
Big, Osceola County.	Little, Branch County.
Black, Cheboygan County.	Long, Clare County.
Brevort, Mackinac County.	Margarete, Crawford County.
Brooks, Newaygo County.	McCormac, Montmorency County.
Brown and West Twin, Alcona County.	Mitchell, Wexford County.
Cadillac and Mitchell, Wexford County.	Mud, Branch County.
Cedar, Alcona County.	Mud, St. Joseph County.
Clam River Improvement, Wexford County.	Mullet, Cheboygan County.
Clare Reservoir, Clare County.	Narrow, Eaton County.
Clear, St. Joseph County.	North Manistique, Luce County.
Corey, St. Joseph County.	Park, Clinton County.
Crystal, Benzie County.	Paw Paw, Berrien County.
Emma, Presque Isle County.	Pipestone, Berrien County.
Four Mile, Washtenaw County.	Ponemah, Genesee County.
Fremont, Newaygo County.	Pontiac—Oxbow, Oakland County.
Garver, Cass County.	Portage (with Hiland), Washtenaw County.
Glen, Leelanau County.	Posey, Lenawee County.
Grand, Presque Isle County.	Potter, Genesee County.
Grass, Montmorency County.	Pugsley, Van Buren County.
Gravel, Van Buren County.	Rock, Montcalm County.
Gun, Barry County.	Rose, Branch County.
Higgins, Roscommon County.	Rush, Montmorency County.
Hiland (with Portage), Livingston County.	Sage's, Ogemaw County.
Homer Mill Pond, Calhoun County.	St. Helens, Roscommon County.
Horseshoe, Washtenaw County.	Silver, Van Buren County.
Houghton, Roscommon County.	Upper Herring, Benzie County.
Indian Lake, Chain, Iosco County.	Tawas, Iosco County.
Indian, Kalamazoo County.	Van Auken, Van Buren County.
Indian, Schoolcraft County.	Van Etten, Iosco County.
Jordan, Ionia and Barry counties.	Wall, Barry County.
	West, Kalamazoo County.
	Whitmore, Washtenaw County.

MICHIGAN CONSERVATION MAGAZINE

Contributions to Public Education in Geology.

Billings, Norman F.

1. Exercise caution when selecting location on a lake: Vol. 14, No. 4, 1945.
2. Ways sought to control wave action: Vol. 15, No. 7, 1946.
3. Is it true what they say about water?: Vol. 18, No. 4, 5, 1949; Vol. 19, No. 1, 2, 1950.
4. Who's who in water: Vol. 19, No. 3, 1950.
5. Ground water: Vol. 24, No. 5, 1955.

Boehler, Charles*

6. Tahquamenon Falls: Vol. 6, No. 5, 1936.

Daoust, William L.

7. Salts of the earth: Vol. 22, No. 1, 1953.

Deason, H. J.*

8. Upper Peninsula once bed of Inland Sea: Vol. 6, No. 4, 1936.

Eddy, Gerald E.

9. Metals for tomorrow: Vol. 24, No. 4, 1955.

Fontanna, Stanley G.*

10. Michigan's water problems are studied: Vol. 15, No. 6, 1946.

Grant, Rex P.

11. Michigan petroleum producing industry: Vol. 17, No. 4, 1948.
12. Liquid gas is stored in "tailormade" caves: Vol. 22, No. 3, 1953.
13. Michigan oil—its past, present, future: Vol. 24, No. 4, 1955.

Hoffmaster, P. J.*

14. Time to do something about water: Vol. 13, No. 2, 1944.
15. Michigan's oil and gas: Vol. 15, No. 9, 1946.

Houghton, Douglass

16. Tahquamenon—Taquiomenon. From field notebook: Vol. 7, No. 11, 1938.
17. Sketch of State Geologist Houghton: Vol. 14, No. 10, 1945.

Hubbard, Bela.

18. Pictures in the rocks (Pictured Rocks). From field notebook: Vol. 7, No. 11, 1935.
19. Journal of Mus-co-ma-in-gun. From field notebook of Hubbard: Vol. 5, No. 6, 1935; No. 12, 1936; Vol. 6, No. 1, 4, 1936.

Humphreys, C. R.*

20. Treasure by the ton: Vol. 22, No. 3, 1953.

Jamison, Knox*.

21. Base and Principal Meridian lines in Michigan: Vol. 14, No. 3, 1945.
22. Mines of the Porcupine Mountains: Vol. 16, No. 3, 1947.

Kennedy, Bruce E.

23. "Forty-Niner" fever: Vol. 18, No. 6, 1949.

Martin, Helen M.

24. 100 years of Michigan geology: Vol. 7, Nos. 1, 2, 4, 1937.
25. The Ice Age in Michigan: Vol. 7, Nos. 7, 9, 1938.
26. War Jobs for Michigan minerals: Vol. 11, No. 7, 1942.
27. Have we enough oil?: Vol. 11, No. 8, 1942.

*Not on the staff of the Geological Survey Division.

28. Sleeping Bear dune: Vol. 11, No. 11, 1942.
29. Magnesium ore: Vol. 12, No. 1, 1943.
30. Those useless scientific facts: Vol. 12, No. 6, 1943.
31. Yankee Springs: Vol. 12, No. 7, 1943.
32. From Michigan's coral seas: Vol. 12, No. 8, 1943.
33. Our untouched wilderness (Porcupines): Vol. 12, No. 8, 1943.
34. The romance of copper: Vol. 13, Nos. 1, 2, 1944.
35. More about our most important resource—water: Vol. 13, No. 4, 1944.
36. Michigan's iron: Vol. 13, Nos. 5, 6, 1944.
37. When Paleontologist and Photographer meet: Vol. 13, No. 8, 1944.
38. Salt for a million years: Vol. 13, No. 11, 1944.
39. Geology to Archeology: Vol. 14, No. 3, 1945.
40. Maps: Vol. 14, Nos. 8, 9, 1945.
41. Douglass Houghton (1809-1845): Vol. 14, No. 10, 1945.
42. Minerals find new use in nylon: Vol. 15, No. 4, 1946.
43. R. A. Smith is retiring on August 1: Vol. 15, No. 6, 1946.
44. Michigan story: Vol. 19, No. 2, 1950.
45. Those busy bacteria: Vol. 19, No. 6, 1950.
46. How old is Michigan?: Vol. 20, No. 1, 1951.
47. From arbutus to ethyl: Vol. 20, No. 2, 1951.
48. No empty lands!: Vol. 21, No. 3, 1952.
49. Romance of the pipelines: Vol. 22, No. 5, 1953.
50. Common stuff: Vol. 22, No. 6, 1953.
51. Fuels—power: Vol. 23, No. 2, 1954.
52. Those marble halls (with H. O. Sorensen): Vol. 23, No. 3, 1954.
53. Rambling rocks: Vol. 23, No. 4, 1954.
54. How it all began: Vol. 23, No. 5, 1954.
55. The Pictured Rocks—then and now: Vol. 23, No. 6, 1954.
56. Mastodons, Mammoths, Elephants: Vol. 24, No. 2, 1955.
57. Water then—and now: Vol. 24, No. 5, 1955.

Miller, Lee S.

58. Why oil proration?: Vol. 12, No. 9, 1943.
59. A shot in the arm for oil fields: Vol. 22, No. 2, 1953.
60. Why oil proration?: Vol. 23, No. 3, 1954.

Osgood, Wayland*

61. Lowered lake levels result in sub-normal rainfall: Vol. 5, No. 3, 1935.

Pardee, Franklin G.

62. Michigan's mythical gold mines: Vol. 14, No. 11, 1945.
63. Iron ore reserves in Michigan: Vol. 17, No. 9, 1948.

Poindexter, O. F.

64. Fire plugs in State forests: Vol. 5, No. 1, 1935.
65. Michigan highlands: Vol. 9, No. 4, 1940.
66. Ground water table at 5-year low: Vol. 9, No. 8, 1940.
67. Something can be done about lake levels: Vol. 11, No. 2, 1942.
68. Water is a vital resource: Vol. 12, No. 2, 1943.

Riggs, H.

69. The oil man's nightmare (salt water): Vol. 12, No. 1, 1943.

Smith, Richard A.

70. Michigan minor minerals: Vol. 10, No. 8, 1941.
71. Saginaw Valley brines pose problems: Vol. 14, No. 12, 1945.
Sketch of in R. A. Smith is retiring: Vol. 15, No. 6, 1946.

Warren, Ebb*

72. Deep drilling in Michigan: Vol. 16, No. 6, 1947.

Wender, Carl*

73. Speeding the search for oil: Vol. 12, No. 1, 1943.
74. Those 'Lake Bottom' leases: Vol. 15, No. 3, 1946.

The titles of P.E.G. (Public Education in Geology) articles do not always indicate content, therefore the following index to subject matter is appended. The numbers refer to the article number.

- | | |
|--|---|
| Age of Michigan: 46. | 29, 30, 34, 36, 38, 39, 42, 45, 47, 62, |
| Altitudes: 65. | 70. |
| Cambrian: 18, 55. | Mines: 22, 34, 62. |
| Copper: 20, 22, 34. | Paleozoic of Northern Peninsula: 8. |
| Conservation and geology: 41, 44, 48. | Paleontology: 37. |
| Dunes: 28. | Petroleum and natural gas: 7, 11, 12, |
| Geological Survey: 17, 19, 24, 30, 43. | 13, 15, 27, 47, 49, 51, 58, 59, 60, 69, |
| Glaciation: 25, 31, 50, 53. | 71, 72, 73. |
| Gold: 62. | Pictured Rocks: 18, 55. |
| Gravel: 39, 50, 53. | Porcupine Mountains: 22, 33, 34. |
| Iron: 36, 63. | Rivers: 6, 16. |
| Lakes and shores, lake levels: 1, 2, 61, | Salt: 7, 38. |
| 67, 74. | Salt water, brine: 7, 71. |
| Limestone: 32. | Scenic features, recreation areas: 3, |
| Magnesium: 29. | 6, 16, 28, 31. |
| Maps: 21, 40. | Tahquamenon: 6, 16. |
| Marble: 52. | Uranium: 23. |
| Mastodon, mammoth: 56. | Water: 3, 4, 5, 10, 14, 35, 57, 64, 66, 68. |
| Minerals and mineral industry: 9, 26, | Yankee Springs: 31. |

REFERENCES TO MICHIGAN GEOLOGY AND
MINERAL RESOURCES

By

MURIEL TARA STRAIGHT

REFERENCES TO MICHIGAN GEOLOGY AND MINERAL RESOURCES

As geologic studies continue and more papers are published it becomes increasingly difficult to keep abreast of the geologic information available for any one area. For several years some kind of author-subject index of papers pertaining to Michigan geology has been needed—hence this compilation. Several published bibliographies were examined and it seemed that the style used by the U. S. Geological Survey in the Bibliography of North American geology is the most useful. Therefore, this compilation is patterned after the U. S. Geological Survey bibliography.

Many references were obtained from the Bibliography of North American geology. Other sources of information were: Dr. Duncan Stewart's progress bibliography of Michigan geology issued by Michigan State College¹, Dept. of Geology and Geography; the files of the Michigan Geological Survey, Lansing; Michigan State College¹ Library, East Lansing; Department of Geology and Geography, Michigan State College¹, East Lansing; Michigan State Library, Lansing; other published bibliographies; and lists of published and unpublished doctoral and masters theses furnished by the geology and physics departments of several colleges and universities. The cooperation of these departments of the several colleges aided greatly in obtaining references not found in any published bibliography and for this gracious cooperation the writer expresses thanks.

Many papers with only brief mention of Michigan are not included, as Stewart's bibliography gives a more comprehensive coverage. The references listed herein were checked for accuracy with the actual papers whenever possible. Not all the papers could be found, however, with the facilities available.

This compilation is in two parts: An alphabetical list of authors with titles and complete bibliographic references and, a subject index. Annotations for a few papers are given in the author index. If followed by "U.S.G.S.", "U.S.B.M.", or "M.L.F." the annotations are from the Bibliography of North American geology, 1950 (U.S. Geological Survey), the List of publications of the Bureau of Mines, July 1, 1910 to January 1, 1949 (U.S. Bureau of Mines) or from bibliographic indices on ground water, Water-Supply Paper 120 by M. L. Fuller, and 163 by M. L. Fuller et al (U.S. Geological Survey).

¹Now Michigan State University

The subject index, exclusive of county headings, is divided into the following major categories:

Bibliography	Mineral resources and mineral industries
Biography	Mineralogy
Deep borings	Mining
Economic geology	Northern Peninsula
Explorations and surveys	Paleontology
General	Petrography and petrology
Geological survey	Physical geology
Historical geology	Sedimentation
Isle Royale	Soils
Lake Superior region	Southern Peninsula
Maps	Stratigraphy
Meteorites	Water resources
Mineral lands	

A few examples may aid in making best use of the subject index. Suppose information regarding the geology of the Marquette iron range is desired. Iron, a mineral resource, is in the category MINERAL RESOURCES AND MINERAL INDUSTRIES. Further subdivisions:

MINERAL RESOURCES AND MINERAL INDUSTRIES

Iron

Geology of

Marquette range: Derby, E. L., Jr., 1; Hotchkiss, W. O., 7; Kimball, J. P., 1; Mich. Acad. Sci., 5; etc.
Gwinn district: Allen, R. C., 11.

References to the Devonian Traverse group of Michigan are subdivisions of STRATIGRAPHY and listed as follows:

STRATIGRAPHY

Paleozoic

Devonian

Traverse: Davies, W. E., 1(th); Grabau, A. W., 2(a), 9(a), 12(a); etc.

Afton-Onaway area: Kelly, W. A., 10, 12.

Alpena area: Mich. Acad. Sci., 3.

Items of a somewhat general nature are under the appropriate major heading. For example:

ECONOMIC GEOLOGY

Deposition of ores, principles of: Van Hise, C. R., 17(*).
Enrichment of ore deposits: Emmons, W. H., 1(*).

The number (or numbers) after the author's name corresponds to a number in the author index. An (a) following the number indicates that the paper is an abstract, an (*) has only brief mention of Michigan, an (f) is written in a foreign language, and a (th) is a thesis. The complete bibliographic reference is found by turning to the corresponding author and number in the author index.

ABBREVIATIONS

A.A.P.G.—American Association of Petroleum Geologists	Mich.—Michigan
abs.—abstract, abstracts	mimeo.—mimeographed
Agr.—agriculture	Min.—mining
Am.—America, American	mineralog.—mineralogy, mineralogical
Ann.—annual	min. res.—mineral resources
approx.—approximately	Minn.—Minnesota
Apr.—April	M.L.F.—Myron L. Fuller
art.—article	mtg.—meeting
Assoc.—association	N. C.—North Carolina
Aug.—August	Nat.—natural, naturalist
Bot.—botanical, botany	Natl.—national
Bull.—bulletin	no., nos.—number, numbers
Bur.—bureau	Nov.—November
Calif.—California	Oct.—October
chap.—chapter	Okla.—Oklahoma
circ.—circular	p., pp.—page, pages
Co.—company	Pa.—Pennsylvania
Comm.—commission, commissioner	Paleont.—paleontological
Conf.—conference	petrol.—petroleum
Cong.—congress	pl., pls.—plate, plates
Conserv.—conservation	P. N.—printed notice
Coun.—council	prelim.—preliminary
Dec.—December	Proc.—proceedings
Dept.—department	prosp.—prospecting
Div.—division	pt.—part, parts
Doc.—document	pub.—publication
ed.—edition	rec.—record, records
Educ.—education	rev.—review
Eng.—engineering	rpt.—report
Ex.—executive	sec.—section, sections
Explor.—exploration	S. E. G.—Society of Economic Geologists
extr.—extract, extracts	S. E. P. M.—Society of Economic Paleontologists Meeting
Feb.—February	Sept.—September
fig., figs.—figure, figures	ser.—series
Geog.—geography	Sess.—session
Geol.—geology, geologic, geological	Soc.—society, societies
Geophys.—geophysical	Spec.—special
Ill.—Illinois	strat.—stratigraphic, stratigraphical
illus.—illustrated	summ.—summary
incl.—including	suppl.—supplement
Ind.—Indiana	Tech.—technology
Inst.—institute	topog.—topographic, topographical
Internat.—international	Univ.—university
Inv.—investigation, investigations	U. S.—United States
Jan.—January	U. S. B. M.—United States Bureau of Mines
Jour.—journal	U. S. G. S.—United States Geological Survey
Kans.—Kansas	v.—volume, volumes
Leg.—Legislature	Wash.—Washington
Mar.—March	Wis.—Wisconsin
Mass.—Massachusetts	
mem.—memoir	

PUBLICATION ABBREVIATIONS

- Acad. Nat. Sci. Phila. Proc.—Academy of Natural Sciences of Philadelphia Proceedings.
- Agr. Eng.—Agricultural Engineering.
- A.I.M.E. Bi-monthly Bull., Bull., Contr., Geophys. Prosp., Tech. Pub., Trans., Yearb.—American Institute of Mining Engineers, or American Institute of Mining and Metallurgical Engineers Bi-monthly Bulletin, Bulletin, Contributions, Geophysical Prospecting, Technical Publication, Transactions, Yearbook.
- Am. Acad. Arts and Sci. Proc.—American Academy of Arts and Sciences Proceedings.
- Am. Assoc. Adv. Sci. Proc.—American Association for the Advancement of Science Proceedings.
- Am. Assoc. Petrol. Geol. Bull.—American Association of Petroleum Geologists Bulletin.
- Am. Geol.—American Geologist.
- Am. Geophys. Union Trans.—American Geophysical Union Transactions.
- Am. Jour. Bot.—American Journal of Botany.
- Am. Jour. Sci.—American Journal of Science.
- Am. Meteorol. Soc. Bull.—American Meteorological Society Bulletin.
- Am. Midland Nat.—American Midland Naturalist.
- Am. Mineralog.—American Mineralogist.
- Am. Mus. Nat. Hist. Novitates—American Museum of Natural History Novitates.
- Am. Mus. Novitates—American Museum Novitates.
- Am. Nat.—American Naturalist.
- Am. Philos. Soc. Trans.—American Philosophical Society Transactions.
- Am. Water Works Assoc. Jour.—American Water Works Association Journal.
- Assoc. Am. Geol. and Nat. Rpt.—Association of American Geologists and Naturalists Report.
- Assoc. Am. State Geol. Jour.—Association of American State Geologists Journal.
- Boston Jour. Nat. History—Boston Journal of Natural History.
- Boston Soc. Nat. Hist. Proc.—Boston Society of Natural History Proceedings.
- Bot. Gaz.—Botanical Gazette.
- British Assoc. Adv. Sci. Rpt.—British Association for the Advancement of Science Report.
- Butler Univ. Bot. Studies—Butler University Botanical Studies.
- Calif. Univ., Dept. Geol. Bull.—California University, Department of Geology Bulletin.
- Canada Dept. Mines, Geol. Survey Mem.—Canada Department of Mines, Geological Survey Memoir.
- Canadian Geol. Survey Mem., Rept. Prog., Summ. Rpt.—Canadian Geological Survey Memoir, Report of Progress, Summary Report.
- Canadian Inst. Proc., Trans.—Canadian Institute Proceedings, Transactions.
- Canadian Inst. Min. Met. Trans.; Bull.—Canadian Institute of Mining and Metallurgy Transactions; Canadian Mining and Metallurgical Bulletin.
- Canadian Min. Inst. Jour., Quart. Bull.—Canadian Mining Institute Journal, Quarterly Bulletin.
- Canadian Min. Jour.—Canadian Mining Journal.
- Canadian Nat. and Geol. and Proc. Nat. Hist. Soc. Montreal—Canadian Naturalist and Geologist and Proceedings of the Natural History Society of Montreal.
- Carnegie Mus. Annals—Carnegie Museum Annals.
- Chicago Acad. Sci. Bull.—Chicago Academy of Science Bulletin.
- Compass—The Compass.
- Cranbrook Inst. Sci. Bull.—Cranbrook Institute of Science Bulletin.

- Davenport Acad. Sci. Proc.—Davenport Academy of Science Proceedings.
- Denison Univ. Bull., Sci. Lab. Jour.—Denison University Bulletin, Scientific Laboratories Journal.
- Earth Sci. Digest—The Earth Science Digest.
- Ecol. Mon.—Ecological Monograph.
- Econ. Geog.—Economic Geography.
- Econ. Geol.—Economic Geology.
- Edinburgh, New Philos. Jour.—Edinburgh, New Philosophical Journal.
- Eng. Mag.—Engineering Magazine.
- Eng. Min. Jour.—Engineering Mining Journal.
- Eng. News—Engineering News.
- Eng. Rec.—Engineering Record.
- Fed. Inst. Min. Eng. Trans.—Federated Institute of Mining Engineers Transactions.
- Field Columbia Mus. Pub.—Field Columbia Museum Publication.
- Franklin Inst. Jour.—Franklin Institute Journal.
- Geog. Rev.—Geographical Review.
- Geol. Mag.—Geological Magazine.
- Geol. Soc. Am. Bull., Proc.—The Geological Society of American Bulletin, Proceedings.
- Geol. Soc. London Quart. Jour., Trans.—Geological Society of London Quarterly Journal, Transactions.
- Geophys.—Geophysics.
- Harpers Mag.—Harpers Magazine.
- Harvard College Mus. Comp. Zool. Bull.—Harvard College Museum of Comparative Zoology Bulletin.
- Ill. Acad. Sci. Trans.—Illinois State Academy of Science Transactions.
- Ind. Acad. Sci. Proc.—Indiana Academy of Science Proceedings.
- Ind. Dept. Conserv., Div. Geol., Pub.—Indiana Department of Conservation, Division of Geology, Publication.
- Inst. Min. and Met. Trans.—Institute of Mining and Metallurgy Transactions.
- Jour. Geol.—Journal of Geology.
- Jour. Geomorphology—Journal of Geomorphology.
- Jour. Mammalogy—Journal of Mammalogy.
- Jour. Paleont.—Journal of Paleontology.
- Jour. Sed. Petr.—Journal of Sedimentary Petrography.
- Kans. Acad. Sci. Trans.—Kansas Academy of Science Transactions.
- Kans. Geol. Soc., Field Conf. Guidebook—Kansas Geological Society, Field Conference Guidebook.
- Kent Scientific Inst. Misc. Papers—Kent Scientific Institute Miscellaneous Papers.
- Lake Superior Min. Inst. Proc.—Lake Superior Mining Institute Proceedings.
- Lyceum Nat. Hist. N. Y. Annals—Lyceum of Natural History of New York Annals.
- Merchants Mag.—Merchants Magazine.
- Mich. Acad. Sci. Ann. Rept., Field Excur., Papers, Rpt.—Michigan Academy of Science Arts and Letters Annual Report, Field Excursion, Papers, Report.
- Mich. College Min. Tech. Bull.—Michigan College of Mining and Technology Bulletin.
- Mich. Conserv.—Michigan Conservation.
- Mich. Eng.—Michigan Engineer.
- Mich. Geol. and Biol. Survey Pub.—Michigan Geological and Biological Survey Publication.
- Mich. Geol. Survey Ann. Rpt., Prog. Rpt., Pub., Summ. Rpt., Tech. Rpt.—Michigan Geological Survey Annual Report, Progress Report, Publication, Summary Report, Technical Report.
- Mich. Hist. Mag.—Michigan History Magazine.

- Mich. Manufacturer and Financial Rec.—Michigan Manufacturer and Financial Record.
 Mich. Miner—Michigan Miner.
 Mich. Mineralog. Soc. Pub., Yearb.—Michigan Mineralogical Society Publication, Yearbook.
 Mich. Pioneer Coll.—Michigan Pioneer Collection.
 Mich. Polit. Sci. Assoc. Pub.—Michigan Political Science Association Publication.
 Mich. State Agr. Soc. Trans.—Michigan State Agricultural Society Transactions.
 Mich. State Board Agr., Ann. Rept.—Michigan State Board of Agriculture, Annual Report.
 Mich. State Geol. Ann. Rpt.—Michigan State Geologists Annual Report.
 Mich. Univ., Alum. Quart. Rev.; Eng. Research Bull.; Eng. Research Inst., Lake Hydraulics Lab., Research Pub.; Mus. Geol. Contr.; Mus. Paleont. Contr.; Mus. Zool. Occ. Papers—Michigan University, Alumnus Quarterly Review; Engineer Research Bulletin; Engineer Research Institute, Lake Hydraulics Laboratory; Research Publication; Museum of Geology Contributions; Museum of Paleontology Contributions; Museum of Zoology Occasional Papers.
 Midwest Geol.—The Midwest Geologist.
 Milwaukee Public Mus. Yearb.—Milwaukee Public Museum Yearbook.
 Mineralog.—The Mineralogist.
 Mineralog. Soc. Am.—Mineralogical Society of America.
 Min. Cong. Jour.—Mining Congress Journal.
 Min. Eng.—Mining Engineering.
 Min. Mag.—Mining Magazine.
 Min. and Met.—Mining and Metallurgy.
 Min. and Sci. Press—Mining and Scientific Press.
 Min. Sci.—Mining Science.
 Min. World—Mining World.
 Minn. Geol. Survey Ann. Rept.—Minnesota Geological Survey Annual Report.
 Mysore Geol. Dept. Rec.—Mysore Geological Department Records.
 Nat. Hist.—Natural History.
 Nat. Hist. Soc. Montreal—Natural History Society of Montreal.
 Natl. Oil Scouts Assoc. Yearb.—National Oil Scouts Association Yearbook.
 Natl. Oil Scouts and Landmens Assoc. Yearb.—National Oil Scouts and Landmens Association Yearbook.
 Nautilus—The Nautilus.
 Northwestern Univ. Summ. Doc., Dissert.—Northwestern University Summary Document, Dissertation.
 N. Y. Acad. Sci. Annals—New York Academy of Science Annals.
 Ohio Geol. Survey Bull.—Ohio Geological Survey Bulletin.
 Oil and Gas Jour.—Oil and Gas Journal.
 Okla. Acad. Sci. Proc.—Oklahoma Academy of Science Proceedings.
 Ontario Bur. Mines Ann. Rpt., Rpt.—Ontario Bureau of Mines Annual Report, Report.
 Ottawa Nat.—Ottawa Naturalist.
 Pan Am. Geol.—Pan American Geologist.
 Petrol. Eng.—The Petroleum Engineer.
 Philos. Soc. Wash. Bull.—Philosophical Society of Washington Bulletin.
 Pop. Astronomy—Popular Astronomy.
 Pop. Sci. Monthly—Popular Science Monthly.
 Proc. Nat. Hist. Soc. Montreal—Proceedings of the Natural History Society of Montreal.
 Quart. Colo. School of Mines—Quarterly Colorado School of Mines.
 Quart. Jour. Sci.—Quarterly Journal of Science.

- Rochester Acad. Sci. Proc.—Rochester Academy of Science Proceedings.
 Royal Geol. Soc. Cornwall Trans.—Royal Geological Society of Cornwall Transactions.
 Royal Inst. Great Britain Proc.—Royal Institute of Great Britain Proceedings.
 Royal Soc. Canada Proc. and Trans.—Royal Society of Canada Proceedings and Transactions.
 School of Mines Quart., Columbia Univ.—School of Mines Quarterly, Columbia University.
 Sci.—Science.
 Sci. Am. Suppl.—Scientific American Supplement.
 Sci. Monthly—The Scientific Monthly.
 Sci. Rev.—Metropolitan Detroit Science Review.
 Seismol. Soc. Am. Bull.—Seismological Society of America Bulletin.
 Smithsonian Inst. Ann. Rpt., Contr. to Knowledge, Explor. and Field Work, Misc. Coll.—Smithsonian Institution Annual Report, Contributions to Knowledge, Exploration and Field Work, Miscellaneous Collections.
 Soil Sci.—Soil Science.
 Tenn. Acad. Sci. Jour.—Tennessee Academy of Science Journal.
 U. S. Bur. Mines Bull., Inf. Circ., Rpt. Inv., Tech. Paper—United States Bureau of Mines Bulletin, Information Circular, Report of Investigations, Technical Paper.
 U. S. General Land Office Rpt.—United States General Land Office Report.
 U. S. Geol. Survey Ann. Rpt., Atlas, Bull., Circ., Geol. Quad. maps, Geophys. Inv., Min. Res., Mon., Oil and Gas Inv., Prelim. Rpt., Prof. Paper, Strategic Min. Inv., Water-Supply Paper—United States Geological Survey Annual Report, Atlas, Bulletin, Circular, Geological Quadrangle maps, Geophysical Investigations, Mineral Resources, Monograph, Oil and Gas Investigations, Preliminary Report, Professional Paper, Strategic Minerals Investigation, Water-Supply Paper.
 U. S. Natl. Mus. Ann. Rpt., Bull., Proc.—United States National Museum Annual Report, Bulletin, Proceedings.
 Wash. Acad. Sci. Jour.—Washington [D.C.] Academy of Science Journal.
 Wis. Acad. Sci. Trans.—Wisconsin Academy of Science, Arts and Letters Transactions.
 Wis. State Hist. Soc. Coll.—Wisconsin State Historical Society Collections.
 World Petrol.—World Petroleum.

AUTHOR INDEX

Ackermann, Hermann W.

1. Die Kupferführenden Schichten am Lake Superior [The copper-bearing veins near Lake Superior]: Naturwissenschaftliche Gesellschaft Isis in Dresden, Sitzungsberichte 1875, pp. 101-105, 1876.

Adams, C. L.

1. Copper concentrating practice at the Mohawk mill: Lake Superior Min. Inst. Proc., v. 27, pp. 98-104, 1929.

Adams, Frank Dawson

1. On the geology of the St. Clair tunnel: Royal Soc. Canada Proc. and Trans., v. 9, pt. IV, pp. 67-73, 1892.

Adams, George I.

1. (and others) Gypsum deposits in the United States: U. S. Geol. Survey Bull. 223, 1904. 129 pp. Contains: Gypsum deposits in Michigan, by G. P. Grimsley, pp. 45-47.

Adams, R. N.

1. Amygdaloid tailings: Lake Superior Min. Inst. Proc., v. 28, pp. 192-198, 1930.

Addison, Carl C.

1. Buckeye oil field, Gladwin County, Michigan: Am. Assoc. Petrol. Geol. Bull., v. 24, no. 10, pp. 1950-1982, 9 figs., incl. index and isopach maps, Nov. 1940; abs., Oil and Gas Jour., v. 38, no. 48, p. 50, Apr. 11, 1940.

Adler, Joseph Leopold

1. Stratigraphic zones in the Negaunee iron formation of Marquette County, Michigan: Jour. Geol., v. 43, no. 2, pp. 113-132, 7 pls., Feb.-Mar. 1935.

Agassiz, Alexander

1. On the position of the sandstone of the southern slope of a portion of Keweenaw Point, Lake Superior: Boston Soc. Nat. Hist. Proc. (1866-68), v. 11, pp. 244-246, 1868.
2. On underground temperatures at great depths: Am. Jour. Sci., ser. 3, v. 50 (v.150), no. 300, pp. 503-504, 1895.

Agassiz, Louis

1. The terraces and the ancient river bars, drift, boulders, and polished surfaces of Lake Superior [abs.]: Am. Assoc. Adv. Sci. Proc. (1848), v. 1, pp. 68-70, 1849.
2. The erratic phenomena about Lake Superior in *Lake Superior* . . . , chap. X, pp. 395-416; also Am. Jour. Sci., ser. 2, v. 10 (v.60), pp. 83-101, 1850; Archives des sciences physiques et naturelles, v. 16, pp. 5-34, 1851.

Albright, J. C.

1. Separation and disposal of salt water in Michigan fields: Petrol. Eng., v. 8, no. 6, pp. 47-49, Mar. 1937.

Aldrich, Henry Ray—See also Hotchkiss, W. O., 7.

- *1. A demonstration of the reflection of geologic conditions in observed magnetic intensity: A.I.M.E. Trans., v. 81, Geophys. Prosp., pp. 385-400, 4 figs., 1929. A discussion of observations made over the Lake Superior syncline in northern Wisconsin.

Alessi, A. Joseph

1. Serpentine at Ishpeming, Michigan: Rocks and Minerals, v. 11, no. 1, p. 11, Jan. 1936.
2. Hunting agates around Lake Superior: Rocks and Minerals, v. 11, no. 9, p. 139, Sept.-Oct. 1936.
3. Some minerals of Ishpeming, Michigan: Rocks and Minerals, v. 12, no. 7, p. 209, July 1937.
4. Chloride garnets of Michigan: Mineralog., v. 6, no. 6, pp. 9-10, June 1938.

Allen, Charles W.

1. Subsidence resulting from the Athens system of mining at Negaunee, Michigan [with discussion]: A.I.M.E. Trans., v. 109, pp. 195-202, 1934.
2. Blasting practice at a Michigan iron ore pit: Lake Superior Min. Inst. Proc., v. 29, pp. 108-117, illus., 1936. Discusses mining operations at the Tilden mine, Marquette range, which began in 1929 with a production of 440,000 tons.
3. Combating sulphur dioxide gas at the Spies-Virgil mine: Lake Superior Min. Inst. Proc., v. 30, pp. 33-36, 1939.

Allen, Rolland Craten

1. The Iron River iron-bearing district of Michigan: Mich. Geol. and Biol. Survey, pub. 3, geol. ser. 2, 18 figs., 17 pls., incl. map, 1910. 151 pp.
2. Progress of the Geological and Biological Survey of Michigan; geology and topography: Mich. Acad. Sci. Rpt., v. 13, pp. 69-78, 1911; v. 14, pp. 33-36, 1912.
3. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1910 and prior years: Mich. Geol. and Biol. Survey, pub. 8, geol. ser. 6, 19 figs., 21 pls., 1912. 465 pp. Contains: The copper industry of Michigan, by R. E. Hore, pp. 15-115; The iron mining industry of Michigan, pp. 117-219; The pig iron industry of Michigan, by A. E. White, pp. 221-244; The Jones step process, by A. E. White, pp. 245-256; Michigan coal, by R. A. Smith, pp. 257-303; Michigan gypsum, by R. A. Smith, pp. 305-314; The salt industry of Michigan, by C. W. Cook, pp. 315-336; Michigan cement, by C. W. Cook, pp. 337-354; Michigan gold, pp. 355-366; Oil and gas in Michigan, by R. A. Smith, pp. 367-397; Directory of mineral producers of Michigan, pp. 399-429; Statistical tables of various non-metallic products, pp. 431-456.
4. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1912 and prior years: Mich. Geol. and Biol. Survey, pub. 13, geol. ser. 10, 1 fig., 8 pls., 1913. 255 pp. Contains: The copper industry of Michigan, by R. E. Hore, pp. 11-92; Notes on potash, sand and gravel, limestone, pp. 93-98; Statistical tables, pp. 99-193; Directory of mineral producers of Michigan for 1912, pp. 194-248.
5. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1913 and prior years: Mich. Geol. and Biol. Survey, pub. 16, geol. ser. 13, 1914. 150 pp. Contains: The Michigan copper industry in 1913, by R. E. Hore, pp. 11-37; The iron ore reserves of Michigan, pp. 39-77; Non-metallic minerals, by R. A. Smith, pp. 81-128; Directory of mineral producers of Michigan for 1913, pp. 129-141.
6. Biennial report of the director, 1912-1914: Mich. Geol. and Biol. Survey, pub. 17, geol. ser. 14, map, 1914. 104 pp.
7. Michigan iron-ore reserves; methods of appraisal for taxation: Lake Superior Min. Inst. Proc., v. 19, pp. 229-244, 1914.
8. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1914 and prior years: Mich. Geol. and Biol. Survey, pub. 19, geol. ser. 16, 24 figs., 18 pls., 1915. 359 pp. Contains: Michigan copper deposits, by R. E. Hore, pp. 21-161; The copper industry in 1914, by W. E. Hopper, pp. 165-220; Statistical tables, iron ore, pp. 222-243; Non-metallic minerals, including coal in Michigan, by R. A. Smith, pp. 247-329; Directory of mineral producers of Michigan for 1914, pp. 334-351.
9. (and Barrett, L. P.) Evidence of the Middle-Upper Huronian unconformity in the quartzite hills at Little Lake, Michigan: Jour. Geol., v. 22, no. 6, pp. 574-581, 1914; Mich. Geol. and Biol. Survey, pub. 18, geol. ser. 15, pp. 153-159, 1915.
10. Relative to an extension of the Menominee iron range eastward from Waucedah to Escanaba, Michigan: Econ. Geol., v. 9, no. 3, pp. 236-238, 1914; Mich. Geol. and Biol. Survey, pub. 18, geol. ser. 15, pp. 161-164, 1915.
11. Correlation and structure of the pre-Cambrian formations of the Gwinn iron-bearing district of Michigan: Jour. Geol., v. 22, no. 6, pp. 560-573,

- map, 1914; Mich. Geol. and Biol. Survey, pub. 18, geol. ser. 15, pp. 141-152, 1915.
12. (and Barrett, L. P.) Contributions to the pre-Cambrian geology of northern Michigan and Wisconsin: Mich. Geol. and Biol. Survey, pub. 18, geol. ser. 15, pp. 13-164, 11 figs., 12 pls., incl. maps, 1915.
 13. (and Barrett, L. P.) A revision of the sequence and structure of the pre-Keweenaw formations of the eastern Gogebic iron range of Michigan: Mich. Geol. and Biol. Survey, pub. 18, geol. ser. 15, pp. 33-61, map, 1915; in part, with discussion by C. K. Leith and R. C. Allen, Jour. Geol., v. 23, no. 8, pp. 689-729, map, 1915.
 14. (and Smith, R. A.; Barrett, L. P.) Geological map of Michigan: Mich. Geol. and Biol. Survey, pub. 23, geol. ser. 19, scale 1:750,000, 1916.
 15. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1915 and prior years: Mich. Geol. and Biol. Survey, pub. 21, geol. ser. 17, illus., 1916. 402 pp. Contains: Michigan copper industry in 1915, by W. E. Hopper, pp. 11-56; Iron industry, pp. 57-100; Limestones of Michigan, by R. A. Smith, pp. 101-311; Miscellaneous non-metallic minerals, by R. A. Smith, pp. 315-361; Directory of mineral producers in Michigan for 1915, pp. 365-383.
 16. (and others) Biennial report of the Director, 1914-1916, and report on retracement and permanent monumenting of the Michigan-Ohio boundary: Mich. Geol. and Biol. Survey, pub. 22, geol. ser. 18, illus., 1917. 118 pp.
 17. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1916 and prior years: Mich. Geol. and Biol. Survey, pub. 24, geol. ser. 20, 7 figs., 1917. 291 pp. Contains: Michigan copper industry in 1916, by W. E. Hopper, pp. 15-65; Iron ore industry, pp. 67-112; Portland cement industry, by R. A. Smith, pp. 117-151; Miscellaneous non-metallic minerals, by R. A. Smith, pp. 155-205; Results of deep borings, by R. A. Smith, pp. 211-256; Directory of mineral producers in Michigan for 1916, pp. 257-276.
 18. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1917 and prior years: Mich. Geol. and Biol. Survey, pub. 27, geol. ser. 22, 2 figs., 1918. 225 pp. Contains: Michigan copper industry in 1917, by W. E. Hopper, pp. 13-76; Iron ore industry, pp. 77-131; Non-metallic minerals of Michigan, by R. A. Smith, pp. 135-192; Directory of mineral producers in Michigan for 1917, pp. 195-212.
 19. (executive officer) Board of Geological Survey Report to Budget Commission 1918.
 20. (and Arnold, Ralph) Principles of mining taxation: A.I.M.E. Trans., v. 61, pp. 649-661, 1920.
 21. (director) Mineral resources of Michigan with statistical tables of production and value of mineral products for 1918 and prior years: Mich. Geol. and Biol. Survey, pub. 29, geol. ser. 24, 4 figs., 1920. 214 pp. Contains: Michigan copper industry in 1918, by L. P. Barrett, pp. 15-57; Michigan iron ore industry in 1918, by O. R. Hamilton, pp. 61-114; Non-metallic minerals industry of Michigan 1918, by H. M. Martin, pp. 117-181; Directory of mineral producers in Michigan for 1918, pp. 183-200.
 22. Correlation of formations of Huronian group in Michigan [with discussion]: A.I.M.E. Bull., no. 135, pp. 2579-2594, 1 fig., Sept. 1919; Bull. no. 156, pp. 3113-3115, Dec. 1919; Trans., v. 63, pp. 188-212, 1920; Min. and Met., v. 1, no. 157, sec. 12, pp. 1-6, Jan. 1920.

23. (and Martin, H. M.) A brief history of the Geological and Biological Survey of Michigan; 1837 to 1872 by R. C. Allen, 1872 to 1920 by H. M. Martin: Mich. Hist. Mag., v. 6, no. 4, pp. 675-750, portraits, 1922; in part, by H. M. Martin, Mich. Acad. Sci. Papers (1921), v. 1, pp. 224-247, 2 pls., 1923.

Alty, Stella West

1. Secondary crystallization of tourmaline in Lower Devonian sediments in Michigan, U.S.A. [abs.]: British Assoc. Adv. Sci. Rpt., Ann. Mtg., 1932 (102d year), p. 330, 1932; Pan Am. Geol., v. 58, no. 3, pp. 235-236, Oct. 1932.
2. Report of an investigation of Sylvania rocks in oil wells of the Michigan Basin: Mich. Acad. Sci. Papers (1932), v. 18, pp. 289-300, 2 figs., 1933. Report discusses an attempt at correlation by mineral counts and insoluble residues.
3. Some properties of authigenic tourmaline from Lower Devonian sediments: Am. Mineralog., v. 18, no. 8, pp. 351-355, 1 fig., Aug. 1933.

Anderson, Alfred L.

- *1. Memorial of Heinrich Ries: Am. Mineralog., v. 37, nos. 3-4, pp. 264-275, portrait, Mar.-Apr. 1952.

Andress, John Edward

1. Michigan's copper country, Keweenaw Peninsula, Lake Superior region: Rocks and Minerals, v. 19, no. 1, pp. 3-6, Jan. 1944.

Andrews, Roger M.

1. Department of mineral statistics, annual report 1909, Menominee, 1910. 154 pp.

Anonymous

1. Atlas of Tuscola County, Michigan: Published by H. S. Hadsell, Vassar, and E. R. Cookingham, Caro, Tuscola County, Mich., no date.
2. A memoir of Dr. Douglass Houghton; late State Geologist, and Professor of Geology and Chemistry in the University of Michigan: Am. Jour. Sci., ser. 2, v. 5 (v.55), no. 14, pp. 217-227, 1848.
3. The silver of the Lake Superior mineral region: Min. Mag., v. 1, pp. 447-454, 1853.
4. The copper mines of Lake Superior: Hyde Park, Printed at Norfolk County Gazette Office, 1873.
5. Gogebic iron ore mines: Eng. Min. Jour., v. 43, p. 182, 1887.
6. Atlas of Genesee County, Michigan: Published by E. R. Cookingham, Caro, Mich., 1889.
7. Alexander Winchell, an editorial tribute: Am. Geol., v. 9, no. 2, pp. 71-148, 1892.
8. Geological writings of Alexander Winchell: Geol. Soc. Am. Bull., v. 5, pp. 557-564, 1894. A bibliography of some of Alexander Winchell's articles. Supplementary lists of the writings of Alexander Winchell: Am. Geol., v. 9, pp. 273-276, 1892.
9. The county of Bay, Michigan; maps, history, illustrations and statistics: Bay City, D. A. Bullock & Co., 1896.
10. The Lake Huron region; an early geographical sketch of Lake Huron with accompanying map of interest: Mich. Miner, v. 3, no. 12, pp. 9-14, Nov. 1901.
11. Shaft sinking for salt [Detroit]: Eng. Min. Jour., v. 80, pp. 972-973, 1 fig., Nov. 25, 1905. Describes the encountering of large quantities of strong sulphur water. M. L. F.

12. Waterworks of Saugatuck, Mich.: Eng. Rec., v. 52, pt. II, no. 24, pp. 665-666, Dec. 9, 1905. Detailed description of the water supply of this village, which is obtained from four wells driven along the bank of the Kalamazoo River. M. L. F.
13. Experimental work with wells at Battle Creek, Michigan: Eng. Rec., v. 51, pt. II, no. 17, p. 502, Apr. 29, 1905. Describes the sinking of wells, the materials passed through, the flow, analyses of the water, and the effect of pumping on the level of the water table at Battle Creek, Mich. The Marshall sandstone is mentioned as containing water-bearing strata. M. L. F.
14. Raphael Pumpelly: A.I.M.E. Trans., v. 70, p. 1228, 1924.
15. Obituary of "Jake" Poindexter: Mich. Conserv., v. 14, no. 1, Jan. 1945.

Archibald, Ralph S.

1. Exploration for iron ore in the Lake Superior district: Lake Superior Min. Inst. Proc., v. 24, pp. 280-288, 1925.
2. (and Chabot, L. S., Jr.) Development, equipment and operation of the Blueberry mine, Marquette iron district: A.I.M.E. Trans., v. 126, pp. 9-26, 9 figs., 1937.

Armstrong, F. H.—See Kelly, William, 4; Orbison, T. W., 1.

Arnold, Chester Arthur

1. A petrified lepidophyte cone from the Pennsylvanian of Michigan: Am. Jour. Bot., v. 17, no. 10, pp. 1028-1032, 3 figs., Dec. 1930.
2. Cordaitan wood from the Pennsylvanian of Michigan and Ohio: Bot. Gaz., v. 91, no. 1, pp. 77-87, 10 figs., Mar. 1931.
3. On *Callixylon newberryi* (Dawson) Elkins et Wieland: Mich. Univ. Mus. Paleont. Contr., v. 3, no. 12, pp. 207-232, 7 pls., 9 figs., Dec. 18, 1931.
4. A sphenopterid fructification from the Pennsylvanian of Michigan: Bot. Gaz., v. 94, no. 4, pp. 821-825, 3 figs., 1933.
5. A preliminary study of the fossil flora of the Michigan coal basin: Mich. Univ. Mus. Paleont. Contr., v. 4, no. 11, pp. 177-204, 7 pls., map, Jan. 15, 1934.
6. Paleobotanical studies in Michigan: Mich. Acad. Sci. Papers (1937), v. 23, pp. 95-99, 1938.
7. A heterosporous species of *Bowmanites* from the Michigan coal basin: Am. Jour. Bot., v. 31, no. 8, pp. 466-469, 9 figs., Oct. 1944; abs., suppl., p. 7, 1944.
8. (and Stanley, G. M.) Pennsylvanian plants from the glacial drift near Jackson, Michigan: Mich. Acad. Sci. Papers (1945), v. 31, pp. 247-250, index map, 1947.
9. Fossil flora of the Michigan coal basin: Mich. Univ. Mus. Paleont. Contr., v. 7, no. 9, pp. 131-269, 34 pls., 2 figs., maps, Dec. 29, 1949.
10. Megaspores from the Michigan coal basin: Mich. Univ. Mus. Paleont. Contr., v. 8, no. 5, pp. 59-111, 18 pls., June 2, 1950. Contains systematic descriptions of 15 species of spores, six of which are new, from the coals and shales of the Saginaw and Grand River groups of Pennsylvanian age. Sections on the classification and terminology of spores and on the technique of examination are included. U.S.G.S.

Arnold, Ralph—See Allen, R. C., 20.

Ash, Arlington D.—See U. S. Geological Survey, 12.

Ashley, George H.

- *1. (and Fisher, C. A.) The valuation of public coal lands: U. S. Geol. Survey Bull. 424, 1910. 75 pp.
- *2. Cannel coal in the United States: U. S. Geol. Survey Bull. 659, 1918. 127 pp. Mentions the occurrence of cannel coal in Michigan (p. 69).

Atwater, Gordon Ingham

1. A summary of the stratigraphy and structure of the Gogebic iron range. Michigan and Wisconsin, in Kan. Geol. Soc. [Guidebook], *Upper Mississippi Valley*, 9th Ann. Field Conf., pp. 417-420, 4 figs., 1935.
2. Correlation of the Tyler and the Copps formations of the Gogebic iron district: Geol. Soc. Am. Bull., v. 49, no. 2, pp. 151-194, 2 pls., 5 figs., incl. geol. map, Feb. 1, 1938; abs., Proc. (1935), p. 63, June 1936.

Averitt, Paul

1. (and Berryhill, L. R.) Coal resources of the United States; a progress report, Nov. 1, 1950: U. S. Geol. Survey Circ. 94, illus., Dec. 1950. 33 pp. Continued work has resulted in a re-appraisal of coal reserves, with more detailed estimates of the reserves of Michigan . . . U.S.G.S.

Avery, William M.

1. Sand and gravel plant reflects owner's mechanical ingenuity: Pit and Quarry, v. 46, no. 2, pp. 97-100, Aug. 1953. Discusses operation of a gravel pit near Traverse City, Michigan.
2. Aetna Portland Cement adds fourth kiln at Bay City: Pit and Quarry, v. 47, no. 1, pp. 71-74, July 1954.

Ayer, F. A.

1. White Pine mine, potential major copper producer: Min. Cong. Jour., v. 36, pp. 26-30, 55, 1950.

Ayres, Vincent L.—See also Snelgrove, A. K., 2.

1. (and Higgins, W. D.) Differentiation in xenolithic lamprophyre dikes at Marquette, Michigan: Jour. Geol., v. 47, no. 6, pp. 561-582, 10 figs., Aug.-Sept. 1939.
2. Stilpnomelane, nontronite, and halloysite from northern Michigan [abs.]: Am. Mineralog., v. 24, no. 12, pt. II, p. 2, Dec. 1939; v. 25, no. 3, p. 203, Mar. 1940.
3. Mineral notes from the Michigan iron country: Am. Mineralog., v. 25, no. 6, pp. 432-434, June 1940.

Bacon, L. O.

1. (and Wyble, D. O.) Gravity investigations in the Iron River-Crystal Falls mining district of Michigan: A.I.M.E. Trans., v. 193 (mining branch), pp. 973-979, 7 figs., 1952; Min. Eng., Oct. 1952.

Bacon, Leslie R.

1. Minerals in the dolomite at Monroe, Michigan: Mich. Mineralog. Soc. Yearb. 1946, pp. 10-11, 1 fig., 1946.

Badenoch, Byrne M.—See Case, E. C., 5.

Bagg, Rufus Mather

- *1. Well, well, well! The story of three extraordinary holes that were dug in the ground: Nat. Hist., v. 53, no. 10, pp. 455, 483, 1 fig., Dec. 1944. This article, written in popular style, briefly discusses the George Fuhri-man well, Rapid River, Michigan.

Baker, Frank Collins

1. Notes on postglacial Mollusca; I Emmet Co., Michigan; II Waukesha Co., Wisconsin: *Nautilus*, v. 27, pp. 7-8, 68, 1913.

Baldwin, Donald Carl

1. Late Pleistocene clays of the Sault Ste. Marie area and vicinity: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Ill., Urbana, 1951. 60 pp. Unpublished.

Ball, Max Waite

1. (and others) Shoestring gas fields of Michigan, in *Stratigraphic type oil fields*, Levorsen ed., pp. 237-266, 14 figs., incl. index and isopach maps: *Am. Assoc. Petrol. Geol.*, 1941; abs., *Oil and Gas Jour.*, v. 39, no. 47, p. 66, Apr. 3, 1941; *Am. Assoc. Petrol. Geol. Bull.*, v. 25, no. 5, pp. 942-943, May 1941.

Ballard, Norval

1. Stratigraphy and structural history of east-central United States: *Am. Assoc. Petrol. Geol. Bull.*, v. 22, no. 11, pp. 1519-1559, 3 figs., correlation tables, Nov. 1938.

Balsley, James Robinson, Jr.—See also Dutton, C. E., 5; U. S. Geological Survey, 13; Wier, K. L., 3.

1. (and James, H. L.; Wier, K. L.) Aeromagnetic survey of parts of Baraga, Iron and Houghton counties, Michigan, with preliminary geologic interpretation: *U. S. Geol. Survey, Geophys. Inv.*, profiles and text, 1949.

Barnes, George Orville

1. Field notes . . . on the Ontonagon district [Lake Superior region]: *U. S. 31st Cong., 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III*, pp. 627-636, 1849.
2. Report [on field work in Keweenaw Point region, Lake Superior]: *U. S. 31st Cong., 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III*, pp. 509-514, 1849.

Barrett, Leslie Park—See also Allen, R. C., 9, 12, 13, 14, 21; Smith, R. A., 4, 7, 8; U. S. Geological Survey, 13.

1. Michigan iron mining industry: *Lake Superior Min. Inst. Proc.*, v. 24, pp. 182-199, 1925.
2. Huronian slate areas of northeastern Baraga County [abs.]: *Geol. Soc. Am. Bull.*, v. 38, no. 1, p. 117, Mar. 30, 1927; *Pan Am. Geol.*, v. 47, no. 1, pp. 68-69, Feb. 1927.
3. (and Pardee, F. G.; Osgood, Wayland) Geological map of Iron County, scale 1 inch=2 miles: *Mich. Geol. Survey*, 1929.

Barris, Willis Hervey

1. Description of some new blastoids from the Hamilton group: *Ill. Geol. Survey*, v. 7, pp. 357-364, illus., 1883; *Davenport Acad. Sci. Proc.*, v. 4, pp. 88-94, illus., 1884.
2. Description of some new crinoids from the Hamilton group [of Michigan]: *Davenport Acad. Sci. Proc.*, v. 4, pp. 98-101, illus., 1884.

Bartlett, Harley Harris

1. Fossils of the Carboniferous coal pebbles of the glacial drift at Ann Arbor: *Mich. Acad. Sci. Papers* (1923), v. 9, pp. 11-28, 23 pls., Mar. 1929.

Bartley, Melville William—See Roberts, H. M., 1.**Bassett, Charles Fernando**

1. Stratigraphy and paleontology of the Dundee limestone of southeastern Michigan: *Geol. Soc. Am. Bull.*, v. 46, no. 3, pp. 425-462, 1 fig., 7 pls., Mar. 31, 1935; abs., *Proc.* (1933), p. 379, June 1934. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, 1933.

Bassler, Ray S.

- *1. Bibliographic index of American Ordovician and Silurian fossils: *U. S. Natl. Mus. Bull.* 92, 2 v., 1915. 1521 pp.

Bath, Gordon D.

1. Magnetic base stations in Lake Superior iron districts: *U. S. Bur. Mines Rpt. Inv.* 4804, Sept. 1951. 16 pp.

Baerman, Hilary

1. Remarks on the copper mines of the state of Michigan: *Geol. Soc. London Quart. Jour.*, v. 22, pp. 448-463, 1866; abs., *Geol. Mag.*, v. 3, pp. 225-226, 1866.

Baxter, Charles H.

1. Diversion of the Sturgeon River at the Loretto mine: *Lake Superior Min. Inst. Proc.*, v. 16, pp. 168-170, 1911.
2. (and others) Mining methods on the Menominee iron range: *Lake Superior Min. Inst. Proc.*, v. 21, pp. 8-60, 258-259, illus., 1917. Contains: Methods of mining at the Chapin mine, by W. C. Gordon, pp. 9-24; The block-caving system used at the Pewabic mine, by A. J. Myers, pp. 25-28; The method of mining at the Loretto mine, by C. H. Baxter, pp. 29-32; Mining methods in the Iron River district of Michigan, by Rudolph Ericson, pp. 33-39; The method of opening and mining the Davidson No. 2 mine, by Rudolph Ericson, pp. 40-45; The sub-stopping method of mining as used at the Chatham mine, by F. J. Smith, pp. 46-49; Mining methods in the Crystal Falls, Amasa and Florence districts, by M. E. Richards, pp. 50-51; Sub-stopping at the Amasa-Porter mine, by M. E. Richards, pp. 52-55; Mining methods in the Florence district, by J. M. Riddell, pp. 56-60; Mining methods used at the Bristol mine, Crystal Falls, Michigan, by Arvid Bjork, pp. 258-259.

Bay, James William

1. Abandoned channels of the lower Huron River, Michigan: *Mich. Acad. Sci. Papers* (1934), v. 20, pp. 435-438, map, 1935.
2. Glacial-lake levels indicated by terraces of the Huron, Rouge, and Clinton rivers, Michigan: *Mich. Acad. Sci. Papers* (1936), v. 22, pp. 411-419, 4 pls., 2 figs., incl. geol. and index maps, 1937.
3. Glacial history of the streams of southeastern Michigan: *Cranbrook Inst. Sci. Bull.* 12, 4 pls., 11 figs., incl. geol. maps, May 1938. 68 pp.
4. Minerals in the sandstone at Rockwood, Michigan: *Mich. Mineralog. Soc. Yearb.* 1946, pp. 8-9, 1 fig., 1946.

Bayley, William Shirley—See also Clements, J. M., 5; Van Hise, C. R., 15, 16.

- *1. The basic massive rocks of the Lake Superior region: *Jour. Geol.*, v. 1, no. 5, pp. 433-456, no. 6, pp. 587-596, no. 7, pp. 688-716, 1893; v. 2, no. 8, pp. 814-825, 1894; v. 3, no. 1, pp. 1-20, 1895.
2. The geological features of the Menominee iron district of Michigan [abs.]: *Am. Assoc. Adv. Sci. Proc.*, v. 49, pp. 189-190, 1900; *Sci.*, new ser., v. 12, no. 313, pp. 992-993, 1900.
3. The Menominee iron-bearing district of Michigan: *U. S. Geol. Survey Mon.* 46, maps, 1904. 513 pp.

Beauchair, W. A.

1. Paleontology and stratigraphy of two well cores in the Middle Devonian rocks of Clare County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1951. Unpublished.

Becker, Hans

1. Die präkambrische Geschichte des Lake Superior-Gebietes, Nordamerika [The pre-Cambrian history of the Lake Superior area, North America]: Geologische Rundschau, Band 22, Heft 6, pp. 385-411, 4 figs., 1 pl., incl. map, Dec. 12, 1931.

Becker, Ralph E.

1. Chemical variations in Dundee brine and their relation to structure: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, Sept. 1940. Unpublished.

Beers, C. M.—See Steele, G. E., 1.**Beers, Roland F.**

1. Radioactivity and organic content of some Paleozoic shales: Am. Assoc. Petrol. Geol. Bull., v. 29, no. 1, pp. 1-22, Jan. 1945. Contains analyses of Coldwater, Sunbury, Antrim and adjacent formations.

Bell, Robert

1. Notes on a visit to Michigan, U.S.A. regarding geological nomenclature. Geol. Sur. of Canada. Pub. 353, 1894.
2. The geological history of Lake Superior: Can. Inst. Trans., v. 6, pp. 45-60, 1899.

Bell, William H.

1. Mineral lands of the upper Mississippi: U. S. 28th Cong., 1st Sess., House Ex. Doc. 43, 1844. 52 pp.

Benedict, A. C.

1. The Bayport, Michigan quarries: Stone, v. 17, pp. 153-164, 1898.

Benedict, C. H.

1. (and Kenny, H. C.) Ammonia leaching of Calumet and Hecla tailings: A.I.M.E. Trans., v. 70, pp. 595-610, 1924.
2. Calumet & Hecla reclamation plant: Lake Superior Min. Inst. Proc., v. 24, pp. 68-88, 1925.
3. Milling method and cost at the Conglomerate mill of the Calumet and Hecla Consolidated Copper Co.: U. S. Bur. Mines Inf. Circ. 6364, 11 figs., 1930. 22 pp. Gives detailed account of various steps in milling practice at establishment with capacity of 33,000 tons of ore daily. U.S.B.M.
4. Methods and costs of treatment at the Calumet and Hecla reclamation plant: U. S. Bur. Mines Inf. Circ. 6357, 3 figs., 1930. 11 pp. Describes milling methods evolved during 15 years of operation. Plant discussed is one of the largest devoted to treatment of concentrator wastes. U.S.B.M.

Bennett, W. R.—See Lane, A. C., 68.**Bergquist, Stanard Gustaf—See also Poindexter, O. F., 12.**

1. Some aspects of marl deposits in Oceana County: Mich. Acad. Sci. Papers (1927), v. 8, pp. 279-284, 1928; Thesis for Degree of Master of Science, entitled Report on marl deposits of Oceana County, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1927.

2. The occurrence of glauconite in the Hermansville formation of Alger County, Michigan: Mich. Acad. Sci. Papers (1929), v. 12, pp. 231-237, 1930.
3. Surface geology of Luce County, Michigan: Mich. Acad. Sci. Papers (1930), v. 14, pp. 437-452, 1 fig., 6 pls., incl. map, 1931.
4. Glacial geology of Iron County, Michigan: Mich. Acad. Sci. Papers (1931), v. 16, pp. 363-372, 7 pls., incl. maps, 1932.
5. Unconformities in the valley-train deposition cycle in northern Michigan [abs.]: Geol. Soc. Am. Proc. (1933), p. 65, 1934.
6. Valley-train deposits in the Northern Peninsula of Michigan: Mich. Acad. Sci. Papers (1934), v. 20, pp. 439-447, 4 pls., incl. geol. map, 1935.
7. The Pleistocene history of the Tahquamenon and Manistique drainage region of the Northern Peninsula of Michigan, in *Occasional papers on the geology of Michigan*: Mich. Geol. Survey, pub. 40, geol. ser. 34, pt. I, pp. 7-148, 7 pls., 59 figs., incl. geol. and index maps, 1936; rev., Am. Assoc. Petrol. Geol. Bull., v. 21, no. 12, pp. 1597-1600, Dec. 1937. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, 1933.
8. The Grand Sable dunes on Lake Superior, Alger County, Michigan: Mich. Acad. Sci. Papers (1935), v. 21, pp. 429-438, 5 pls., 4 figs., incl. geol. map, 1936.
9. Mineral resources, in *Michigan Today*, pp. 65-109: Mich. Dept. Public Instruction, Bull. no. 307, 1937.
10. The Cambrian-Ozarkian contact in Alger County, Michigan: Mich. Acad. Sci. Papers (1936), v. 22, pp. 421-435, 8 pls., 1 fig., incl. geol. and index maps, 1937.
11. Relic flora in relation to glaciation in the Keweenaw Peninsula of Michigan: Sci., new ser., v. 86, no. 2220, pp. 53-55, July 16, 1937.
12. Presidential Address, "Natural gas developments in Michigan": Mich. Acad. Sci. 40th Ann. Rpt., pp. 47-68, Mar. 1938.
13. The occurrence of spore coal in the Williamston basin, Michigan: Jour. Sed. Petr., v. 9, no. 1, pp. 14-19, 7 figs., incl. index map, Apr. 1939.
14. Surface geology of Montmorency County, Michigan: Mich. Acad. Sci. Papers (1939), v. 25, pp. 453-463, 8 figs., incl. maps, 1940.
15. Glacial evolution of Michigan [abs.]: Geol. Soc. Am. Bull., v. 52, no. 12, pt. II, p. 2022, Dec. 1, 1941.
16. The distribution of drumlins in Michigan: Mich. Acad. Sci. Papers (1941), v. 27, pp. 451-464, 2 figs., 1942. Contains a bibliography on drumlins.
17. New drumlin areas in Cheboygan and Presque Isle counties, Michigan: Mich. Acad. Sci. Papers (1942), v. 28, pp. 481-485, index map, 1943.
18. Memorial to Frank Leverett: Sci., v. 99, no. 2573, pp. 312-313, Apr. 21, 1944.
19. High-level clays in the Port Huron morainic system in Michigan [abs.]: Geol. Soc. Am. Bull., v. 57, no. 12, pt. II, p. 1263, Dec. 1946; Proc. (1947), p. 264, 1946.
20. Glacial evolution of the Grand River in Michigan [abs.]: Geol. Soc. Am. Bull., v. 59, no. 12, pt. II, p. 1311, Dec. 1948; Proc. (1948), p. 7, 1949.
21. Pleistocene complex in the northern rim of the Southern Peninsula of Michigan [abs.]: Geol. Soc. Am. Bull., v. 63, no. 12, pt. II, pp. 1234-1235, Dec. 1952.
22. An unusual occurrence of varved deposits in southwestern Michigan: Mich. Acad. Sci. Papers (1950), v. 36, pp. 197-202, 1 fig., 2 pls., 1952.

23. Red drift of the Manistee moraine in Michigan [abs.]: Geol. Soc. Am. Bull., v. 64, no. 12, pt. II, pp. 1394-1395, Dec. 1953.

Berkey, Charles P.

- *1. Paleogeography of Saint Peter time: Geol. Soc. Am. Bull., v. 17, 6 figs., 1 pl., pp. 229-250, June 8, 1906.

Berner, Paul C.

1. The petrography and structure of "Bald Knob", Huron Mountains, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Wayne Univ., Detroit, Jan. 1952. Unpublished.

Berner, Ruth E.

1. New species of *Favosites* from the Niagaran series of Michigan: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, 1930. Unpublished.

Berryhill, Louise Russell—See Averitt, Paul, 1.

Berteling, John F.

1. Notes on mining the North Palms ore body: Lake Superior Min. Inst. Proc., v. 25, pp. 52-62, illus., 1926.

Best, Byron G.

1. The Gogebic range mines of the Oliver Iron Mining Company: Lake Superior Min. Inst. Proc., v. 25, pp. 75-111, 22 figs., 1926.

Beutner, Edward Louis—See also Kelly, W. A., 4.

1. Intrusive rocks of the Marenisco range, Michigan and Wisconsin: Thesis for Degree of Master of Science, Dept. of Geol., Northwestern Univ., Evanston, Ill., 1932. 51 pp. Unpublished.

Bhatt, Kireet J.

1. Geology of Mount Bohemia, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. Eng., Mich. College Min. Tech., Houghton, 1952. 53 pp. Unpublished.

Biddle, H. C.

1. The deposition of copper by solutions of ferrous salts: Jour. Geol., v. 9, no. 5, pp. 430-436, 1901. An explanation of the genesis of the large deposits of native copper.

Bignell, L. G. E.

1. Michigan limestone formations suited for salt water disposal: Oil and Gas Jour., v. 36, no. 30, pp. 55, 57, Dec. 9, 1937.

Bigsby, John Jeremiah

1. Geological and mineralogical observations along northwest portion of Lake Huron: Am. Jour. Sci., v. 3, pp. 254-272, 1821.
2. Notes on the geography and geology of Lake Huron [region]: Geol. Soc. London Trans., ser. 2, v. 1, pp. 175-209, 1824.
3. Notes on the geography and geology of Lake Superior [region]: Quart. Jour. Sci., v. 18, pp. 1-34, 228-269, 1824-1825; abs., Bull. des sciences naturelles et de geologie, v. 7, pp. 8-13, 1826.
4. On the physical geography, geology, and commercial resources of Lake Superior [region]: Royal Inst. Great Britain Proc., v. 1, pp. 154-162, 1852; Edinburgh, New Philos. Jour., v. 53, pp. 55-62, 1852.
5. Region of Lake Superior: Am. Jour. Sci., ser. 2, v. 14 (v.64), no. 40, p. 138, 1852.

Billings, Norman F.—See also U. S. Geological Survey, 12.

1. Ways sought to control wave action: Mich. Conserv., v. 15, no. 7, pp. 5, 11, Aug. 1946. Article written in popular style.
2. Relation of geology to ground water in Michigan: Am. Water Works Assoc. Jour., v. 38, no. 12, pp. 1373-1379, geol. map., Dec. 1946.
3. Is it true what they say about water? Mich. Conserv., v. 18, nos. 4-5, July-Aug., Sept.-Oct. 1949; v. 19, nos. 1-2, Jan.-Feb., Mar.-Apr. 1950. Article written in popular style.

Bingham, Marjorie T.

1. Surface formations of Oakland County, in *The flora of Oakland County, Michigan*: Cranbrook Inst. Sci. Bull. 22, map, scale approx. 1 inch = 2 miles, May 1945.

Birch, Francis

1. Thermal conductivity, climatic variations, and heat flow near Calumet, Michigan: Am. Jour. Sci., v. 252, no. 1, pp. 1-25, 5 figs., Jan. 1954.

Birdseye, C. H.

1. (and others) Triangulation and primary traverse, 1916-1918: U. S. Geol. Survey Bull. 709, 1923. 914 pp. Contains: Primary traverse in Michigan, pp. 187-209 (Bull. 709 F).

Birkinbine, John

1. The resources of the Lake Superior region: A.I.M.E. Trans., v. 16, pp. 168-203, 1887.
2. The iron ore supply: A.I.M.E. Trans., v. 27, pp. 519-528, 1897.
- *3. The United States iron industry from 1871-1910: A.I.M.E. Trans., v. 42, pp. 222-235, 1911.
- *4. The reserves of iron ore for the United States: A.I.M.E. Trans., v. 50, pp. 197-203, 1914.

Bishop, Margaret Stearns—See also Stearns, M. D., 1, 2.

1. Isopachous studies of Ellsworth to Traverse limestone section of southwestern Michigan: Am. Assoc. Petrol. Geol. Bull., v. 24, no. 12, pp. 2150-2162, 8 figs., incl. index and isopach maps, Dec. 1940; abs., Oil and Gas Jour., v. 38, no. 48, p. 50, Apr. 11, 1940.

Bjork, Arvid—See Baxter, C. H., 2.

Blackwell, Frank—See also Olsen, O. E., 1.

1. The sinking of a vertical shaft at the Palms mine of the Newport Mining Co., at Bessemer, Michigan [with discussion]: Lake Superior Min. Inst. Proc., v. 19, pp. 116-130, illus., 1914.

Blake, W. P.

1. The mass copper of the Lake Superior mines, and the method of mining it: A.I.M.E. Trans., v. 4, pp. 110-112, 1876.

Blandy, John F.—See also Williams, C. P., 1.

1. Topography with especial reference to the Lake Superior copper district: A.I.M.E. Trans., v. 1, pp. 75-82, 1873.
2. Stamp mills of Lake Superior: A.I.M.E. Trans., v. 2, pp. 208-215, 1874.
3. The origin of the native copper in the Michigan deposits: Eng. Min. Jour., v. 70, pp. 278-279, 1900.

Bond, William, Capt.

1. Sinking "C" shaft, West Vulcan: Lake Superior Min. Inst. Proc., v. 2, pp. 105-110, 1894.

Booth, John C.

1. (and Hulbert, E. J.) Geological and topographical map of the mineral district of Lake Superior, Michigan, New York, 1855.

Borie, Jules

1. Notice sur le lac Supérieur et ses mines de cuivre de la rive américaine [Notice of Lake Superior and the copper mines of the American shore]: Société de l'industrie minérale Bull. 6, pp. 233-284, 1860; Bull. 7, pp. 185-251, 1861; Bull. 8, pp. 270-271, 1862; *Allegemeine berg-und hüttenmännische Zeitung* 4, pp. 448-450, 457-460, 469-471, 1862.

Boss, C. M.

1. Some dike features of the Gogebic iron range [with discussion]: *A.I.M.E. Trans.* (1897), v. 27, pp. 556-563, 978, 1898.

Bowers, R. W.

1. Method of sampling ores on the Marquette range: *A.I.M.E. Trans.*, v. 72, pp. 657-658, 1925.

Bowman, Isaiah

1. A typical case of stream capture in Michigan: *Jour. Geol.*, v. 12, no. 4, pp. 326-334, map, 1904.

Bownocker, J. A.—See Campbell, M. R., 1.**Brabb, Earl E.**

1. Description of Whittlesey beach sediments, Ann Arbor area, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1952. Unpublished.

Bradish, Alva

1. Memoir of Douglass Houghton, first State Geologist of Michigan; with an appendix containing reports or abstracts of the first geological survey, a chronological statement of the progress of geological exploration in Michigan, portrait, Detroit, 1889. 302 pp.

Brady, Michael B.

1. A petrographic and structural study of an area in the Huron Mountains, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Wayne Univ., Detroit, June 1952. Unpublished.

Branson, E. B.

- *1. Origin of thick gypsum and salt deposits: *Geol. Soc. Am. Bull.*, v. 26, pp. 231-242, 5 figs., June 28, 1915.

Brater, Ernest Frederick

1. Beach erosion in Michigan: *Mich. Univ., Eng. Research Inst., Lake Hydraulics Lab., Research Pub. 2*, illus., Nov. 1, 1950. 39 pp. General comments and notes on beach erosion processes, waves, currents, protective and remedial measures, and research at the Lake Hydraulics Laboratory, with particular attention to the problems of Michigan shore lines. U.S.G.S.

Bretz, J. Harlen

1. Glacial features of Genesee County: *The Schoolmaster*, pp. 482-487, 530-539, Feb.-Mar., no date.
2. Geology of the beach phenomena of Lake Michigan [with discussion]: *Shore and Beach*, v. 12, no. 2, pp. 31-40, Oct. 1944.
3. The stages of Lake Chicago; their causes and correlations: *Am. Jour. Sci.*, v. 249, no. 6, pp. 401-429, 2 figs., June 1951.

4. Causes of the glacial lake stages in Saginaw basin, Michigan: *Jour. Geol.*, v. 59, no. 3, pp. 244-258, 3 figs., 1951.
5. Glacial Grand River, Michigan: *Mich. Acad. Sci. Papers* (1952), v. 38, pp. 359-382, 4 figs., 1953.

Brewer, Carl

1. List of iron mining properties of Michigan and Wisconsin: *Lake Superior Min. Inst. Proc.*, v. 19, pp. 252-268, 1914.

Briggs, Louis I., Jr.—See also Dellwig, L. F., 1.

1. (and Lucas, P. T.) Mechanism of Salina salt deposition in the Michigan Basin [abs.]: *Geol. Soc. Am. Bull.*, v. 65, no. 12, pt. II, p. 1233, Dec. 1954.

Brigham, Edward Morris

1. Concerning a granite pebble included in a varved pre-Cambrian sediment: *Mich. Acad. Sci. Papers* (1931), v. 16, pp. 373-378, 1 fig., 1 pl., 1932.

Brinsmade, Robert Bruce

1. The great iron fields of the Lake Superior district: *Min. Sci.*, v. 58, pp. 425-427, 444-446, 465-467, 484-485, 505-507, 528-530, 1908; v. 59, pp. 127-129, 149-151, 304-306, 325-327, map, 1909.
2. The Michigan copper mines and methods: *Min. World*, v. 32, pp. 549-552, 1910.

Bristol, T. W.—See Houghton, Jacob, Jr., 2.**Broan, J. M.**

1. Sinking of the Woodbury shaft at the Newport mine, Ironwood, Michigan [with discussion]: *Lake Superior Min. Inst. Proc.*, v. 20, pp. 37-53, illus., 1915.

Broderick, Thomas Monteith—See also Hotchkiss, W. O., 7.

1. (and Hohl, C. D.) Geophysical methods applied to exploration and geologic mapping in the Michigan copper district: *Econ. Geol.*, v. 23, no. 5, pp. 489-514, 1928; *Lake Superior Min. Inst. Proc.*, v. 26, pp. 65-84, 1926; a communication, Magnetic surveys in Michigan copper country, *Econ. Geol.*, v. 34, no. 5, p. 581, 1939.
2. Zoning in Michigan copper deposits and its significance: *Econ. Geol.*, v. 24, no. 2, pp. 149-162, 3 figs., Mar.-Apr. 1929; no. 3, pp. 311-326, 5 figs., May 1929; discussion, v. 25, no. 3, pp. 285-286, May 1930. A study of the changes of the ratio of arsenic to copper with depth and its use in placing the lode deposits of native copper in zonal relationship to each other. Includes genetic classification of Michigan copper deposits.
3. (and Hohl, C. D.) Geology and exploration in the Michigan copper district: *Min. Cong. Jour.*, v. 17, no. 10, pp. 478-481, 486, 2 figs., Oct. 1931.
4. Fissure vein and lode relations in Michigan copper deposits: *Econ. Geol.*, v. 26, no. 8, pp. 840-856, 7 figs., Dec. 1931.
5. Differentiation in lavas of the Michigan Keweenawan: *Geol. Soc. Am. Bull.*, v. 46, no. 4, pp. 503-558, 22 figs., Apr. 30, 1935; *Mich. College Min. Tech. Bull.*, new ser., v. 8, no. 4, pp. 503-558, 22 figs., July 1935; abs., with discussion, *Geol. Soc. Am. Proc.* (1933), pp. 69-70, June 1934.
6. (and Hohl, C. D.) Differentiation in traps and ore deposition: *Econ. Geol.*, v. 30, no. 3, pp. 301-312, 2 figs., May 1935; *Mich. College Min. Tech. Bull.*, new ser., v. 8, no. 4; pp. 301-312, 2 figs., July 1935; discussion, *Econ. Geol.*, v. 30, no. 8, pp. 924-927, 1935. Discusses differentiation in the Keweenawan lava flows and its bearing on copper deposition.

7. (and Hohl, C. D.) The Michigan copper district, in *Copper resources of the world*, pp. 271-284, 2 figs., incl. geol. map, 16th Internat. Geol. Cong., Washington, D. C., 1935.
8. Application of geology to problems of iron ore concentration [with discussion]: Mich. College Min. Tech. Bull., v. 6, no. 4, July 1933; A.I.M.E. Trans., v. 115, pp. 273-289, 7 figs., 1935; Contr., no. 20, 7 figs., 1933. 17 pp.
9. Geology of the Ropes gold mine, Marquette County, Michigan: Econ. Geol., v. 40, no. 2, pp. 115-128, 1945; abs., v. 34, no. 8, pp. 939-940, Dec. 1939.
10. (and Hohl, C. D.; Eidemiller, H. N.) Recent contributions to the geology of the Michigan copper district: Econ. Geol., v. 41, no. 7, pp. 675-725, 11 figs., incl. index maps, Nov. 1946.
11. The origin of Michigan copper deposits [with discussion]: Econ. Geol., v. 47, no. 2, pp. 215-219, Mar.-Apr. 1952.

Broman, William H.

1. Geophysical investigation of the Bear Lake area, Houghton County, Michigan: Thesis for Degree of Master of Science, Dept. of Phys., Mich. College Min. Tech., Houghton, 1953. 68 pp. Unpublished.

Brooke, Gerald L.

1. Sub-Huronian (Timiskaming) sediments of the Lake Enchantment area, Marquette County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1951. 44 pp. Unpublished.

Brooks, Thomas Benton

1. On the use of the magnetic needle in mineral explorations on Lake Superior: Paper read before Am. Philos. Soc., Apr. 1872.
2. An analysis of the cost and description of the methods of mining employed in the Marquette iron region, Lake Superior, Michigan: Paper read before Am. Soc. Civil Eng., Mar. 6, 1872.
3. (and Pumpelly, Raphael) On the age of the copper-bearing rocks of Lake Superior: Am. Jour. Sci., ser. 3, v. 3 (v.103), no. 18, pp. 428-432, 1872.
4. The method and cost of mining the red specular and magnetic ores of the Marquette iron region of Lake Superior [with discussion]: A.I.M.E., v. 1, pp. 193-202, 1873.
5. (and Julien, A. A.; and others) Upper Peninsula; pt. I, Iron-bearing rocks (economic): Mich. Geol. Survey, v. 1, 1873. 319 pp. Correction, entitled Geology of the Marquette iron range, Am. Jour. Sci., ser. 3, v. 41 (v.141), no. 242, p. 160, 1891. Pt. II, v. 2, appendices to pt. I, v. 1, is largely lithologic descriptions of hand specimens. 1873. 298 pp.
6. On the youngest Huronian rocks south of Lake Superior and the age of the copper-bearing series: Am. Jour. Sci., ser. 3, v. 11 (v.111), no. 63, pp. 206-211, 1876; note, no. 66, p. 493, 1876.
7. Classified list of the rocks observed in the Huronian series, south of Lake Superior, with remarks on their abundance, transitions, and geographical distribution; also a tabular presentation of the sequence of the beds, with an hypothesis of equivalency: Am. Jour. Sci., ser. 3, v. 12 (v. 112), no. 69, pp. 194-204, 1876.
8. Huronian rocks of the Lake Superior region described by Major Brooks: Am. Jour. Sci., ser. 3, v. 13 (v.113), no. 75, p. 245, 1877. Title, and reference to 30 thin sections.

9. Sketch of the Laurentian rocks of Michigan, in *The geology of the Menominee iron region, Oconto County, Wisconsin*; pt. VII, *Geology of Wisconsin*: Wis. Geol. Survey, v. 3, pp. 661-663, 1880.

Broughton, Samuel H.

1. Remarks on the mining interest and details of the geology of Ontonagon County, map, Philadelphia, 1863. 24 pp.

Brown, E. A.—See also Stuart, W. T., 6.

1. (and Stuart, W. T.) Ground-water resources of the glacial deposits, Bessemer area, Michigan: Mich. Geol. Survey Prog. Rpt. 14, prepared in cooperation with U. S. Geol. Survey, 8 figs., incl. index map, 6 tables, June 1951. 68 pp.

Brown, E. F.

1. Distribution of phosphorus and system of sampling at the Pewabic mine, Iron Mountain, Michigan: Lake Superior Min. Inst. Proc., v. 3, pp. 49-55, 1895.
2. A system of mining ore bodies of uniform grade: Lake Superior Min. Inst. Proc., v. 5, pp. 40-45, 1898.

Brown, George Granger

1. Clays and shales of Michigan and their uses: Mich. Geol. Survey, pub. 36, geol. ser. 30, 69 figs., 41 pls., incl. map, 1926. 444 pp.
2. Molding sands of Michigan and their uses: Mich. Geol. Survey, pub. 41, geol. ser. 35, 31 figs., tables, 1936. 262 pp.

Brown, Julia Wilson—See Ehlers, G. M., 12.**Browne, David H.**

1. The distribution of phosphorus in the Ludington mine, Iron Mountain, Michigan; a study in isochemic lines: A.I.M.E. Trans., v. 17, pp. 616-632, 1889; Am. Jour. Sci., ser. 3, v. 37 (v.137), pp. 299-310, 1889; abs., entitled Isochemic lines in ore deposits, Eng. Min. Jour., v. 49, pp. 446-448, 1890.

Bruce, E. L.

- *1. Pre-Cambrian iron formations: Geol. Soc. Am. Bull., v. 56, no. 6, pp. 589-602, June 1945.

Buell, John L.

1. Menominee range: Lake Superior Min. Inst. Proc., v. 11, pp. 38-49, 1906.

Burbank, Wilbur Swett—See Butler, B. S., 1.**Burchard, E. F.—See McCasky, H. D., 1.****Burgess, Curtis W.**

1. Devonian stratigraphy and faunas of two cores from Antrim and Crawford counties, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, Dec. 1950. Unpublished.

Burr, Floyd L.

1. Square set mining at the Vulcan mines: Lake Superior Min. Inst. Proc., v. 16, pp. 144-155, 5 figs., 1911.

Burt, E. M.—See Ferris, J. G., 4.**Burt, William A.—See also Houghton, Jacob, Jr., 2.**

1. Topography and geology of the survey of a district of township lines, south of Lake Superior, 1845: U. S. 29th Cong., 1st Sess., Senate Ex. Doc. 357, pp. 2-19, 1846.

2. Geological report of survey [in Lake Superior region]: U. S. 31st Cong., 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III, pp. 811-832, 842-875, 933-935, maps, 1849.
- Butler, Bert Sylvenus**—See also Gardner, E. D., 1.
- (and Burbank, W. S.; and others) The copper deposits of Michigan: U. S. Geol. Survey Prof. Paper 144, 18 figs., 75 pls., incl. maps, 1929. 238 pp. Rev., Lake Superior Min. Inst. Proc., v. 37, pp. 76-83, 1929.
- Cahn, Alvin Robert**
- Records and distribution of the fossil beaver *Castoroides ohioensis*: Jour. Mammalogy, v. 13, no. 3, pp. 229-241, 1932.
 - Further notes on the giant beaver [*Castoroides ohioensis*]: Jour. Mammalogy, v. 17, no. 1, pp. 66-67, Feb. 1936.
- Cain, Louise G.**—See Cain, S. A., 2.
- Cain, Stanley Adair**
- Pollen grains write history: Earth Sci. Digest, v. 2, no. 5, pp. 9-11, illus., Jan.-Feb. 1948.
 - (and Cain, L. G.; Slater, J. V.) Palynological studies at Sodon Lake, Michigan; pt. I, Size-frequency study of fossil spruce pollen: Sci., v. 108, no. 2796, pp. 115-117, illus., incl. index map, July 30, 1948. Pt. II, Size-frequency studies of pine pollen, fossil and modern: Am. Jour. Bot., v. 35, no. 9, pp. 583-590, illus., Nov. 1948. Pt. III, The sequence of pollen spectra, profile 1: Ecology, v. 29, no. 4, pp. 492-500, illus., Oct. 1948.
- Callender, John A.**
- The Lake Superior copper mines: Min. Mag., v. 2, pp. 249-253, 1854.
- Calver, James Lewis**
- Roundness of grains in western Michigan dune sands: Mich. Acad. Sci. Papers (1939), v. 25, pp. 465-471, 3 figs., 1940.
 - The glacial and post-glacial history of the Platte and Crystal lake depressions, Benzie County, Michigan, in *Occasional papers for 1946 on the geology of Michigan*: Mich. Geol. Survey, pub. 45, geol. ser. 38, pt. II, illus., incl. geol. map, 1947. 70 pp. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, Feb. 1942.
- Calvert, Floyd A.**
- Legal history of conservation of oil and gas in Michigan, in *Legal history of conservation of oil and gas, a symposium*, pp. 75-90, Section of Mineral Law, American Bar Association, Dec. 1938.
- Campau, Donald Edmund**
- The stratigraphic distribution of Ostracoda within the Traverse formation of the Michigan Basin: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1950. 50 pp. Unpublished.
- Campbell, Colin A.**
- (and Van Evera, R. W.) Recent drilling trends at Calumet & Hecla: Min. Cong. Jour., v. 40, no. 5, pp. 26-28, 79, May 1954.
- Campbell, James M.**—See Slaughter, J. L., 1.
- Campbell, Marius R.**
- (and Bownocker, J. A.) The coal fields of the United States: U. S. Geol. Survey Prof. Paper 100, 1929. 101 pp.

- Campbell, Robert E.**
- Geophysical investigation of the Silver Mountain area, Houghton County, Michigan: Thesis for Degree of Master of Science, Dept. of Phys., Mich. College Min. Tech., Houghton, 1952. 64 pp. Unpublished.
- Carlson, Charles Gordon**
- Geology of the Saginaw oil field, Michigan, and discussion of Michigan's oil prospects, in *Structure of typical American oil fields*, v. 1, pp. 105-111, 3 figs.: Am. Assoc. Petrol. Geol., 1929; Am. Assoc. Petrol. Geol. Bull., v. 11, no. 9, pp. 959-965, 3 figs., Sept. 1927.
 - Bitumen in Nonesuch formation of Keweenaw series of northern Michigan: Am. Assoc. Petrol. Geol. Bull., v. 16, no. 8, pp. 737-740, 2 figs., Aug. 1932.
 - Important Michigan production: World Petrol., pp. 211-214, July 1933.
- Carlson, Emery T.**—See Sorensen, H. O., 1.
- Carman, J. Ernest**
- Sylvania sandstone of northwestern Ohio: Geol. Soc. Am. Bull., v. 47, no. 2, pp. 253-266, 1 pl., 5 figs., Feb. 29, 1936. Contains also some discussion of the Sylvania in Michigan.
- Case, Ermine Cowles**
- On a nearly complete skull of *Symbos cavifrons* Leidy from Michigan: Mich. Univ. Mus. Zool. Occ. Papers, no. 13, illus., 1915. 3 pp.
 - (and Robinson, W. I.) The geology of Limestone Mountain and Sherman Hill in Houghton County, Michigan: Mich. Geol. and Biol. Survey, pub. 18, geol. ser. 15, pp. 165-181, 1915; in part, Jour. Geol., v. 23, no. 3, pp. 256-260, 1915. A discussion of three Paleozoic outliers of residual dolomite; faunal lists.
 - The coral seas of Michigan: Nat. Hist., v. 27, no. 5, pp. 420-429, 7 figs., Sept.-Oct. 1927.
 - Arthrodiran remains from the Devonian of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 3, no. 9, pp. 163-182, 13 figs., 5 pls., Dec. 18, 1931.
 - (and Scott, I. D.; Badenoch, B. M.; White, T. E.) Discovery of *Elephas primigenius americanus* in the bed of glacial Lake Mogadore, in Cass County, Michigan: Mich. Acad. Sci. Papers (1934), v. 20, pp. 449-454, 2 figs., maps, 1935.
 - (and Stanley, G. M.) The Bloomfield Hills mastodon: Cranbrook Inst. Sci. Bull. 4, 5 pls., 1 fig., Oct. 1935. 8 pp.
- Case, Leslie Cline**
- Exceptional Silurian brine near Bay City, Michigan: Am. Assoc. Petrol. Geol. Bull., v. 29, no. 5, pp. 567-570, May 1945.
- Catlin, J. Mortimer**
- Large mass of native copper: Am. Jour. Sci., v. 27, no. 2, p. 381, 1835.
- Cayeux, L.**
- Existence de restes organiques dans les roches ferrugineuses associées aux mineraux de fer huroniens des États-Unis [Existence of organic remains in the ferruginous rocks associated with the Huronian iron minerals of the United States]: Académie des sciences, Comptes rendus, v. 153, pp. 910-912, Paris, 1911.
- Chabot, L. S., Jr.**—See also Archibald, R. S., 2.
- Field blasting at the Volunteer mine: Lake Superior Min. Inst. Proc., v. 27, pp. 259-270, 1929.

- The development, mining and caving of the east orebody Blueberry mine: *Lake Superior Min. Inst. Proc.*, v. 29, pp. 124-130, 1936.

Chamberlain, Leonard C., Jr.

- (and Fitzgerald, P. E.) Acidizing in Michigan, 1932-37: *Mich. Acad. Sci. Papers* (1937), v. 23, pp. 409-417, 7 figs., 3 pls., 1938.

Chamberlin, Rollin Thomas

- The gases in rocks: *Jour. Geol.*, v. 17, no. 6, pp. 534-568, 1909. Contains analyses of some Michigan rocks; abs., *Sci.*, new ser., v. 27, pp. 731-732, 1908.
- Shifting orogenic belts of the southern Canadian Shield: *Jour. Geol.*, v. 45, no. 6, pp. 663-681, 1937.

Chamberlin, Thomas Chowder—See also Irving, R. D., 10, 11.

- Preliminary paper on the terminal moraine of the second glacial epoch: *U. S. Geol. Survey, 3d Ann. Rpt.*, pp. 291-402, 1881-1882.
- The copper-bearing series of Lake Superior: *Sci.*, v. 1, pp. 453-455, 1883.
- Roland Duer Irving: *Am. Geol.*, v. 3, no. 1, pp. 1-6, 1889; *Wis. Acad. Sci. Trans.*, v. 8, pp. 433-437, portrait, 1892.

Channing, J. Parke

- Address by the President [mine accidents]: *Lake Superior Min. Inst. Proc.*, v. 3, pp. 34-48, 1895.
- The caving system of mining in Lake Superior iron mines [with discussion]: *Lake Superior Min. Inst. Proc.*, v. 19, pp. 245-251, 1914.

Channing, William F.

- [St. Marys River, Michigan]: *U. S. General Land Office Rpt. 1847* (U. S. 30th Cong., 1st Sess., Senate Ex. Doc. 2), pp. 199-209, 1847.

Chapman, Donald H.

- Late-glacial and postglacial history of the Champlain valley: *Am. Jour. Sci.*, ser. 5, v. 34 (v.234), no. 200, pp. 89-124, 1937. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1931.

Chapman, Rodger H.

- Seismic depth to ledge studies as related to water problems at Morris mine, Ishpeming, Michigan: Thesis for Degree of Master of Science, Dept. of Phys., Mich. College Min. Tech., Houghton, 1952. 51 pp. Unpublished.

Chapman, William B.

- (and Fitzpatrick, R. C.) Terrestrial tides as determined from deviations of gravity at Ann Arbor, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1950. Unpublished. Note: both M. S. candidates.

Chenneour, R. J.—See Elliott, S. R., 3.**Chester, Albert H.**

- On the percentage of iron in certain ores: *A.I.M.E. Trans.*, v. 4, pp. 219-220, 1876.

Chynoweth, Clyde E.

- The petrography of some Huronian rocks in Baraga County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Wayne Univ., Detroit, Oct. 1951. Unpublished.

Clancey, Thomas

- Charcoal humor: *Lake Superior Min. Inst. Proc.*, v. 25, pp. 252-258, 1926. Article relates some tales of the days when charcoal furnaces flourished in Marquette County.

Clapp, Frederick G.—See Fuller, M. L., 1.**Clark, Inez Margaret**

- Two new paleobotanical records for the Antrim shale of Michigan: *Mich. Acad. Sci. Papers* (1933), v. 19, pp. 59-64, 2 pls., 1934.

Clark, Lorin Delbert—See James, H. L., 1, 7.**Clarke, Frank Wigglesworth**

- A report of the work done in the division of chemistry and physics, mainly during the fiscal year 1888-89: *U. S. Geol. Survey Bull.* 64, 1890 (contains metamorphic rock from Pigeon Point and diabase from Penokee-Gogebic range); mainly during the fiscal year 1887-88, *Bull.* 60, 1890 (contains novaculite from Marquette); mainly during the fiscal year 1885-86, *Bull.* 42, 1887 (contains Grand Rapids meteorite); mainly during the fiscal year 1884-85, *Bull.* 27, 1886 (contains sandstone from Michigan).
- (and Hillebrand, W. F.) Analyses of rocks, with a chapter on analytical methods, laboratory of the United States Geological Survey, 1880 to 1896: *U. S. Geol. Survey Bull.* 148, 1897. 306 pp. Contains analyses of rocks from Lake Superior region, and of carbonate rocks from Michigan.
- (chief chemist) Contributions to chemistry and mineralogy from the laboratory of the United States Geological Survey: *U. S. Geol. Survey Bull.* 167, 1900.
- (chief chemist) Mineral analyses from the laboratories of the United States Geological Survey, 1880 to 1903: *U. S. Geol. Survey Bull.* 220, 1903. 119 pp. Contains analysis of gypsum from Alabaster, Michigan, p. 104.
- (chief chemist) Analyses of rocks from the laboratory of the United States Geological Survey, 1880 to 1903: *U. S. Geol. Survey Bull.* 228, 1904; 1880 to 1899, *Bull.* 168, 1900. Contains analyses of rocks from the Lake Superior region; a stony meteorite from Allegan; carbonate rocks, slates and shales.
- (chief chemist) Water analyses from the laboratory of the United States Geological Survey: *U. S. Geol. Survey Water-Supply Paper* 364, 1914. 40 pp.
- (chief chemist) Analyses of rocks and minerals from the laboratory of the United States Geological Survey, 1880 to 1914; *U. S. Geol. Survey Bull.* 591, 1915; 1880 to 1908, *Bull.* 419, 1910. Contains analyses of crystalline and igneous rocks from the Lake Superior region; of sandstones, cherts and sinters, carbonate rocks, slates and shales; and of a stony meteorite from Allegan.

Clarke, Robert E.

- Notes from the copper region [Lake Superior]: *Harpers Mag.*, v. 6, pp. 433-448, 577-588, 1853.

Classen, Edo

- Mineralogical notes: (1) Analysis of orthoclase from Ishpeming, Marquette County, Michigan; (2) On regular polyhedral cavities in hematite: *Am. Jour. Sci.*, ser. 3, v. 23 (v.123), no. 133, p. 67, 1882.

Claypole, E. W.

- *1. Evidence from the drift of Ohio, Indiana and Illinois, in support of the preglacial origin of the basins of lakes Erie and Ontario: *Am. Assoc. Adv. Sci. Proc.* (1881), v. 30, pp. 147-159, 1882.

Clements, Donald

1. Later S phases of the Michigan earthquake of August 9, 1947: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1952. Unpublished.

Clements, J. Morgan

1. The volcanics of the Michigamme district of Michigan: *Jour. Geol.*, v. 3, no. 7, pp. 801-822, map 1:250,000, 1895.
2. Some stages in the development of rivers as illustrated by the Deer River, Michigan [abs.]: *Am. Geol.*, v. 17, no. 2, pp. 126-127, 1896.
3. A study of some examples of rock variation: *Jour. Geol.*, v. 6, no. 4, pp. 372-392, 1898. Rocks discussed occur in Michigan, in the vicinity of Crystal Falls.
4. A contribution to the study of contact metamorphism: *Am. Jour. Sci.*, ser. 4, v. 7 (v.157), no. 38, pp. 81-91, 1899. The results of the intrusion of basic dikes into some Lower Huronian iron-bearing formations of the Crystal Falls district.
5. (and Smyth, H. L.) The Crystal Falls iron-bearing district of Michigan; with a chapter on the Sturgeon River tongue, by W. S. Bayley, and an introduction, by C. R. Van Hise: *U. S. Geol. Survey Mon.* 36, maps, 1899. 512 pp. In part, *U. S. Geol. Survey Ann. Rpt.*, v. 19, pt. III, pp. 19-151, maps, 1899; abs., *Am. Jour. Sci.*, ser. 4, v. 9 (v.159), no. 54, pp. 451-455, 1900.
6. Ellipsoidal structure in pre-Cambrian rocks of Lake Superior region [abs.]: *Sci.*, new ser., v. 16, pp. 260-261, 1902; *Geol. Soc. Am. Bull.*, v. 14, p. 8, 1903.

Cochran, Robert

1. New plant successfully floats Michigan jasper: *Eng. Min. Jour.*, v. 155, no. 8, pp. 100-104, 114, Aug. 1954.

Cohee, George Vincent—See also U. S. Geological Survey, 4, 5, 6, 8, 10, 11, 14, 15, 17.

1. Cambrian and Ordovician rocks in recent wells in southeastern Michigan: *Am. Assoc. Petrol. Geol. Bull.*, v. 31, no. 2, pp. 293-307, 5 figs., incl. maps, Feb. 1947; abs., v. 30, no. 5, p. 752, May 1946.
2. Lower and Middle Silurian rocks in Michigan Basin [abs.]: *Am. Assoc. Petrol. Geol. Bull.*, v. 32, no. 2, p. 305, Feb. 1948.
3. Cambrian and Ordovician rocks in Michigan Basin and adjoining areas: *Am. Assoc. Petrol. Geol. Bull.*, v. 32, no. 8, pp. 1417-1448, illus., incl. index and isopach maps, Aug. 1948.
4. (and others) Coal resources of Michigan: *U. S. Geol. Survey Circ.* 77, prepared in cooperation with Mich. Geol. Survey and Univ. of Mich., 1 pl., 37 figs., 6 tables, June 1950. 56 pp. With the exception of a few introductory pages, the circular consists of 36 maps of various townships and ranges showing reserves by depth and thickness, and several tables of mines, production, and reserve data. A map of the Michigan coal basin shows the area of reserves and thickness of glacial drift. Total reserves as of January 1950 are placed at 220 million tons. U.S.G.S.

Cole, Leon J.

1. The delta of the St. Clair River: *Mich. Geol. Survey*, v. 9, pt. I, 2 figs., 4 pls., 1903. 28 pp.

Coleman, A. P.

- *1. The Huronian question: *Am. Geol.*, v. 29, no. 6, pp. 325-334, 1902.

Coley, Tyrol B.

- *1. A study of the stratigraphic distribution and correlation of some Middle Devonian Ostracoda: Thesis for Degree of Master of Science, Dept. of Geol., Wayne Univ., Detroit, 1949. Published in part; see below.
- *2. Stratigraphic distribution and correlation of some Middle Devonian Ostracoda: *Jour. Paleont.*, v. 28, no. 4, pp. 452-464, 2 figs., 1 pl., July 1954.

Collins, W. D.

- *1. The industrial utility of public water supplies in the United States: *U. S. Geol. Survey Water-Supply Paper* 496, 1923. 59 pp.
- *2. Temperature of water available for industrial use in the United States, in *Contributions to the hydrology of the United States, 1923-1924*: *U. S. Geol. Survey Water-Supply Paper* 520, pp. 97-104 (Paper 520 F), 1925.
- *3. (and Howard, C. S.) Index of analyses of natural waters in the United States, in *Contributions to the hydrology of the United States, 1925*: *U. S. Geol. Survey Water-Supply Paper* 560, pp. 53-85, 1925.
- *4. Relations between quality of water and industrial development in the United States: *U. S. Geol. Survey Water-Supply Paper* 559, 1926. 43 pp.
- *5. (and Howard, C. S.) Index of analyses of natural waters in the United States, 1926-31, in *Contributions to the hydrology of the United States, 1932*: *U. S. Geol. Survey Water-Supply Paper* 659, pp. 191-209, 1932.
- *6. (and Lamar, W. L.; Lohr, E. W.) The industrial utility of public water supplies in the United States, 1932: *U. S. Geol. Survey Water-Supply Paper* 658, 1934. 135 pp.

Colwell, Alfred B.

1. Notes on the geology of the Michigamme River: Thesis for Degree in Mining Engineering, Mich. College Min. Tech., Houghton, 1895. 35 pp.

Conibear, William

1. All accidents, Lake Superior mining industry, 1911-1923, inclusive [with discussion]: *Lake Superior Min. Inst. Proc.*, v. 24, pp. 314-322, 1925.
2. Development of safety in the iron mines of Michigan: *Lake Superior Min. Inst. Proc.*, v. 29, pp. 180-184, 1936.

Conlin, Thomas

1. (and O'Brien, P.) Historical sketch of Menominee range: *Lake Superior Min. Inst. Proc.*, v. 16, pp. 7-16, 1911.

Conrad, Malcolm A.

1. Contact metamorphic effects of three pegmatitic dikes in the Upper Peninsula of Michigan: Thesis for Degree of Master of Science, Dept. of Geol. Eng., Mich. College Min. Tech., Houghton, 1952. 31 pp. Unpublished.

Cook, Charles Wilford—See also Allen, R. C., 3; Stearns, M. D., 1.

1. Preliminary report on the salt industry of Michigan: *Mich. Acad. Sci. Rpt.*, v. 13, pp. 81-86, 1911.
2. The brine and salt deposits of Michigan: their origin, distribution and exploitation: *Mich. Geol. and Biol. Survey*, pub. 15, geol. ser. 12, 47 figs., 15 pls., 1914. 188 pp.
3. The influence of joints in the formation of the islands at the western end of Lake Erie: *Mich. Acad. Sci. Papers* (1925), v. 5, pp. 243-251, 5 figs., 1926.

Cooke, Harold Caswell

1. "Between the Archean and Keweenawan is the Huronian": Royal Soc. Canada Proc. and Trans., ser. 3, v. 20, sec. 4, pp. 17-37, 1 fig., 1926.

Cookingham, E. R.

1. Atlas of Sanilac County, Michigan: Philadelphia, J. L. Smith, 1894.

Cooley, Gerald A.

1. Insoluble residues of Detroit River and Dundee formations: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1947. Unpublished.

Cooley, Mary E.—See Ehlers, G. M., 10.**Cooper, Chalmer L.**

- *1. Occurrence and stratigraphic distribution of Paleozoic ostracodes: Jour. Paleont., v. 16, no. 6, pp. 764-776, 9 figs., 1942.

Cooper, Gustav Arthur—See also Warthin, A. S., Jr., 3, 4, 6.

1. (and Warthin, A. S., Jr.) New correlations of Hamilton rocks [abs.]: Geol. Soc. Am. Proc. (1935), pp. 376-377, 1936.
2. (and Warthin, A. S., Jr.) New Middle Devonian stratigraphic names: Wash. Acad. Sci. Jour., v. 31, no. 6, pp. 259-260, June 15, 1941.
3. (and Warthin, A. S., Jr.) New Devonian (Hamilton) correlations: Geol. Soc. Am. Bull., v. 53, no. 6, pp. 873-888, 3 figs., June 1, 1942.

Cooper, James B.

1. Historical sketch of smelting and refining lake copper: Lake Superior Min. Inst. Proc., v. 7, pp. 44-49, 1901.

Cooper, William Funk—See also Fuller, M. L., 2; Lane, A. C., 17, 35, 37, 50.

1. The coal formation of Bay County: Mich. Miner, v. 7, nos. 9-12, 1905.
2. Geology and physical geography of Michigan: Mich. Acad. Sci. Rpt., v. 9, pp. 136-144, 1907. An attempt to show the close relationships between geology and physical geography.
3. Pleistocene beaches of Saginaw County: Mich. Acad. Sci. Rpt., v. 10, pp. 90-98, 1908.

Cordier, Louis

1. Note sur une masse de cuivre natif provenant des rives du lac Supérieur aux États-Unis d'Amérique [Notice of a mass of native copper originating on the shores of Lake Superior in the United States of America]: Académie des sciences, Comptes rendus, v. 28, pp. 161-162, Paris, 1849.

Corey, G. W.

1. The Nonesuch sandstone: Eng. Min. Jour., v. 82, p. 778, Oct. 26, 1906.

Cornwall, Henry R.—See also White, W. S., 2; Wright, J. C., 2.

1. (and Runner, J. J.; Stromquist, A. A.; Swanson, R. W.; White, W. S.) Detailed geologic maps of recently active copper mines, Houghton and Keweenaw counties, Michigan: U. S. Geol. Survey, Strategic Min. Inv., 24 pls., 1949. 43 pp. Open file report, Mich. Geol. Survey, Lansing.
2. Differentiation in lavas of the Keweenawan series and the origin of the copper deposits of Michigan: Geol. Soc. Am. Bull., v. 62, pp. 159-202, 9 figs., 4 pls., Feb. 1951; rev., Econ. Geol., v. 46, no. 6, pp. 658-659, Sept.-Oct. 1951.
3. Differentiation in magmas of the Keweenawan series: Jour. Geol., v. 59, pp. 151-172, Mar. 1951; rev., Econ. Geol., v. 46, no. 6, pp. 658-659, Sept.-Oct. 1951.

4. Ilmenite, magnetite, hematite, and copper in lavas of the Keweenawan series: Econ. Geol., v. 46, no. 1, pp. 51-67, 1951.

5. Bedrock geology of the Lake Medora quadrangle, Michigan: U. S. Geol. Survey, Geol. Quad. maps, GQ 52, with text, 1954.

6. Bedrock geology of the Delaware quadrangle, Michigan: U. S. Geol. Survey, Geol. Quad. maps, GQ 51, with text, 1954.

- *7. (and White, W. S.) Native copper deposits [abs.]: Geol. Soc. Am. Bull., v. 65, no. 12, pt. II, pp. 1242-1243, Dec. 1954.

8. (and Wright, J. C.) Bedrock geology of the Eagle Harbor quadrangle, Michigan: U. S. Geol. Survey, Geol. Quad. maps, GQ 36, with text, 1954.

9. Bedrock geology of the Phoenix quadrangle, Michigan: U. S. Geol. Survey, Geol. Quad. maps, GQ 34, with text, 1954.

Coupal, Frank E.

1. Stratigraphy and paleontology of a well core from Sharon Township, Washtenaw County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1954.

Courtis, William Munroe—See Lane, A. C., 45.**Cowpland, C. C.**

1. A résumé of the early history of the explosives industry in Marquette County: Lake Superior Min. Inst. Proc., v. 29, pp. 21-28, 1936.

Crane, W. R.

1. Mining methods and practice in the Michigan copper mines: U. S. Bur. Mines Bull. 306, 1929. 192 pp.

Crawford, F. S.

1. Safety education in and around iron mines in the Lake Superior region: U. S. Bur. Mines Inf. Circ. 6520, 1931. 15 pp. Reviews safety-education methods of some Lake Superior companies and outlines a course in safety as taught at the Bessemer Township schools on the Gogebic iron range of Michigan. U.S.B.M.
2. Safety in iron mines of Menominee range, Michigan: U. S. Bur. Mines Inf. Circ. 6521, 1931. 28 pp. A study of safety methods used by various companies. U.S.B.M.

Crawford, Lawrence C.—See Williams, G. R., 2.**Credner, Hermann**

1. Beschreibung einiger charakteristischer Vorkommen des gediegenen Kupfers auf Keweenaw Point am Oberen See Nord-Amerika's [Description of some characteristic occurrences of pure copper on the Keweenaw Point near Lake Superior in North America]: Neues Jahrbuch für Mineralogie, Geologie, und Paläontologie, pp. 1-14, 1869.
2. Die vorsilurischen Gebilde der "Oberen Halbinsel von Michigan" en Nord-Amerika [The pre-Silurian structures of the Upper Peninsula of Michigan in North America]: Deutsche geologische Gesellschaft, Zeitschrift 21, pp. 516-554, 1869.
3. Ueber nordamerikanische Schieferporphyroide [The North American schist porphyroids]: Neues Jahrbuch für Mineralogie, Geologie, und Paläontologie, pp. 970-984, 1870.
4. Gewaltige Kupfermassen an Lake Superior [Immense copper masses near Lake Superior]: Neues Jahrbuch für Mineralogie, Geologie, und Paläontologie, p. 86, 1870.

- Creveling, J. G.**
1. The peridotite of Presque Isle, Michigan; a study in serpentinization: *Am. Jour. Sci.*, ser. 5, v. 12 (v.212), pp. 515-521, Dec. 1926.
- Cromwell, Benedict**
1. Methods of sampling at Lake Superior iron mines: *Lake Superior Min. Inst. Proc.*, v. 17, pp. 76-93, 1912.
- Crooks, Harold Fordyce**—See also Savage, T. E., 1.
1. On the Lower Paleozoic stratigraphy of the Northern Peninsula of Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Ill., Urbana, 1918. Unpublished.
- Crothwaite, E. G.**—See Ferris, J. G., 4.
- Crowell & Murray**
1. The iron ores of Lake Superior; containing facts of interest relating to mining, beneficiation and shipping of the ore and location of principal mines (7th ed.): Cleveland, Prenton Press Co., 1930. 332 pp.
- Crump, Robert Myres**
1. Origin of hard iron ores of the Marquette district: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Wis., Madison, 1948. 87 pp. Unpublished.
- Cummings, Edgar Roscoe**
*1. (and Shrock, R. R.) The geology of the Silurian rocks of northern Indiana: *Ind. Dept. Conserv., Div. Geol.*, Pub. 75, 1928. 226 pp.
*2. (and Shrock, R. R.) Niagaran coral reefs of Indiana and adjacent states and their stratigraphic relations: *Geol. Soc. Am. Bull.*, v. 39, 12 figs., pp. 579-619, 1928.
3. Two Fort Wayne wells in the Silurian, and their bearing on the Niagaran of the Michigan Basin: *Ind. Acad. Sci. Proc.* (1929), v. 39, pp. 183-199, 4 figs., 1930.
4. Silurian of the Michigan Basin [abs.]: *Geol. Soc. Am. Proc.* (1937), pp. 319-320, June 1938.
- Curren, Robert F.**
1. An investigation of some methods of chemical precipitation in the artificial growth of calcite: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1953. 27 pp. Unpublished.
- Dana, Edward S.**
1. On the crystallization of native copper: *Am. Jour. Sci.*, ser. 3, v. 32 (v.132), no. 192, pp. 413-429, 1886.
- Dana, James D.**
1. Apophyllite from the Cliff mine, Lake Superior region, Michigan: *Am. Jour. Sci.*, ser. 2, v. 18 (v.68), no. 54, p. 419, 1854.
- Daoust, William L.**
1. Salts of the earth: *Mich. Conserv.*, v. 22, no. 1, pp. 23-24, Jan.-Feb. 1953. Article, written in popular style, is a discussion of the oilmen's headache—brine disposal.
- Darton, N. H.**
1. Preliminary list of deep borings in the United States; pt. I, Alabama-Montana: *U. S. Geol. Survey Water-Supply Paper* 57, 1902. 60 pp. Pages 53-54 concern Michigan.
2. Preliminary list of the deep borings in the United States: *U. S. Geol. Survey Water-Supply Paper* 149, 1905. 175 pp. Pages 65-69 concern Michigan.
3. Geothermal data of the United States, including many original determinations of underground temperature: *U. S. Geol. Survey Bull.* 701, 1920. 97 pp. Pages 50-54 concern Michigan.
- Daugherty, Carroll Roop**
*1. (and Horton, A. H.; Davenport, R. W.) Power capacity and production in the United States: *U. S. Geol. Survey Water-Supply Paper* 579, 1928. 210 pp. Contains information regarding the development of water power.
- Davenport, R. W.**—See Daugherty, C. R., 1.
- Davies, William E.**
1. Stratigraphic significance of crinoidal columns of the Traverse of Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1941. 45 pp. Unpublished.
- Davis, Charles Albert**—See also Lane, A. C., 45, 46, 50.
1. A remarkable marl lake [Littlefield Lake, Isabella County]: *Jour. Geol.*, v. 8, no. 6, pp. 498-503, 1900.
2. A contribution to the natural history of marl: *Mich. Geol. Survey*, v. 8, pt. III, pp. 65-96, 1903; *Jour. Geol.*, v. 8, no. 6, pp. 485-497, 1900; *Jour. Geol.*, v. 9, no. 6, pp. 491-506, 1901.
3. Some interesting glacial phenomena in the Marquette region: *Mich. Acad. Sci. Rpt.*, v. 9, pp. 132-135, 1907.
*4. Peat deposits as geological records: *Mich. Acad. Sci. Rpt.*, v. 10, pp. 107-112, 1908.
- Davis, Darrell H.**
1. A study of river meanders on the Middle Rouge: *Jour. Geol.*, v. 16, no. 8, pp. 755-764, 1908.
- Davis, Dorothy W.**
1. Oil production from Traverse group of southwestern Michigan: *Am. Assoc. Petrol. Geol. Bull.*, v. 36, no. 8, pp. 1642-1644, Aug. 1952.
- Decker, Charles Elijah**
1. Ordovician graptolites from well-core, Calhoun County, Michigan: *Am. Assoc. Petrol. Geol. Bull.*, v. 34, no. 9, pp. 1903-1909, illus., Sept. 1950. Graptolites and associated forms from the Utica shale of Ordovician age, in Calhoun County, Michigan, are listed and illustrated. The significance of each form is indicated briefly. U.S.G.S.
*2. Stratigraphic significance of graptolites of Athens shale: *Am. Assoc. Petrol. Geol. Bull.*, v. 36, no. 1, pp. 1-145, Jan. 1952. Contains reference to collection in Calhoun County, Michigan (p.105).
- Deiss, Charles Frederick**
1. A description and stratigraphic correlation of the Fenestellidae from the Devonian of Michigan: *Mich. Univ. Mus. Paleont. Contr.*, v. 3, no. 13, pp. 233-275, 14 pls., Apr. 9, 1932. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1928.
- Dellwig, Louis F.**
1. (and Briggs, L. I., Jr.) Textural relationships in the Salina salt of Michigan [abs.]: *Geol. Soc. Am. Bull.*, v. 63, no. 12, pt. II, p. 1242, Dec. 1952.
2. Origin of the Salina salt of Michigan: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, 1953. 94 pp. Unpublished.

Denning, Reynolds M.

1. The petrology of the Jacobsville sandstone, Lake Superior: Thesis for Degree of Master of Science, Dept. of Geol. Eng., Mich. College Min. Tech., Houghton, 1949. 71 pp. Unpublished.
2. Geology of the Ishpeming gold range [Marquette County]: Mich. Geol. Survey, prepared in cooperation with Mich. College Min. Tech., maps, 1948. 17 pp. Open file report, Mich. Geol. Survey, Lansing.

Denton, F. W.

1. Development and extraction methods for Lake Superior copper deposits [with discussion]: Lake Superior Min. Inst. Proc., v. 22, pp. 46-62, 1922.

Derby, E. L., Jr.—See also Elliott, S. R., 3.

1. Geology of ores on the Marquette range: Min. Cong. Jour., v. 15, no. 10, pp. 731-733, Oct. 1929.

Deroux, H.

1. Die Kupfergruben des Oberen See's (Lake Superior) [The copper mines of Lake Superior]: Berg-und hüttenmännische Zeitung, v. 20, pp. 305-307, 329-331, 1861; From Journal des Mines, v. 7, no date.

Desollar, T. C.

1. Rockhouse practice of the Quincy Mining Company: Lake Superior Min. Inst. Proc., v. 17, pp. 217-226, 1912.
2. Handling underground waste rock through underground skip dump, Quincy Mining Company: Lake Superior Min. Inst. Proc., v. 22, pp. 42-45, illus., 1922.

Desor, Edouard

1. [On clay and drift deposits in the vicinity of Lake Superior]: Boston Soc. Nat. Hist. Proc. (1848-51), v. 3, pp. 235-236, 1851.
2. [On the sand dunes of Lake Superior]: Boston Soc. Nat. Hist. Proc. (1848-51), v. 3, p. 207, 1851.
3. On the superficial deposits of this district, in *Report on the geology of the Lake Superior land district*, J. W. Foster and J. D. Whitney, pt. II (U. S. 32nd Cong., Spec. Sess., Senate Ex. Doc. 4), pp. 232-270, 1851; in part, entitled On the drift of Lake Superior, Am. Jour. Sci., ser. 2, v. 13 (v.63), no. 37, pp. 93-109, 1852.
4. [On the origin of some of the elements of the so-called Tertiary or drift of Lake Superior]: Boston Soc. Nat. Hist. Proc. (1851-54), v. 4, pp. 28-29, 1854.
5. [On the existence of dunes on the shores of the upper American lakes]: Boston Soc. Nat. Hist. Proc. (1851-54), v. 4, pp. 41-42, 1854.

Dibble, Oliver A.

1. Clay-mining methods and costs at the Corunna (Mich.) pit of the Aetna Portland Cement Co.: U. S. Bur. Mines Inf. Circ. 6657, 2 figs., 1932. 7 pp. Describes open-pit recovery of clay and cites costs. U.S.B.M.

Dickenson, George J.

1. [Report on Isle Royale]: U. S. 31st Cong., 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III, pp. 503-506, 1849.

Dickey, Robert McCullough

1. The granitic sequence in the southern complex of Upper Michigan: Jour. Geol., v. 44, no. 3, pp. 317-340, 4 figs., incl. geol. map, Apr.-May 1936.
2. Present trends in studies of Michigan Huronian: Mich. Acad. Sci. Papers (1937), v. 23, pp. 419-426, 1938.

3. The Ford River granite of the southern complex of Upper Michigan: Jour. Geol., v. 46, no. 3, pp. 321-335, 2 figs., index and geol. maps, Apr.-May 1938.
4. (and Young, D. S.) Relations between granite and slate in the Eureka mine, Ramsey, Michigan: Mich. Acad. Sci. Papers (1938), v. 24, pp. 43-49, 1939. Contact between granite and Palms quartz slate dominantly one of erosion, modified by hydrothermal waters rising along the contact.

Diehl, O. C.

1. Gypsum [in Michigan and Utah]: Mich. Miner, v. 6, no. 6, pp. 21-24, 1904.

Din, Min

1. Microfossils of the Middle and Upper Ordovician formations in deep wells of Alpena, Ogemaw, Bay and Ingham counties of Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1950. 58 pp.

Dole, R. B.

1. The quality of surface waters in the United States; pt. I, Analyses of water east of the 100th meridian: U. S. Geol. Survey Water-Supply Paper 236, 1909. 123 pp. Contains analyses of waters of the Great Lakes.

Douglas, Edward M.

1. Boundaries, areas, geographic centers and altitudes of the United States and the several states, with a brief record of important changes in their territory: U. S. Geol. Survey Bull. 689, 1923. Pages 172-175 concern Michigan. Second edition, U. S. Geol. Survey Bull. 817, 1930. Pages 195-197 concern Michigan.

Douglas, James

1. The native copper mines of Lake Superior: Quart. Jour. Sci., v. 11, pp. 162-180, 1874; Canadian Nat. and Geol. and Proc. Nat. Hist. Soc. Montreal, new ser., v. 7, pp. 318-336, 1874.
2. The copper resources of the United States: A.I.M.E. Trans., v. 19, pp. 678-704, 1891.

Douglass, Columbus C.—See also Houghton, Douglass, 3.

1. Report [on Ingham County, and parts of Eaton and Jackson counties]: Mich. State Geol. Ann. Rpt., v. 2, pp. 66-77, 1839; Mich. State Agr. Soc. Trans. 1854, v. 6, pp. 261-271, 1855.
2. Report [on Jackson, Calhoun, Kalamazoo, Eaton, Ionia, Kent, Ottawa, Van Buren, and Allegan counties]: Mich. State Geol. Ann. Rept., v. 3, pp. 53-75, 1840; Mich. State Agr. Soc. Trans. 1854, v. 6, pp. 271-290, 1855.
3. Report [on the northern portion of the Southern Peninsula]: Mich. State Geol. Ann. Rept., v. 4, pp. 97-111, 1841.
4. Rocks of Michigan: Mich. State Agr. Soc. Trans. 1854, v. 6, pp. 290-303, 1855.

Dow, Kenneth W.—See also Scott, I. D., 7.

1. The origin of perched dunes on the Manistee moraine, Michigan: Mich. Acad. Sci. Papers (1937), v. 23, pp. 427-440, 3 pls., 3 figs., incl. sketch maps, 1938.
2. Some examples of ventifacts from Sleeping Bear Point, Leelanau County, Michigan: Mich. Acad. Sci. Papers (1939), v. 25, pp. 473-476, 2 pls., 1940.

Duncan, Helen Margaret

1. Taxonomy of Devonian *Trepostomata* [abs.]: Geol. Soc. Am. Proc. (1937), pp. 276-277, June 1938.
2. Trepostomatous Bryozoa from the Traverse group of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 5, no. 10, pp. 171-270, 16 pls., map, July 1, 1939; abs., Geol. Soc. Am. Proc. (1937), p. 277, June 1938.

Duparc, Louis

1. Note sur la région cuprifère de l'extrémité nord-est de la péninsule de Keweenaw (Lac Supérieur) [Notice of the copper region of the north-east extremity of the Keweenaw Peninsula, Lake Superior]: Archives des sciences physiques et naturelles, ser. 4, v. 10, pp. 518-538, 1900.

Dupee, J. A.

1. [On copper deposits of Keweenaw Point, Lake Superior]: Boston Soc. Nat. Hist. Proc. (1855-56), v. 5, pp. 279-280, 1856.

Dustin, Fred

1. The gems of Isle Royale, Michigan: Mich. Acad. Sci. Papers (1931), v. 16, pp. 383-398, 1932.
2. The gems of Isle Royale, Michigan; the chlorastrolite: Mineralog., v. 3, no. 2, pp. 5-6, 31, Feb. 1935.
3. A study of the Bayport chert: Mich. Acad. Sci. Papers (1934), v. 20, pp. 465-475, 1935.
4. Agates of the Lake Superior region: Rocks and Minerals, v. 11, no. 9, pp. 152-155, Sept.-Oct. 1936.
5. Mineral collecting in unpromising localities: Rocks and Minerals, v. 17, no. 3, pp. 86-89, 1942.

Dutton, Carl Evans—See also James, H. L., 6; Lamey, C. A., 13, 14.

1. (and Lamey, C. A.) Geology of the Menominee range, Dickinson County: Mich. Geol. Survey Prog. Rpt. 5, geol. map, Dec. 1939. 10 pp.
2. Structural revisions in the Norway district, Menominee range, Michigan [abs.]: Geol. Soc. Am. Bull., v. 49, no. 12, pt. II, p. 1879, Dec. 1, 1938.
3. Recent geological work in Dickinson County: Lake Superior Min. Inst. Proc., v. 30, pp. 119-126, 1939.
4. Economic geology of a part of the Menominee range, Dickinson County: Mich. Geol. Survey Prog. Rpt. 9, 2 pls., geol. maps, Nov. 1942. 27 pp.
5. (and Park, C. F., Jr.; Balsley, J. R., Jr.) General character and succession of tentative divisions in the stratigraphy of Mineral Hills district, Iron County, Michigan: U. S. Geol. Survey Prelim. Rpt., 1945. 4 pp.
6. Geology of the central part of the Iron River district, Iron County, Michigan: U. S. Geol. Survey Circ. 43, illus., incl. index and geol. maps, Nov. 1949. 9 pp.
7. Progress of geologic work in Iron and Dickinson counties, Michigan: U. S. Geol. Survey Circ. 84, illus., incl. geol. maps, Sept. 1950. 7 pp. In northern Michigan, recent work has considerably advanced knowledge of the stratigraphy and structure of the highly deformed Huronian iron-bearing sedimentary rocks. The strata, structures, and results of aeromagnetic surveys are described briefly and preliminary maps are included. U.S.G.S.

Eastman, John Robie

1. A new meteorite (Grand Rapids, Michigan): Am. Jour. Sci., ser. 3, v. 28 (v. 128), pp. 299-300, 1884; abs., Philos. Soc. Wash. Bull., v. 7, p. 32, 1884 (Smithsonian Misc. Coll., v. 33, Art. II, 1888).

Eaton, Lucien—See also Hayden, J. E., 2.

1. Methods of stocking ore on the Marquette range: Lake Superior Min. Inst. Proc., v. 19, pp. 72-99, illus., 1914.
2. Equipping and sinking the No. 1 shaft at the Holmes mine: Lake Superior Min. Inst. Proc., v. 21, pp. 106-124, illus., 1917.
3. Mechanical ventilation at Lake mine: Lake Superior Min. Inst. Proc., v. 22, pp. 106-112, illus., 1922.
4. Present scraping practice at the Cliffs Shaft mine: Lake Superior Min. Inst. Proc., v. 24, pp. 121-125, 1925.
5. Mining soft hematite at Mine No. 2 of the Marquette range, Mich.: U. S. Bur. Mines Inf. Circ. 6179, 7 figs., 1929. 15 pp. Outlines history, geology, methods of prospecting, and estimation of tonnages and values, methods of development and mining, contract system, ventilation system, fire-prevention methods, and safety work. U.S.B.M.
6. Mining soft hematite by open stopes at Mine No. 1, Menominee range, Mich.: U. S. Bur. Mines Inf. Circ. 6180, 6 figs., 1929. 10 pp. Outlines history, geology, and physical characteristics of ore, methods of prospecting, sampling, and estimation of tonnage. Describes methods of development, underground transportation, and ventilation. U.S.B.M.
7. Method and cost of mining hard specular hematite on the Marquette range, Michigan: Lake Superior Min. Inst. Proc., v. 27, pp. 190-209, 10 figs., 1929; U. S. Bur. Mines Inf. Circ. 6138, 7 figs., 1929. 14 pp. Discusses methods of prospecting and exploration, sampling and estimating tonnage and values and development methods. Gives data regarding percentage of ore extraction and costs in units of labor, fuel, and supplies. U.S.B.M.

Eckel, Edwin Clarence—See also Emmons, S. F., 3.

1. Cement materials and industry of the United States: U. S. Geol. Survey Bull. 243, 1905. 395 pp. Pages 189-206 concern Michigan.
2. (and others) Portland cement materials and industry in the United States: U. S. Geol. Survey Bull. 522, maps, 1913. 401 pp. Pages 208-224 concern Michigan.

Eddy, Gerald Ernest—See also U. S. Geological Survey, 12.

1. A study of the insoluble residues of the Lower Traverse, Bell, and Upper Dundee formations of Michigan: Mich. Acad. Sci. Papers (1932), v. 18, pp. 345-361, 2 figs., 8 pls., 1933. Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, Apr. 1932.
2. Magnetic surveying of the copper country of northern Michigan: Compass, v. 13, no. 3, pp. 117-119, Mar. 1933.
3. Geology of the Crystal oil field, Montcalm County, Michigan: Mich. Geol. Survey Prog. Rpt. 1, 2 pls., incl. structural contour map, July 1936. 8 pp. Oil and Gas Jour., v. 35, no. 16, pp. 32, 35, 38, 3 figs., Sept. 3, 1936.

Edwards, James P.

1. Mines and mineral statistics [Ann. Rpt., Comm. Mineral Statistics, 1891]: Lansing, 1892. 138 pp.

Eggleston, G. C.—See Keck, W. E., 3.**Eggleston, Thomas**

1. Copper mining on Lake Superior: A.I.M.E. Trans., v. 6, pp. 275-312, 1879.
2. Copper refining in the United States: A.I.M.E. Trans., v. 9, pp. 678-730, 1881.

- Ehlers, George Marion—See also Landes, K. K., 3; Ruedemann, Rudolf, 1.
1. An interesting illustration of a process of destruction of a glaciated surface: Mich. Acad. Sci. Ann. Rpt., v. 20, pp. 59-63, 2 pls., 2 figs., 1918. Area discussed is near Seul Choix Pointe, approximately fifteen miles east of Manistique.
 2. *Heterolasma foerstei*, a new genus and species of Tetracoralla from the Niagaran of Michigan: Am. Jour. Sci., ser. 4, v. 48 (v.198), pp. 461-467, 3 figs., Dec. 1919.
 3. Notes on the stratigraphy of the Racine formation of the Northern Peninsula of Michigan: Mich. Acad. Sci. Ann. Rpt., v. 21, pp. 87-90, 1920.
 4. Niagaran rocks of the Northern Peninsula of Michigan [abs.]: Geol. Soc. Am. Bull., v. 32, no. 1, pp. 129-130, Mar. 31, 1921.
 5. (and Hussey, R. C.) A new gastropod and a new cephalopod from the Devonian of Michigan: Mich. Acad. Sci. Papers (1921), v. 1, pp. 248-252, 2 pls., 1923.
 6. (and Leighly, J. B.) *Lipsanocystis traversensis*, a new cystid from the Devonian of Michigan: Mich. Acad. Sci. Papers (1922), v. 2, pp. 155-160, 3 figs., 1 pl., 1923.
 7. The presence of Cataract strata in Michigan supported by fossil evidence: Mich. Acad. Sci. Papers (1923), v. 3, pp. 281-283, 1924.
 8. An Ordovician reef on Sulphur Island, Lake Huron: Mich. Acad. Sci. Papers (1924), v. 4, pp. 425-429, 1 fig., 3 pls., 1925.
 9. Two new crinoids from the Devonian of Michigan: Mich. Univ. Mus. Geol. Contr., v. 2, no. 6, pp. 99-104, 1 pl., June 3, 1925; abs., Pan Am. Geol., v. 44, no. 2, p. 60, Sept. 1925.
 10. (and Cooley, M. E.) Discovery of a Hamilton fauna in southeastern Michigan: Mich. Univ. Mus. Geol. Contr., v. 2, no. 13, pp. 231-236, Aug. 3, 1927.
 11. Stratigraphy of the Niagaran series of the Northern Peninsula of Michigan: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1930. Unpublished.
 12. (and Brown, J. W.) Graptolites of the Niagaran strata of Michigan [abs.]: Geol. Soc. Am. Bull., v. 42, no. 1, p. 351, Mar. 31, 1931; Pan Am. Geol., v. 55, no. 2, pp. 151-152, Mar. 1931.
 13. (and White, T. E.) *Cylindrophyllum panicum* (Winchell) and *Cylindrophyllum hindshawi* sp. nov., Tetracoralla from the Traverse group of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 4, no. 4, pp. 93-100, 5 pls., Dec. 1, 1932.
 14. (and Kline, V. H.) Revision of Alexander Winchell's types of brachiopods from the Middle Devonian Traverse group of rocks of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 4, no. 10, pp. 143-176, 2 figs., 4 pls., Jan. 15, 1934; abs., Geol. Soc. Am. Proc. (1933), p. 347, June 1934. Also, thesis by V. H. Kline for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, 1933.
 15. (and Radabaugh, R. E.) The Rogers City limestone, a new Middle Devonian formation in Michigan: Mich. Acad. Sci. Papers (1937), v. 23, pp. 441-446, 2 pls., 1938.
 16. (and Humphrey, W. E.) Revision of E. A. Strong's species from the Mississippian Point au Gres limestone of Grand Rapids, Michigan: Mich. Univ. Mus. Paleont. Contr., v. 6, no. 6, pp. 113-130, 3 pls., Feb. 10, 1944. Also, thesis by W. E. Humphrey for Degree of Master of Science, entitled Revision of A. E. Strong's types from the Mississippian Point au Gres limestone at Grand Rapids, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1940.

17. Classification of the Upper Silurian and Middle Devonian strata of the Mackinac region [abs.]: Geol. Soc. Am. Bull., v. 55, no. 12, pt. II, pp. 1475-1476, Dec. 1944.
18. (and Stumm, E. C.) Corals of the Devonian Traverse group of Michigan; pt. I, *Spongophyllum*: Mich. Univ. Mus. Paleont. Contr., v. 7, no. 8, pp. 123-130, 3 pls., May 13, 1949. Pt. II, *Cylindrophyllum*, *Depasophyllum*, *Disphyllum*, *Eridophyllum*, and *Synaptophyllum*, v. 8, no. 3, pp. 21-41, 8 pls., Nov. 22, 1949. Pt. III, *Antholites*, *Pleurodictyum*, and *Procteria*, v. 8, no. 8, pp. 205-220, 5 pls., Aug. 11, 1950. Pt. IV, *Billingstraea*, v. 9, no. 3, pp. 83-92, 3 pls., July 11, 1951. Abs., pt. I., Geol. Soc. Am. Bull., v. 59, no. 12, pt. II, p. 1319, Dec. 1948; Proc. (1948), p. 6, 1949.

Eidemiller, H. N.—See Broderick, T. M., 10.

Eights, James

1. Outlines of the geological structure of Lake Superior mineral region belonging to the New York and Lake Superior Mining Company, Albany, 1846. 21 pp. Appendix to New York and Lake Superior Mining Company, 1st Ann. Rpt., Albany, 1846.

Eisenlohr, William S.—See Williams, G. R., 2.

Elias, Maxim Konrad

1. *Fenestella deissi* (new name) from the Middle Devonian of Michigan, and related forms: Jour. Paleont., v. 24, no. 3, pp. 390-392, May 1950. Because *Fenestella foraminosa* Deiss is preoccupied, it is renamed *F. deissi* Elias. Its relation to other forms is indicated. U.S.G.S.

Elie de Beaumont, Léonce

1. [On the age of the Lake Superior sandstone]: Société géologie de France Bull., ser. 2, v. 7, p. 209, 1850.

El-Khalidi, Hatem Hussein

1. A field and petrographic study of the sandstones and conglomerates of the Porcupine Mountains, Ontonagon County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1950. 110 pp. Unpublished.

Elkington, Robert B.

1. Structure of the Michigamme slate along the Huron River, Baraga County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Wayne Univ., Detroit, June 1952. Unpublished.

Ellard, H. F.

1. Sinking and equipping No. 9 shaft, Ashland mine [with discussion]: Lake Superior Min. Inst. Proc., v. 9, pp. 24-38, 1903.

Eller, Eugene Rudolph

1. Scolecodonts from the Potter Farm formation of the Devonian of Michigan: Carnegie Mus. Annals, v. 27, art. 17, pp. 275-286, 2 pls., Oct. 22, 1938.
2. Scolecodonts from well cuttings [abs.]: Geol. Soc. Am. Bull., v. 56, no. 12, pt. II, p. 1157, Dec. 1945. Description of cuttings from the 2859-2938 foot depth from a well at Kawkawlin, Michigan.

Elliott, S. R.

1. Method of raising, sinking and concreting No. 3 shaft, Negaunee mine: Lake Superior Min. Inst. Proc., v. 17, pp. 260-282, 1912.

2. Spies open-stope system of mining: Lake Superior Min. Inst. Proc., v. 22, pp. 113-118, illus., 1922; A.I.M.E. Trans., v. 68, pp. 282-286, 5 figs., 1923.
3. (and Jopling, J. E.; Chenneour, R. J.; Derby, E. L., Jr.) Mining methods of Marquette district, Michigan: A.I.M.E. Trans., v. 72, pp. 122-138, 8 figs., 1925.

Ely, Northcutt

1. The oil and gas conservation statutes: Federal Oil Conservation Board, Washington, D. C., 1933. Pages 195-217 concern Michigan.

Emmons, S. F.—See also Leith, C. K., 9.

- *1. (and Hayes, C. W.; and others) Contributions to economic geology, 1902: U. S. Geol. Survey Bull. 213, 1903. Contains: Coal fields of the United States, pp. 257-269; Geologic work in the Lake Superior iron district during 1902, by C. K. Leith, pp. 247-250.
2. (and Hayes, C. W.; and others) Contributions to economic geology, 1903: U. S. Geol. Survey Bull. 225, 1904. Contains: The Lake Superior region during 1903, by C. K. Leith, pp. 215-220.
- *3. (and Hayes, C. W.; and others) Contributions to economic geology, 1904: U. S. Geol. Survey Bull. 260, 1905. 620 pp. Contains: The production of gold in the United States in 1904, by Waldemar Lindgren, pp. 32-38; The copper production of the United States, by W. H. Weed, pp. 211-216; Iron and manganese ores of the United States, by E. C. Eckel, pp. 317-320; The American cement industry, by E. C. Eckel, pp. 496-505.

Emmons, William Harvey

- *1. The enrichment of ore deposits: U. S. Geol. Survey Bull. 625, 1917. 530 pp.

Engel, Theodore, Jr.

1. The stratigraphy and petrography of the Holyoke meta-sediments of the Dead River basin, Marquette County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1954. 74 pp. Unpublished.

Engels, William Louis

1. Two new records of the Pleistocene beaver *Castoroides ohioensis*: Am. Midland Nat., v. 12, no. 12, pp. 529-532, 3 figs., Nov. 1931.

Engineering and Mining Journal

1. A new mine for Michigan's Gogebic range—The Peterson: Eng. Min. Jour., v. 154, no. 9, pp. 76-79, 1 fig., Sept. 1953.

Enyert, Richard L.

1. Middle Devonian sandstones of the Michigan Basin: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, Feb. 1950. Unpublished. Microfilmed.

Erickson, Ralph LeRoy—See also Sandefur, B. T., 1.

1. A petrographical investigation of the longitudinal deposition within the Mason esker relative to its origin: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1948. 27 pp. Unpublished.

Ericson, Rudolph—See Baxter, C. H., 2.**Espenshade, Edward B., Jr.**

1. An intensive study of the sphericity and roundness of beach and dune sands of the south of Lake Michigan: Thesis for Degree of Master of

Science, Dept. of Geol., Univ. of Chicago, Chicago, Ill., June 1932. Unpublished. Microfilmed.

Evans, Oren Frank

1. Bathymetric studies of the Lake Michigan basin: Geog. Rev., v. 25, no. 4, pp. 667-670, 2 figs., incl. index map, Oct. 1935; abs., entitled Bathymetric map of Lake Michigan, Okla. Acad. Sci. Proc. (1934), v. 15, pp. 80-81, 1935.
2. Origin of the harbor lakes of western Michigan [abs.]: Okla. Acad. Sci. Proc. (1935), v. 16, p. 74, 1936.
3. Origin of the coastal lakes of western Michigan: Geog. Rev., v. 27, no. 1, pp. 136-137, Jan. 1937.
4. Transportation of sediments on fresh-water surfaces by flotation: Jour. Sed. Petr., v. 8, no. 1, pp. 33-35, 1938.
5. The undertow: Sci., v. 88, no. 2282, pp. 279-281, Sept. 23, 1938. Contains studies of subsurface currents in lakes of western Michigan.
6. Mass transportation of sediments on subaqueous terraces: Jour. Geol., v. 47, no. 3, pp. 325-334, 3 figs., Apr.-May 1939.
7. The low and ball of the eastern shore of Lake Michigan: Jour. Geol., v. 48, no. 5, pp. 476-511, 6 figs., incl. aerial photograph, July-Aug. 1940; abs., Geol. Soc. Am. Bull., v. 51, no. 12, pt. II, pp. 2039-2040, Dec. 1, 1940; Jour. Geomorphology, v. 4, no. 4, p. 339, Dec. 1941. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, Mar. 1940.
8. The classification of wave-formed ripple marks: Jour. Sed. Petr., v. 11, no. 1, pp. 37-41, 2 figs., Apr. 1941.
9. The relation between the size of wave-formed ripple marks, depth of water, and size of generating waves: Jour. Sed. Petr., v. 12, no. 1, pp. 31-35, Apr. 1942.
10. The origin of spits, bars, and related structures: Jour. Geol., v. 50, no. 7, pp. 846-865, 10 figs., Oct.-Nov. 1942; abs., Okla. Acad. Sci. Proc., v. 22, p. 144, 1942; Pan Am. Geol., v. 77, no. 3, p. 235, Apr. 1942; Geol. Soc. Am. Bull., v. 52, no. 12, pt. II, p. 1999, Dec. 1, 1941.
11. Effect of change of wave size on the size and shape of ripple marks: Jour. Sed. Petr., v. 13, no. 1, pp. 35-39, Apr. 1943.
12. Some structural differences between wind-laid and water-laid deposits on the west shore of Lake Michigan: Jour. Sed. Petr., v. 14, no. 2, pp. 94-96, 2 figs., Aug. 1944.
13. The classification and origin of beach cusps: Jour. Geol., v. 46, no. 4, pp. 615-627, 2 figs., May-June 1938; further observations, Jour. Geol., v. 53, no. 6, pp. 403-404, 1945.
14. On the action of waves breaking against the edge of a submerged shelf: Jour. Geol., v. 58, no. 3, pp. 281-282, May 1950. Observations on a submerged shelf in Crystal Lake, Michigan, show that over a 60-year period no ridge has been formed at the outer edge of the shelf by waves moving sediment shoreward. U.S.G.S.

Eveland, Harmon Edwin, Jr.

1. Topographic expression of geology in the Lake Huron basin: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Ill., Urbana, 1948. 18 pp. Unpublished.

Everhart, H. A.

1. A trip to Michigan's Upper Peninsula: Rocks and Minerals, v. 21, no. 9, p. 570, 1946.

Everts & Stewart

1. New historical atlas of Washtenaw County, Michigan: Chicago, Everts & Stewart, 1874.

Exworthy, Alice

1. Enormous salt deposits in Michigan: *Mineralog.*, v. 3, no. 4, p. 22, Apr. 1935.

Fairbairn, Harold Williams

1. Deformation lamellae in quartz from the Ajibik formation, Michigan: *Geol. Soc. Am. Bull.*, v. 52, no. 8, pp. 1265-1277, 2 pls., 7 figs., Aug. 1, 1941; abs., v. 51, no. 12, pt. II, pp. 1925-1926, Dec. 1, 1940.

Faul, Henry

1. *Prismatophyllum* in the Traverse group of north central Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1942. 46 pp. Unpublished.
2. Growth-rate of a Devonian reef-coral (*Prismatophyllum*): *Am. Jour. Sci.*, v. 241, no. 9, pp. 579-582, 1 pl., 1943.
3. Fossil burrows from the pre-Cambrian Ajibik quartzite of Michigan: *Jour. Paleont.*, v. 24, no. 1, pp. 102-106, illus., Jan. 1950; abs., entitled, Pre-Cambrian fossil trails from the Ajibik quartzite in Michigan, *Geol. Soc. Am. Bull.*, v. 59, no. 12, pt. II, pp. 1320-1321, Dec. 1948; a brief summary, *Nature*, v. 164, no. 4157, p. 32, illus., July 2, 1949. Markings found on the surfaces of the Ajibik mid-Huronian quartzite north of Ishpeming, Michigan, are interpreted as burrows made by a small, unknown organism. U.S.G.S.

Fausser, W. B., Jr.

1. Paleontology and stratigraphy of well cores from Garfield Twp., Newaygo County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, 1951 [?]. Unpublished.

Fay, Albert Hill

1. Shaft of the Detroit Salt Company: *Eng. Min. Jour.*, v. 91, pp. 565-569, 8 figs., Mar. 18, 1911.
2. Mine accidents classified by mining methods, for Lake Superior district, 1915: *Lake Superior Min. Inst. Proc.*, v. 21, pp. 65-70, 1917.

Fenton, Carroll Lane—See also Fenton, M. A., 4.

1. (and Fenton, M. A.) Studies on the genus *Atrypa*: *Am. Midland Nat.*, v. 12, no. 1, pp. 1-18, 2 figs., 2 pls., Jan. 1930.
- *2. Niagaran stromatoporoid reefs of the Chicago region: *Am. Midland Nat.*, v. 12, no. 7, pp. 203-212, Jan. 1931.
3. (and Fenton, M. A.) Some snail borings of Paleozoic age: *Am. Midland Nat.*, v. 12, no. 12, pp. 522-528, 1 fig., 1 pl., Nov. 1931.

Fenton, Mildred Adams—See also Fenton, C. L., 1, 3.

1. True reef formed by stromatoporoids [abs.]: *Geol. Soc. Am. Bull.*, v. 40, no. 1, p. 244, Mar. 30, 1929; *Pan Am. Geol.*, v. 51, no. 3, p. 237, Apr. 1929.
2. A Devonian stromatoporoid reef [Petoskey, Michigan]: *Am. Midland Nat.*, v. 12, no. 7, pp. 195-202, 2 figs., 2 pls., Jan. 1931.
3. Species of *Aulopora* from the Traverse and Hamilton groups: *Am. Midland Nat.*, v. 18, no. 1, pp. 115-119, 4 figs., Jan. 1937.
4. (and Fenton, C. L.) *Aulopora*, a form-genus of tabulate corals and bryozoans: *Am. Midland Nat.*, v. 18, no. 1, pp. 109-115, 1 fig., Jan. 1937.

Fernekes, Gustave—See also Lane, A. C., 41.

1. Precipitation of copper from chloride solutions by means of ferrous chloride: *Econ. Geol.*, v. 2, no. 6, pp. 580-584, 1907.

Ferris, John G.—See also U. S. Geological Survey, 12.

1. Ground-water hydraulics as a geophysical aid: *Mich. Geol. Survey Tech. Rpt. 1*, prepared in cooperation with U. S. Geol. Survey, 11 figs., Mar. 1948. 12 pp.
2. A quantitative method for determining ground-water characteristics for drainage design: *Agr. Eng.*, v. 31, no. 6, pp. 285-289, 291, June 1950.
3. Ground-water resources of the Holland area, Ottawa County, Michigan: U. S. Geol. Survey, Ground Water Branch, Lansing, Michigan; prepared in cooperation with Mich. Dept. Conserv., Mich. Water Resources Comm., and Holland Dept. Public Works, 29 figs., May 1953. 29 pp. Open file report, Mich. Geol. Survey, Lansing.
4. (and Burt, E. M.; Stramel, G. J.; Crosthwaite, E. G.) Ground-water resources of southeastern Oakland County, Michigan: *Mich. Geol. Survey Prog. Rpt. 16*, prepared in cooperation with U. S. Geol. Survey, 6 pls., 44 figs., 9 tables, 1954. 158 pp.

Fieldner, A. C.

1. (and others) Analyses of Michigan, North Dakota, South Dakota, and Texas coals: U. S. Bur. Mines Tech. Paper 700, 2 figs., 3 pls., 1948. 106 pp.

Finlay, James R.

- *1. Valuation of iron-mines [with discussion]: *A.I.M.E. Trans.*, v. 45, pp. 282-326, 1913; *Trans.*, v. 50, pp. 184-196, 1914.

Fisher, Cassius A.—See Ashley, G. H., 1.**Fisher, James—See also Hotchkiss, W. O., 6.**

1. Historical sketch of the Lake Superior copper district: *Lake Superior Min. Inst. Proc.*, v. 27, pp. 54-67, 1929.
2. (and others) Recent geothermal measurements in the Michigan copper district [with discussion]: *A.I.M.E. Trans.*, v. 110, *Geophys. Prosp.*, pp. 528-545, 6 figs., 1934; *A.I.M.E. Tech. Pub. 481*, 4 figs., July 1932. 11 pp.
3. Geophysical prospecting and some of its applications in the Lake Superior district: *Lake Superior Min. Inst. Proc.*, v. 30, pp. 47-60, 1939.

Fitzgerald, Paul Eugene—See also Chamberlain, L. C., Jr., 1; Love, W. W., 1.

1. (and Thomas, W. A.) The occurrence of fluorite in the Monroe formation of the Mount Pleasant oil pool: *Mich. Acad. Sci. Papers* (1931), v. 16, pp. 415-420, 2 pls., incl. map, 1932; abs., *Am. Assoc. Petrol. Geol. Bull.*, v. 16, no. 1, pp. 91-92, 1932.
2. Memorial—Alfred Church Lane: *Am. Assoc. Petrol. Geol. Bull.*, v. 32, no. 11, pp. 2168-2170, 1948.

Fitzpatrick, R. C.—See Chapman, W. B., 1.**Flanagan, J. M.—See Foss, A. L., 1.****Fleener, Frank**

- *1. Silver Islet—Bonanza: *Earth Sci. Digest*, v. 6, no. 5, pp. 20-25, Mar. 1953.

Flint, Richard Foster

- *1. (and others) Pleistocene research; a review by the members of the committee on inter-relations of Pleistocene research, National Research Council: *Geol. Soc. Am. Bull.*, v. 60, no. 9, pp. 1305-1525, illus., Sept. 1949.

2. Probable Wisconsin sub-stages and late-Wisconsin events in northeastern United States and southeastern Canada: *Geol. Soc. Am. Bull.*, v. 64, pp. 897-920, 3 pls., Aug. 1953.

Foerste, August Frederick

1. The Richmond faunas of Little Bay de Noquette in northern Michigan: *Ottawa Nat.*, v. 31, no. 91, pp. 97-103, illus., Dec. 1917; v. 31, no. 10, pp. 121-127, Jan. 1918.
2. Silurian cephalopods of northern Michigan: *Mich. Univ. Mus. Geol. Contr.*, v. 2, no. 3, pp. 19-120, 2 figs., 17 pls., July 10, 1924; abs., *Am. Jour. Sci.*, ser. 5, v. 8 (v.208), no. 46, pp. 348-349, 1924.
3. Notes on American Paleozoic cephalopods: *Denison Univ. Sci. Lab. Jour.*, v. 20, pp. 193-267, 22 pls., Dec. 1924.
4. Devonian cephalopods from Alpena in Michigan: *Mich. Univ. Mus. Geol. Contr.*, v. 2, no. 9, pp. 189-208, 5 pls., Aug. 3, 1927.
- *5. The color patterns of fossil cephalopods and brachiopods, with notes on gastropods and pelecypods: *Mich. Univ. Mus. Paleont. Contr.*, v. 3, no. 6, pp. 109-150, 5 pls., Feb. 20, 1930.
6. Additional notes on *Nephriticerina*: *Mich. Univ. Mus. Paleont. Contr.*, v. 3, no. 7, pp. 151-154, 1 fig., 1 pl., Feb. 20, 1930.
7. Black River and other cephalopods from Minnesota, Wisconsin, Michigan, and Ontario, pt. I: Reprinted from *Denison Univ. Bull.* (v.32) *Sci. Lab. Jour.*, v. 27, pp. 47-136, 37 pls., Dec. 1932; pt. II, *Denison Univ. Bull.* (v.33) *Sci. Lab. Jour.*, v. 28, pp. 1-146, Apr. 1933.

Folger, Anthony

1. (and others) Geologic descriptions of states included in central United States cross section: Reprint, Guidebook, 5th Ann. Field Conf., *Kan. Geol. Soc.*, Sept. 1931. 93 pp.

Fontanna, Stanley G.

1. Michigan's water problems are studied: *Mich. Conserv.*, v. 15, no. 6, July 1946.

Foote, C. M.

1. (and Hood, E. C.) Plat book of Isabella County, Michigan: Minneapolis, C. M. Foote Publishing Co., 1899.

Foote, E. B.

1. (and others) Plat book of Tuscola County, Michigan: Philadelphia, Monarch Publishing Co., 1902.

Forsyth, A. C.—See Schwartz, G. M., 1.**Forsythe, James T.**

1. Pre-glacial drainage of central southern Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1952. Unpublished.

Foshag, William Frederick

1. (and Larsen, E. S., Jr.) Eakleite from Isle Royale, Michigan: *Am. Mineralog.*, v. 7, no. 2, pp. 23-24, Feb. 1922.

Foss, A. L.—See also Nilsen, N. E., 1.

1. (and Flanagan, J. M.) Shaft sinking at the Eureka mine: *Lake Superior Min. Inst. Proc.*, v. 25, pp. 39-51, illus., 1926.

Foster, John Wells—See also Desor, Edouard, 3; Hall, James, 1, 2; Whitney, J. D., 9, 11, 12, 19.

1. (and Whitney, J. D.) Synopsis of the explorations . . . in the Lake Superior land district in the Northern Peninsula of Michigan: *U. S. 31st*

- Cong., 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III, pp. 605-626, maps, 1849.
2. (and Hill, S. W.) Statistics of the mines of Keweenaw Point, Michigan: *U. S. 31st Cong.*, 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III, pp. 759-765, 1849.
 3. [Field notes of work in Lake Superior region]: *U. S. 31st Cong.*, 1st Sess., Senate Ex. Doc. 1, pt. III; House Ex. Doc. 5, pt. III, pp. 766-801, 1849.
 4. [Report of field work in the Lake Superior land district]: *U. S. 30th Cong.*, 2d Sess., Senate Ex. Doc. 2, pp. 159-163, 1849.
 5. (and Whitney, J. D.) On the different systems of elevation which have given configuration to North America with an attempt to identify them with those of Europe: *Am. Assoc. Adv. Sci. Proc.*, v. 5, pp. 136-138, 1851. Three grand systems of elevation in North America; Lake Superior, Appalachian, and Rocky Mountain systems; and two lesser systems—Kaministiquia, and Isle Royale and Keweenaw Point.
 6. (and Whitney, J. D.) On the Azoic system, as developed in the Lake Superior land district [abs.]: *Am. Assoc. Adv. Sci. Proc.*, v. 5, pp. 4-7, 1851.
 7. (and Whitney, J. D.) On the age of the sandstone of Lake Superior, with a description of the phenomena of the association of igneous rocks: *Am. Assoc. Adv. Sci. Proc.*, v. 5, pp. 22-38, 1851.
 8. (and Whitney, J. D.; and others) Report on the geology and topography of a portion of the Lake Superior land district in the state of Michigan; pt. I, Copper lands: *U. S. 31st Cong.*, 1st Sess., House Ex. Doc. 69, maps, 1850. 224 pp. Pt. II, The iron region, together with the general geology: *U. S. 32d Cong.*, Spec. Sess., Senate Ex. Doc. 4, v. 16, illus., maps, 1851. 406 pp. Extr., *Am. Jour. Sci.*, ser. 2, v. 17 (v.67), pp. 11-13, 1854; notice, v. 15 (v.65), no. 44, pp. 295-296, 1853; v. 12 (v.62), no. 35, pp. 222-239, 1851.
 9. (and Whitney, J. D.) [Mineralogical notes]: *Am. Jour. Sci.*, ser. 2, v. 15 (v.65), no. 45, p. 434 (Limestones, marble of Lake Superior region), p. 439 (Honeslate or novaculite), p. 440 (Feldspar of the granite of the Lake Superior region), p. 440 (Leonhardtite of Copper Falls, Lake Superior region), p. 444 (On the iron ores of the Lake Superior region), p. 446 (Native copper of the Lake Superior region), 1853. See also J. W. Foster, 8.
 10. (and Whitney, J. D.) Pitchstone from the trap of Isle Royale: *Am. Jour. Sci.*, ser. 2, v. 17 (v.67), no. 49, p. 128, 1854.
 11. (and Kimball, J. P.) Geology and metallurgy of the iron ores of Lake Superior, Iron Cliffs Company, New York, 1865. 89 pp. Report, by J. W. Foster, addressed to the Board of Directors of the Iron Cliffs Company, New York, 1865. 16 pp.
- Fowle, J. C.**
1. Magnetic concentration at the Michigamme iron-mine, Lake Superior: *A.I.M.E. Trans.*, v. 19, pp. 62-70, 1890.
- Frantti, Gordon E.**
1. Geophysical investigations in Upper Peninsula of Michigan: Thesis for Degree of Master of Science, Dept. of Phys., Mich. College Min. Tech., Houghton, 1954. 75 pp. Unpublished.
- Franz, Harvey—See also Hill, Jeff, 3.**
1. Fulgurites in Michigan: *Rocks and Minerals*, v. 21, no. 6, pp. 354-355, June 1946.

Fraser, Lee

1. Coal mining in Michigan: Eng. Min. Jour., v. 48, pp. 594-595, 1024-1027, 1907.

Fritts, Crawford E.

1. A petrologic study of the Mount Houghton felsite, Keweenaw Peninsula: Thesis for Degree of Master of Science, Dept. of Geol. Eng., Mich. College Min. Tech., Houghton, 1952. 42 pp. Unpublished.

Fritz, Madeleine Alberta

- *1. Devonian fossil zones in wells from southwestern Ontario: Geol. Soc. Am. Bull., v. 50, no. 1, 3 figs., pp. 79-88, Jan. 1, 1939.

Fry, William H.

1. Sections of two Michigan salt wells: Jour. Geol., v. 21, no. 4, pp. 320-322, 1913.
2. Log of well of Pennsylvania Salt Company, Detroit, Michigan: Jour. Geol., v. 21, no. 7, p. 671, 1913.

Frye, F. R.—See Smith, R. A., 11.**Fugate, Ross J.**

1. Developments in Michigan in 1952: Am. Assoc. Petrol. Geol. Bull., v. 37, no. 6, pp. 1315-1328, June 1953.
2. (and Sleight, G. C.) Developments in Michigan in 1953: Am. Assoc. Petrol. Geol. Bull., v. 38, no. 6, pp. 1091-1106, 3 figs., 7 tables, June 1954.

Fuller, George Damon

1. Postglacial vegetation of the Lake Michigan region: Ecology, v. 16, no. 3, pp. 473-487, 8 figs., incl. geol. map, July 1, 1935; abs., Am. Meteorol. Soc. Bull., v. 19, no. 5, pp. 187-188, May 1938.

Fuller, Myron Leslie—See also Lane, A. C., 36.

1. (and Clapp F. G.; Johnson, B. L.) Bibliographic review and index of underground-water literature published in the United States in 1905: U. S. Geol. Survey Water-Supply Paper 163, 1906. 130 pp.
2. (and others) Contributions to hydrology of eastern United States, 1903: U. S. Geol. Survey Water-Supply Paper 102, 1904. 522 pp. Contains: Lower Michigan, by W. F. Cooper, pp. 489-512.
3. Artesian flows from unconfined sandy strata: Eng. News., v. 53, no. 13, pp. 329-330, 3 figs., Mar. 30, 1905. Describes examples on Long Island, New York, and in Michigan and offers an explanation of the cause.
4. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey 1879-1904: U. S. Geol. Survey Water-Supply Paper 120, 1905. 128 pp.
5. Underground waters of eastern United States: U. S. Geol. Survey Water-Supply Paper 114, 1905. 285 pp. Contains: Lower Michigan, compiled from report by A. C. Lane, pp. 242-247.
- *6. (and Lines, E. F.; Veatch, A. C.) Record of deep-well drilling for 1904: U. S. Geol. Survey Bull. 264, 1905. 106 pp.
7. Contributions to the hydrology of eastern United States 1905: U. S. Geol. Survey Water-Supply Paper 145, 1905. Contains: A ground-water problem in southeastern Michigan, pp. 129-147.
- *8. (and Sanford, Samuel) Record of deep-well drilling for 1905: U. S. Geol. Survey Bull. 298, 1906. 299 pp.

Fulton, John

1. Mode of deposition of the iron ores of the Menominee range, Michigan: A.I.M.E. Trans. (1887-88), v. 16, pp. 525-536, 9 figs., incl. map, 1887.

2. Methods of mining in the Menominee range, Michigan: A.I.M.E. Trans. (1887-88), v. 16, pp. 891-905, 8 figs., 1888.

Gacek, Walter F.

1. Mechanical analyses of sediments from southwest Lake Erie: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1951. Unpublished.

Gannett, Henry

1. Results of primary triangulation: U. S. Geol. Survey Bull. 122, 1894. 412 pp. Pages 117-119 concern Michigan.
2. Summary of the primary triangulation executed by the United States Geological Survey between the years 1882 and 1894: U. S. Geol. Survey Ann. Rpt., v. 16, pt. I, pp. 875-885, 1894-1895.
3. (compiler) A dictionary of geographic positions in the United States: U. S. Geol. Survey Bull. 123, 1895. 183 pp. Pages 107-112 concern Michigan.
4. Magnetic declination in the United States: U. S. Geol. Survey Ann. Rpt., v. 17, pt. I, pp. 203-440, 1896.
5. Boundaries of the United States and of the several States and Territories with an outline of the history of all important changes of territory (1st ed.): U. S. Geol. Survey Bull. 13, 1885. 135 pp. 2d ed., Bull. 171, 1900. 142 pp. 3d ed., Bull. 226, 1901. 145 pp.
6. The origin of certain place names in the United States (2d ed.): U. S. Geol. Survey Bull. 258, 1905. 334 pp. 1st ed., Bull. 197, 1902. 280 pp.
7. (compiler) A dictionary of altitudes in the United States (4th ed.): U. S. Geol. Survey Bull. 274, 1906. 1072 pp. Pages 445-471 concern Michigan. 3d ed., Bull. 160, 1899. 775 pp. Pages 297-319 concern Michigan.
8. The areas of the United States, the States, and the Territories: U. S. Geol. Survey Bull. 302, 1906. 9 pp.

Gannett, Samuel S.

1. Results of primary triangulation and primary traverse, fiscal year 1902-03: U. S. Geol. Survey Bull. 216, 1903; for 1903-04, Bull. 245, 1904; for 1905-06, Bull. 310, 1907.

Gardner, E. D.

- *1. (and Johnson, C. H.; Butler, B. S.) Copper mining in North America: U. S. Bur. Mines Bull. 405, 1938. 300 pp.

Garner, H. F.—See Miller, A. K., 1, 2.

1. Lower Mississippian orthoconic nautiloid cephalopods of Michigan: Thesis for Degree of Master of Science, Dept. of Geol., State Univ. of Iowa, Iowa City, 3 pls., 1951. 72 pp. Published in part; see Miller, A. K., 1, 2.
2. Lower Mississippian cephalopods of Michigan, coiled nautiloids and ammonoids: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., State Univ. of Iowa, Iowa City, 11 pls., 1953. 201 pp. Published in part; see Miller, A. K., 1, 2.

Garrigues, S. S.—See Rominger, C. L., 3.**Garton, E. L.**

1. Analyses of crude oils from some fields of Michigan: U. S. Bur. Mines Rpt. Inv. 3346, May 1937. 28 pp. Discusses briefly oil fields of Michigan and characteristics of crude oils produced from them. Gives analyses of 15 samples of crude. U.S.B.M.

Gates, David M.

1. A deposit of mammal bones under Sleeping Bear dune: *Kan. Acad. Sci. Trans.*, v. 42, pp. 337-338, 1 fig., 1939.

Gates, Frank C.

1. The disappearing Sleeping Bear dune: *Ecology*, v. 31, no. 3, pp. 386-392, 13 figs., July 1950. Sleeping Bear dune, about 25 miles west of Traverse City, Michigan, is perched on a glacial moraine overlooking Lake Michigan to the west. Formerly covered by vegetation, the dune is now being eroded away by the wind as a result of activity within the past 20 years which has destroyed the protective vegetative covering. Variations in the measurements from 1928 to the present time are given. U.S.G.S.

Gates, William B.

1. Michigan copper and Boston dollars: Cambridge, Mass., Harvard Univ. Press. 1951. *Rev., Econ. Geol.*, v. 47, no. 2, pp. 227-229, Mar.-Apr. 1952.

Geijer, Per

1. Lake Superior områdets prekambriiska järnformationer [Pre-Cambrian iron formation, Lake Superior district]: *Geologiska Föreningens i Stockholm, Förhandlingar* 35, pp. 439-483, 1914.

Genth, F. A.

1. Contributions to mineralogy; Whitneyite, a new species: *Am. Jour. Sci.*, ser. 2, v. 27 (v.77), no. 81, p. 400, 1859; Whitneyite, v. 28 (v.78), no. 83, p. 247, 1859; Arsenides of copper, v. 33 (v.83), no. 98, pp. 191-194, 1862.

Gibbs, Clifford J.

1. The influence of sub-surface geology upon the propagation of electromagnetic waves: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1939. 55 pp. Unpublished.

Gibson, Thomas G.

- *1. Principles of mining taxation [with discussion]: *A.I.M.E. Trans.*, v. 61, pp. 639-648, 709-711, 1919.

Gidley, James Williams

1. Descriptions of two new species of Pleistocene ruminants of the genera *Ovibos* and *Boötherium*, with notes on the latter genus: *U. S. Natl. Mus. Proc.*, v. 34, pp. 681-684, illus., 1908. Specimen of *Boötherium* obtained from post-glacial swamp near Grand Rapids.

Gilbert, Grove Karl

1. Recent earth movement in the Great Lakes region: *U. S. Geol. Survey Ann. Rpt.*, v. 18, pt. II, pp. 595-647, 1897; in part, *Am. Jour. Sci.*, ser. 4, v. 7 (v.157), no. 39, pp. 239-241, 1899.

Glock, Waldo S.

- *1. Algae as limestone makers and climatic indicators: *Am. Jour. Sci.*, ser. 5, v. 6 (v.206), no. 35, pp. 377-408, Nov. 1923. This paper might be of value in determining the origin of some Michigan marls.

Goetz, G. W.

1. Analyses of Lake Superior iron-ores: *A.I.M.E. Trans.*, v. 19, pp. 59-61, 1890.

Goldthwait, James Walter

- *1. Correlation of the raised beaches on the west side of Lake Michigan: *Jour. Geol.*, v. 14, no. 5, pp. 411-424, 1906.
2. A reconstruction of water planes of the extinct glacial lakes in the Lake Michigan basin: *Jour. Geol.*, v. 16, no. 5, pp. 459-476, 1908; *abs.*, *Sci.*, new ser., v. 27, pp. 724-725, 1908.

3. Isobases of the Algonquin and Iroquois beaches, and their significance: *Geol. Soc. Am. Bull.*, v. 21, pp. 227-248, 1910.

4. The altitude of the Algonquin beach and its significance [abs.]: *Sci.*, new ser., v. 28, pp. 382-383, 1908.

5. Isobases of post-Algonquin elevation across lakes Michigan and Huron [abs.]: *Sci.*, new ser., v. 29, p. 754, 1909.

Good, Stanley Edgar

1. (and Pettijohn, F. J.) Magnetic survey and geology of the Stager area, Iron County, Michigan: *U. S. Geol. Survey Circ.* 55, prepared in cooperation with Mich. Geol. Survey, illus., incl. index and geol. maps, Aug. 1949. 4 pp.

Goodell, Edwin B.

- *1. A review of the laws forbidding pollution of inland waters in the United States (2d ed.): *U. S. Geological Survey Water-Supply Paper* 152, 1905. 149 pp. Pages 36-38 concern Michigan.

Goodman, Robert J.

1. The future of iron mining on the Marquette range, Marquette County, Michigan: *Mich. Acad. Sci. Papers* (1949), v. 35, pp. 189-195, 5 figs., 1951.
2. The discovery and early exploitation of iron ore on the Marquette range, Marquette County, Michigan: *Mich. Acad. Sci. Papers* (1951), v. 37, pp. 161-165, 1 fig., 1952.

Gordon, Charles Henry—See also Lane, A. C., 27.

1. Geological report on Sanilac County, Michigan: *Mich. Geol. Survey*, v. 7, pt. III, 5 pls., 2 figs., incl. map, 1900. 34 pp.
2. Notes on the Kalamazoo and other old glacial outlets in southern Michigan: *Jour. Geol.*, v. 6, no. 5, pp. 477-482, map, 1898.

Gordon, W. C.—See also Baxter, C. H., 2; Lane, A. C., 45.

1. The Black River section near Bessemer: *Mich. Acad. Sci. Rpt.*, v. 7, pp. 188-195, 1905.

Grabau, Amadeus William—See also Lane, A. C., 27; Sherzer, W. H., 6, 8.

1. A preliminary geologic section in Alpena and Presque Isle counties, Michigan: *Am. Geol.*, v. 28, no. 3, pp. 177-189, 1901.
2. Traverse group of Michigan [abs.]: *Sci.*, new ser., v. 15, p. 83, 1902; *Geol. Soc. Am. Bull.*, v. 13, p. 519, 1903.
3. Limestone regions of Michigan [abs.]: *N. Y. Acad. Sci. Annals*, v. 15, no. 1, p. 81, 1903.
4. Paleozoic coral reefs: *Geol. Soc. Am. Bull.*, v. 14, pp. 337-352, 2 pls., 1903.
- *5. Types of sedimentary overlap: *Geol. Soc. Am. Bull.*, v. 17, pp. 567-636, 17 figs., Dec. 31, 1906.
6. Subaerial erosion cliffs and talus in the lower Devonian of Michigan [abs.]: *Sci.*, new ser., v. 25, pp. 295-296, 1907.
7. The Sylvania sandstone; a study in paleogeography [abs.]: *Sci.*, new ser., v. 26, p. 832, 1907; note, *N. Y. Acad. Sci. Annals*, v. 18, p. 344, 1908.
8. Devonian elements in the late Silurian fauna of southern Michigan [abs.]: *Sci.*, new ser., v. 27, p. 726, 1908.
9. Notes on the Traverse group of Michigan [abs.]: *Sci.*, new ser., v. 27, p. 726, 1908.
10. Discovery of the Schoharie fauna in Michigan [abs.]: *Sci.*, new ser., v. 23, p. 467, 1906; *Geol. Soc. Am. Bull.*, v. 17, pp. 718-719, 1906; *N. Y. Acad. Sci. Annals*, v. 18, p. 267, 1908.

11. (and Sherzer, W. H.) The Monroe formation of southern Michigan and adjoining regions: Mich. Geol. and Biol. Survey, pub. 2, geol. ser. 1, illus., 1910. 248 pp.
12. Subdivisions of the Traverse group of Michigan and its relation to the other mid-Devonic formations [abs.]: Geol. Soc. Am. Bull., v. 27, p. 159, 1916.

Grabau, Warren Edward

1. The significance of oriented coral sections: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1950. 53 pp. Unpublished.

Graff, W. W.

1. Mining practices, methods, and costs at Mine No. 5 of the Marquette range, Mich.: U. S. Bur. Mines Inf. Circ. 6380, 5 figs., 1930. 10 pp. Describes working of mine by top-slicing system. Discusses methods of prospecting, developing, mining, and haulage. U.S.B.M.
2. Mining practices, methods, and costs, Mine No. 4 of the Marquette range, Mich.: U. S. Bur. Mines Inf. Circ. 6390, 3 figs., 1930. 8 pp. Describes mining methods used for semihard hematite ore. U.S.B.M.

Grant, Rex Potter

1. Oil and gas developments in Michigan during 1941: Am. Assoc. Petrol. Geol. Bull., v. 26, no. 6, pp. 1097-1109, 1 fig., index map, June 1942; abs., no. 5, p. 914, May 1942; in 1940, v. 25, no. 6, pp. 1125-1134, June 1941; abs., v. 25, no. 5, p. 944, May 1941.
2. Recent developments in western Michigan [abs.]: Am. Assoc. Petrol. Geol. Bull., v. 32, no. 2, p. 305, Feb. 1948.
3. The petroleum producing industry in Michigan: Compass, v. 25, no. 3, pp. 113-120, Mar. 1948.
4. Michigan's petroleum-producing industry: Mich. Conserv., v. 17, no. 4, pp. 8-9, 14-15, Apr. 1948.
5. Liquid gas is stored in "Tailor-Made" caves: Mich. Conserv., v. 22, no. 3, pp. 24-27, May-June 1953. Liquefied petroleum gas is being stored in Michigan in caves dissolved out of natural salt beds. Article is written in popular style.

Grant, Ulysses Sherman

1. The name of the copper-bearing rocks of Lake Superior: Am. Geol., v. 15, no. 3, pp. 192-194, 1895.
2. Investigations on the Lake Superior iron-ore deposits: Min. Mag., v. 10, pp. 175-183, 1904.

Graton, Louis Caryl

1. Memorial to Henry Lloyd Smyth: Geol. Soc. Am. Proc. (1947), pp. 177-190, portrait, May 1948.

Gray, A. B.

1. [Mineral lands of Lake Superior region]: U. S. 28th Cong., Spec. Sess., Senate Ex. Doc. 175, pp. 14-22, 1845.
2. Report on mineral lands on Lake Superior: U. S. 29th Cong., 1st Sess., House Ex. Doc. 211, map, 1846. 23 pp.

Greenman, Norman N.

1. The origin of the Randville dolomite of Dickinson and Iron counties, Michigan: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Chicago, Chicago, Ill., no date. Unpublished. Microfilmed.

Gregory, W. M.—See also Grimsley, G. P., 1; Lane, A. C., 27, 35.

1. Geological report on Arenac County: Mich. Geol. and Biol. Survey, pub. 11, geol. ser. 8, 6 pls., 18 figs., incl. map, 1912. 146 pp.

Gresley, W. S.

1. Organic markings in Lake Superior iron ores: Sci., new ser., v. 3, pp. 622-623, 1896.
2. Traces of organic remains from the Huronian (?) series, at Iron Mountain, Michigan, etc.: A.I.M.E. Trans., v. 26, pp. 527-534, illus., 1896.

Griffin, A. M.—See Hearn, W. E., 1.**Grimsley, G. P.—See also Adams, G. I., 1.**

1. The gypsum of Michigan and the plaster industry: Mich. Geol. Survey, v. 9, pt. II, 49 figs., 29 pls., incl. maps, 1904. 246 pp. Contains: The Alabaster area, by W. M. Gregory, pp. 60-77.
2. A theory of origin for the Michigan gypsum deposits: Am. Geol., v. 34, no. 6, pp. 378-387, 1904.
3. Origin of gypsum, with special reference to the origin of the Michigan deposits: Kan. Acad. Sci. Trans. (1904), v. 19, pp. 110-117, 1905.

Gritzner, G. F.

1. Vacation prospecting in Michigan: Rocks and Minerals, v. 24, nos. 1-2, pp. 38-39, 1949.

Grout, Frank Fitch—See also Hotchkiss, W. O., 7; Tyler, S. A., 3.

- *1. Contribution to the petrography of the Keweenawan: Jour. Geol., v. 18, no. 7, pp. 633-657, 1910.
- *2. Keweenawan copper deposits: Econ. Geol., v. 5, no. 5, pp. 471-476, 1910.

Gruner, John Walter—See also Hotchkiss, W. O., 7.

1. Hydrothermal oxidation and leaching experiments; their bearing on the origin of Lake Superior hematite-limonite ores: Econ. Geol., v. 25, nos. 7-8, pp. 697-719, 837-867, 12 figs., Nov.-Dec. 1930.
2. Magnesiosussexite, a new mineral from a Michigan iron mine, isomorphous with sussexite and camsellite: Am. Mineralog., v. 17, no. 11, pp. 509-513, Nov. 1932.
3. Additional notes on secondary concentration of Lake Superior iron ores: Econ. Geol., v. 27, no. 2, pp. 189-205, 1932; discussion, v. 27, no. 5, pp. 487-491, 1932; v. 28, no. 3, p. 293, 1933.
4. Hydrothermal leaching of iron ores of the Lake Superior type; a modified theory: Econ. Geol., v. 32, no. 2, pp. 121-130, 3 figs., Mar.-Apr. 1937; discussion, v. 32, no. 3, pp. 389-392; no. 6, pp. 855-857, 1937.
5. Dickite and chromium silicate in the iron ores of the Marquette and Gogebic ranges, Michigan [abs.]: Am. Mineralog., v. 31, nos. 3-4, p. 195, Mar.-Apr. 1946; Mineralog. Soc. Am., Program 26th Ann. Mtg., pp. 12-13, Dec. 1945.

Guck, Homer

1. Geology of the Michigan copper district: Eng. Min. Jour., v. 108, no. 23, pp. 948-949, Dec. 27, 1919.

Gulley, M. G.

1. Petroleum development in Michigan and the "Trenton Rock" fields of northwestern Ohio and northern Indiana, 1931 [with discussion]: A.I.M.E. Trans., v. 98, pp. 208-215, 1 fig., 1932.

Gutenberg, B.

1. Tilting due to glacial melting: Jour. Geol., v. 41, no. 5, pp. 449-467, July-Aug. 1933. Contains a discussion of the Great Lakes region.

Hager, Dorsey

1. Tectonics of North Central States: *Am. Assoc. Petrol. Geol. Bull.*, v. 33, no. 7, pp. 1198-1205, 1949; abs., v. 32, no. 2, pp. 296-297, 1948.

Hagni, Richard D.

1. Petrology and origin of the Kitchi conglomerite, Marquette County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1954. 45 pp. Unpublished.

Hake, Benjamin Franklin

1. (and Maebius, J. B.) Lithology of the Traverse group of central Michigan: *Mich. Acad. Sci. Papers* (1937), v. 23, pp. 447-461, 4 pls., incl. index map, 1938.
2. Geologic occurrence of oil and gas in Michigan: *Am. Assoc. Petrol. Geol. Bull.*, v. 22, no. 4, pp. 393-415, 5 figs., incl. index map, Apr. 1938; abs., *World Petrol.*, v. 9, no. 6, p. 50, June 1938.

Hale, David J.

1. (and others) Marl (bog lime) and its application to the manufacture of Portland cement: *Mich. Geol. Survey*, v. 8, pt. III, 23 pls., 44 figs., incl. maps, 1903. 399 pp. Abs., *Mich. Miner.*, v. 3, no. 11, pp. 11-14, 1901. Contains: Uses of marl; The use of marl for cement manufacture; Theories of origin; A contribution to the natural history of marl; Shells of marl; Manufacture of Portland cement; Notes on the origin of Michigan bog limes; List of localities and mills; and Marls and clays in Michigan.

Hale, Lucille

1. Study of sedimentation and stratigraphy of Lower Mississippian in western Michigan: *Am. Assoc. Petrol. Geol. Bull.*, v. 25, no. 4, pp. 713-723, 5 figs., incl. index and geol. maps, Apr. 1941; abs., *Oil and Gas Jour.*, v. 38, no. 48, p. 52, Apr. 11, 1940.

Hall, James

1. Description of new or rare species of fossils from the Paleozoic series, in *Report on the geology and topography of the Lake Superior land district*, J. W. Foster and J. D. Whitney, pt. II, (U. S. 32d Cong., Spec. Sess., Senate Ex. Doc. 4), pp. 203-231, illus., 1851.
2. Lower Silurian system; Upper Silurian and Devonian series, in *Report on the geology and topography of the Lake Superior land district*, J. W. Foster and J. D. Whitney, pt. II, (U. S. 32d Cong., Spec. Sess., Senate Ex. Doc. 4), pp. 140-166, 1851; in part, entitled On the Silurian system of the Lake Superior region, *Am. Jour. Sci.*, ser. 2, v. 17 (v.67), no. 50, pp. 181-194, 1854.

Haller, F. J.

1. Wire netting in top slicing operations in The Cleveland-Cliffs Iron Company's Negaunee district: *Lake Superior Min. Inst. Proc.*, v. 30, pp. 160-167, 1939.

Hamberg, Lawrence R.

1. Paleontology and stratigraphy of two well cores in the Devonian rocks of Bay and Arenac counties in Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, 1953. 22 pp. Unpublished.

Hamilton, O. R.—See Allen, R. C., 21.

Handley, Charles O., Jr.

1. Marine mammals in Michigan Pleistocene beaches: *Jour. Mammalogy*, v. 34, no. 2, pp. 252-253, May 1953.

Hanna, Tom A.

1. Mines and mineral statistics: *Ann. Rpt., Comm. Mineral Statistics*, 1901, Marquette, 1902. 148 pp.
1. Mines and mineral statistics: *Ann. Rpt., Comm. Mineral Statistics*, 1902-03, 1903. 162 pp.

Hansen, Ethel B.

1. A postglacial plant succession at Ann Arbor, Michigan, dating from the highest Lake Maumee level: *Mich. Acad. Sci. Papers* (1946), v. 32, pp. 47-75, 7 figs., 9 pls., tables, 1948.

Hard, Edward Wilhelm

1. Mississippian gas sands of central Michigan area: *Am. Assoc. Petrol. Geol. Bull.*, v. 22, no. 2, pp. 129-174, 17 figs., incl. index and isopach maps, Feb. 1938. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1937.

Hardenberg, Harry J.

1. Developments [oil and gas] in Michigan in 1942: *Am. Assoc. Petrol. Geol. Bull.*, v. 27, no. 6, pp. 822-834, June 1943; in 1943, v. 28, no. 6, pp. 760-766, 1 fig., index map, June 1944; in 1944, v. 29, no. 6, pp. 693-700, 1 fig., index map, June 1945; abs., *Dallas Digest*, p. 71, Dallas, Texas, 1944.
2. Michigan's oil and gas industry: *Mich. Manufacturer and Financial Rec.*, 23rd Annual Book of Michigan Industry, May 1946.
3. Developments [oil and gas] in Michigan in 1945: *Am. Assoc. Petrol. Geol. Bull.*, v. 30, no. 6, pp. 886-894, 1 fig., index map, June 1946; in 1946, v. 31, no. 6, pp. 988-998, 1 fig., index map, 6 tables, June 1947; abs., *AAPG-SEPM-SEG., Joint Ann. Mtg.*, Los Angeles, pp. 36-37, Mar. 24-27, 1947.
4. Michigan's mineral industries, [1946]: *Mich. Geol. Survey*, Lansing, 1948. 10 pp.
5. (and Rosenau, J. C.) Michigan's mineral industries, 1948: *Mich. Geol. Survey*, Lansing, Jan. 1950; for 1949, *Mich. Geol. Survey*, Dec. 1950. The 1948 report includes summary statistics for 1947.

Hardenburgh, L. M.

1. The Pewabic concentrating works: *Lake Superior Min. Inst. Proc.*, v. 6, pp. 23-26, 1900.

Harder, Edmund Cecil—See also Leith, C. K., 6.

- *1. Manganese deposits of the United States, with sections on foreign deposits, chemistry, and uses: *U. S. Geol. Survey Bull.* 427, 1910. 298 pp. Contains production figures and some analyses of Lake Superior manganese iron ores, pp. 127-129, 275.

Harger, Charles

1. Electrical power in mining on the Menominee range: *Lake Superior Min. Inst. Proc.*, v. 21, pp. 103-113, 1917.

Hart, W. C.

1. The opening of the Wakefield mine [with discussion]: *Lake Superior Min. Inst. Proc.*, v. 20, pp. 103-113, 1915.

Hatt, Robert Torrens

1. History of the Cranbrook mineral collection: *Midwest Geol.*, v. 1, no. 2, p. 5, July 1947.

- Hautau, Gordon Henry**
1. The Richfield challenge; a review of the Richfield developments in Michigan: Mich. Geol. Survey Prog. Rpt. 15, June 1952. 15 pp.
 2. Richfield is a major oil zone for Michigan: World Oil, v. 139, no. 7, pp. 100, 102-104, 3 figs., Dec. 1954.
- Hawes, Charles C.**
1. Vitiated air in the Spies-Virgil mine-Iron River district: Lake Superior Min. Inst. Proc., v. 30, pp. 109-113, 1939.
- Hawes, E. L.**
- *1. The development of the rock drill and its relation to the Lake Superior mining district: Lake Superior Min. Inst. Proc., v. 28, pp. 171-191, 1930.
- Hawes, George W.**
1. On zonochlorite and chlorastrolite; contributions from the Sheffield Laboratory of Yale: Am. Jour. Sci., ser. 3, v. 10, (v.110), no. 55, pp. 24-26, 1875.
- Hayden, J. E.**
1. Rock drifting in the Morris-Lloyd mine, The Cleveland Cliffs Iron Co.: Lake Superior Min. Inst. Proc., v. 20, pp. 142-147, 1915.
 2. (and Eaton, Lucien) Building reinforced-concrete shaft houses: Lake Superior Min. Inst. Proc., v. 22, pp. 124-134, illus., 1922.
- Hayes, Augustus Allen**
1. On the occurrence of massive datolite in the mines of Lake Superior: Boston Soc. Nat. Hist. Proc. (1861-62), v. 8, pp. 62-64, 1862.
- Hayes, Charles Willard—See also Emmons, S. F., 1, 2, 3.**
1. (compiler) The state geological surveys of the United States: U. S. Geol. Survey Bull. 465, 1911. 177 pp. Pages 76-79 concern Michigan.
- Hayes, E. L.**
1. Atlas of Gratiot County, Michigan: Philadelphia, Lake & Hayes, 1889.
- Hearding, John H.**
1. Reminiscences of the early days on the Gogebic range: Lake Superior Min. Inst. Proc., v. 16, pp. 251-257, 1911.
 2. Early methods of transporting iron ore in the Lake Superior region: Lake Superior Min. Inst. Proc., v. 29, pp. 174-179, 1936.
- Hearn, W. Edward**
1. (and Griffin, A. M.) Soil survey of the Alma area, Michigan: Field Operations, U. S. Dept. Agr., Bur. Soils, pp. 639-664, 1 map, 1 fig., 1905. Mentions occurrence of artesian and ordinary wells, and depths to water. M. L. F.
- Heath, George L.**
- *1. The testing and control of the product in a modern copper refinery [with discussion]: Lake Superior Min. Inst. Proc., v. 7, pp. 68-82, 1901.
- Helland, Randolph O.—See Jones, B. E., 1.**
- Henderson, Janet**
1. Ostracod fauna of the Bell shale formation of Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1951. Unpublished.
- Henrich, Carl**
1. Faulting and accompanying features observed in glacial gravel and sand in southern Michigan: A.I.M.E. Trans., v. 26, pp. 460-464, 1896.
- Henry, William Waldo**
1. An investigation of sub-surface reef conditions in the Traverse group of Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1949. 22 pp. Unpublished.
- Henwood, William Jory**
1. On the native copper of Lake Superior: Royal Geol. Soc. Cornwall Trans., v. 8, pp. 385-489, 1871.
- Herndon, Thomas**
1. Niagaran reefs: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, 1951 [?]. Unpublished.
- Herringshaw, D. E.**
1. (and McGowan, D.) Burying gas in Michigan: Public Utilities Fort-nightly, v. 40, pp. 471-475, Oct. 9, 1947.
- Heyman, Louis**
1. A loess-like silt in Ann Arbor, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1949. Unpublished.
- Hibbard, Claude W.**
1. Animal Life in Michigan During the Ice Age: Mich. Alum. Quar. Rev. (1951), v. 57, no. 18, pp. 200-208, illus.
 2. Remains of the barren ground caribou in Pleistocene deposits of Michigan: Mich. Acad. Sci. Papers (1951), v. 37, pp. 235-237, 1 fig., 1952.
- Higgins, Edwin**
1. Ventilation in the iron mines of the Lake Superior district [with discussion]: Lake Superior Min. Inst. Proc., v. 19, pp. 154-176, 1914.
 2. The safety movement in the Lake Superior iron region: A.I.M.E. Trans., v. 50, pp. 755-770, 1914.
- Higgins, James W.**
1. Structural petrology of the Pine Creek area, Dickinson County, Michigan: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Chicago, Chicago, Ill., Aug. 1947. Microfilmed. In part, Jour. Geol., v. 55, no. 6, pp. 476-489, 1 pl., 15 figs., incl. index and geol. sketch maps, Nov. 1947.
- Higgins, Samuel Gaty**
1. The salt industry in Michigan: Mich. Polit. Sci. Assoc. Pub., v. 4, Ann Arbor, 1900 [?].
- Higgins, William D.—See Ayres, V. L., 1.**
- Hildebrand, F. A.—See Pettijohn, F. J., 2.**
- Hill, Jeff**
1. Something new in fulgurites [lightning bolt on concrete sidewalk, Detroit]: Rocks and Minerals, v. 22, no. 10, p. 923, Oct. 1947.
 2. A report on unusual limonite forms from Van Buren County, Michigan: Rocks and Minerals, v. 23, nos. 9-10, pp. 802-806, illus., Sept.-Oct. 1948.
 3. (and Franz, Harvey) A second report on unusual limonite forms from Van Buren County, Michigan: Rocks and Minerals, v. 24, nos. 9-10, pp. 458-461, illus., Sept.-Oct. 1949.

Hill, S. W.—See Foster, J. W., 2; Williams, C. P., 2.

Hillebrand, W. F.—See Clarke, F. W., 2.

Hobbs, Robert Adelbert

1. The application of roundness and sphericity measurements to subsurface samples of the Marshall formation of western Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1949. 36 pp. Unpublished.

Hobbs, William Herbert

1. Mineralogical notes: *Am. Jour. Sci.*, ser. 3, v. 50 (v.150), no. 296, pp. 121-128, 1895. Contains: Barite and manganite from the Lucy mine, Negaunee, Michigan, pp. 123-125; Chloritoid from blocks on the south shore of Michigamme Lake, Michigamme, Michigan, pp. 125-127 (with correction, ser. 4, v. 2 (v.152), p. 87, 1896).
2. The diamond field of the Great Lakes: *Jour. Geol.*, v. 7, no. 4, pp. 375-388, 1899.
3. The late glacial and postglacial uplift of the Michigan Basin: *Mich. Geol. and Biol. Survey*, pub. 5, geol. ser. 3, pp. 11-68, 1911.
4. Earthquakes in Michigan: *Mich. Geol. and Biol. Survey*, pub. 5, geol. ser. 3, pp. 69-87, 2 pls., 5 figs., incl. maps, 1911.
5. The southwestern Michigan meteor of November 26, 1919: *Mich. Acad. Sci. Papers* (1921), v. 1, pp. 253-268, 3 figs., 1923.
6. Memorial of Charles Wilford Cook: *Geol. Soc. Am. Proc.* (1933), pp. 181-184, portrait, 1934.

Hodge, James Thacher

1. On the mineral region of Lake Superior: *Am. Assoc. Adv. Sci. Proc.* (1849), v. 2, pp. 301-308, 1850.

Hoffman, George Albert

1. The correlation by petrographic methods of dikes designated as numbers five and six in the Newport mine, Ironwood, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1950. 44 pp. Unpublished.

Hoffmaster, P. J.

1. Michigan's oil and gas: *Mich. Conserv.*, v. 15, no. 9, pp. 6, 14, Oct. 1946.

Hofstra, Warren Elwin

1. The effects of washing oil well cuttings from rotary and cable tool wells as related to sample losses: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1949. 84 pp. Unpublished.

Hohl, C. D.—See Broderick, T. M., 1, 3, 6, 7, 10.

Hohlt, Richard B.

- *1. The nature and origin of limestone porosity: *Quart. Colo. School of Mines*, v. 43, no. 4, Oct. 1948. 51 pp.

Holder, Clayton E.

1. Salt at Detroit: *Mich. Mineralog. Soc. Pub.* 2, 1947 Annual, pp. 14-16, illus., [1948 ?].

Holland, William T.

1. (and Jarvis, C. S.) Inventory of unpublished hydrologic data: *U. S. Geol. Survey Water-Supply Paper* 837, 1938. 77 pp.

Holmberg, Clyde Laurence—See Zinner, Paul, 1.

Holmes, Charles

1. Coal and coal mining in Michigan: *Eng. Min. Jour.*, v. 68, pp. 335-336, 1899.

Holmquest, Harold John, Jr.

1. A statistical morphologic classification of the Paleozoic Ostracoda: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1952. 32 pp. Unpublished.

Holway, William

1. The origin and occurrence of specular hematite (specularite) in the Lower Huronian of the Marquette district, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1952. 46 pp. Unpublished.

Hood, E. C.—See Foote, C. M., 1.

Hopper, Walter E.—See Allen, R. C., 8, 15, 17, 18.

Hore, Reginald E.—See also Allen, R. C., 3, 4, 5, 8.

1. In the Michigan copper country: *Canadian Min. Jour.*, v. 30, pp. 421-422, 1909.
2. The copper-mining industry of Michigan: *Min. World*, v. 36, pp. 601-603, 656-658, 707-710, 763-767, 1912.

Hornstein, Owen Merle

1. A field and petrographic study of some extrusive and sedimentary rocks along the Carp and Little Carp rivers in Ontonagon and Gogebic counties, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1950. 55 pp. Unpublished.

Horton, A. H.—See Daugherty, C. R., 1.

Hotchkiss, William Otis

1. (and Ingersoll, L. R.) Post-glacial time calculations from recent geothermal measurements in the Calumet copper mines: *Jour. Geol.*, v. 42, no. 2, pp. 113-122, 3 figs., 1934.
2. Exploration methods on the Gogebic range: *A.I.M.E. Trans.*, v. 68, pp. 287-293, 1923; preprint no. 995, 1920. 7 pp. *Abs., Min. and Met.*, no. 163, pp. 29-30, July 1910 [?].
3. Geology of the Gogebic range and its relation to recent mining developments: *Eng. Min. Jour.*, v. 108, no. 11, pp. 443-452, no. 12, pp. 501-507, no. 13, pp. 537-541, no. 14, pp. 577-582, 35 figs., Sept.-Oct. 1919.
4. Recent developments in the geology of the Gogebic range [with discussion]: *Lake Superior Min. Inst. Proc.*, v. 23, pp. 47-55, 1923.
5. The Lake Superior geosyncline: *Geol. Soc. Am. Bull.*, v. 34, no. 4, pp. 669-678, Dec. 30, 1923; *Lake Superior Min. Inst. Proc.*, v. 24, pp. 140-148, 1925.
6. (and Fisher, James; Rooney, W. J.) Earth-resistivity measurements in the Lake Superior copper country: *A.I.M.E., Geophys. Prosp.*, pp. 51-67, 5 figs., 1929.
7. (and others) Lake Superior Region: 16th Internat. Geol. Cong., United States, 1933; Guidebook 27, Excursion C-4, 22 figs., 8 pls., incl. geol. maps, 1933. 101 pp. Contains: Introduction, by C. K. Leith, pp. 1-10; Geology of the Marquette range, by C. O. Swanson, pp. 10-21; Mining on the Marquette range, by F. G. Pardee, pp. 21-29; Geology, exploration and mining in the Michigan copper district, by T. M. Broderick, pp. 29-49; The Gogebic range, by W. O. Hotchkiss, pp. 49-59; Mining on

- the Gogebic range, by F. G. Pardee, pp. 60-65; Gogebic range to Duluth, by H. R. Aldrich, pp. 66-67; Duluth rocks and structure, by F. F. Grout, pp. 67-72; The Cuyuna iron-ore district, by Carl Zapffe, pp. 72-88; The Mesabi range, by J. W. Gruner, pp. 88-101.
8. Memorial to Rolland Craten Allen: Geol. Soc. Am. Proc. (1948), pp. 111-116, portrait, May 1949.
- Houdek, Paul King**
1. Pollen statistics for two bogs in southwestern Michigan: Mich. Acad. Sci. Papers (1934), v. 20, pp. 49-56, 2 figs., 1935.
- Hough, Jack Luin**
1. The mechanical composition of the deposits of southern Lake Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Chicago, Chicago, Ill., no date. Unpublished. Microfilmed.
 2. The bottom deposits of southern Lake Michigan: Jour. Sed. Petr., v. 5, no. 2, pp. 57-80, 4 figs., incl. sketch maps, Aug. 1935; abs., Ill. Acad. Sci. Trans., v. 23, no. 2, p. 197, Dec. 1935.
 3. Fathogram indications of bottom materials in Lake Michigan: Jour. Sed. Petr., v. 22, no. 3, pp. 162-172, 8 figs., Sept. 1952.
 4. Post-glacial low-water stage of Lake Michigan indicated by bottom sediments [abs.]: Geol. Soc. Am. Bull., v. 63, no. 12, pt. II, p. 1265, Dec. 1952.
 5. Post-Cary glacial substages and lake levels of the Lake Michigan basin [abs.]: Geol. Soc. Am. Bull., v. 63, no. 12, pt. II, p. 1382, Dec. 1952.
 6. Pleistocene chronology of the Great Lakes region: Office of Naval Research, Contract No. N6ori-07133, Project NR-018-122, Final Rpt., Univ. of Ill., Urbana, Jan. 31, 1953. 108 pp.
- Houghton, Douglass—See also Hubbard, Bela, 7; Williams, H. S., 1.**
1. [Remarks on the metalliferous veins of the Northern Peninsula of Michigan], presented before the Assoc. Am. Geol., 1841: Am. Jour. Sci., v. 41, pp. 183-186, 1841; Assoc. Am. Geol. and Nat. Rpt., pp. 35-38, 1843.
 2. Report on the copper of Lake Superior, in *Narrative of an expedition through the Upper Mississippi to Itasca Lake*, H. R. Schoolcraft, pp. 287-292: New York, 1834. Also in Summary narrative, H. R. Schoolcraft, pp. 526-531: Philadelphia, 1855.
 3. (and others) Geological reports of Douglass Houghton, first State Geologist of Michigan, 1837-1845; edited by George N. Fuller, 8 pls., incl. portrait and maps, Mich. Hist. Comm., Lansing, 1928. 700 pp. For the original publications see the State Legislative documents. Detailed reference to these is contained in the *Catalog and table of contents of the publications of the Geological and Biological Survey Division of the Michigan Department of Conservation . . . 1838-1922*, and in the Index of Geological Survey publications.
- Houghton, Jacob, Jr.**
1. The mineral region of Lake Superior: Buffalo, Oliver G. Steele, 1846. 191 pp.
 2. (and Bristol, T. W.) Reports of Wm. A. Burt, and Bela Hubbard on the geography, topography, and geology . . . of the south shore of Lake Superior . . . , map: Detroit, 1846. 109 pp.
 3. The ancient copper mines of Lake Superior: Wis. State Hist. Soc. Coll., v. 8, pp. 140-151, 1879.
- Hovey, Edmund Otis**
1. An analcite copper boulder from the Keweenaw range, Michigan: Sci., v. 22, p. 93, 1893.
2. Aerolite from Rose City, Michigan: Am. Mus. Novitates, no. 52, 3 figs., Nov. 23, 1922. 7 pp. Abs., Geol. Soc. Am. Bull., v. 34, no. 1, p. 97, Mar. 30, 1923.
 3. A new meteorite from Michigan: Nat. Hist., v. 23, no. 1, pp. 87-88, Jan.-Feb. 1923.
- Howard, C. S.—See Collins, W. D., 3, 5.**
- Howard, W. V.**
- *1. A classification of limestone reservoirs: Am. Assoc. Petrol. Geol. Bull., v. 12, no. 12, pp. 1153-1161, 1928.
 2. Two recent discoveries may signal Michigan's comeback: Oil and Gas Jour., v. 39, p. 31, Aug. 15, 1940. The discoveries were Rayburn's No. 1 Yenor, Arenac County and Sun's No. 1, J. F. McKenna, Gladwin County.
- Hoyt, John C.**
1. Drought of 1936, with discussion on the significance of drought in relation to climate: U. S. Geol. Survey Water-Supply Paper 820, 1938. 62 pp. Contains numerous tables which give data on rainfall for Michigan as well as other states.
- Hubbard, Bela—See also Houghton, Douglass, 3; Houghton, Jacob, Jr., 2.**
1. General observations upon the geology and topography of the district south of Lake Superior: U. S. 29th Cong., 1st Sess., Senate Ex. Doc. 357, pp. 20-29, 1846.
 2. Geological report [of field work in Lake Superior land district]: U. S. 31st Cong., 1st Sess., Senate Ex. Doc. 1, pt. III, and House Ex. Doc. 5, pt. III, pp. 833-842, 882-932, 1849.
 3. Report [on the geology of the organized counties of Michigan]: Mich. State Geol. Ann. Rpt., v. 4, pp. 113-146, 1841; Mich. State Agr. Soc. Trans. (1853), v. 5, pp. 312-339, 1854.
 4. Report [on Lenawee, Hillsdale, Branch, St. Joseph, Cass, Berrien, Washtenaw, Oakland, and Livingston counties]: Mich. State Geol. Ann. Rpt., v. 3, pp. 77-111, 1840; Mich. State Agr. Soc. Trans. (1853), v. 5, pp. 279-312, 1854.
 5. Report [on Wayne and Monroe counties]: Mich. State Geol. Ann. Rpt., v. 2, pp. 79-114, 1839; Mich. State Agr. Soc. Trans. (1855), v. 7, pp. 355-386, 1856.
 6. A Michigan geological expedition in 1837 [in Saginaw Valley, Michigan]: Mich. Pioneer Coll., v. 3, pp. 189-201, 1881.
 7. The journal of Mus-co-me-in-gun: Mich. Conserv., v. 5, nos. 6, 12, Nov. 1935, May 1936; v. 6, no. 1, June 1936. Excerpts from Hubbard's notebooks describing the expedition made in 1840 by the State Geologist, Douglass Houghton, to the Lake Superior region.
- Hubbard, Lucius Lee—See also Koenig, G. A., 1; Lane, A. C., 3; Wadsworth, M. E., 14.**
1. Two new geological cross-sections of Keweenaw Point: Lake Superior Min. Inst. Proc., v. 2, pp. 79-96, 1894.
 2. The relation of the vein at the Central mine, Keweenaw Point to the Kearsarge conglomerate: Lake Superior Min. Inst. Proc., v. 3, pp. 74-83, 4 pls., 1895.
 3. Keweenaw Point, with particular reference to the felsites and their associated rocks: Mich. Geol. Survey, v. 6, pt. II, 10 pls., 11 figs., incl. maps, 1898. 155 pp.
 4. Sixth annual report of the State Geologist [extr.]: Ann. Rpt. of the State Geologist of Michigan, Lansing, 1899. 9 pp.

5. Work of the Geological Survey in the Upper Peninsula: Mich. Miner, v. 3, no. 3, p. 9, 1901.
6. Foot wall shafts in Lake Superior mines [with discussion]: Lake Superior Min. Inst. Proc., v. 17, pp. 144-161, 1912.
7. In the Lake Superior area what influence, if any, did the thickness and contour of foot wall beds have upon the subsequent deposition and distribution of copper in overlying beds? [with discussion]: Lake Superior Min. Inst. Proc., v. 17, pp. 227-237, 1912.
- Hubbard, Oliver P.**
1. Notice of Geological Surveys; I, of the State of Ohio; II, of Indiana; II, of Michigan: Am. Jour. Sci., v. 40, pp. 126-137, 1841.
- Hubbert, M. King**
- *1. Strength of the earth: Am. Assoc. Petrol. Geol. Bull., v. 29, no. 11, pp. 1630-1653, 3 figs., Nov. 1945. Brief mention is made of the uplift of the land surface in the Great Lakes region following retreat of the Pleistocene ice sheet.
- Hubbs, Carl Leavitt**
1. The cranium of a fresh-water sheephead from post-glacial marl in Cheboygan County, Michigan: Mich. Acad. Sci. Papers (1939), v. 25, pp. 293-296, 1 pl., 1940.
- Hulst, Harry T.**
1. (and Jackson, G. R.; Siebenthal, W. A.) Mining methods on the Marquette range [with discussion]: Lake Superior Min. Inst. Proc., v. 19, pp. 131-141, 1914.
2. Brief history of some of the abandoned mines of the Marquette iron range: Lake Superior Min. Inst. Proc., v. 29, pp. 168-173, 1936.
- Hulst, Nelson P.**
1. President's address [historical review, mining industry]: Lake Superior Min. Inst. Proc., v. 2, pp. 11-22, 1894.
2. The geology of that portion of the Menominee range east of Menominee River: Lake Superior Min. Inst. Proc., v. 1, pp. 19-29, map, 1893; abs., Eng. Min. Jour., v. 55, p. 366, 1893.
3. Moisture in Lake Superior iron ores [with discussion]: Lake Superior Min. Inst. Proc., v. 8, pp. 21-32, 1902.
- Hulbert, E. J.—See Booth, J. C., 1.**
- Humphrey, W. E.—See Ehlers, G. M., 16.**
- Humphrys, C. R.**
1. Treasure by the ton: Mich. Conserv., v. 22, no. 3, pp. 3-7, May-June 1953. Operations are again started on the White Pine copper deposit. This article, written in popular style, gives a brief review of the development of copper mining in Michigan.
- Hunt, Hubert B.**
1. A regional magnetometer survey of the Pinckney area, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1952. Unpublished.
- Hunt, T. Sterry**
- *1. Contributions to the chemistry of natural waters; pt. II, analyses of various natural waters: Am. Jour. Sci., ser. 2, v. 40 (v.90), no. 118, pp. 43-60, 1865.
- *2. Notes on the geology of southwestern Ontario: Am. Jour. Sci., ser. 2, v. 46 (v.96), no. 138, pp. 355-362, 1868.
- Hunt, W. F.—See Kraus, E. H., 3.**
- Hurd, Paul**
1. Fulgurites: Rocks and Minerals, v. 25, nos. 3-4, p. 135, Mar.-Apr. 1950. Fulgurites occur in the sands of dunes near Stevensville and Riverside on Lake Michigan. U.S.G.S.
- Hussey, Russell Claudius—See also Ehlers, G. M., 5; Kesling, R. V., 10.**
1. The Richmond formation of Michigan: Mich. Univ. Mus. Geol. Contr., v. 2, no. 8, pp. 113-187, 1 fig., 11 pls., July 15, 1926. Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1925.
2. Cystoids from the Trenton rocks of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 3, no. 4, pp. 77-79, 1 pl., Nov. 10, 1928.
3. The Trenton and Black River rocks of Michigan, in *Occasional papers on the geology of Michigan*: Mich. Geol. Survey, pub. 40, geol. ser. 34, pt. III, pp. 227-260, 8 figs., 1936; rev., Am. Assoc. Petrol. Geol. Bull., v. 21, no. 12, pp. 1597-1600, Dec. 1937.
4. New species of fossils from the Middle Ordovician of Michigan: Mich. Acad. Sci. Papers (1940), v. 26, pp. 445-448, 1 pl., 1941.
5. The Middle and Upper Ordovician rocks of Michigan: Mich. Geol. Survey, pub. 46, geol. ser. 39, 10 pls., 11 figs., 1952. 89 pp.
- Hussey, W. J.**
1. List of earthquake shocks recorded at the observatory of the University of Michigan, Ann Arbor, during 1910: Seismol. Soc. Am. Bull., v. 1, pp. 83-84, 1911.
- Imbrie, John**
1. Population studies in *Strophodonta* from the Michigan Devonian [abs.]. Geol. Soc. Am. Bull., v. 64, no. 12, pt. II, p. 1439, Dec. 1953.
- Imlay, Ralph Willard**
1. *Gypidula petoskeyensis*, sp. nov., a new brachiopod from the Traverse group of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 4, no. 5, pp. 101-104, 1 pl., Dec. 1, 1932.
- Imperial Publishing Co.**
1. The county of Saginaw, Michigan; topography, history, art folio: Saginaw, Imperial Publishing Co., 1896.
- Ingersoll, Leonard Rose—See Hotchkiss, W. O., 1.**
- Irvin, W. C.—See also Williams, G. H., 2.**
1. The topographic expression of the sub-lacustrine geology of the Lake Superior basin: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Ill., Urbana, 1948. 18 pp. Unpublished.
- Irving, Roland Duer**
1. On the age of the copper-bearing rocks of Lake Superior; and on the westward continuation of the Lake Superior synclinal: Am. Jour. Sci., ser. 3, v. 8 (v.108), no. 43, pp. 46-56, map, 1874.
2. Note on the stratigraphy of the Huronian series of northern Wisconsin; and on the equivalency of the Huronian of the Marquette and Penoque districts: Am. Jour. Sci., ser. 3, v. 17 (v.117), no. 101, pp. 393-398, 1879.
3. On the paramorphic origin of the hornblende of the crystalline rocks of the Northwestern States: Am. Jour. Sci., ser. 3, v. 26 (v.126), nos. 151, 154, pp. 27-32, 321-322, 1883; suppl., v. 27 (v.127), no. 158, pp. 130-134, 1884; notes, ser. 3, v. 26 (v. 126), no. 152, p. 155, 1883.

4. (and Van Hise, C. R.) On secondary enlargement of mineral fragments in certain rocks: U. S. Geol. Survey Bull. 8, 1884. 56 pp. Contains discussion of some rocks from the Lake Superior region.
5. Preliminary paper on an investigation of Archean formations of the Northwestern States: U. S. Geol. Survey Ann. Rpt., v. 5, pp. 175-242, 1883-1884.
6. Divisibility of the Archean in the northwest: Am. Jour. Sci., ser. 3, v. 29 (v.129), no. 171, pp. 237-249, 1885. Discussion of Penokee-Gogebic iron region.
7. The copper-bearing rocks of Lake Superior: U. S. Geol. Survey Mon. 5, maps, 1883. 464 pp. In part, U. S. Geol. Survey Ann. Rpt., v. 3, (1881-82), pp. 89-188, map, 1883; abs., Sci., v. 1, pp. 140-141, 359-360, 422, 1883; Am. Jour. Sci., ser. 3, v. 28 (v.128), no. 168, pp. 462-464, 1884; v. 29 (v.129), no. 169, pp. 67-68, no. 171, pp. 258-259, 1885.
8. Origin of the ferruginous schists and iron ores of the Lake Superior region: Am. Jour. Sci., ser. 3, v. 32 (v.132), no. 190, pp. 255-272, 1886; Eng. Min. Jour., v. 42, pp. 347-349, 1886.
9. Is there a Huronian group?: Am. Jour. Sci., ser. 3, v. 34 (v.134), no. 201, pp. 204-216, no. 202, pp. 249-263, no. 203, pp. 365-374, 1887.
10. (and Chamberlin, T. C.) Observations on the junction between the eastern sandstone and the Keweenaw series on Keweenaw Point, Lake Superior: U. S. Geol. Survey Bull. 23, 1885. 124 pp. Rev., Am. Geol., v. 1, no. 1, pp. 44-57, 1888.
11. (and Chamberlin, T. C.; and others) The crystalline schists of the Lake Superior district: 4th Internat. Geol. Cong., London, 1888, Comptes rendus, pp. 156-170, 1891.
12. (and Van Hise, C. R.) The Penokee iron-bearing series of Michigan and Wisconsin: U. S. Geol. Survey Mon. 19, maps, 1892. 534 pp. In part, U. S. Geol. Survey Ann. Rpt., v. 10, pt. I, pp. 341-507, map, 1890.

Ives, L. E.

1. Finding the Judson ore body [iron deposits near Crystal Falls]: Eng. Min. Jour., v. 99, pp. 443-445, 1915.

Jackson, Charles F.—See Mendelsohn, Albert, 2.

Jackson, Charles Thomas

1. [On minerals from Keweenaw Point, Lake Superior]: Boston Soc. Nat. Hist. Proc. 1841-44, v. 1, p. 203, 1844.
2. Sur le gisement de cuivre et d'argent natifs des bords du lac Supérieur [On the deposit of native copper and silver on the borders of Lake Superior]: Académie des sciences, Comptes rendus, v. 20, pp. 593-595, Paris, 1845; Société géologique de France Bull., ser. 2, v. 2, pp. 317-319, 1845; abs., Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, pp. 479-480, 1845.
3. On the copper and silver of Keweenaw Point, Lake Superior: Am. Jour. Sci., v. 49, no. 1, pp. 81-93, 1845; Assoc. Am. Geol. and Nat. Proc., v. 6, pp. 53-61, 1845.
4. Ores and minerals of Lake Superior: Am. Jour. Sci., ser. 2, v. 2 (v.52), no. 4, pp. 118-119, 1846.
5. Chemical analyses of the [copper] ores [of the Lake Superior region]: U. S. 29th Cong., 1st Sess., House Rpt. no. 591, pp. 38-44, 1846.
6. [Report on the survey of the mineral lands in Michigan]: U. S. General Land Office Rpt. 1847 (U. S. 30th Cong., 1st Sess., Senate Ex. Doc. 2), pp. 175-183, 1847.

7. [On the copper and silver ores of the Lake Superior region]: Boston Soc. Nat. Hist. Proc. (1845-48), v. 2, pp. 57-58, 110-114, 1848.
8. Report on the geological and mineralogical survey of the mineral lands of the United States in the state of Michigan . . . : U. S. 31st Cong., 1st Sess., Senate Ex. Doc. 1, pt. III, House Ex. Doc. 5, pt. III, pp. 371-502, maps, 1849.
9. Copper of the Lake Superior region [correspondence]: Am. Jour. Sci., ser. 2, v. 7 (v.57), no. 20, pp. 286-287, 1849.
10. On the geological structure of Keweenaw Point: Am. Assoc. Adv. Sci. Proc. (1849), v. 2, pp. 288-301, 1850; Am. Jour. Sci., ser. 2, v. 10 (v.60), no. 28, pp. 65-77, 1850; Annales des mines, Paris, ser. 4, v. 17, pp. 103-115, 1850.
11. Remarks on the geology, mineralogy, and mines of Lake Superior: Am. Assoc. Adv. Sci. Proc. (1849), v. 2, pp. 283-287, 1850; Société géologique de France Bull., ser. 2, v. 7, pp. 667-673, 1850.
12. [Notes on the Lake Superior region]: Boston Soc. Nat. Hist. Proc. (1848-51), v. 3, pp. 76-77, 228, 1851.
13. Analyses of pitchstone porphyry from Isle Royale, and a crystal of phosphate of lime from Hurdstown, New Jersey: Boston Soc. Nat. Hist. Proc. (1851-54), v. 4, pp. 39-41, 1854; Am. Jour. Sci., ser. 2, v. 11 (v.61), no. 33, pp. 401-403, 1851.
14. Ueber den Metall-führenden Distrikt am Oberen See in Staate Michigan [The ore bearing area near Lake Superior in the state of Michigan]: Archiv für Mineralogie, Geognosie, Bergbau und Hüttenkunde, v. 25, pp. 656-667, 1853.
15. Geology, mineralogy, and topography of the lands around Lake Superior: U. S. 32d Cong., 1st Sess., Senate Ex. Doc. 112, pp. 232-244, 1853.
16. Observations sur quelques mines des États-Unis et sur le gres rouge du lac Supérieur [Observations on several mines of the United States and on the red sandstones of Lake Superior]: Académie des sciences, Comptes rendus, v. 39, pp. 803-807, Paris, 1854.
17. Catalogue of rocks, minerals, and ores collected during the years 1847 and 1848, on the Geological Survey of the United States mineral lands in Michigan; Smithsonian Inst. Ann. Rpt. (1854), v. 9, pp. 338-367, 1855.
18. [On copper deposits, Lake Superior region]: Boston Soc. Nat. Hist. Proc. (1855-56), v. 5, pp. 280-281, 1856.
19. [On the genesis of the native copper and silver of Lake Superior]: Boston Soc. Nat. Hist. Proc. (1859-61), v. 7, p. 31, 1861.
20. [A discussion, On the age of the red sandstones of Perry, Maine, Nova Scotia, and Keweenaw Point]: Boston Soc. Nat. Hist. Proc. (1859-61), v. 7, pp. 396-398, 1861.
21. [A communication, On domeykite from the vicinity of Portage Lake, Lake Superior region]: Boston Soc. Nat. Hist. Proc. (1861-62), v. 8, p. 258, 1862.
22. Sur les mines de cuivre du lac Supérieur et sur un nouveau gisement d'étain dans l'état du Maine [On the copper mines of Lake Superior and on a new deposit of tin in the state of Maine]: Académie des sciences, Comptes rendus, v. 69, pp. 1082-1083, Paris, 1869.

Jackson, G. R.—See Hulst, H. T., 1.

Jackson, J. F.

1. Copper mining in Upper Michigan; a description of the region, mines and some methods and machinery used: Mines and Minerals, v. 23, pp. 535-540, 1903.

2. Five years of progress in the Lake Superior copper country [with discussion]: Lake Superior Min. Inst. Proc. (1906), v. 12, pp. 143-153, 1907.
- Jackson, Kern C.**
1. A heavy mineral study of the Ajibik and Mesnard quartzites of Marquette County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol. Eng., Mich. College Min. Tech., Houghton, 7 maps, 1950. 11 pp. Unpublished.
- Jacobson, R. C.**
1. Stratigraphy and fauna of two cores penetrating Middle Devonian formations of Missaukee County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, 1951 [?]. Unpublished.
- James, Harold Lloyd**—See also Balsley, J. R., Jr., 1.
1. (and Clark, L. D.; Smith, L. E.) Magnetic survey and geology of the Ice Lake-Chicagon Creek area, Iron County, Michigan: U. S. Geol. Survey, Strategic Min. Inv., Prelim. Rpt. 3-213, 6 pls., incl. geol. maps, 1947. 11 pp. Prepared in cooperation with the Mich. Geol. Survey. Accompanied by P. N. 29712, dated Dec. 11, 1947.
 2. (and Wier, K. L.) Magnetic survey and geology of the eastern and southeastern parts of the Iron River district, Iron County, Michigan: U. S. Geol. Survey Circ. 26, illus., incl. index and geol. maps, July 1948. 18 pp.
 3. Current U. S. Geological Survey investigations in the iron ranges of northern Michigan [abs.]: Econ. Geol., v. 45, no. 4, pp. 385-386, June-July 1950.
 4. Iron formation and associated rocks in the Iron River district, Michigan: Geol. Soc. Am. Bull., v. 62, no. 3, pp. 251-266, 1 fig., 4 pls., Mar. 1951; abs., v. 60, no. 12, pt. II, pp. 1899-1900, Dec. 1949.
 5. Sedimentary facies of the Lake Superior iron-bearing formations, and their relation to volcanism and geosynclinal development, [abs.]: Geol. Soc. Am. Bull., v. 62, no. 12, pt. II, p. 1452, 1951.
 6. (and Dutton, C. E.) Geology of the northern part of the Iron River district, Iron County, Michigan: U. S. Geol. Survey Circ. 120, prepared in cooperation with the Mich. Geol. Survey, 3 figs., maps, Sept. 1951. 12 pp.
 7. (and Clark, L. D.; Lamey, C. A.) Pre-Huronian ("Archean") sedimentary and volcanic sequence in northern Michigan [abs.]: Geol. Soc. Am. Bull., v. 63, no. 12, pt. II, p. 1267, Dec. 1952.
 8. Zones of regional metamorphism in the pre-Cambrian of northern Michigan [abs.]: Geol. Soc. Am. Bull., v. 64, no. 12, pt. II, pp. 1440-1441, Dec. 1953.
 9. Sedimentary facies of iron-formation: Econ. Geol., v. 49, no. 3, pp. 235-293, 33 figs., May 1954.
- Jamison, Knox**
1. Mines of the Porcupine Mountains: Mich. Conserv., v. 16, no. 3, pp. 6, 13, Mar.-Apr. 1947.
- Jarvis, Clarence S.**—See Holland, W. T., 1.
- Jasberg, Paul**—See Keck, W. E., 1, 2.
- Jefferson, Mark Sylvester William**
1. Some phenomena on Lake Huron [rev.]: Jour. Geol., v. 11, pp. 123-124, 1903; abs., entitled Some shore features of Lake Huron, Sci., new ser., v. 17, p. 221, 1903; Sci. Am. Suppl., v. 55, p. 22647, 1903.
2. The scaurs on the River Rouge: Sci., new ser., v. 19, pp. 150-151, 1904.
 3. Lateral erosion on some Michigan rivers: Geol. Soc. Am. Bull., v. 18, pp. 333-350, 5 figs., 1907.
- Jenny, William Paul**
1. Magnetic vector study of Kentucky and southern Michigan: Am. Assoc. Petrol. Geol. Bull., v. 18, no. 1, pp. 97-105, 4 figs., incl. maps, Jan. 1934.
- Jodry, Richard Louis**
1. A rapid method for determining the magnesium/calcium ratios of well samples and its use as an aid in predicting structure and secondary porosity in calcareous formations: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1954. 49 pp. Unpublished.
- Johnson, B. L.**—See Fuller, M. L., 1.
- Johnson, C. H.**—See Gardner, E. D., 1.
- Johnson, Douglas Wilson**
- *1. Relation of the law to underground waters: U. S. Geol. Survey Water-Supply Paper 122, 1905. 55 pp.
- Jones, Benjamin E.**
1. (and Helland, R. O.) Preliminary index to river surveys made by the U. S. Geological Survey and other agencies: U. S. Geol. Survey Water-Supply Paper 558, 1926. 108 pp. Revised to July 1, 1947, Water-Supply Paper 995, 1948. 145 pp.
- Jones, John T.**
1. Unwatering the Hamilton mine: Eng. Min. Jour., v. 80, pp. 867-868, Nov. 11, 1905. Describes the encountering of a water cavern while drilling in one of the shafts, the immense head on the water, the drainage of water from higher level of a near-by mine, the subsequent filling of both mines by the water, and the steps taken to exhaust the contents of the cavity, after which the flow of water was normal. M.L.F.
 2. The unwatering of the Hamilton and Ludington mines: Lake Superior Min. Inst. Proc. (1905), v. 11, pp. 139-145, 1906.
- Jopling, J. E.**—See also Elliott, S. R., 3.
1. The Marquette range; its discovery, development, and resources: A.I.M.E. Trans., v. 27, pp. 541-555, 1897.
 2. Personal experiences as mining engineer in the Marquette district: Lake Superior Min. Inst. Proc., v. 24, pp. 335-342, 1925.
 3. Charcoal furnaces of Michigan: Lake Superior Min. Inst. Proc., v. 25, pp. 249-251, 1926.
- Joy, Charles A.**
1. Examination of a few American minerals: Lyceum Nat. Hist. N. Y. Annals, v. 8, pp. 120-125, 1867. Contains chrysocolla and black oxide of copper from Copper Harbor.
- Joyce, J. Wallace**—See Stratton, E. F., 1.
- Julien, Alexis Anastay**—See also Brooks, T. B., 5.
1. Note on a feldspar from the Calumet copper mine, Keweenaw Point, Michigan [abs.]: Sci., new ser., v. 9, p. 719, 1899; N. Y. Acad. Sci. Annals, v. 12, no. 15, pp. 650-654, June 2, 1900.

Kaufmann, Dale W.

1. (and Slawson, C. B.) Ripple mark in rock salt of the Salina formation: *Jour. Geol.*, v. 58, no. 1, pp. 24-29, illus., Jan. 1950. Extensive series of ripple mark at various horizons have been observed in Silurian rock salt of the Salina formation, Michigan, and anhydrite lamellae which show similar ripple mark have been noted in the clear salt mass. These are the first such observations on a large scale. U.S.G.S.

Kay, George Marshall

1. Distribution of *Escharopora hogbeni* Fritz: *Jour. Paleont.*, v. 18, no. 6, pp. 560-561, Nov. 1944.

Keck, W. E.

1. (and Jasberg, Paul) A study of the flotative properties of gypsum: *A.I.M.E. Trans.*, v. 129, pp. 218-234, 12 figs., 1938. A description of part of a general investigation on the flotation of Michigan's potential iron ores.
2. (and Jasberg, Paul) A study of the flotative properties of magnetite [with discussion]: *A.I.M.E. Trans.*, v. 134, pp. 129-145, 1939. A description of part of a general investigation on the flotation of Michigan's potential iron ores.
3. (and Eggleston, G. C.; Lowry, W. W.) A study of the flotative properties of hematite [with discussion]: *A.I.M.E. Trans.*, v. 134, pp. 102-128, 1939. A description of part of a general investigation on the flotation of Michigan's potential iron ores.

Keck, William G.

1. Geophysical measurements in Livingston County, Michigan: *Mich. Acad. Sci. Papers* (1937), v. 23, pp. 463-471, 4 figs., 1938.

Keller, Harry F.—See Lane, A. C., 1, 2.**Kelley, Robert W.**

- *1. Silurian stratigraphy of Cockburn Island, Ontario: Thesis for Degree of Master of Science, Dept. of Geol., Wayne Univ., Detroit, June 1949. 97 pp., 12 tables, 10 pls. Unpublished.

Kelly, William

1. Sinking through wet gravel and quicksand near Norway, Michigan: *A.I.M.E. Trans.* (1891), v. 20, pp. 188-195, 1892.
2. A mine-dam: *A.I.M.E. Trans.*, v. 27, pp. 400-404, 1897. A method of closing off the water encountered in the Curry mine.
3. Address of President William Kelly [a discussion of the mining industry]: *Lake Superior Min. Inst. Proc.*, v. 6, pp. 13-22, 1900.
4. (and Armstrong, F. H.) Use of electricity at the Penn and Republic iron mines, Michigan: *A.I.M.E. Trans.*, v. 48, pp. 262-294, 23 figs., 1914.

Kelly, William Aultin

1. The Carboniferous fauna of Grand Ledge: *Mich. Acad. Sci. Papers* (1927), v. 8, pp. 293-295, 1928.
2. Lower Pennsylvanian faunas from Michigan: *Jour. Paleont.*, v. 4, no. 2, pp. 129-151, 2 pls., June 1930; abs., *Pan Am. Geol.*, v. 53, no. 2, p. 160, Mar. 1930; *Geol. Soc. Am. Bull.*, v. 41, no. 1, pp. 205-206, Mar. 31, 1930.
3. A review of the stratigraphy of the Saginaw formation: *Mich. Acad. Sci. Papers* (1930), v. 14, pp. 453-469, 1 fig., 1931.
4. (and Beutner, E. L.) Heavy minerals from some Pennsylvanian sandstones of Michigan: *Mich. Acad. Sci. Papers* (1930), v. 14, pp. 471-474, 1 fig., 1931.

5. Erosional record during the Pennsylvanian period at Grand Ledge, Michigan [abs.]: *Geol. Soc. Am. Bull.*, v. 43, no. 1, p. 276, Mar. 1932; *Pan Am. Geol.*, v. 57, no. 2, pp. 155-156, Mar. 1932.
6. Pennsylvanian stratigraphy near Grand Ledge, Michigan: *Jour. Geol.*, v. 41, no. 1, pp. 77-88, 4 figs., Jan.-Feb. 1933.
7. Pennsylvanian Mollusca from Michigan [abs.]: *Geol. Soc. Am. Bull.*, v. 44, pt. I, p. 204, Feb. 28, 1933.
8. The Pennsylvanian system of Michigan, in *Occasional papers on the geology of Michigan*: *Mich. Geol. Survey*, pub. 40, geol. ser. 34, pt. II, pp. 149-226, 6 pls., incl. geol. and index maps, 9 figs., 3 tables, 1936; rev., *Am. Assoc. Petrol. Geol. Bull.*, v. 21, no. 12, pp. 1597-1600, Dec. 1937.
9. Tar as a trap for unwary humans: *Am. Jour. Sci.*, v. 238, no. 6, pp. 451-452, 1940.
10. Afton-Onaway district: *Guidebook*, 10th Ann. Geol. Excursion, Mich. Acad. Sci., 12 pls., incl. index and geol. maps, May 1940.
11. Cirques in northwestern Michigan [abs.]: *Geol. Soc. Am. Bull.*, v. 56, no. 12, pt. II, p. 1173, Dec. 1945; *Proc.* (1945), p. 12, 1946.
12. (and Smith, G. W.) Stratigraphy and structure of Traverse group in Afton-Onaway area, Michigan: *Am. Assoc. Petrol. Geol. Bull.*, v. 31, no. 3, pp. 447-469, 6 figs., incl. geol. and isopach maps, Mar. 1947.
13. The Traverse group of the northern part of the Southern Peninsula of Michigan: [Guidebook], *Ann. Geol. Excur.*, Mich. Geol. Soc., well logs, maps, June 1949.

Kemp, C. Ernest

1. Geiger counter reconnaissance in upper Michigan, 1948: *Mich. College Min. Tech.*, Conf. on Radioactive Ores, May 6, 1949, pp. 25-26, 1949.

Kennedy, Bruce E.—See also Wier, K. L., 1.

1. A guide to uranium prospectors in Michigan [revised]: *Mich. Dept. Conserv., Geol. Survey Div.*, in cooperation with Lands and Educ. Div., July 1949. 20 pp.
2. "Forty-Niner" fever: *Mich. Conserv.*, v. 18, no. 6, Nov.-Dec. 1949. An article, written in popular style, concerning the search for uranium.

Kenny, H. C.—See Benedict, C. H., 1.**Kersting, Cecil C.**

1. Stratigraphy of the Delray core, Wayne County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, Feb. 1953. Unpublished.

Kesling, Robert V.

1. A new genus and species of primitiopsisid ostracod from the Devonian Traverse group of Michigan: *Mich. Univ. Mus. Paleont. Contr.*, v. 8, no. 9, pp. 221-230, 3 pls., 1 fig., Jan. 19, 1951.
2. (and McMillan, G. W.) Ostracods of the family Hollinidae from the Bell shale of Michigan: *Mich. Univ. Mus. Paleont. Contr.*, v. 9, no. 2, pp. 45-81, 7 pls., 2 figs., map, July 11, 1951.
3. (and Tabor, N. R.) Two new species of ostracods from the Genshaw formation (Middle Devonian) of Michigan: *Jour. Paleont.*, v. 26, no. 5, pp. 761-763, 1 pl., Sept. 1952.
4. (and Kilgore, J. E.) Ostracods of the families Leperditellidae, Drepanellidae, Glyptopleuridae, Kloedenellidae, Bairdiidae, Barychilinidae, and Thlipsuridae from the Genshaw formation of Michigan: *Mich. Univ. Mus. Paleont. Contr.*, v. 10, no. 1, pp. 1-19, 4 pls., Oct. 31, 1952.

5. Ostracods of the families Leperditellidae, Primitiidae, Drepanellidae, Aechminidae, and Kirkbyidae from the Middle Devonian Bell shale of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 10, no. 2, pp. 21-44, 5 pls., Oct. 31, 1952.
 6. Ostracods of the family Hollinidae from the Ferron Point formation of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 10, no. 3, pp. 45-57, 2 pls., Oct. 31, 1952.
 7. (and Tabor, N. R.) Ostracods of the family Hollinidae from the Genshaw formation of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 10, no. 5, pp. 83-100, 3 pls., Feb. 15, 1953.
 8. A new beyrichiid ostracod from the Middle Devonian Rockport Quarry limestone of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 10, no. 10, pp. 221-229, 2 pls., 1 fig., Apr. 30, 1953.
 9. (and Weiss, Martin) Ostracods from the Norway Point formation of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 11, no. 3, pp. 33-76, 5 pls., July 31, 1953.
 10. (and Hussey, R. C.) A new family and genus of ostracod from the Ordovician Bill's Creek shale of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 11, no. 4, pp. 77-95, 2 pls., 1 fig., Nov. 16, 1953.
 11. A new species of *Phlyctiscapha* from the Middle Devonian Ferron Point formation of Michigan: Mich. Univ. Mus. Paleont. Contr., v. 11, no. 9, pp. 187-192, 1 pl., 1954.
- Keyes, Charles Rollin**
1. American copper mining in the Stone Age: Pan Am. Geol., v. 40, no. 2, pp. 153-160, 1923.
 2. Raphael Pumpelly; premier explorer: Pan Am. Geol., v. 40, no. 4, pp. 241-250, portrait, Nov. 1923.
 3. Horace Vaughan Winchell; mining geologist: Pan Am. Geol., v. 40, no. 3, pp. 161-180, portrait, Oct. 1923.
- Kilbourne, Deane Earle**
1. Origin of the Howell anticline: Compass, v. 25, no. 3, pp. 132-138, illus., geol. map, Mar. 1948. Thesis for Degree of Master of Science, entitled The origin and development of the Howell anticline in Michigan, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1948. 120 pp.
- Kilgore, John E.—See also Kesling, R. V., 4.**
1. Ostracods of the families Leperditellidae, Drepanellidae, Glyptopleuridae, Kloedenellidae, Bairdiidae, Barychilinidae and Thlipsuridae from the Genshaw formation of Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, Aug. 1951. Published in part; see Kesling, R. V., 4.
- Kimball, James Putnam—See also Foster, J. W., 11.**
1. On the iron ores of Marquette, Michigan: Am. Jour. Sci., ser. 2, v. 39 (v.89), no. 117, pp. 290-303, 1865.
- Kindle, Edward Martin**
1. The physical and biological characteristics of certain types of marlite balls from Manitoba and Michigan: Royal Soc. Canada Proc. and Trans., ser. 3, v. 17, sec. 4, pp. 105-114, 3 pls., May 1923.
- Kirk, Edwin**
1. Four new genera of Camerate crinoids from the Devonian: Am. Jour. Sci., v. 243, no. 6, pp. 341-355, 1945.
 2. A new species of *Dolatocrinus* from the Traverse (Middle Devonian) of Michigan: Jour. Paleont., v. 20, no. 3, pp. 267-268, May 1946.
3. Two new inadunate crinoid genera from the Middle Devonian: Am. Jour. Sci., v. 246, no. 11, pp. 701-710, 1948.
- Kirkham, Virgil Raymond Drexel**
1. Unconformity at the top of the Traverse formation in Michigan [abs.]: Geol. Soc. Am. Bull., v. 43, no. 1, pp. 136-137, Mar. 1932; Pan Am. Geol., v. 57, no. 1, p. 66, Feb. 1932.
 2. Unconformity at the top of the Marshall formation in Michigan [abs.]: Geol. Soc. Am. Bull., v. 43, no. 1, pp. 137-138, Mar. 1932; Pan Am. Geol., v. 57, no. 1, p. 66, Feb. 1932.
 3. Possibility of future oil production in Michigan: Oil and Gas Jour., v. 35, no. 52, pp. 45-46, May 13, 1937; abs., Drilling and Production Practice 1937, p. 443, 1938.
- Klein, Ira**
1. Microcline in the native copper deposits of Michigan: Am. Mineralog., v. 24, no. 10, pp. 643-650, 5 figs., Oct. 1939.
- Kline, Virginia Harriet—See also Ehlers, G. M., 14.**
1. Stratigraphy and paleontology of the Silica formation of southeastern Michigan: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1935. Unpublished.
- Knight, James Brooks**
- *1. Bellerophon muscle scars: Jour. Paleont., v. 21, no. 3, pp. 264-267, 1 pl., May 1947.
- Knoll, W. A.**
1. Shaft sinking on the Gogebic iron range [with discussion]: A.I.M.E. Trans., v. 141, pp. 128-145, 1940.
- Knowlton, Fred G.**
1. Drift or float copper [north-central U. S.]: Rocks and Minerals, v. 21, no. 8, pp. 491-492, 1946.
- Koch, Friedrich Karl Ludwig**
1. [Copper and iron ores near Lake Superior]: Deutsche geologische Gesellschaft Zeitschrift, v. 3, pp. 355-358, 1851.
 2. Die Mineralgegenden der Vereinigten Staaten Nord-Amerikas am Lake Superior [The mineral area of the United States of North America near Lake Superior], Göttingen, 1851. 72 pp.
 3. Die Mineral-Regionen der obern Halbinsel Michigan's (N. A.) am Lake Superior und die Isle Royale [The mineral areas of the Upper Peninsula of Michigan (N. A.) near Lake Superior and Isle Royale], map, Göttingen, 1852. 248 pp. Göttingischer Verein bergmännischer Freunde (J.F.L. Hausmann), Studien, v. 6, pp. 1-248, map, 1854; abs., Min. Mag., v. 1, pp. 261-268, 1853.
- Koenig, George Augustus**
1. (and Hubbard, L. L.) On powellite from a new locality [Houghton County]: Am. Jour. Sci., ser. 3, v. 46 (v.146), no. 275, pp. 356-358, 1893; Zeitschrift für Krystallographie und Mineralogie, v. 22, pp. 463-466, 1894.
 2. On mohawkite, stibio-domeykite, domeykite, algodonite and some artificial copper-arsenides: Am. Jour. Sci., ser. 4, v. 10 (v.160), no. 60, pp. 439-448, 1900; Zeitschrift für Krystallographie und Mineralogie, v. 34, pp. 67-77, 1901.
 3. The crystallization of mohawkite, domeykite and other similar arsenides: Lake Superior Min. Inst. Proc., v. 7, pp. 62-64, 1901.

4. On the new species melanochalcite and keweenaquite; with notes on some other known species: *Am. Jour. Sci.*, ser. 4, v. 14 (v.164), no. 84, pp. 404-416, 1902.

Koepel, Edward

1. Copper concentrating practice on amygdaloid rock at the Champion Copper Company's stamp mill: *Lake Superior Min. Inst. Proc.*, v. 27, pp. 112-130, illus., 1929.
- *2. The annual production of copper and the yearly average price of copper: *Lake Superior Min. Inst. Proc.*, v. 27, pp. 147-149, 1929; v. 28, pp. 220-222, 1930.

Kornfeld, Joseph A.

1. Gas-storage center: *Oil and Gas Jour.*, v. 51, no. 51, p. 123, 1953. Gas storage in central Michigan basin aids companies in supplying the Great Lakes industrial centers.

Kramer, James R.

1. The spectrochemical analysis of limestone and dolomite: Thesis for Degree of Master of Science, Dept. of Geol., Univ. of Mich., Ann Arbor, June 1954. Unpublished.

Kraskovsky, S. A.

1. Geotermicheskie ezmereniya v mednykh rudnikakh u verkhnego Ozera [Geothermal temperatures in copper mines at Lake Superior]: *Priroda Akad. Nauk., U.S.S.R.*, no. 5, pp. 18-21, 1935.

Kraus, Edward Henry

1. On the origin of the sulphur deposits at the Woolmth quarry, Monroe Co., Michigan: *Mich. Acad. Sci. Rpt.*, v. 7, pp. 26-29, 1905.
2. Occurrence and distribution of celestite-bearing rocks: *Am. Jour. Sci.*, ser. 4, v. 19 (v.169), no. 112, pp. 286-293, 1905; abs., *Am. Geol.*, v. 35, no. 2, p. 130, 1905; *Geol. Soc. Am. Bull.*, v. 16, p. 574, 1905; *Sci. Am. Suppl.*, v. 59, p. 24326, 1905; *Mich. Acad. Sci. Rpt.*, v. 7, p. 29, 1905.
3. (and Hunt, W. F.) The occurrence of sulphur and celestite at Maybee, Michigan: *Am. Jour. Sci.*, ser. 4, v. 21 (v.171), no. 123, pp. 237-244, 1906; *Zeitschrift für Krystallographie und Mineralogie*, v. 42, pp. 1-12, 1906.
4. Some unusual specimens of "float" copper: *Am. Mineralog.*, v. 9, no. 2, pp. 23-26, 6 figs., Feb. 1924.
5. (and Seaman, W. A.; Slawson, C. B.) Seamanite, a new manganese phosphoborate from Iron County, Michigan: *Am. Mineralog.*, v. 15, no. 6, pp. 220-225, 1 fig., June 1930.

Krimmel, Carl Peter

1. The serpentinite of Presque Isle, Marquette County, Michigan: Thesis for Degree of Master of Science, Dept. of Geol., Northwestern Univ., Evanston, Ill., 1941. 62 pp. Unpublished.

Kropschot, Robert E.

1. A quantitative sedimentary analysis of the Mississippian deposits in the Michigan basin: Thesis for Degree of Master of Science, Dept. of Geol. and Geog., Mich. State College, East Lansing, 1953. 57 pp. Unpublished.

Krumbein, William Christian

1. Textural and lithological variations in glacial till: *Jour. Geol.*, v. 41, no. 4, pp. 382-408, 10 figs., May-June 1933.

Lachlan, Major

1. On the periodical rise and fall of the Lakes: *Am. Jour. Sci.*, ser. 2, v. 19 (v.69), nos. 55-56, pp. 60-71, 164-175, 1855; v. 20 (v.70), no. 53, pp. 45-53, 1855.

Lahee, Frederic Henry

- *1. Further data on wildcat drilling in 1937: *Am. Assoc. Petrol. Geol. Bull.*, v. 22, no. 9, pp. 1231-1235, 1 fig., Sept. 1938.
- *2. Wildcat drilling in 1940: *Am. Assoc. Petrol. Geol. Bull.*, v. 25, no. 6, pp. 997-1003, 1941; in 1939, v. 24, no. 6, pp. 953-958, 1940; in 1938, v. 23, no. 6, pp. 789-794, 1939.
- *3. Wildcat drilling in 1941 with comments on discovery rate: *Am. Assoc. Petrol. Geol. Bull.*, v. 26, no. 6, pp. 969-982, June 1942; abs., entitled, Discovery rate and relation of wildcatting to the discovery of new reserves, v. 26, no. 5, p. 904, May 1942.
- *4. Wildcat drilling in 1942: *Am. Assoc. Petrol. Geol. Bull.*, v. 27, no. 6, pp. 715-729, 1943.
- *5. Review of exploratory drilling statistics, 1938-1944: *Am. Assoc. Petrol. Geol. Bull.*, v. 29, no. 11, pp. 1581-1592, 1 fig., Nov. 1945.
- *6. Exploratory drilling in 1953: *Am. Assoc. Petrol. Geol. Bull.*, v. 38, no. 6, pp. 971-987, 3 figs., 13 tables, June 1954; in 1952, v. 37, no. 6, pp. 1193-1210, June 1953; in 1951, v. 36, no. 6, pp. 977-995, June 1952; in 1950, v. 35, no. 6, pp. 1123-1141, June 1951; in 1949, v. 34, no. 6, pp. 995-1013, June 1950; in 1948, v. 33, no. 6, pp. 783-804, June 1949; in 1947, v. 32, no. 6, pp. 851-868, June 1948; in 1946, v. 31, no. 6, pp. 917-930, June 1947; in 1945, v. 30, no. 6, pp. 813-828, June 1946; in 1944, v. 29, no. 6, pp. 629-645, June 1945; in 1943, v. 28, no. 6, pp. 701-721, June 1944.

Laird, L. B.—See Wisler, C. O., 1.**Lake, M. C.**

1. The future of the Lake Superior district: *Lake Superior Min. Inst. Proc.*, v. 24, pp. 48-67, 1925.

Lake Superior Iron Ore Association

1. Lake Superior iron ores, illus., incl. maps: Cleveland, Lake Superior Iron Ore Assoc., 1938. 364 pp. 2d ed., Lake Superior iron ores; mining directory and statistical record of the Lake Superior iron ore district of the United States and Canada, illus., 1952. 334 pp.

Lake Superior Mining Institute

1. Institute trip to the different mines, mills and smelters: *Lake Superior Min. Inst. Proc.*, v. 12, pp. 25-49, 1907.
2. The Gogebic range; brief description of its discovery and development: *Lake Superior Min. Inst. Proc.*, v. 10, pp. 158-162, 1904; v. 15, pp. 10-26, 1910.
3. Description of mines on the Menominee range: *Lake Superior Min. Inst. Proc.*, v. 16, pp. 17-41, 1911.
4. Geological notes of the Lake Superior copper formation: *Lake Superior Min. Inst. Proc.*, v. 17, pp. 9-49, 1912. Contains descriptions of the equipment and a list of the active mining companies of the Lake Superior copper district of Michigan.
5. The founding of the Calumet and Hecla mine, 1866-1916: *Lake Superior Min. Inst. Proc.*, v. 21, pp. 71-78, 1917.
6. Extracts from the Proceedings of the Lake Superior Mining Section National Safety Council, Duluth, Minnesota, Aug. 28-29, 1923: *Lake Superior Min. Inst. Proc.*, v. 23, pp. 117-146, 1923.

7. The Menominee range: Lake Superior Min. Inst. Proc., v. 26, pp. 7-12, 1928.

Lamar, W. L.—See Collins, W. D., 6.

Lamey, Carl Arthur—See also Dutton, C. E., 1; James, H. L., 7.

1. Granite intrusions in the Huronian formations of northern Michigan: Jour. Geol., v. 39, no. 3, pp. 288-295, 4 figs., Apr.-May 1931.
2. The intrusive relations of the Republic granite: Jour. Geol., v. 41, no. 5, pp. 487-500, 7 figs., July-Aug. 1933.
3. The intrusive relations and metamorphic effects of the Republic granite: Thesis for Degree of Doctor of Philosophy, Dept. of Geol., Northwestern Univ., Evanston, Ill., 1933. 238 pp. In part, Northwestern Univ., Summ. Doc. Dissert., v. 1, pp. 207-215, 1933. Also represented in part by a number of papers published in scientific journals.
4. What is the Palmer gneiss? [abs.]: Geol. Soc. Am. Proc. (1933), p. 92, June 1934.
5. Some metamorphic effects of the Republic granite: Jour. Geol., v. 42, no. 3, pp. 248-263, 10 figs., Apr.-May 1934.
6. Mineral resources of Michigan: Federal Emergency Relief Administration Project, Houghton, Michigan, Feb. 1935. Unpublished.
7. Lead-silver veins of Michigan; Federal Emergency Relief Administration Project, Houghton, Michigan, Feb. 1935. Unpublished.
8. The Palmer gneiss: Geol. Soc. Am. Bull., v. 46, no. 7, pp. 1137-1162, 1 pl., 8 figs., incl. geol. map, July 31, 1935.
9. Republic granite or basement complex?: Jour. Geol., v. 45, no. 5, pp. 487-510, 3 figs., incl. geol. sketch maps, July-Aug. 1937.
10. A dip-needle survey of the Toivola-Challenge mine area, Michigan: Econ. Geol., v. 33, no. 6, pp. 635-646, 2 figs., index and geol. maps, Sept.-Oct. 1938.
11. Recent geological surveying in the Michigan copper district: Lake Superior Min. Inst. Proc., v. 30, pp. 90-94, 1939.
12. Metamorphic contrasts in Minnesota and Michigan [abs.]: Geol. Soc. Am. Bull., v. 50, no. 12, pt. II, p. 2000, Dec. 1, 1939.
13. (and Dutton, C. E.) Geology of the Menominee range, vicinity of Iron Mountain: Mich. Geol. Survey Prog. Rpt. 6, geol. map, Mar. 1941. 14 pp.
14. (and Dutton, C. E.) Geology of the Menominee range, Norway to Waucedah: Mich. Geol. Survey Prog. Rpt. 8, geol. map, Apr. 1942. 20 pp.
15. Geology of an area southwest of Randville, Dickinson County, Michigan: U. S. Geol. Survey, in cooperation with Mich. Geol. Survey, 2 pls., [Apr. 19, 1946]. 8 pp. Open file report, Mich. Geol. Survey, Lansing.
16. Geology of a part of the Felch Mountain iron range, Michigan: U. S. Geol. Survey, 2 pls., maps, 1949. 19 pp. Open file report, Mich. Geol. Survey, Lansing.

Land Economic Survey

1. Land Economic Survey Reports: Mich. Dept. Conserv., Lands Div., Lansing. Contain water-power reports for the following counties: Alger (fieldwork in 1923), Alpena (1924), Antrim (1923), Charlevoix (1922), Chippewa (1925), Crawford (1927), Kalkaska (no date), Menominee (1925), Ogemaw (1936-37).
2. Land Economic Survey Reports: Mich. Dept. Conserv., Lands Div., Lansing. Contain geological reports for the following counties: Alger (fieldwork in 1923), Alpena (1924), Antrim (1923), Charlevoix (1922), Chippewa (1925), Crawford (1927), Iron (1930), Kalkaska (no date), Luce

(1929), Menominee (1925), Montmorency (1930), Ogemaw (1936-37), Roscommon (1924), Schoolcraft (1932).

Landes, Kenneth Knight—See also U. S. Geological Survey, 7, 9.

1. Porter oil field, Midland County, Michigan: Am. Assoc. Petrol. Geol. Bull., v. 28, no. 2, pp. 173-196, 6 figs., incl. index and structure maps, Feb. 1944.
2. (and Wilson, J. T.) Ground-water exploration by earth-resistivity methods: Mich. Acad. Sci. Papers (1943), v. 29, pp. 345-354, 7 figs., incl. index map, 1944. Plymouth district chosen as test area. Discusses a method of finding low-resistivity areas in buried sediments.
3. (and Ehlers, G. M.; Stanley, G. M.) Geology of the Mackinac Straits region and subsurface geology of the northern part of the Southern Peninsula: Mich. Geol. Survey, pub. 44, geol. ser. 37, 20 pls., 14 figs., 1945. 204 pp.
4. Origin of Mackinac breccia [abs.]: Geol. Soc. Am. Bull., v. 55, no. 12, pt. II, p. 1479, 1944.
5. Porosity through dolomitization: Am. Assoc. Petrol. Geol. Bull., v. 30, no. 3, pp. 305-318, 1 fig., Mar. 1946.
6. Salt basin rim collapse [abs.]: Geol. Soc. Am. Bull., v. 59, no. 12, pt. II, p. 1334, Dec. 1948. Reference to the Salina salt basin.
7. Deep River oil field, Arenac County, Michigan, in *Structure of typical American oil fields*, v. 3, pp. 299-304, illus.: Am. Assoc. Petrol. Geol., 1948.
8. Detroit River group in the Michigan basin: U. S. Geol. Survey Circ. 133, 12 figs., Sept. 1951. 23 pp.

Lane, Alfred Church—See also Fuller, M. L., 5; Powers, Sidney, 1; Wadsworth, M. E., 14.

1. (and Keller, H. F.; Sharpless, F. F.) Notes on Michigan minerals: Am. Jour. Sci., ser. 3, v. 42 (v.142), no. 252, pp. 499-508, 1891. Contains chloritoid, grünerite and riebeckite.
2. (and Keller, H. F.) Chloritoid von Champion, Michigan, U.S.A.: Zeitschrift für Krystallographie und Mineralogie, v. 19, pp. 383-385, 1891.
3. The geology of lower Michigan with reference to deep borings (edited from notes of C. E. Wright): Mich. Geol. Survey, v. 5, pt. II, 74 pls., incl. well logs, cross sections, maps, 1895. 100 pp. Contains: Introduction, on the origin of salt, gypsum and petroleum, by L. L. Hubbard. Rev., Am. Jour. Sci., ser. 3, v. 50 (v.150), no. 295, pp. 71-72, 1895.
4. Crystallized slags from copper smelting [abs.]: Geol. Soc. Am. Bull., v. 6, pp. 469-470, 1895.
5. The drainage of the Saginaw Valley [note]: Sci., new ser., v. 5, p. 553, 1897.
6. Geological report on Isle Royale, Michigan: Mich. Geol. Survey, v. 6, pt. I, 16 pls., 29 figs., incl. map, 1898. 281 pp.
7. Magmatic differentiation in rocks of the copper-bearing series [abs.]: Geol. Soc. Am. Bull., v. 10, pp. 15-18, 1899.
8. Note on a method of stream capture: Geol. Soc. Am. Bull., v. 10, pp. 12-15, 1899.
9. Water resources of the Lower Peninsula of Michigan: U. S. Geol. Survey Water-Supply Paper 30, maps, 1899. 97 pp.
10. Lower Michigan mineral waters, a study into the connection between their chemical composition and mode of occurrence: U. S. Geol. Survey Water-Supply Paper 31, maps, 1899. 97 pp.

11. Coal in lower Michigan: *Mich. Miner*, v. 1, no. 3, pp. 9-13; no. 4, pp. 9-16; no. 5, pp. 9-12; no. 6, pp. 9-12; no. 7, pp. 9-12; no. 8, pp. 9-12; no. 9, pp. 9-12; no. 10, pp. 9-12, 1899. Reprint, [Saginaw 1899] 36 pp.
12. Isle Royale; what has been accomplished in unearthing its mineral wealth: *Mich. Miner*, v. 1, no. 11, pp. 18-21; no. 12, pp. 14-18, 1899.
13. Dr. L. L. Hubbard: *Mich. Miner*, v. 3, no. 1, pp. 14-15, portrait, 1900.
14. The geological survey; annual report of the State Geologist for the year ending December 31, 1899: *Mich. Miner*, v. 2, no. 3, pp. 9-13, 1900.
15. The coal basin of Michigan: *Eng. Min. Jour.*, v. 69, pp. 767-768; v. 70, p. 12, 1900.
16. The geothermal gradient in Michigan: *Am. Jour. Sci.*, ser. 4, v. 9 (v.159), no. 54, pp. 434-438, 1900.
17. Geological report on Huron County, Michigan: *Mich. Geol. Survey*, v. 7, pt. II, 11 pls., 12 figs., incl. maps, tables, 1900. 329 pp. Contains: Geological column; Physical geography; Formation of soils and subsoils; Stratigraphy; Distribution and structure of the rocks; Wells and borings; Economic geology; Recent shells, by Bryant Walker and A. C. Lane; Fossils of the Marshall and Coldwater, by W. F. Cooper and A. C. Lane.
18. Michigan limestones and their uses: *Eng. Min. Jour.*, v. 71, pp. 662-663, 693-694, 725, 1901.
19. The pre-glacial surface deposits of lower Michigan [abs.]: *Sci.*, new ser., v. 14, pp. 798-799, 1901.
20. Annual report of the State Geologist [for 1900]: *Mich. Miner*, v. 3, no. 2, pp. 13-21, 1901.
21. [Suggested changes in nomenclature of Michigan formations]: *Mich. Miner*, v. 3, no. 10, p. 9, 1901.
22. The economic geology of Michigan in its relation to the business world: *Mich. Miner*, v. 4, no. 1, pp. 9-15, Dec. 1901.
23. The northern interior coal field: *U. S. Geol. Survey Ann. Rpt.*, v. 22, pt. III, pp. 307-331, map, 1901.
24. Asphalt in Delta County, Michigan: *Eng. Min. Jour.*, v. 73, p. 50, 1902.
25. Recent work of the geological survey: *Mich. Acad. Sci. Rpt.*, v. 3, pp. 38-39, 1902.
26. Coal of Michigan; its mode of occurrence and quality: *Mich. Geol. Survey*, v. 8, pt. II, 9 pls., 9 figs., incl. map, 1902. 233 pp. *Abs.*, *Am. Jour. Sci.*, ser. 4, v. 13 (v.163), no. 78, p. 475, 1902.
27. (and others) Third annual report of the State Geologist for the year 1901: *Mich. Geol. Survey Ann. Rpt.* 1901, maps, 1902. 304 pp. *Abs.*, *Am. Jour. Sci.*, ser. 4, v. 14 (v.164), no. 83, p. 393, 1902. Contains: Preliminary report on Arenac County and parts of Ogemaw, Iosco, and Alcona counties, by W. M. Gregory, pp. 9-29 (extr., *Mich. Miner*, v. 4, no. 3, pp. 11-15, Feb. 1902); Report on Alcona County, surface geology by Frank Leverett, sub-surface geology by A. C. Lane, pp. 35-76; Reports on Alpena, Kent, Muskegon and Washtenaw counties, by B. E. Livingston, C. D. McLouth, and others, pp. 77-108; Surface geology of Lapeer County, Michigan, by F. B. Taylor, pp. 111-117; Economic geology, pp. 121-137; Limestones, pp. 139-159; Stratigraphy of the Traverse group of Michigan, by A. W. Grabau, pp. 163-210; Deep wells and prospects for oil and gas, pp. 211-237; Salt, pp. 241-242; Meteorites, p. 243; Geothermal gradient, pp. 244-251 (also, *Am. Jour. Sci.*, ser. 4, v. 9 (v.159), no. 54, pp. 434-438, 1900); The Port Huron oil field, by C. H. Gordon, pp. 269-281; Wave cutting on west shore of Lake Huron, by C. H. Gordon, pp. 283-290 (also, *Mich. Miner*, v. 4, no. 12, pp. 10-14, 1902).

28. Variation of geothermal gradient in Michigan [abs.]: *Sci.*, new ser., v. 15, p. 88, 1902; *Geol. Soc. Am. Bull.*, v. 13, pp. 528-529, 1903.
29. Studies of the grain of igneous intrusives: *Geol. Soc. Am. Bull.*, v. 14, pp. 369-384, 1903; *abs.*, *Sci.*, new ser., v. 17, p. 296, 1903. Contains studies of the diabase dike at Lighthouse Point, Marquette.
30. Annual report geological survey of Michigan [for 1902]: *Mich. Miner*, v. 5, no. 2, pp. 16-26, (reprinted, map, 26 pp.), 1903.
31. The economic geology of Michigan [abs.]: *Sci.*, new ser., v. 17, p. 218, 1903; *Eng. Min. Jour.*, v. 75, p. 152, 1903; *Sci. Am. Suppl.*, v. 55, p. 22666, 1903.
32. Historical review of the geology of Michigan: *Mich. Acad. Sci. Rpt.*, v. 5, pp. 184-195, 1904.
33. Magnetic phenomena around deep borings: *Mich. Acad. Sci. Rpt.*, v. 4, pp. 166-167, 1904.
34. The coarseness of igneous rocks and its meaning: *Am. Geol.*, v. 35, no. 2, pp. 65-72, 1905.
35. (and others) Fifth annual report of the State Geologist for the year 1903: *Mich. Geol. Survey Ann. Rpt.* 1903, maps, 1905. 342 pp. Contains: Relation of soils to natural vegetation in Roscommon and Crawford counties, Michigan, by B. E. Livingston, pp. 9-31; Report of progress in the Porcupines, by F. E. Wright, pp. 33-44; Water supply of the Lower Peninsula of Michigan, by W. F. Cooper, pp. 47-109; Waters of the Upper Peninsula of Michigan, pp. 113-167; Limestone, pp. 169-174; Building and road materials, pp. 182-193 (also *Mich. Miner*, v. 6, no. 5, pp. 9-12; no. 6, pp. 9-11, 1904); Theory of copper deposition, pp. 239-249 (also, *Mich. Miner*, v. 6, no. 2, pp. 9-11; no. 3, pp. 9-11, 1904; *Am. Geol.*, v. 34, no. 5, pp. 297-309, 1904); The Tamarack mine cross section and the Keweenaw lodes, pp. 251-270; Deep borings for oil and gas, pp. 271-294; Peat, pp. 294-301; and Recent shore forms, by W. M. Gregory, pp. 301-305.
36. (and others) Sixth annual report of the State Geologist for the year 1904: *Mich. Geol. Survey Ann. Rpt.* 1904, maps, 1905. 182 pp. Contains: Failure of wells along the lower Huron River, Michigan, in 1904, by M. L. Fuller, pp. 1-32; A geological reconnaissance along the north shore of lakes Huron and Michigan, by I. C. Russell, pp. 33-112; Notes on clays and shales, sand brick, cement, peat, coal, surface geology of the Upper Peninsula, stratigraphy of the iron-bearing rocks, Lake Superior gold mining, Black River work, drill-core preservation, wells and borings, pp. 113-168.
37. (and others) Seventh annual report of the State Geologist for the year 1905: *Mich. Geol. Survey Ann. Rpt.* 1905, illus., maps, 1906. 638 pp. Contains: Geological report on Bay County, by W. F. Cooper, pp. 135-426 (abs., *Am. Jour. Sci.*, ser. 3, v. 23 (v.123), no. 135, p. 227, 1907); An illustrated catalogue of the Mollusca of Michigan, by Bryant Walker, pp. 427-534; Notes on the origin of strontium, on wells, artesian and mineral waters, building material, marl, shale, sand-lime brick, road metal, gypsum, paint, iron, and coal, pp. 535-571.
38. The geology of Keweenaw Point; a brief description: *Lake Superior Min. Inst. Proc.* (1906), v. 12, pp. 81-104, 1907; *abs.*, *Mines and Minerals*, v. 27, pp. 204-206, 1906.
39. Die Korngrösse der Auvergnosen [The grain size of the auvergnoses], Stuttgart, 1906. 19 pp.
40. Salt water in the Lake mines: *Lake Superior Min. Inst. Proc.* (1906), v. 12, pp. 154-163, 1907.