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 Crystal Falls area: Clements, J. M., 5; Pettijohn, F. J., 8; Zinn, J., 3.
 Felch Mountain area: Lamey, C. A., 16.
 Gravity investigations: Bacon, L. O., 1.
 Ice Lake-Chicagon Creek area: James, H. L., 1.

- Iron River district: Allen, R. C., 1; Dutton, C. E., 6; James, H. L., 2, 4, 6; Wier, K. L., 1, 2.
- Judson ore body: Ives, L. E., 1.
- Magnetic data: Good, S. E., 1; James, H. L., 1, 2; Pettijohn, F. J., 5; Stratton, E. F., 1; U. S. Geol. Survey, 13; Wier, K. L., 1, 2, 3.
- Mineral Hills district: Dutton, C. E., 5.
- Stager area: Good, S. E., 1.
- Origin of: Gruner, J. W., 1, 3, 4; Irving, R. D., 8; James, H. L., 5(a), 9; Leith, C. K., 3; Mann, V. I., 1; Spurr, J. E., 1; Tyler, S. A., 4; Whitney, J. D., 15; Winchell, N. H., 19.
- Gogebic range: Leith, C. K., 2.
- Marquette range: Crump, R. M., 1(th); Holway, W., 1(th); Wadsworth, M. E., 2.
- Menominee range: Fulton, J., 1.
- History of development: Clancey, T., 1; Harding, J. H., 2; Hulst, N. P., 1; Jopling, J. E., 3; Longyear, J. M., 1; Martin, H. M., 13; Mather, W. G., 1; Swineford, A. P., 1, 2, 3, 5; Winchell, H. V., 1, 2; Zapffe, C., 2.
- Gogebic range: Harding, J. H., 1; Lake Superior Min. Inst., 2; Leith, C. K., 2.
- Marquette range: Goodman, R. J., 2; Hulst, H. T., 2; Jopling, J. E., 1, 2; Newett, G. A., 4.
- Cascade range: McDonald, P. B., 1.
- Menominee range: Conlin, T., 1; Swineford, A. P., 6.
- Industry: Allen, R. C., 3, 4, 8, 15, 17, 18, 21; Barrett, L. P., 1; Birkinbine, J., 3(*); Crowell & Murray, 1; Kelly, W., 3; Mich. Geol. Survey, 5, 13; Pardee, F. G., 1; Smith, R. A., 4, 6, 7, 8, 9; Swineford, A. P., 1, 2, 3, 5, 7.
- Beneficiation, low grade ores: Cochran, R., 1; Crowell & Murray, 1; Snelgrove, A. K., 2; Sweet, A. T., 1; Sweetser, R. H., 1.
- Furnaces: Clancey, T., 1; Jopling, J. E., 3; Mather, W. G., 1; Swineford, A. P., 1, 2, 3, 5.
- Mines: Crowell & Murray, 1; Lane, A. C., 51.
- Gases in: Quayle, S. E., 1.
- Gogebic range: Anonymous, 5; Best, B. G., 1.
- Ashland, sinking and equipping: Ellard, H. F., 1.
- Aurora: Winchell, N. H., 5(a).
- Eureka: Dickey, R. M., 4; Foss, A. L., 1; Nilsen, N. E., 1.
- Eureka-Asteroid: Schaus, O. M., 1.
- Newport: Broan, J. M., 1; Hoffman, G. A., 1(th); Vallat, B. W., 1; Zinn, R. P., 1.
- Palms: Blackwell, F., 1.
- Peterson: Eng. Min. Jour., 1.
- Wakefield: Hart, W. C., 1.
- Marquette range
- Abandoned, history of: Hulst, H. T., 2.
- Athens: Allen, C. W., 1; Nicolson, C. W., 1.
- Blueberry: Archibald, R. S., 2; Chabot, L. S., Jr., 3.
- Cliff: Eaton, L., 4; Hayden, J. E., 2.
- Curry, water in: Kelly, W., 2.
- Holmes: Eaton, L., 2.
- Lake, mechanical ventilation at: Eaton, L., 3.
- Michigamme, magnetic concentration at: Fowle, J. C., 1.
- Morris: Chapman, R. H., 1(th); Hayden, J. E., 1.
- Negaunee, No. 3 shaft: Elliott, S. R., 1.
- Republic, electricity at: Kelly, W., 4.
- Tilden: Allen, C. W., 2.
- Ventilation in: Nicolson, C. W., 2.
- Volunteer, blasting at: Chabot, L. S., Jr., 1.

- Menominee range: Lake Superior Mining Inst., 3.
- Amasa-Porter, sub-stopping: Baxter, C. H., 2.
- Balkan, drag-line stripping and mining: Lawrence, C. E., 1.
- Brier Hill, ground movement from mining: Rice, G. S., 1.
- Bristol: Baxter, C. H., 2.
- Cannon shaft: Mining World, 3.
- Carpenter, sub-level stoping: Wortley, R. B., 1.
- Caspian, top slicing at: McEachern, W. A., 1.
- Cayia, water in: Stuart, W. T., 5.
- Chapin: Baxter, C. H., 2; Larsson, P., 1.
- Chatham, sub-stopping: Baxter, C. H., 2.
- Davidson No. 2: Baxter, C. H., 2.
- Hamilton, unwatering of: Jones, J. T., 1, 2.
- Loretto: Baxter, C. H., 1, 2.
- Ludington: Browne, D. H., 1; Jones, J. T., 2.
- Penn, electricity at: Kelly, W., 4.
- Pewabic: Baxter, C. H., 2; Brown, E. F., 1.
- Safety in: Crawford, F. S., 2.
- Spies-Virgil: Allen, C. W., 3; Elliott, S. R., 2; Hawes, C. C., 1.
- Tobin, block caving and sub-stope system: Roberts, F. C., 1.
- Vulcan, square-set mining: Burr, F. L., 1.
- West Vulcan: Bond, W., Capt., 1; Schroeder, M. J., 1.
- Safety in: Conibear, W., 2; Crawford, F. S., 1, 2; Higgins, E., 2; Lake Superior Min. Inst., 6.
- Valuation of: Allen, R. C., 7, 20; Finlay, J. R., 1(*).
- Ventilation in: Eaton, L., 3; Higgins, E., 1; Nicolson, C. W., 2.
- Waters in: Chapman, R. H., 1(th); Jones, J. T., 1, 2; Kelly, W., 2; Lane, A. C., 40, 51; Stuart, W. T., 5.
- Mining: Crowell & Murray, 1.
- Costs and production: Brooks, T. B., 2; Mich. Geol. Survey, 5, 13.
- Gogebic range: Hotchkiss, W. O., 3, 7.
- Methods: Knoll, W. A., 1; Nilsen, N. E., 1; Olsen, O. E., 1; Schaus, O. M., 1; Sullivan, J. C., 1; Williams, P. S., 1; Zinn, R. P., 1.
- North Palms orebody: Berteling, J. F., 1.
- Influence of geology on: Royce, S., 4.
- Jones step process: Allen, R. C., 3.
- Marquette range: Hotchkiss, W. O., 7.
- Future of: Goodman, R. J., 1.
- Methods: Allen, C. W., 2; Brooks, T. B., 2, 4; Eaton, L., 5, 7; Elliott, S. R., 3; Graff, W. W., 1, 2; Haller, F. J., 1; Hulst, H. T., 1; Stoek, H. H., 1.
- Soft hematite: Eaton, L., 5.
- Specular, and magnetic ores: Brooks, T. B., 4; Eaton, L., 7.
- Menominee range
- Electrical power in: Harger, C., 1; Orbison, T. W., 1.
- Methods: Baxter, C. H., 1, 2; Fulton, J., 2.
- Mine drainage investigation: U. S. Geol. Survey, 12.
- Pewabic concentrating works: Hardenburgh, L. M., 1.
- Sinking shaft through wet gravel and quicksand: Kelly, W., 1.
- Soft hematite: Eaton, L., 6.
- Methods: Allen, C. W., 2; Baxter, C. H., 1, 2; Brooks, T. B., 2, 4; Channing, J. P., 2; Eaton, L., 5, 7; Elliott, S. R., 3; Fulton, J., 2; Graff, W. W., 1, 2; Haller, F. J., 1; Hulst, H. T., 1; Kelly, W., 1, 2; Knoll, W. A., 1; Matson, R. C., 1; Nilsen, N. E., 1; Olsen, O. E., 1; Parks, R. D., 1; Schaus, O. M., 1; Stoek, H. H., 1; Sullivan, J. C., 1; Williams, P. S., 1; Zinn, R. P., 1.
- Ore bodies of uniform grade: Brown, E. F., 2.

- Properties: Brewer, C., 1.
 Soft ores: Eaton, L., 5, 6; Larsson, P., 2; Rothwell, R. P., 1.
- Ores
 Analysis of: Chester, A. H., 1; Goetz, G. W., 1; Harder, E. C., 1(*); Separk, E. A., 1; Siebenthal, W. A., 1.
 Beneficiation of: Cochran, R., 1; Crowell & Murray, 1; Snelgrove, A. K., 2; Sweet, A. T., 1; Sweetser, R. H., 1.
 Estimation of: Wolff, J. F., 1, 2.
 Grading of: Separk, E. A., 1.
 Manganiferous: Harder, E. C., 1(*); Zapffe, C., 1.
 Moisture in: Hulst, N. P., 3.
 Phosphorus in: Brown, E. F., 1; Browne, D. H., 1.
 Potential ores, flotation of: Keck, W. E., 1, 2, 3.
 Sampling of: Bowers, R. W., 1; Brown, E. F., 1; Cromwell, B., 1; Mixer, C. T., 1; Putnam, B. T., 1.
 Stocking of: Eaton, L., 1.
 Taxation of: Allen, R. C., 7; Young, O. H., 1.
 Transportation of: Crowell & Murray, 1; Hearing, J. H., 2; Sampson, J., 1.
- Reserves: Allen, R. C., 5, 7; Birkinbine, J., 2, 4(*); Leith, C. K., 8; Mich. Geol. Survey, 5; Pardee, F. G., 4; Richards, F. B., 1(*); Zapffe, C., 1.
- Lake Superior region: See Lake Superior Region
- Lead-silver veins: Lamey, C. A., 7.
- Limestone: Allen, R. C., 4, 15; Grabau, A. W., 3(a); Lane, A. C., 18, 27, 35, 45, 46; Martin, H. M., 10; Sherzer, W. H., 3(a); Smith, R. A., 3; Trauffer, W. E., 1(*); Whittemore, C. A., 1.
- Industry: Morrison, P. C., 1, 2.
 Quarries: Benedict, A. C., 1; Pit and Quarry, 1; Randall, C. B., 1.
- Marl: Bergquist, S. G., 1; Davis, C. A., 1, 2; Glock, W. S., 1(*); Hale, D. J., 1; Lane, A. C., 37; Pepper, J. F., 1(th); Russell, I. C., 1(a).
- Molding sand: See sand and gravel.
- Non-metallic: Allen, R. C., 3, 4, 5, 8, 15, 17, 18, 21; Hardenberg, H. J., 4, 5; Poindexter, O. F., 3; Smith, R. A., 4, 6, 7, 8, 9; Sorensen, H. O., 1.
- Oil and Gas
 Acidizing: Chamberlain, L. C., Jr., 1; Love, W. W., 1(*).
 Bitumen, Nonesuch formation: Carlson, C. G., 2.
 Conservation of, legal history: Calvert, F. A., 1; Ely, N., 1; Miller, L. S., 6.
 Crude oils, analyses of: Garton, E. L., 1.
 Developments of: Fugate, R. J., 1, 2; Grant, R. P., 1, 2(a); Guley, M. G., 1; Hardenberg, H. J., 1, 3; Mich. Geol. Survey, 10, 15; Miller, L. S., 3; Natl. Oil Scouts Assoc., 1; Natl. Oil Scouts and Landmen's Assoc., 1, 2; Newcombe, R. J. B., 14; Newman, E. A., 2; Osgood, M., Jr., 1; Osgood, W., 1; Price, L. W., 1; Sanger, W. A., 1; Smith, R. A., 5, 9; Terwilliger, F. W., 1, 2, 3; Wasson, T., 1; Wolcott, R. H., 2.
 Discoveries: Howard, W. V., 2; Lyon, N. X., 2.
 Economic effects of: Pogue, J. E., 1.
 In salt-bearing rocks: Newcombe, R. J. B., 3.
 Lag in: Lyon, N. X., 6.
- Drilling
 Deep tests: Lane, A. C., 27, 35; MacDonald, G. C., 1; Maebius, J. B., 2; Warren, E., 1.
 Drill pipe, recovery of: Lyon, N. X., 7.
 Exploratory: Lahee, F. H., 1(*), 2(*), 3(*), 4(*), 5(*), 6(*).
 Low costs: Simons, H. F., 3.
 Methods: Simons, H. F., 1, 4.
 Well cuttings: Hofstra, W. E., 1(th).
 Exploration for: Lyon, N. X., 8; Wender, C., 1.
 By surface minerals: Lasky, B. H., 1.

- Industry: Grant, R. P., 3, 4; Hardenberg, H. J., 2; Hoffmaster, P. J., 1; Lyon, N. X., 5, 8; Walsworth, K. G., 1.
 Future of: Kirkham, V. R. D., 3; Lane, A. C., 27; Lyon, N. X., 1; Martin, H. M., 8; Simons, H. F., 2; Smith, R. A., 4.
 United States: Soyster, H. B., 1.
- Influence of structure: Newcombe, R. J. B., 1.
 Leasing for: Lane, A. C., 46; Wender, C., 2.
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 Middle western states: Newcombe, R. J. B., 5.
 Pay out rates, southwestern Michigan: Lyon, N. X., 3.
 Pressure maintenance in: Miller, L. S., 2.
 Proration: Miller, L. S., 1, 4.
 Regulations: Mich. Dept. Conserv., 2, 3, 4, 5.
 Richfield: Hautau, G. H., 1, 2.
 Salt water disposal: Albright, J. C., 1; Bignell, L. G. E., 1; Daoust, W. L., 1; Riggs, C. H., 4; Sanders, T. P., 1.
 Shallow: Oil and Gas Jour., 1.
 Statistics: Mich. Geol. Survey, 15.
 Traverse: Davis, D. W., 1.
 Water injection, underground reservoirs: Schoeneck, W. E., 1.
- Fields: Newcombe, R. J. B., 7; Oil and Gas Jour., 6; Terwilliger, F. W., 2, 3.
 Buckeye: Addison, C. C., 1; Lyon, N. X., 2.
 Central Michigan fields: Zavoico, B. B., 1.
 Clare County: Newcombe, R. J. B., 12.
 Coldwater: Wolcott, R. H., 1(a).
 Crystal: Eddy, G. E., 3.
 Deep River: Landes, K. K., 7.
 Deerfield: Lindberg, G. D., 1.
 Hart: Riggs, C. H., 1.
 Muskegon: Newcombe, R. J. B., 6.
 Northville: Miller, L. S., 5.
 Pinconning, CaCO₃-Mg ratios, Rogers City and Dundee: Powell, L. M., 1(th).
 Porter: Landes, K. K., 1.
 Port Huron: Lane, A. C., 27.
 Reed City: Oil and Gas Jour., 5.
 Saginaw: Carlson, C. G., 1; Smith, R. A., 1.
 Southern Michigan: Oil and Gas Jour., 1.
 Southwestern Michigan: Oil and Gas Jour., 4.
 Temple: Maebius, J. B., 1(a).
 Walker: Oil and Gas Jour., 3; Riggs, C. H., 3(a).
 Walker-Wyoming limit: Oil and Gas Jour., 2.
 West Branch: Newman, E. A., 1.
- Gas: Bergquist, S. G., 12.
 Conservation of: Calvert, F. A., 1; Natl. Conserv. Comm., 1.
 Fields: Newcombe, R. J. B., 9.
 Gas sands, Mississippian: Hard, E. W., 1.
 Liquid gas, underground storage of: Grant, R. P., 5.
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 Shoestring fields: Ball, M. W., 1.
 Storage of: Grant, R. P., 5; Herringshaw, D. E., 1; Kornfeld, J. A., 1; Spindle, J. E., 1.
 Limestone porosity: Hohlt, R. B., 1(*).
 Limestone reservoirs: Howard, W. V., 1(*); Murray, A. N., 1(*).
 Maps: Mich. Geol. Survey, 12, 16.
 Oil and gas investigations: U. S. Geol. Survey, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 17.

- Wildcat: Mich. Geol. Survey, 11, 18.
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 Accumulation and structure: Newcombe, R. J. B., 8.
 Gratiot County: Rockwood, D. N., 1(th).
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 North America: Powers, S., 2(*).
 Possibilities of: Lane, A. C., 27; Nattress, T., 4; Robinson, W. I., 2; Smith, R. A., 4.
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 Pipelines: Martin, H. M., 25.
 Porosity through dolomitization: Landes, K. K., 5.
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 Bradley No. 4, Newaygo: Manulik, A. J., 1(th).
 Natural flowing, Trenton lime: Lyon, N. X., 4.
 Well logs: Mich. Geol. Survey, 2.
 Well samples: Mich. Geol. Survey, 1.
 Magnesium/calcium ratios, method of determination: Jodry, R. L., 1(th).
 Peat: Lane, A. C., 35, 36, 45, 46, 50; Soper, E. K., 1.
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 Petroleum: See oil and gas
 Potash, notes on: Allen, R. C., 4; Lindgren, W., 1(*).
 Road metal: Lane, A. C., 35, 37.
 Salt: Exworthy, A., 1; Holder, C. E., 1; Lane, A. C., 27, 50; Martin, H. M., 12; Mich. Leg., 1; Phalen, W. C., 1; Poindexter, O. F., 7(a); Sherzer, W. H., 3(a); Winchell, A., 4.
 Industry: Allen, R. C., 3; Cook, C. W., 1, 2; Higgins, S. G., 1; Parker, E. W., 1; Rominger, C. L., 3; Winchell, A., 2.
 Mine: Anonymous, 11; Fay, A. H., 1.
 Origin of: Branson, E. B., 1(*); Cook, C. W., 2; Dellwig, L. F., 2(th); Lane, A. C., 3.
 Wells: Fry, W. H., 1, 2.
 Sand and gravel: Allen, R. C., 4.
 Foundry sand: Lane, A. C., 46.
 Molding sand: Brown, G. G., 2; Lane, A. C., 45.
 Production of: Avery, W. M., 1; Rock Products, 1; Ward, F. L., 1.
 Shale: Brown, G. G., 1; Lane, A. C., 36, 37; Ries, H., 2, 3, 4.
 Silver: Anonymous, 3; Jackson, C. T., 2, 3, 7; Nishio, K., 1; Nöggerath, J. J., 1(f); Schoolcraft, H. R., 5; Swineford, A. P., 5; Winchell, H. V., 2.
 Iron River district: Swineford, A. P., 3, 4; Whittlesey, C., 10.
 Ontonagon district: Rominger, C. L., 3.
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 Silver Islet: Fleener, F., 1(*); McDermott, W., 1(*).
 Slate: Rominger, C. L., 3; Swineford, A. P., 3, 5.
 Stone, Bayport: Benedict, A. C., 1.
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 Adularia: Winchell, N. H., 18.
 Agate: Alessi, A. J., 2; Dustin, F., 4; Luoma, H. L., 2.
 Algodonite: Koenig, G. A., 2.
 Analcite: Hovey, E. O., 1; Penfield, S. L., 1.
 Anthraconite, near Norwood: Wulfman, C. E., 1.
 Apophyllite, Cliff mine: Dana, J. D., 1.
 Barite: Hobbs, W. H., 1.
 Calcite: Palache, C., 1, 4; Rath, G. von, 1(f); Spiroff, K., 5.

- Celestite: Kraus, E. H., 2, 3.
 Champion area: Mandarin, J. A., 1.
 Chlorastrolite: Dustin, F., 2; Hawes, G. W., 1; Luoma, H. L., 3; Winchell, N. H., 16.
 Chlorite, pseudomorphs of: Pumpelly, R., 3.
 Chloritoid: Hobbs, W. H., 1; Lane, A. C., 1, 2.
 Chrysocolla: Joy, C. A., 1; Luoma, H. L., 4.
 Copper: Cornwall, H. R., 4; Rath, G. von, 2(f).
 Copper arsenides: Genth, F. A., 1; Koenig, G. A., 2, 3; Nichols, J. B., 1; Schwartz, G. M., 1.
 Copper oxides: Joy, C. A., 1; Schaller, W. T., 1; Whitney, J. D., 4, 8.
 Copper-silver nugget: Luoma, H. L., 1.
 Cranbrook collection: Hatt, R. T., 1.
 Datolite: Hayes, A. A., 1.
 Diamond field, Great Lakes region: Hobbs, W. H., 2.
 Dickite and chromium silicate, in iron ores: Gruner, J. W., 5(a).
 Domeykite: Jackson, C. T., 21; Koenig, G. A., 2, 3.
 Eakleite, Isle Royale: Foshag, W. F., 1.
 Feldspar: Classen, E., 1; Julien, A. A., 1; Stewart, D., Jr., 1.
 Float copper: Knowlton, F. G., 1; Kraus, E. H., 4.
 Fluorite, Monroe formation: Fitzgerald, P. E., 1.
 Fulgurites: Franz, H., 1; Hill, J., 1; Hurd, P., 1.
 Garnet: Alessi, A. J., 4; Penfield, S. L., 2.
 Gems, Isle Royale: Dustin, F., 1, 2.
 Glauconite, in Hermansville: Bergquist, S. G., 2.
 Grünerite: Lane, A. C., 1; Richarz, S., 1, 2, 4.
 Halite: Slawson, C. B., 4(a); Spiroff, K., 1.
 Halloysite: Ayres, V. L., 2(a).
 Heavy minerals, podzol soils: Matelski, R. P., 1.
 Hematite: Classen, E., 1; Cornwall, H. R., 4; Winchell, N. H., 8.
 Ilmenite: Cornwall, H. R., 4.
 Jacksonite: Whitney, J. D., 3; Winchell, N. H., 17.
 Keweenawite: Koenig, G. A., 4.
 Limonite, Van Buren County: Hill, J., 2, 3.
 Lintonite: Winchell, N. H., 15.
 Magnesiosussexite: Gruner, J. W., 2.
 Magnetite: Cornwall, H. R., 4.
 Manganite: Hobbs, W. H., 1.
 Martite, in sideritic ore: Wienert, F., 1.
 Melanochalcite: Koenig, G. A., 4.
 Michigan: Bigsby, J. J., 1; Dustin, F., 5; Gritzner, G. F., 1; Jackson, C. T., 17; Mich. College Min. Tech., 1; Parsons, W. H., 1; Poindexter, O. F., 12; Wadsworth, M. E., 14; Wright, F. E., 1; Zuidema, H. P., 1.
 Microcline, native copper: Klein, I., 1.
 Mineral collecting: Dustin, F., 5; Gritzner, G. F., 1; Luoma, W. E., 1.
 Minerals in dolomite, Monroe, Michigan: Bacon, L. R., 1.
 Minerals in sandstone, Rockford, Michigan: Bay, J. W., 4.
 Mirabilite, Isle Royale mine: Lane, A. C., 59; Peck, A. B., 1.
 Mohawkite: Koenig, G. A., 2, 3; Richards, J. W., 1.
 Nontronite: Ayres, V. L., 2(a).
 Northern Peninsula: Ayres, V. L., 2(a); Brooks, T. B., 5; Cornwall, H. R., 4; Everhart, H. A., 1; Jackson, C. T., 17; Koch, F. K. L., 3; Luoma, W. E., 1.
 Iron country: Alessi, A. J., 1, 3; Ayres, V. L., 3; Classen, E., 1; Spiroff, K., 3.
 Isle Royale: Dustin, F., 1, 2; Foshag, W. F., 1; Foster, J. W., 10; Koch, F. K. L., 3; Winchell, N. H., 16.

- Keweenaw Peninsula: Andress, J. E., 1; Cornwall, H. R., 4; Jackson, C. T., 1; Lane, A. C., 59; Mandarino, J. A., 1; Palache, C., 1, 3, 4; Peck, A. B., 1; Spiroff, K., 2, 5.
- Lake Superior region: Andress, J. E., 1; Ayres, V. L., 3; Foster, J. W., 9; Jackson, C. T., 1, 4, 11, 15; Koch, F. K. L., 2, 3; Locke, J., 3, 4; Richarz, S., 1, 2, 4; Rogers, H. D., 1; Spiroff, K., 2, 3; Teschemacher, J. E., 1; Whitney, J. D., 1, 13, 17; Winchell, N. H., 15.
- Oldhamite, in Allegan meteorite: Tassin, W., 1.
- Powellite: Koenig, G. A., 1; Palache, C., 2.
- Quartz, isotropic: Winchell, A. N., 3.
- Radium, Keweenawan basalts: Urry, W. D., 1.
- Riebeckite: Lane, A. C., 1.
- Seamanite: Kraus, E. H., 5; McConnell, D., 1.
- Serpentine, Ishpeming: Alessi, A. J., 1.
- Stibio-domeykite: Koenig, G. A., 2.
- Stilpnomelane: Ayres, V. L., 2(a).
- Sulphur: Kraus, E. H., 1, 3; Sherzer, W. H., 2.
- Sussexite, Iron County: Slawson, C. B., 2.
- Thomsonite: Winchell, N. H., 15.
- Tourmaline: Alty, S. W., 1(a), 3; Slawson, C. B., 3(a).
- Vanadium minerals: Teschemacher, J. E., 1.
- Whitneyite: Genth, F. A., 1.
- Zonochlorite: Hawes, G. W., 1; Winchell, N. H., 16.
- Mining**
- Accidents: Channing, J. P., 1; Conibear, W., 1; Fay, A. H., 2; Quine, J. T., 1.
- Concrete shaft houses: Hayden, J. E., 2.
- Cut-and-fill stoping system: Mendelsohn, A., 2.
- Hoisting problem: Thompson, J. R., 1.
- Lake Superior region: Jackson, C. T., 11; Lawrence, C. E., 2(*); Stevens, W. H., 1; White, P., 2; Winchell, A. N., 2; Winchell, H. V., 2.
- Mine taxation: Allen, R. C., 7, 20; Gibson, T. G., 1(*); Young, O. H., 1.
- Mine waters: Chapman, R. H., 1(th); Jones, J. T., 1, 2; Kelly, W., 2; Lane, A. C., 40, 44, 51, 57; Stuart, W. T., 5.
- Ontonagon County: Broughton, S. H., 1.
- Rock drill, development of: Hawes, E. L., 1(*).
- Missaukee County**
- Devonian stratigraphy and fauna, from cores: Jacobson, R. C., 1(th).
- Oil and gas maps: Mich. Geol. Survey, 16.
- Monroe County: Hubbard, B., 5.**
- Deerfield oil field: Lindberg, G. D., 1.
- Geology of: Nattress, T., 1; Sherzer, W. H., 4.
- Mineralogy: Bacon, L. R., 1; Kraus, E. H., 1, 3.
- Oil and gas maps: Mich. Geol. Survey, 16.
- Size analysis, beach sand, Sterling State Park: Steiner, W. W., 1(th).
- Montcalm County**
- Crystal oil field, geology of: Eddy, G. E., 3.
- Oil and gas maps: Mich. Geol. Survey, 16.
- Montmorency County**
- Geology of: Land Econ. Survey, 2.
- Glacial: Bergquist, S. G., 14.
- Pollen studies, Middle Fish Lake: Wilson, I. T., 1.
- Muskegon County: Lane, A. C., 27.**
- Muskegon oil field: Newcombe, R. J. B., 6.
- Oil and gas maps: Mich. Geol. Survey, 16.

- Newaygo County**
- Oil and gas maps: Mich. Geol. Survey, 16.
- Well cores, Garfield Township, stratigraphy and paleontology: Fauser, W. B., Jr., 1(th); Manulik, A. J., 1(th); Preble, H. D., 1(th).
- Northern Peninsula: See also Lake Superior Region; Mineral Resources and Mineral Industries, copper, iron; Petrography and Petrology.**
- Geology of: Hubbard, L. L., 5; Locke, J., 2; Whitney, J. D., 2.
- Glacial: Lane, A. C., 36; Leverett, F., 13, 14, 27(a); Mich. Acad. Sci., 8.
- Metalliferous veins of: Houghton, D., 1.
- Paleozoic: Crooks, H. F., 1(th); Ehlers, G. M., 3, 4(a), 11(th); Mich. Acad. Sci., 8; Rominger, C. L., 2; Savage, T. E., 1.
- Pre-Silurian structures: Credner, H., 2(f).
- Geophysical investigations and magnetic surveys: See Explorations and Surveys.
- Mineral industries: Snelgrove, A. K., 1.
- Mineralogy: See Mineralogy
- Water resources: Brown, E. A., 1; Lane, A. C., 35; Poindexter, O. F., 5; Stuart, W. T., 3(a), 4, 6; U. S. Geol. Survey, 12.
- Oakland County: Hubbard, B., 4.**
- Ground-water resources: Ferris, J. G., 4; Mozola, A. J., 1, 2.
- Oil and gas maps: Mich. Geol. Survey, 16.
- Surface geology of: Bingham, M. T., 1.
- Oceana County**
- Hart oil field: Riggs, C. H., 1.
- Marl deposits: Bergquist, S. G., 1.
- Oil and gas maps: Mich. Geol. Survey, 16.
- Ogemaw County: Lane, A. C., 27.**
- Geology of: Land Econ. Survey, 2; Newman, E. A., 1.
- Microfossils in deep well: Din, M., 1(th).
- Oil and gas maps: Mich. Geol. Survey, 16.
- Water power of: Land Econ. Survey, 1.
- West Branch oil field: Newman, E. A., 1.
- Oil and Gas: See Mineral Resources and Mineral Industries**
- Ontonagon County**
- Dip-needle survey, Cherokee area: Spiroff, K., 4.
- Extrusive and sedimentary rocks, petrographic study of: Hornstein, O. M., 1(th).
- Keweenawan sediments of: Van Altena, P. J., 1(th).
- Mining interests and geology of: Broughton, S. H., 1.
- Mines of: Jamison, K., 1.
- Notes on: Barnes, G. O., 1; White, W. S., 4(a).
- Porcupine Mountains, geology of: El-Khalidi, H. H., 1(th); Lane, A. C., 49; Thaden, R. E., 1(th).
- Silver in: Swineford, A. P., 3, 4, 5.
- White Pine: Ayer, F. A., 1; Humphrys, C. R., 1; McLeod, B. H., 1; Mining World, 1; Ramsey, R. H., 1; White, W. S., 3, 5.
- Osceola County**
- Oil and gas maps: Mich. Geol. Survey, 16.
- Reed City field: Oil and Gas Jour., 5.
- Ottawa County: Douglass, C. C., 2.**
- Ground-water resources, Holland area: Ferris, J. G., 3.
- Oil and gas maps: Mich. Geol. Survey, 16.
- Walker field: Oil and Gas Jour., 3; Riggs, C. H., 3(a).
- Walker-Wyoming limit: Oil and Gas Jour., 2.

Paleontology

Algae

- As limestone markers: Glock, W. S., 1(*).
 Lake sediment, algal origin: Phinney, H. K., 1.
 Pre-Cambrian and Carboniferous: Twenhofel, W. H., 1.
 Stromatolites: Richardson, E. S., Jr., 1.

Blastoids

- Hamilton group: Barris, W. H., 1.
Heteroschisma gracile: Wachsmuth, C., 1.

Brachiopoda

- American, synopsis of: Schuchert, C., 1.
Atrypa: Fenton, C. L., 1.
 Cambrian: Walcott, C. D., 3(*).
 Color patterns of: Foerste, A. F., 5(*).
 Mississippian: Oden, A. L., 1(th).
Strophodonta: Imbrie, J., 1(a).
 Traverse group, *Gypidula petoskeyensis*: Imlay, R. W., 1.
 Winchell's types, revision of: Ehlers, G. M., 14.

Bryozoa

Devonian

- Cryptostomata*, from Traverse group: McNair, A. H., 1; Slaughter, A. E., 1(th).

Fenestella deissi: Elias, M. K., 1.

- Fenestellidae, stratigraphic correlation: Deiss, C. F., 1.

Trepostomata: Duncan, H. M., 1(a), 2.

Escharopora hogbeni, distribution of: Kay, G. M., 1.

Carboniferous: Stevens, R. P., 1.

Ammonoids, America: Smith, J. P., 1.

Coal pebbles in glacial drift, Ann Arbor: Bartlett, H. H., 1.

Fauna, Grand Ledge: Kelly, W. A., 1.

Conodonts, Norwood and Antrim shales: Morse, M. L., 1(th).

Corals: Rominger, C. L., 3.

Aulopora: Fenton, M. A., 3, 4.

Calamoporae, in gravel deposits: Rominger, C. L., 1.

Devonian

Eridophyllum: Stumm, E. C., 8.

Hexagonaria: Stumm, E. C., 2.

Microcyclus: Stumm, E. C., 3.

Traverse group: Ehlers, G. M., 13, 18; Sloss, L. L., 1.

Favosites alpenensis: Swann, D. H., 1.

Prismatophyllum: Faul, H., 1(th), 2.

Diphyphyllum simcoense: Sherzer, W. H., 1.

Niagaran

Favosites, new species: Berner, R. E., 1(th).

Heterolasma foerstei: Ehlers, G. M., 2.

Oriented sections, significance of: Grabau, W. E., 1(th).

Reefs of: Grabau, A. W., 4.

Devonian: Faul, H., 2.

Niagaran: Cumings, E. R., 2(*).

Seas: Case, E. C., 3.

Triplasma, Silurian rugose coral: Stumm, E. C., 5(*).

Crinoids

Devonian: Ehlers, G. M., 9; Kirk, E., 1, 3; Wood, E., 1.

Hamilton group: Barris, W. H., 2.

Megistocrinus concavus: Wachsmuth, C., 2.

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Dolatocrinus: Kirk, E., 2.

Stratigraphic significance of: Davies, W. E., 1(th).

Cystoids

Devonian: Stumm, E. C., 10(a).

Lipsanocystis traversensis: Ehlers, G. M., 6.

Trenton: Hussey, R. C., 2.

Devonian

Arthrodiran remains: Case, E. C., 4.

Blastoids: Barris, W. H., 1.

Brachiopoda: Ehlers, G. M., 14; Imbrie, J., 1(a); Imlay, R. W., 1.

Bryozoa: Deiss, C. F., 1; Duncan, H. M., 1(a), 2; Elias, M. K., 1; McNair, A. H., 1; Slaughter, A. E., 1(th).

Corals: Ehlers, G. M., 13, 18; Faul, H., 1(th), 2; Fenton, M. A., 3; Sloss, L. L., 1; Stumm, E. C., 2, 3, 8; Swann, D. H., 1.

Crinoids: Barris, W. H., 2; Davies, W. E., 1(th); Ehlers, G. M., 9; Kirk, E., 1, 2, 3; Wachsmuth, C., 2; Wood, E., 1.

Cystoids: Ehlers, G. M., 6; Stumm, E. C., 10(a).

Detroit River: Stauffer, C. R., 5.

Dundee limestone: Bassett, C. F., 1; Sherzer, W. H., 8.

Fauna: Burgess, C. W., 1(th); Ehlers, G. M., 10; Grabau, A. W., 10(a); Schuchert, C., 2; Sherzer, W. H., 8; Stumm, E. C., 4; Williams, H. S., 2.

Fossils, spectrographic analysis of: Uhri, D. C., 1(th).

Fossil zones in wells, southwestern Ontario: Fritz, M. A., 1(*).

Mollusca: La Rocque, J. A., 1(th).

Cephalopoda: Ehlers, G. M., 5; Foerste, A. F., 4.

Gastropoda: Ehlers, G. M., 5; La Rocque, J. A., 2; Linsley, R. M., 1(th);

Radabaugh, R. E., 2(th).

Pelecypoda: La Rocque, J. A., 3.

Ostracodes: Campau, D. E., 1(th); Coley, T. B., 1(*,th), 2(*); Henderson, J., 1(th); Kesling, R. V., 1, 2, 3, 4, 5, 6, 7, 8, 9, 11; Kilgore, J. E., 1(th); McMillan, G. W., 1(th); Stewart, G. A., 1(*); Tabor, N. R., 1(th); Van Pelt, H. L., 1; Warthin, A. S., Jr., 1(a), 2; Weiss, M., 1(th); Wuckert, A. E., 1(th).

Reefs: Faul, H., 2; Henry, W. W., 1(th).

Silica formation: Kline, V. H., 1(th).

Stromatoporoid reef: Fenton, M. A., 2.

Traverse-Ferron Point and Genshaw: Smith, G. W., 1(th).

Trilobites: Stumm, E. C., 6, 7, 9.

Well cores: Beauclair, W. A., 1(th); Burgess, C. W., 1(th); Hamberg, L. R., 1(th); Jacobson, R. C., 1(th).

Fauna

Carboniferous, Grand Ledge: Kelly, W. A., 1.

Devonian: Burgess, C. W., 1(th); Jacobson, R. C., 1(th); Stumm, E. C., 4; Williams, H. S., 2.

Dundee limestone: Bassett, C. F., 1; Sherzer, W. H., 8.

Faunal provinces, America: Schuchert, C., 2.

Hamilton, southeastern Michigan: Ehlers, G. M., 10.

Schoharie: Grabau, A. W., 10(a).

Traverse: Stumm, E. C., 4.

Faunal lists, Limestone Mountain and Sherman Hill: Case, E. C., 2.

Microfossils, deep wells: Din, M., 1(th).

Pennsylvanian: Kelly, W. A., 1, 2.

Richmond: Foerste, A. F., 1.

Silurian, Ontario Peninsula, Manitoulin: Williams, M. Y., 1.

Silurice: Grabau, A. W., 8(a); Sherzer, W. H., 6.

Unionie, Great Lakes, preglacial distribution of: Walker, B., 1.

Flora

Bowmanites: Arnold, C. A., 7.

Callixylon newberryi: Arnold, C. A., 3.

- Cordaitean wood: Arnold, C. A., 2.
 Geographical distribution of: Ward, L. F., 1.
 Lepidophyte cone: Arnold, C. A., 1.
 Megaspores: Arnold, C. A., 10.
 Paleobotanical studies: Arnold, C. A., 6.
 Antrim shale: Clark, I. M., 1.
 Pennsylvanian: Arnold, C. A., 1, 2, 4, 5, 7, 8, 9, 10.
 Pollen: Cain, S. A., 1.
 Bogs: Houdek, P. K., 1; Potzger, J. E., 1, 3.
 Forest succession indicated by pollen: Potzger, J. E., 1, 2.
 Lake sediments: Cain, S. A., 2; Potzger, J. E., 2;
 Wilson, I. T., 1, 3.
 Tension zone, lower Michigan: Potzger, J. E., 5.
 Postglacial: Fuller, G. D., 1; Hansen, E. B., 1; Potzger, J. E., 4; West,
 G. F., 1.
 Relic, Keweenaw Peninsula: Bergquist, S. G., 11.
 Sphenopterid fructification: Arnold, C. A., 4.
 Spore coal: Bergquist, S. G., 13.
 Fossil burrows, Ajibik quartzite: Faul, H., 3.
 Fossil collecting: Raasch, G. O., 1.
 Graptolites
 Niagaran: Ehlers, G. M., 12(a).
 Ordovician, Calhoun County, stratigraphic significance: Decker, C. E.,
 1, 2(*).
 Huron group: Winchell, A., 5.
 Lake Superior region: Hall, J., 1; Locke, J., 3, 4.
 Lake Superior sandstone: Winchell, A., 6.
 Michigan: Martin, H. M., 19.
 Mississippian
 Brachiopoda: Oden, A. L., 1(th).
 Cephalopoda: Garner, H. F., 1(th), 2(th); Miller, A. K., 1, 2.
 Coldwater: Lane, A. C., 17.
 Limestone exposures at Grand Rapids, fossils in: Strong, E. A., 1.
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 Point au Gres, revision of E. A. Strong's species: Ehlers, G. M., 16.
 Mollusca: Lane, A. C., 37.
 Cephalopoda: Winchell, A., 3.
 Black River: Foerste, A. F., 7.
 Carboniferous ammonoids, America: Smith, J. P., 1.
 Color patterns: Foerste, A. F., 5(*).
 Devonian: Ehlers, G. M., 5; Foerste, A. F., 4.
 Mississippian: Garner, H. F., 1(th), 2(th); Miller, A. K., 1, 2.
Nephriticerina: Foerste, A. F., 6.
 Paleozoic, America: Foerste, A. F., 3.
 Silurian: Foerste, A. F., 2.
 Devonian: La Rocque, J. A., 1(th).
 Gastropoda: Foerste, A. F., 5(*).
 Bellerophon muscle scars: Knight, J. B., 1(*).
 Devonian: Ehlers, G. M., 5; La Rocque, J. A., 2; Linsley, R. M., 1(th).
 Rogers City limestone: Radabaugh, R. E., 2(th).
 Snail borings: Fenton, C. L., 3.
 Pelecypoda: Foerste, A. F., 5(*).
 Devonian: La Rocque, J. A., 3.
 Pennsylvanian: Kelly, W. A., 7(a).
 Postglacial: Baker, F. C., 1.
 Monroe formation: Grabau, A. W., 11.
 Nomenclature, priority: Stumm, E. C., 1.

- Ordovician: Hussey, R. C., 4.
 Bibliographic index: Bassler, R. S., 1(*).
 Cephalopoda: Foerste, A. F., 7.
 Cystoids, Trenton: Hussey, R. C., 2.
 Graptolites: Decker, C. E., 1, 2(*).
 Microfossils of, in deep wells: Din, M., 1(th).
 Ostracodes: Kesling, R. V., 10.
 Reef, Sulphur Island: Ehlers, G. M., 8.
 Richmond fauna: Foerste, A. F., 1.
 Organic markings, iron ores: Gresley, W. S., 1.
 Organic remains, Huronian: Cayeux, L., 1(f); Gresley, W. S., 2.
 Ostracodes
 Devonian:
 Bell shale: Henderson, J., 1(th); Kesling, R. V., 5; Van Pelt, H. L., 1.
 Hollinidae: Kesling, R. V., 2; McMillan, G. W., 1(th).
 Stratigraphic distribution of: Campau, D. E., 1(th); Coley, T. B.,
 1(*, th), 2(*).
 Traverse group: Kesling, R. V., 1; Warthin, A. S., Jr., 2.
 Ferron Point: Kesling, R. V., 6, 11.
 Genshaw: Kesling, R. V., 3, 4, 7; Kilgore, J. E., 1(th); Tabor, N. R.,
 1(th).
 Norway Point: Kesling, R. V., 9; Weiss, M., 1(th).
Ponderodictya, bioseries of: Wuckert, A. E., 1(th).
 Rockport Quarry limestone: Kesling, R. V., 8.
 Stratigraphic distribution of: Campau, D. E., 1(th).
 Zonal distribution of: Stewart, G. A., 1(*).
 Traverse-Hamilton correlations: Warthin, A. S., Jr., 1(a).
 Ordovician: Kesling, R. V., 10.
 Paleozoic
 Occurrence and distribution of: Cooper, C. L., 1(*).
 Statistical morphological classification of: Holmquest, H. J., Jr., 1(th).
 Paleozoic: Case, E. C., 2; Hall, J., 1.
 Pennsylvanian: See also Carboniferous.
 Faunas: Kelly, W. A., 1, 2.
 Flora: Arnold, C. A., 1, 2, 4, 5, 7, 8, 9, 10; Bergquist, S. G., 13.
 Mollusca: Kelly, W. A., 7(a).
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 Pre-Cambrian: Walcott, C. D., 2(*).
 Reefs
 Devonian: Faul, H., 2; Henry, W. W., 1(th).
 Niagaran: Cumings, E. R., 2(*); Herndon, T., 1(th); Lowenstam, H. A., 1.
 Ordovician, Sulphur Island: Ehlers, G. M., 8.
 Paleozoic: Grabau, A. W., 4.
 Restricted conditions: Verhoeven, C. S., 1(th).
 Stromatoporoid: Fenton, C. L., 2(*); Fenton, M. A., 1(a), 2.
 Sclerodonts: Eller, E. R., 1, 2.
 Silurian
 Bibliographic index: Bassler, R. S., 1(*).
 Cataract strata: Ehlers, G. M., 7.
 Cephalopoda: Foerste, A. F., 2.
 Corals: Berner, R. E., 1(th); Ehlers, G. M., 2; Stumm, E. C., 5(*).
 Fauna: Grabau, A. W., 8(a); Sherzer, W. H., 6; Williams, M. Y., 1.
 Graptolites: Ehlers, G. M., 12(a).
 Reefs: Cumings, E. R., 2(*); Herndon, T., 1(th); Lowenstam, H. A., 1.
 Stromatoporoid, Niagaran: Fenton, C. L., 2(*).
 Stromatolites, Lower Huronian: Richardson, E. S., Jr., 1; See also algae.
 Stromatoporoid reef: Fenton, C. L., 2(*); Fenton, M. A., 1(a), 2.

- Supposed fossil from copper-bearing rocks: Wadsworth, M. E., 8.
 Trilobites, Devonian: Stumm, E. C., 6, 7, 9.
- Vertebrates
 Arthrodiran remains: Case, E. C., 4.
 Beaver: Cahn, A. R., 1, 2; Engels, W. L., 1.
Boötherium: Gidley, J. W., 1.
 Caribou, barren ground: Hibbard, C. W., 1.
Elephas primigenius americanus: Case, E. C., 5.
 Fishes, Paleozoic: Newberry, J. S., 2.
 Fresh-water sheepshead, Cheboygan County: Hubbs, C. L., 1.
 Mammal bones, Sleeping Bear dune: Gates, D. M., 1.
 Marine mammals in Pleistocene beaches: Handley, C. O., Jr., 1.
 Mastodon: Case, E. C., 6; MacAlpin, A. J., 1; MacCurdy, H. M., 1;
 Warren, J. C., 1; Winchell, A., 7.
Ovibos: Gidley, J. W., 1.
Platygonus compressus: Wagner, G., 1.
Symbos cavifrons: Case, E. C., 1.
 Woolly elephant: Sherzer, W. H., 10.
- Well cores
 Antrim and Crawford counties: Burgess, C. W., 1(th).
 Bay and Arenac counties: Hamberg, L. R., 1(th).
 Clare County: Beauclair, W. A., 1(th).
 Microfossils, deep wells: Din, M., 1(th).
 Missaukee County: Jacobson, R. C., 1(th).
 Newaygo County: Fauser, W. B., Jr., 1(th); Manulik, A. J., 1(th); Preble,
 H. D., 1(th).
 Washtenaw County: Coupal, F. E., 1(th).
- Petrography and Petrology
 Accessory minerals, pre-Cambrian: Tyler, S. A., 3; Urry, W. D., 1.
 Amygdules, Keweenaw district: Wadsworth, M. E., 3.
 Analyses, rocks and minerals: Chamberlin, R. T., 1; Clarke, F. W., 1(*),
 2(*), 3(*), 4(*), 5(*), 7(*); Sundius, N., 1; Washington, H. S., 1(*);
 Winchell, A. N., 1.
 Calcium carbonate-magnesium ratios, Dundee-Rogers City: Powell, L.
 M., 1(th).
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 Auvergnose rocks: Lane, A. C., 39.
 Baraga County, Huronian rocks: Chynoweth, C. E., 1(th).
 Basic massive rocks, Lake Superior region: Bayley, W. S., 1(*).
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 Clay slates, Huronian: Wichman, A., 1.
 Crystal Falls district: Clements, J. M., 3, 4, 5.
 Deformation lamellae in quartz, Ajibik formation: Fairbairn, H. W., 1.
 Detroit River series: Tharp, M., 1(th).
- Dikes:
 Intrusion of into Lower Huronian: Clements, J. M., 4.
 Lighthouse Point: Lane, A. C., 29.
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 Pegmatite dikes, contact metamorphic effects of: Conrad, M. A., 1(th).
 Doneykite group, x-ray study of: Ramsdell, L. S., 1.
 Eagle River district: Pumpelly, R., 2.
 Extrusive and sedimentary rocks, Ontonagon and Gogebic counties: Horn-
 stein, O. M., 1(th).
 Ellipsoidal structure, pre-Cambrian: Clements, J. M., 6.
 Felch Mountain district, gneissic complex: Lehner, R., 1(th).

- Feldspar, secondary enlargement of: Van Hise, C. R., 1.
 Ford River granite: Dickey, R. M., 3.
 General: Wadsworth, M. E., 14.
 Geochemical and radiometric investigations: Orajaka, S. O., 1(th).
 Grain size, igneous rocks: Lane, A. C., 29, 34.
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 Granitization, Lake Pelesier area: Porturas, P. A., 1(th).
 Grünerite: Richarz, S., 1, 2, 4; Sundius, N., 1, 2.
 Heavy mineral studies
 Ajibik and Mesnard quartzites: Jackson, K. C., 1(th).
 Pennsylvanian sandstones: Kelly, W. A., 4.
 Podzol soil profiles: Matelski, R. P., 1.
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 Holyoke meta-sediments, Dead River basin: Engel, T., Jr., 1(th).
 Hornblende, paramorphic origin of: Irving, R. D., 3.
 Hornblendes and augites, enlargement of: Van Hise, C. R., 3.
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 S. O., 1(th).
 Huronian: Brooks, T. B., 7, 8; Chynoweth, C. E., 1(th); Clements, J. M., 4;
 Elkington, R. B., 1(th); Pettijohn, F. J., 3; Wichman, A., 1, 2.
- Insoluble residues
 Bell: Eddy, G. E., 1.
 Detroit River: Cooley, G. A., 1(th); Saunders, J. M., 1(th); Wellman,
 D. C., 1.
 Dundee: Cooley, G. A., 1(th); Eddy, G. E., 1; Wellman, D. C., 1.
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- Intrusives
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 Grain studies of: Lane, A. C., 29.
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 1(*); Lane, A. C., 53, 69; Urry, W. D., 1; Van Altena, P. J., 1(th); Win-
 chell, A. N., 1; Zinn, J., 1(th).
 Keweenaw Point: Hubbard, L. L., 3.
 Kitchi conglomerite: Hagni, R. D., 1(th).
 Lake Enchantment area, sub-Huronian sediments: Brooke, G. L., 1(th).
 Lake Superior region: Bayley, W. S., 1(*); Brooks, T. B., 7, 8; Credner, H.,
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 Laurentian: Brooks, T. B., 9.
 Leucoxene, nature of: Tyler, S. A., 1.
 Little Preque Isle: Tara, M. E., 1(th).
 Magmatic differentiation
 Copper-bearing series: Lane, A. C., 7.
 Effusive rocks: Powers, S., 1(*).
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 Xenolithic lamprophyre dikes: Ayres, V. L., 1.
 Magnesium/calcium ratios, well samples: Jodry, R. L., 1(th).
 Marenisco range, intrusives of: Beutner, E. L., 1(th).
 Marquette district: Van Hise, C. R., 15; Williams, G. H., 2.
 Marshall: Hobbs, R. A., 1(th); O'Hara, N. W., 1(th); Stearns, M. D., 1, 2.
 Menominee district: Williams, G. H., 2.
 Michigamme district, volcanics of: Clements, J. M., 1.

- Mineral fragments, secondary enlargement: Irving, R. D., 4.
 Mount Bohemia, intrusives: Lane, A. C., 50.
 Mount Houghton felsite: Fritts, C. E., 1(th).
 Northern Peninsula: Allen, R. C., 12; Brooks, T. B., 5.
 Peridotite, Presque Isle: Creveling, J. G., 1.
 Pine Creek area: Higgins, J. W., 1.
 Pitchstone: Foster, J. W., 10; Jackson, C. T., 13.
 Porcupine Mountain area: El-Khalidi, H. H., 1(th); Hornstein, O. M., 1(th); Thaden, R. E., 1(th).
 Quinnesec complex: Prinz, W., 1(th).
 Radium, Keweenawan basalts: Urry, W. D., 1.
 Randville dolomite: Theodosis, S. D., 1(th).
 "Red Rock", Porcupine Mountains: Thaden, R. E., 1(th).
 Salina salt, textural relationships: Dellwig, L. F., 1(a).
 Sedimentary
 Beach sands: Espenshade, E. B., Jr., 1(th); Pettijohn, F. J., 1; Steiner, W. W., 1(th).
 Cary and Valdres till, northeastern Wisconsin: Murray, R. C., 1(*).
 Dune sands: Calver, J. L., 1; Espenshade, E. B., Jr., 1(th); Lutz, H. J., 1.
 Eskers, analyses of: Erickson, R. L., 1(th); McCallum, M. L., 1(th); Sandefur, B. T., 1(a); Schmitt, G. T., 1(th).
 Fine-grained, correlation of: Paige, D. S., 1(th).
 Keweenawan, Ontonagon County: Van Alton, P. J., 1(th).
 Lake Erie, mechanical analyses of: Gacek, W. F., 1(th).
 Marshall: Hobbs, R. A., 1(th); O'Hara, N. W., 1(th); Stearns, M. D., 1, 2.
 Mississippian, analysis of: Kropschot, R. E., 1(th).
 Sand grains, types of: Sherzer, W. H., 7.
 Sand, nonwetting, Muskallonge Lake: Tague, G. C., 1.
 Sand, size analyses of: Marschner, A. W., 1; Steiner, W. W., 1(th).
 Silurian, analysis of: Melhorn, W. N., 1(th).
 Sphericity and roundness of: Calver, J. L., 1; Espenshade, E. B., Jr., 1(th); Hobbs, R. A., 1(th).
 Unconsolidated sands, petrofabrics of: Smith, H. C., Jr., 1(*,th).
 Whittlesey beach sediments: Brabb, E. E., 1(th).
 Serpentine, Presque Isle: Krimmel, C. P., 1(th).
 Shales, radioactivity and organic content of: Beers, R. F., 1.
 Spectrochemical analysis, limestone and dolomite: Kramer, J. R., 1(th).
 Sylvania: Alty, S. W., 2; Carman, J. E., 1.
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 Base level, northern Michigan: Van Hise, C. R., 14.
 Bog, Hartford: Osvold, H., 1.
 Camp Custer area: Leverett, F., 22.
 Caverns, influence on topography: Russell, I. C., 5.
 Chemical evolution, ocean: Lane, A. C., 42.
 Cirques, northwestern Michigan: Kelly, W. A., 11(a).
 Climatic changes, pedologic evidence of: Veatch, J. O., 3.
 Coastal lakes, origin of: Evans, O. F., 3.
 Drainage features
 Artificial: Miller, D. G., 1.
 Carboniferous area: Mudge, E. H., 2.
 Delta, St. Clair River: Cole, L. J., 1.
 Tributaries St. Clair and Detroit rivers: Taylor, F. B., 23(a).
 Elsie and Perrinton quadrangles: Leverett, F., 24(a).
 Glacial
 Abandoned channels, lower Huron: Bay, J. W., 1.
 Erie-Ohio basins: Leverett, F., 3.

- Fort Wayne outlet: Mich. Acad. Sci., 2.
 Grand River, evolution of: Bergquist, S. G., 20(a); Bretz, J. H., 5.
 Great Lakes basins: Newberry, J. S., 1.
 Kalamazoo and other old outlets: Gordon, C. H., 2.
 Probable outlet, Lake Superior: Winchell, N. H., 1.
 Southeastern Michigan: Bay, J. W., 3.
 Submerged valley, Mackinac Straits: Stanley, G. M., 5.
 Tahquamenon and Manistique: Bergquist, S. G., 7.
 Grand River: Bergquist, S. G., 20(a); Mudge, E. H., 1, 5.
 Great Lakes basins: Newberry, J. S., 1.
 Lateral erosion: Jefferson, M. S. W., 3.
 Meanders, Middle Rouge: Davis, D. H., 1.
 Pre-glacial: Forsythe, J. T., 1(th); Mudge, E. H., 4, 6; Whittlesey, C., 11.
 River development, Deer River: Clements, J. M., 2(a).
 Saginaw Valley: Lane, A. C., 5.
 Scaurs, River Rouge: Jefferson, M. S. W., 2.
 St. Marys River: Channing, W. F., 1.
 Stream capture: Bowman, I., 1; Lane, A. C., 8.
 Valley filling: Parkins, A. E., 1(a), 2.
 Western Michigan: Wooldridge, C. W., 3.
 Drift deposits: Winchell, A., 16(a), 24.
 Cary and Valdres, northeastern Wisconsin: Murray, R. C., 1(*).
 Faulting and accompanying features in: Henrich, C., 1.
 Jasper conglomerate, index of drift dispersion: Slawson, C. B., 1.
 Lake Superior region: Agassiz, L., 1, 2; Desor, E., 1, 3, 4; Shepherd, F., 2; Whittlesey, C., 3.
 Lithological and textural variations in: Krumbein, W. C., 1.
 Northward transportation of: Winchell, A., 9.
 Northwest United States: Whittlesey, C., 2.
 Red, Manistee area: Bergquist, S. G., 23(a).
 Drumlins: Russell, I. C., 7(a).
 Cheboygan and Presque Isle counties: Bergquist, S. G., 17.
 Distribution of: Bergquist, S. G., 16; Taylor, F. B., 20(a).
 Grand Traverse region: Leverett, F., 6(a).
 Northern Michigan: Russell, I. C., 6.
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 Along shores, upper American lakes: Desor, E., 5.
 Fine-textured material in: Lutz, H. J., 1.
 Form and wind direction of: Smith, H. T. U., 1.
 Grain roundness of, western Michigan: Calver, J. L., 1.
 Grand Sable: Bergquist, S. G., 8.
 Herring Lake embayment: Scott, I. D., 7.
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 Manistique area: Stevenson, E. B., 1.
 Perched, Manistee moraine: Dow, K. W., 1.
 Physiography of: Scott, I. D., 4(a).
 Sleeping Bear: Gates, F. C., 1.
 Strand: Scott, I. D., 6(a), 8(a), 9(a).
 Ventifacts, Sleeping Bear Point: Dow, K. W., 2.
 Earthquakes: Hobbs, W. H., 4; Hussey, W. J., 1; Lane, A. C., 45.
 Later S phases of: Clements, D., 1(th).
 Elevation systems, North America: Foster, J. W., 5.
 Erosion cliffs and talus, lower Devonian: Grabau, A. W., 6.
 Eskers: Sandefur, B. T., 1(a); Schmitt, G. T., 1(th).
 Mason: Erickson, R. L., 1(th); McCallum, M. L., 1(th); Wooster, L. C., 2.
 Faulting, glacial sand and gravel: Henrich, C., 1.

- Foliation and sedimentation, Lake Superior region: Winchell, A., 30.
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- General
- Diagonal system in physical features: Winchell, A., 21.
 - Geology, factor in soil classification: Veatch, J. O., 1.
 - Geology, relation to pedology: Veatch, J. O., 2.
- Geothermal data: Agassiz, A., 2; Darton, N. H., 3.
- Copper district: Birch, F., 1; Fisher, J., 2; Hotchkiss, W. O., 1; Kraskovsky, S. A., 1(f); Lane, A. C., 62(a), 64; Wheeler, H. A., 1.
 - Gradients: Lane, A. C., 16, 27, 28(a), 62(a), 70; Noble, J. A., 1(*).
 - Post-glacial time calculations from: Hotchkiss, W. O., 1.
- Glacial: Bergquist, S. G., 15(a); Lane, A. C., 46; Leverett, F., 19, 20; Martin, H. M., 2, 5, 6, 7.
- Alcona County: Lane, A. C., 27.
 - Bessemer area: Brown, E. A., 1.
 - Champlain valley: Chapman, D. H., 1(*).
 - Chicago area: Leverett, F., 2(*).
 - Dickinson County: Lane, A. C., 45.
 - Douglas Lake, Cheboygan County: Wilson, I. T., 3.
 - Erie-Ohio basins: Leverett, F., 3.
 - Expression of structural features: Newcombe, R. J. B., 10.
 - Genesee County: Bretz, J. H., 1.
 - Great Lakes region: Hough, J. L., 6; Spencer, J. W. W., 2(*); Taylor, F. B., 4, 21(*), 22(*), 24(a), 26, 29.
 - Iron County: Bergquist, S. G., 4; Lane, A. C., 45.
 - Iron River district: Stuart, W. T., 4.
 - Kalamazoo, vicinity of: Leverett, F., 25(a).
 - Lake Superior region: Agassiz, L., 1, 2; Leverett, F., 12; Shepherd, F., 2.
 - Lapeer County: Lane, A. C., 27.
 - Luce County: Bergquist, S. G., 3.
 - Marquette region: Davis, C. A., 3.
 - Menominee County: Lane, A. C., 45; Trow, J. W., 4(a); Ver Wiebe, W. A., 2.
 - Montmorency County: Bergquist, S. G., 14.
 - Northern Peninsula: Lane, A. C., 36; Leverett, F., 13, 14, 27(a); Mich. Acad. Sci., 8.
 - Northwestern United States: Whittlesey, C., 2.
 - Oakland County: Bingham, M. T., 1.
 - Pitted outwash: Thwaites, F. T., 1(*).
 - Platte and Crystal lake depressions: Calver, J. L., 2.
 - Pleistocene research: Flint, R. F., 1(*).
 - Pleistocene sediments, Lake Erie: Ross, A. R., 1(th).
 - Post-Cary glacial substages: Hough, J. L., 5.
 - Pre-Cambrian tillite: Pettijohn, F. J., 7(a).
 - Pre-Huronian, Menominee district: Trow, J. W., 4(a).
 - Relationship to settlement: Martin, H. M., 18.
 - Roscommon County: Ver Wiebe, W. A., 3.
 - Sault Ste. Marie area, Pleistocene clays of: Baldwin, D. C., 1(th).
 - Southern Peninsula: Bergquist, S. G., 21(a); Leverett, F., 4(a), 5, 15, 28; Mich. Acad. Sci., 4.
 - Succession, eastern Michigan: Taylor, F. B., 13(a).
 - Van Buren County: Terwilliger, F. W., 4.
 - Wexford County: Stewart, D. P., 1.
 - Wisconsin substages and late Wisconsin events: Flint, R. F., 2.
- Grand Marais embayment: Tague, G. C., 2.
- Great Lakes
- Drainage basins of: Newberry, J. S., 1.

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- Islands in, formation of: Cook, C. W., 3.
 - Origin of, preglacial: Claypole, E. W., 1(*).
 - Pleistocene and recent sediments of: Ross, A. R., 1(th).
 - Status of in land tilting: Taylor, F. B., 27.
- Glacial
- Algonquin: Stanley, G. M., 6(a); Taylor, F. B., 8.
- Beaches of
- Abandoned: Goldthwait, J. W., 2; Stanley, G. M., 1(th); Taylor, F. B., 2, 3, 12(*), 17(a); Wright, G. F., 1.
 - Algonquin: Goldthwait, J. W., 3, 4(a); Leverett, F., 17(a); Spencer, J. W. W., 6; Stanley, G. M., 4(a); Taylor, F. B., 10; Upham, W., 3.
 - Arkona: Taylor, F. B., 19.
 - Correlation of: Goldthwait, J. W., 1(*); Leverett, F., 1, 30(a), 32; Taylor, F. B., 14(a), 15.
 - Erie basin: Leverett, F., 1, 32; Taylor, F. B., 15.
 - High level: Spencer, J. W. W., 4.
 - Huron basin: Leverett, F., 30(a), 32; Taylor, F. B., 15.
 - Iroquois: Goldthwait, J. W., 3.
 - Isle Royale: Stanley, G. M., 1(th).
 - Lake Superior basin: Leverett, F., 29; Stanley, G. M., 1(th); Taylor, F. B., 2, 5(*), 12(*).
 - Mackinac Island: Taylor, F. B., 1.
 - Marine mammals in: Handley, C. O., Jr., 1.
 - Nipissing: Taylor, F. B., 5(*), 10.
 - Saginaw basin: Leverett, F., 26(a), 30(a).
 - Saginaw County: Cooper, W. F., 3.
 - Warren: MacLachlan, D. B., 1(th); Taylor, F. B., 14(a); Upham, W., 3.
 - Whittlesey: Brabb, E. E., 1(th); Stanley, G. M., 2.
- Chicago, stages of: Bretz, J. H., 3.
- Closing of: Smyth, B. B., 1.
- Correlation with Lake Agassiz: Leverett, F., 16(a).
- Correlative ice borders, Superior basin: Leverett, F., 21(a).
- Departure of ice sheet from: Upham, W., 2(a).
- Isobases of:
- Algonquin and Iroquois: Goldthwait, J. W., 3.
 - Huron-Erie district: Leverett, F., 31(a).
 - Post-Algonquin: Goldthwait, J. W., 5(a).
- Levels, indicated by river terraces: Bay, J. W., 2.
- Maumee: Taylor, F. B., 18.
- Michigan lake basin, levels of: Goldthwait, J. W., 2; Hough, J. L., 5.
- Nipissing: Stanley, G. M., 6(a).
- Saginaw basin: Bretz, J. H., 4; Leverett, F., 23(a).
- Time relations of: Leverett, F., 18(a).
- Warren: Taylor, F. B., 18.
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- Harbors, history of: Shaler, N. S., 1.
- History of: Leverett, F., 11; Martin, H. M., 6; Spencer, J. W. W., 3(a), 7, 8; Taylor, F. B., 21(a), 24(a), 29.
- Huron: Anonymous, 10; Jefferson, M. S. W., 1.
- Along shore of: Bigsby, J. J., 1; Lane, A. C., 36.
 - Deep water sediments: Weinberg, E. L., 1(th).
 - Topographic expression of geology in: Eveland, H. E., Jr., 1(th).
 - Wave cutting: Lane, A. C., 27.
- Levels of: Hough, J. L., 4; Lachlan, Major, 1; Mather, W. W., 1; Taylor, F. B., 7; Whiting, H., 1; Whittlesey, C., 4, 8.

- Michigan
- Bathymetric studies: Evans, O. F., 1.
 - Bottom deposits: Hough, J. L., 1(th), 2, 3; Snodgrass, D. B., 1(th).
 - Geomorphology of basin: Thwaites, F. T., 4.
 - Low water stage, postglacial: Hough, J. L., 4.
 - Shore features of: Bretz, J. H., 2; Evans, O. F., 7, 12.
 - North shore, lakes Huron and Michigan: Lane, A. C., 36.
 - Ontario, preglacial origin of: Claypole, E. W., 1.
 - Origin of: Newberry, J. S., 1; Spencer, J. W. W., 2(*), 3(a), 5.
 - Sources of water, subterranean: Shufeldt, G. A., 1.
 - Studies of: Spencer, J. W. W., 8, 9; Taylor, F. B., 9.
 - Superior: Marcou, J., 1(f); Rivot, L. E., 3(f), 4(f); Whittlesey, C., 9.
 - Basin of: Leith, C. K., 4.
 - Geologic history of: Bell, R., 1.
 - Levels of: Mather, W. W., 1; Whittlesey, C., 8.
 - Sublacustrine geology of: Irvin, W. C., 1(th).
 - Harbor lakes, origin of: Evans, O. F., 2(a).
 - Howell anticline
 - Location by radioactivity: Lane, A. C., 68(a).
 - Origin of: Kilbourne, D. E., 1(th).
 - Huronian weathering and sedimentation: Trow, J. W., 4(a).
 - Ice work: Scott, I. D., 2(a), 3; Sherzer, W. H., 5; Winslow, D. C., 1(th); Zumberge, J. H., 1(a), 2.
 - Imbrication and initial dip, Keweenaw: White, W. S., 1.
 - Influence of subsurface geology on electromagnetic waves: Gibbs, C. J., 1(th).
 - Inland lakes: Scott, I. D., 1.
 - Kames, near Lansing: Wooster, L. C., 1.
 - Keweenaw fault: Lane, A. C., 56(a), 58.
 - Lake Huron region, geology and geography of: Bigsby, J. J., 1, 2.
 - Lake Superior geosyncline: Hotchkiss, W. O., 5.
 - Limonite-sand concretions, Spring Lake: Nichols, H. W., 1.
 - Loess-like silt, Ann Arbor: Heyman, L., 1(th).
 - Mackinac Straits, submerged valley: Stanley, G. M., 5.
 - Marlite balls: Kindle, E. M., 1.
 - Metamorphism: Clements, J. M., 4; Lamey, C. A., 12(a); Williams, G. H., 1, 2.
 - Randville dolomite: Theodosis, S. D., 1(th).
 - Regional, pre-Cambrian: James, H. L., 8(a).
 - Republic granite: Lamey, C. A., 2, 3, 5.
 - Moraines
 - Correlative beaches of: Leverett, F., 1, 30(a), 32; Taylor, F. B., 14(a), 15.
 - Lake Superior basin: Leverett, F., 29.
 - Port Huron system: Bergquist, S. G., 19(a); Taylor, F. B., 28.
 - Recessional, significance of: Taylor, F. B., 11.
 - Terminal, second glacial epoch: Chamberlin, T. C., 1.
 - Nonwetting sand, Muskallonge Lake: Tague, G. C., 1.
 - Northern and northwestern lakes: Schermerhorn, L. Y., 1.
 - Postglacial
 - Ann Arbor: Wooldridge, C. W., 2.
 - Central Michigan, submergence: Mudge, E. H., 3.
 - Champlain valley, history of: Chapman, D. H., 1(*).
 - Detroit: Taylor, F. B., 16(a).
 - Lake Michigan, low-water stage: Hough, J. L., 4.
 - Platte and Crystal lake depressions: Calver, J. L., 2.
 - Time determinations from sediments: Wilson, I. T., 2(a).
 - Western Michigan: Wooldridge, C. W., 1.
 - Pre-Pleistocene geomorphology, Saginaw lowland: Rhodehamel, E. C., 1(th).
 - Recession of lakes, relation to soil profiles: Veatch, J. O., 4.

- Ripple marks
 - Salina formation: Kaufmann, D. W., 1.
 - Wave formed: Evans, O. F., 8, 9, 11.
- Salina salt basin, rim collapse: Landes, K. K., 6(a).
- Salina salt deposition: Briggs, L. I., Jr., 1(a); Lucas, P. T., 1(th).
- Sedimentary overlap: Grabau, A. W., 5(*).
- Sediments, transportation of: Evans, O. F., 4, 6.
- Shore features
 - Beach cusps, origin and classification: Evans, O. F., 13.
 - Beach erosion: Billings, N. F., 1; Brater, E. F., 1; Univ. of Mich., 1.
 - Lake Huron: Jefferson, M. S. W., 1.
 - Wave cutting: Lane, A. C., 27.
 - Lake Michigan: Bretz, J. H., 2; Evans, O. F., 12.
 - Low and ball, eastern shore: Evans, O. F., 7.
 - Recent: Lane, A. C., 35.
- Spits, bars, etc., origin of: Evans, O. F., 10.
- Singing sands: Richardson, W. D., 1.
- Sinkholes: Poindexter, O. F., 5, 6.
- Subsurface currents in lakes: Evans, O. F., 5.
- Surface deposits, pre-glacial: Lane, A. C., 19(a).
- Tar as trap for humans: Kelly, W. A., 9.
- Terrestrial tides determined from gravity deviations: Chapman, W. B., 1(th).
- Tidal gravity measurements: Rose, H., 1(th).
- Uplift
 - Due to glacial melting: Gutenberg, B., 1.
 - Elsie and Perrinton quadrangles: Leverett, F., 24(a).
 - Glacial and postglacial: Hobbs, W. H., 3.
 - Great Lakes region: Gilbert, G. K., 1; Hubbert, M. K., 1(*); Moore, S., 1; Taylor, F. B., 25, 26.
 - Relation to glacial lakes, Saginaw basin: Leverett, F., 23(a).
 - Status of Lake Erie in: Taylor, F. B., 27.
 - Valley train deposits: Bergquist, S. G., 5(a), 6.
- Varved deposits: Bergquist, S. G., 22.
- Pre-Cambrian, granite pebble in: Brigham, E. M., 1.
- Walnut Lake, Oakland County: Lane, A. C., 46.
- Wave action, on submerged shelf: Evans, O. F., 14.
- Weathering: Ehlers, G. M., 1; Zirbel, N. N., 1.
- Weathering and sedimentation, Menominee district: Trow, J. W., 4(a).
- Presque Isle County
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 - Geology of: Grabau, A. W., 1; Winchell, N. H., 2.
 - Ferron Point and Genshaw formations in: Smith, G. W., 1(th).
- Reefs: See Paleontology
- Roscommon County
 - Geology of: Land Econ. Survey, 2; Ver Wiebe, W. A., 3.
 - Oil and gas maps: Mich. Geol. Survey, 16.
 - Soils, relation of vegetation to: Lane, A. C., 35.
- Saginaw County
 - Atlas of: Imperial Publishing Co., 1.
 - Oil and gas maps: Mich. Geol. Survey, 16.
 - Pleistocene beaches of: Cooper, W. F., 3.
 - Saginaw oil field: Carlson, C. G., 1; Smith, R. A., 1.
- St. Joseph County: Hubbard, B., 4.
- Salt: See Mineral Resources and Mineral Industries
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Atlas of: Cookingham, E. R., 1.
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Geology of: Land Econ. Survey, 2; Poindexter, O. F., 1.
Oil and gas possibilities: Robinson, W. I., 2.
Sinkholes, Indian Lake region: Poindexter, O. F., 5, 6.

Sedimentary Geology: See Petrography and Petrology; Physical Geology

Shale: See Mineral Resources and Mineral Industries

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Soils: Lane, A. C., 17, 35; Winchell, A., 11.

Alma area: Hearn, W. E., 1.
Classification, geology factor in: Veatch, J. O., 1.
Heavy minerals in podzol soils: Matelski, R. P., 1.
Loess-like silt, Ann Arbor: Heyman, L., 1(th).
Pedologic evidence of climatic changes: Veatch, J. O., 3.
Pedology, relation to geology: Veatch, J. O., 2.
Soil profiles, relation to lakes: Veatch, J. O., 4.

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Stratigraphy, Paleozoic

Geology of: Lane, A. C., 3; Mich. Acad. Sci., 4; Rominger, C. L., 3.
Surface: Bergquist, S. G., 21(a); Leverett, F., 4(a), 5, 15, 28; Mich. Acad. Sci., 4.

Notes on: Douglass, C. C., 3.

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

Alpena County: Grabau, A. W., 12; Mich. Acad. Sci., 3; Ver Wiebe, W. A., 1.

Cambrian-Keweenaw boundary: Raasch, G. O., 2.

Chippewa County: Ver Wiebe, W. A., 4.

East-central United States: Ballard, N., 1.

Escanaba-Stonington area: Mich. Geol. Soc., 2.

Facies deposition, reef conditions determined from: Verhoeven, C. S., 1(th).

General: Lane, A. C., 45, 50; U. S. Geol. Survey, 6.

Huron County: Lane, A. C., 17.

Keweenaw Point, sandstone of: Agassiz, A., 1; Jackson, C. T., 20; Wadsworth, M. E., 11.

Newaygo County, well records: Fauser, W. B., Jr., 1(th); Manulik, A. J., 1(th); Preble, H. D., 1(th).

Nomenclature

Devonian: Cooper, G. A., 2; Warthin, A. S., Jr., 4.

Pre-Cambrian: Grant, U. S., 1; Van Hise, C. R., 20; Willmott, A. B., 1; Winchell, A. N., 1.

Suggested changes: Lane, A. C., 21.

Upper Siluric: Lane, A. C., 47(a).

North America: Willis, B., 2.

Northern Peninsula: Thwaites, F. T., 2, 3.

Ontonagon County, White Pine area: White, W. S., 3.

Paleozoic: Mich. Acad. Sci., 1, 4, 6, 8; Oetking, P. F., 1(th); Rominger, C. L., 2; Winchell, A., 3.

Antrim: Tarbell, E., 1.

Black shale problem: Ulrich, E. O., 1.

Cambrian: Cohee, G. V., 3; U. S. Geol. Survey, 10.

In well logs, Northern Peninsula: Thwaites, F. T., 2.

Southeastern Michigan: Cohee, G. V., 1.

Cambrian-Ozarkian contact: Bergquist, S. G., 10.

Carboniferous, thickness and lithology of: U. S. Geol. Survey, 17.

Correlations: Newcombe, R. J. B., 2; Williams, H. S., 1.

Devonian: McGregor, D. J., 1; U. S. Geol. Survey, 17; Warthin, A. S., Jr., 3; Winchell, N. H., 3.

Bois Blanc: U. S. Geol. Survey, 7.

Correlations, bearing of Detroit River series on: Warthin, A. S., Jr., 5.

Detroit River: Landes, K. K., 8; Saunders, J. M., 1(th).

Age of: Stauffer, C. R., 4.

Subsurface studies of: Tharp, M., 1(th).

Dundee: Bassett, C. F., 1; Radabaugh, R. E., 1(th); U. S. Geol. Survey, 4, 8.

Hamilton correlations: Cooper, G. A., 1(a), 3.

Mackinac region: Ehlers, G. M., 17(a).

New York: Mich. Geol. Soc., 3(*).

Nomenclature: Cooper, G. A., 2; Warthin, A. S., Jr., 4.

Ohio: Carman, J. E., 1; Mich. Geol. Soc., 4; Stauffer, C. R., 1(*), 2(*).

Ontario: Mich. Geol. Soc., 3(*); Stauffer, C. R., 3(*); Warthin, A. S., Jr., 3.

Rogers City: Ehlers, G. M., 15; Radabaugh, R. E., 1(th), 2(th); U. S. Geol. Survey, 8.

Sandstones of: Enyert, R. L., 1(th).

Silica formation: Kline, V. H., 1(th).

Southeastern Michigan: Mich. Geol. Soc., 4.

Sylvania: Carman, J. E., 1; Nattress, T., 2; U. S. Geol. Survey, 7.

Traverse: Davies, W. E., 1(th); Grabau, A. W., 2(a), 9(a), 12(a); Hake, B. F., 1; Kelly, W. A., 12, 13; Lane, A. C., 27; Mich. Geol. Soc., 1; Pohl, E. R., 2; U. S. Geol. Survey, 4, 14.

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

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

Ferron Point and Genshaw formations: Smith, G. W., 1(th).

Isopachous studies: Bishop, M. S., 1.

Sub-surface reef conditions in: Henry, W. W., 1(th).

Thunder Bay region: Warthin, A. S., Jr., 6.

Unconformity at top of: Kirkham, V. R. D., 1(a).

Unconformity: Newcombe, R. J. B., 4.

Well cores

Antrim and Crawford counties: Burgess, C. W., 1(th).

Bay and Arenac counties: Hamberg, L. R., 1(th).

Clare County: Beauclair, W. A., 1(th).

Missaukee County: Jacobson, R. C., 1(th).

Mississippian: McGregor, D. J., 1.

Berea: U. S. Geol. Survey, 5.

Coldwater: Tarbell, E., 1; Wooten, M. J., 1(th).

Ellsworth: Bishop, M. S., 1; Tarbell, E., 1.

Gas sands of: Hard, E. W., 1.

Limestone, Grand Rapids: Whittemore, C. A., 1.

Mackinac breccia: Landes, K. K., 4(a).

Marshall: Monnett, V. B., 1; Winchell, A., 15.

Unconformity at top of: Kirkham, V. R. D., 2(a).

Western Michigan: Hale, L., 1.

Newaygo County, well cores: Fauser, W. B., Jr., 1(th); Manulik, A. J., 1(th); Preble, H. D., 1(th).

Northern Peninsula: Crooks, H. F., 1(th); Mich. Acad. Sci., 8; Rominger, C. L., 2.

Ordovician: Cohee, G. V., 3; Hussey, R. C., 5; U. S. Geol. Survey, 10, 15.

Black River: Hussey, R. C., 3; Lane, A. C., 36; U. S. Geol. Survey, 11.

Cincinnatian environments, correlation of: Uhri, D. C., 1(th).

- Collingwood formation, occurrence of: Ruedemann, R., 1.
 Escanaba-Stonington area: Mich. Geol. Soc., 2.
 Reef, Sulphur Island: Ehlers, G. M., 8.
 Richmond: Hussey, R. C., 1.
 Saint Peter, paleogeography of: Berkey, C. P., 1(*).
 Southeastern Michigan: Cohee, G. V., 1.
 Trenton: Hussey, R. C., 3; U. S. Geol. Survey, 11.
 Pennsylvanian: Kelly, W. A., 5(a), 6, 8.
 Saginaw formation: Kelly, W. A., 3.
 "Red Beds": Swartz, D. H., 1(th).
 Relation to older rocks, Northern Peninsula: Oetking, P. F., 1(th).
 Silurian: Cohee, G. V., 2(a); Cumings, E. R., 3, 4(a); Lane, A. C., 47(a); U. S. Geol. Survey, 15.
 Bass Island: U. S. Geol. Survey, 9.
 Cataract strata, supported by fossil evidence: Ehlers, G. M., 7.
 Lake Superior region: Hall, J., 2.
 Mackinac region: Ehlers, G. M., 17(a).
 New York: Mich. Geol. Soc., 3(*).
 Niagaran: Ehlers, G. M., 4(a), 11(th).
 Indiana: Mich. Acad. Sci., 2.
 Reefs: Cumings, E. R., 2(*).
 North America, correlation of: Swartz, C. K., 1(*).
 Northern Indiana: Cumings, E. R., 1(*).
 Northern Peninsula: Ehlers, G. M., 3, 4(a), 11(th); Savage, T. E., 1; Seaman, A. E., 1.
 Ontario: Kelley, R. W., 1(*,th); Mich. Geol. Soc., 3(*); Williams, M. Y., 1.
 Racine formation: Ehlers, G. M., 3.
 Salina: U. S. Geol. Survey, 9; Vandervilt, J. W., 1.
 Southeastern Michigan: Mich. Acad. Sci., 1.
 St. Ignace-Mackinac Island: Mich. Acad. Sci., 6.
 Pre-Cambrian: Whitney, J. D., 16.
 Archean: Irving, R. D., 5, 6.
 Field studies in: Winchell, A., 31.
 Laurentian rocks, sketch of: Brooks, T. B., 9.
 Sedimentary and volcanic sequence: James, H. L., 7(a).
 Archean-Algonkian, correlation of: Van Hise, C. R., 6.
 Azoic: Foster, J. W., 6(a); Whittlesey, C., 6.
 Azoic or Archean: Wadsworth, M. E., 13.
 Contact, Lower Huronian and underlying granite: Smyth, H. L., 1.
 Correlation of: Allen, R. C., 11; Lane, A. C., 61; Lawson, A. C., 1; Leith, C. K., 10; Marsden, R. W., 1(a).
 Gogebic range: Atwater, G. I., 1, 2.
 Granitic sequence, southern complex: Dickey, R. M., 1.
 Huronian: Allen, R. C., 9, 11, 12, 13, 22; Brooks, T. B., 6, 7; Coleman, A. P., 1(*); Cooke, H. C., 1; Dickey, R. M., 2; Irving, R. D., 2, 9; Tyler, S. A., 5; Winchell, N. H., 6.
 Correlation of: Allen, R. C., 22; Zinn, J., 3.
 Holyoke meta-sediments: Engel, T., Jr., 1(th).
 Iron-bearing rocks: James, H. L., 5(a), 9; Lane, A. C., 36.
 Menominee and Marquette series: Smyth, H. L., 3.
 Negaunee formation: Adler, J. L., 1; MacIntosh, A. N., 1(th).
 Slate areas, Baraga County: Barrett, L. P., 2(a).
 Tyler and Copps formations: Atwater, G. I., 2.
 Keweenawan: Lane, A. C., 53.
 Nomenclature: Grant, U. S., 1; Winchell, A. N., 1.
 Nonesuch formation: Corey, G. W., 1.
 Relation to eastern sandstone: Irving, R. D., 10; Wadsworth, M. E., 7, 11.
 South trap range: Wadsworth, M. E., 12.

- Lake Enchantment area: Brooke, G. L., 1(th).
 Lake Superior region: Leith, C. K., 10, 13(a), 16; Van Hise, C. R., 5, 6, 20; Whitney, J. D., 19.
 Literature: Leith, C. K., 1; Steidtmann, E., 1, 2(*).
 Mineral Hills district: Dutton, C. E., 5.
 Nomenclature: Grant, U. S., 1; Van Hise, C. R., 20; Willmott, A. B., 1; Winchell, A. N., 1.
 Pre-Keweenawan, eastern Gogebic range: Allen, R. C., 13.
 Quartzite tongue at Republic: Smyth, H. L., 2.
 Republic granite: Lamey, C. A., 2, 3, 9.
 Trappean rocks, Lake Superior region: Whitney, J. D., 19.
 Presque Isle County: Grabau, A. W., 1.
 Sandstones, Lake Superior region: Agassiz, A., 1; Élie de Beaumont, L., 1; Foster, J. W., 7; Irving, R. D., 10; Jackson, C. T., 16(f), 20; Wadsworth, M. E., 7, 11; Whitney, J. D., 18.
 Washtenaw County, well core: Coupal, F. E., 1(th).
 Wayne County, Delray core: Kersting, C. C., 1(th).
 Tuscola County
 Atlas of: Anonymous, 1.
 Geology of: Lane, A. C., 50.
 Oil and gas maps: Mich. Geol. Survey, 16.
 Plat book of: Foote, E. B., 1.
 Van Buren County: Douglass, C. C., 2.
 Geology of, surface: Terwilliger, F. W., 4.
 Ground water resources of: Terwilliger, F. W., 4.
 Limonite from: Hill, J., 2, 3.
 Oil and gas maps: Mich. Geol. Survey, 16.
 Washtenaw County: Hubbard, B., 4; Lane, A. C., 27.
 Atlas of: Everts & Stewart, 1.
 Fossils in coal pebbles of drift, Ann Arbor: Bartlett, H. H., 1.
 Geology of: Winchell, A., 26, 27(a).
 Post-glacial, Ann Arbor: Wooldridge, C. W., 2.
 Oil and gas map: Mich. Geol. Survey, 16.
 Water resources, Ann Arbor area: Musselman, G. H., 1(th).
 Well core, Sharon Township: Coupal, F. E., 1(th).
 Water Resources: Billings, N. F., 3; Fontanna, S. G., 1; Lane, A. C., 45, 50; Leverett, F., 7; Martin, H. M., 14; Mich. State Planning Comm., 1; Poindexter, O. F., 11; Slaughter, J. L., 1; U. S. Geol. Survey, 12, 16.
 Analyses of: Clarke, F. W., 6(*); Collins, W. D., 3(*), 5(*); Dole, R. B., 1; Hunt, T. S., 1(*); Lane, A. C., 67(a); Peale, A. C., 1.
 Detroit area: Wisler, C. O., 1.
 Ground water
 A few pointers on supplies: Slaughter, J. L., 1.
 Alma area: Hearn, W. E., 1.
 Ann Arbor area: Musselman, G. H., 1(th).
 Artesian flows: Fuller, M. L., 3; Hearn, W. E., 1; Lane, A. C., 37.
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 Battle Creek, experimental work with wells: Anonymous, 13.
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 Bessemer area: Brown, E. A., 1.
 Bibliography and index of papers relating to: Fuller, M. L., 1, 4; Meinzer, O. E., 1.
 Big Spring, study of: Poindexter, O. F., 5.
 Characteristics, for drainage design: Ferris, J. G., 2.
 Exploration, earth resistivity methods: Landes, K. K., 2.
 Holland area: Ferris, J. G., 3.
 Hydraulics, as geophysical aid: Ferris, J. G., 1.

- Iron River district: Stuart, W. T., 3(a), 4; U. S. Geol. Survey, 12.
 Lansing area: Stuart, W. T., 1.
 Law: Johnson, D. W., 1(*).
 Lower Michigan: Fuller, M. L., 2, 5.
 Marquette iron-mining district: Stuart, W. T., 6.
 Michigan: McGuinness, C. L., 1(a), 2; U. S. Geol. Survey, 12.
 Mineral waters: Lane, A. C., 37.
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 Lower Michigan: Lane, A. C., 10.
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 Mine waters: Anonymous, 11; Chapman, R. H., 1(th); Jones, J. T., 1, 2;
 Lane, A. C., 40, 57; Stuart, W. T., 5; U. S. Geol. Survey, 12.
 Oakland County: Ferris, J. G., 4; Mozola, A. J., 1, 2.
 Pontiac, sources of: Taylor, F. C., 1.
 Relation of geology to: Billings, N. F., 2.
 Saugatuck, waterworks of: Anonymous, 12.
 Southeastern Michigan: Fuller, M. L., 7.
 Table at 5-year low: Poindexter, O. F., 10.
 United States, occurrence of: Meinzer, O. E., 2(*).
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 Alma area: Hearn, W. E., 1.
 Experimental, Battle Creek: Anonymous, 13.
 Failure of, along Huron River: Lane, A. C., 36.
 Flowing: Leverett, F., 8, 9, 10.
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 Ypsilanti area: McGuinness, C. L., 3.
 Hydrologic data, unpublished: Holland, W. T., 1.
 Industrial use of: Collins, W. D., 1(*), 2(*), 6(*).
 Relation to quality of water: Collins, W. D., 4(*).
 Temperature of water available: Collins, W. D., 2(*).
 Legislation: Johnson, D. W., 1(*); U. S. Geol. Survey, 12.
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 Municipal supplies: Leverett, F., 7, 9, 10.
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 Pollution, inland waters: Goodell, E. B., 1(*); Leverett, F., 7.
 Pollution caused by brine: Smith, R. A., 11.
 Power capacity and production: Daugherty, C. R., 1(*).
 Saginaw Valley report: Mich. Stream Control Comm., 1.
 Southern Peninsula: Fuller, M. L., 2, 5; Lane, A. C., 9, 35.
 Surface water: McNamee, R. L., 1.
 Clinton River basin: Water Resources Comm., 1.
 Drought of 1936: Hoyt, J. C., 1.
 Flood, Grand River: Murphy, E. C., 1.
 Lake levels: Mich. Dept. Conserv., 1; U. S. Geol. Survey, 12.
 Quality of: Dole, R. B., 1.
 River surveys, index to: Jones, B. E., 1.
 Stream measurements: Newell, F. H., 1, 2; Williams, G. R., 2; Wood, B.
 D., 1, 2.
 Supplies, United States: U. S. Geol. Survey, 3.
 Water loss, selected drainage basins: Williams, G. R., 1.
 United States: McGuinness, C. L., 4(*); Meinzer, O. E., 1, 2(*).
 Water power: Land Econ. Survey, 1.

- Wayne County: Hubbard, B., 5.
 Delray core, stratigraphy of: Kersting, C. C., 1(th).
 Geology of: Nattress, T., 1; Sherzer, W. H., 8, 9; Taylor, F. B., 16(a).
 Water resources: Wisler, C. O., 1.
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 Surface geology of: Stewart, D. P., 1.

**Acts of the Michigan Legislature 1837 to 1921
relating to the
Michigan Geological Survey**

and

Mines and Minerals

and

**Acts of the Michigan Legislature 1921 to 1954
relating to the functions of the
Department of Conservation**

delegated to the

Geological Survey Division

Geological Survey Authorized

Act 20, P.A. 1837

AN ACT TO PROVIDE FOR A GEOLOGICAL SURVEY OF THE STATE

Sec. 1. Be it enacted by the Senate and House of Representatives of the State of Michigan, That the governor is hereby authorized and directed to nominate, and by and with the advice and consent of the senate, to appoint a competent person, whose duty it shall be to make an accurate and complete geological survey of this state, which shall be accompanied with proper maps and diagrams, and furnish a full and scientific description of its rocks, soils and minerals, and of its botanical and geological productions, together with specimens of the same; which maps, diagrams and specimens shall be deposited in the state library, and similar specimens shall be deposited in such literary and scientific institutions as the governor shall direct; and the governor is further authorized to appoint from time to time, as the exigencies of the case may require, competent persons to act as assistants under the direction of the geologist.

Sec. 2. A sum not exceeding three thousand dollars for the year one thousand eight hundred and thirty-seven, a sum not exceeding six thousand dollars for the year one thousand eight hundred and thirty-eight, a sum not exceeding eight thousand for the year one thousand eight hundred and thirty-nine, and a sum not exceeding twelve thousand for the year one thousand eight hundred and forty, is hereby appropriated to defray the expenses that may be incurred under this act, which sums shall be paid out of the treasury from any money not otherwise appropriated, at such times, and in such sums as the governor may direct; and an account of all the expenditures of each year shall be annually reported to the legislature.

Sec. 3. The geologist, appointed under the provisions of this act, shall make a report annually to the legislature, on the first Monday of January, in each year, setting forth generally the progress made in the survey hereby authorized.

Approved February 23, 1837.

Repealed by Act 49, P.A. 1838, which was actually a repetition of Act 20, 1837, amending it to include other departments than geological.

Act 49, P.A. 1838, approved March 22, 1838.

Provided that "the state geological survey . . . shall hereafter consist of four departments, geological and mineralogical, zoological, botanical, and topographical."

That the geological corps shall consist of a state geologist, and three chief assistants; a zoologist, botanist and topographer, appointed by the governor, on the nomination of the geologist, four minor assistants, one geologist, two zoologists and one botanist.

That the state geologist . . . supervise the whole survey.

The act described the duties of each officer, provided for the distribution of "specimens collected" and appropriated \$12,000 (of which \$4,000 was to be refunded from University funds) to pay salaries and defray expenses of the survey.

Section 2 amended by Act 75, P.A. 1840 which abolished offices and duties of State Zoologist and State Botanist.

Act 55, P.A. 1838, approved March 24, 1838.

An act to provide for the improvement of state salt springs under the direction of the State Geologist and appropriated \$3,000 therefor.

Act 1, P.A. 1839, approved January 28, 1839.

Directs the state geologist to continue improvements at the state salt springs with an appropriation of \$15,000 and report to the legislature at the next session.

Act 18, P.A. 1839, approved March 4, 1839.

This is the first statute related to land use planning and mineral valuation. It directs the state geologist to examine the iron ore on Section 16, T 5 S, R 7 W, Branch County—the school section. Expenses to be defrayed by \$250 paid by the superintendent of public instruction provided interested citizens match the appropriation.

Act 75, P.A. 1840, approved March 28, 1840.

Abolished the offices of State Zoologist and State Botanist.

Act 79, P.A. 1840, approved March 28, 1840.

Provided for publication of a topographical map and "the geological data laid down thereon". Appropriated \$2,000. State geologist, auditor general and state treasurer to have charge of sale.

Act 92, P.A. 1840, approved March 31, 1840.

For the improvement of the state salt springs on the Tittabawassee River, Midland County, and at Grand River, Kent County, under direction of the State Geologist. Appropriated \$5,000 for each project.

Act 10, P.A. 1842, approved February 1, 1842.

An appropriation of \$15,000 for the improvement of the state salt springs on Grand River, Kent County, and Tittabawassee River, Midland County.

Act 73, P.A. 1842, approved February 17, 1842.

An act making appropriations for the current expenses of the government, for the year 1842. Salary of the State Geologist \$1,000, State Topographer \$800, and \$400 for contingent expenses for completion of the survey.

Act 42, P.A. 1843, approved March 6, 1843.

An act to organize a land office and to regulate the sale of the public lands. State geologist required to furnish maps.

Act 68, P.A. 1844, approved March 11, 1844.

An act to establish a land office, to prescribe and regulate the disposition of the public lands, and for other purposes. State Land office established in Marshall, Calhoun County. State geologist required to subdivide state lands on map obtained from the U. S. Surveyor General.

Act 92, P.A. 1844, approved March 12, 1844.

An act to provide for the current expenses of the state for the year 1844; \$3,700 appropriated for the survey.

Act 17, P.A. 1845, approved March 1, 1845.

An act authorizing the state geologist to ascertain quantity of state lands to be selected by state in lieu Section 16. Appropriation of \$1,000 from primary school fund.

Act 90, P.A. 1845, approved March 24, 1845.

An act to provide for the sale of the salt spring lands belonging to the state.

Act 78, P.A. 1846, approved April 25, 1846.

An act declaratory of the interests of the state of Michigan in mines and minerals.

Sec. 1. ". . . property in the following mines is fully vested in the people of the State of Michigan, in their right of sovereignty: 1. All mines of gold and silver now discovered, or hereafter to be discovered within the territorial limits of this State: 2. All mines of other metals or minerals . . . which are connected with, or shall be known to contain gold or silver in any proportion." Applies to state lands however acquired but does not deprive fee owners of ownership.

"Sec. 4. A specific tax of four per cent to be in lieu of all other state taxes, shall be levied and collected upon all ores and the product of all mines within the limits of this state, whether the lands containing them have been sold to bona fide purchasers by the general government or not, which said tax shall in all cases be assessed thereon upon the average yield and value of such ores, after the same is smelted, if smelted within this state, but if not smelted within this state then said taxes shall be paid before such ores are removed from the premises where they are raised: Provided, That the specific tax upon the product of iron mines shall not exceed two per cent."

Section 4 suspended by Act 131, P.A. 1885.

Act 122, P.A. 1846, approved May 11, 1846.

An act relative to the Department of Natural History in the University of Michigan. Specimens of geology, mineralogy, zoology and botany transferred to Board of Regents of the University.

J.R. 26, 1846, approved May 15, 1846.

Joint Resolution relative to a final geological report.

Resolved, by the Senate and House of Representatives of the State of Michigan, That the Governor be and he hereby is authorized and empowered to select and appoint some competent and suitable person to collect, collate and arrange all the geological notes, memoranda, specimens, maps, topographical delineations, engravings, barometrical and other observations, including geological surveys kept, taken, made, collected and preserved for and in behalf of the state of Michigan by the late Dr. Douglass Houghton, State Geologist, and designed and intended by him to be used in making a final geological report, for the benefit of the people of said state; and from the materials thus collected and to be collected, and the requisite additional information derived from other sources, the person thus to be appointed may be required by the Governor to prepare a final report upon the geology of Michigan.

Act 200, P.A. 1859, approved February 15, 1859.

An act to encourage the manufacture of salt in the state of Michigan. Provides for a bounty of 10 cents a bushel if company manufactures 5,000 bushels. Amended by Act 186, P.A. 1861.

Act 206, P.A. 1859, approved February 15, 1859.

An act to finish the geological survey of the state.

Sec. 1. ". . . the Governor is hereby authorized and directed to appoint a competent person, whose duty it shall be to finish the geological survey of this state, which shall be accompanied with proper maps and diagrams, and shall furnish a full and scientific description of its rocks, soils and minerals, and of its botanical and natural productions, together with specimens of the same; which maps, diagrams and specimens, shall be deposited in the library of the State University, and the library of the Agricultural College, and similar specimens shall be deposited in such other library (literary) and scientific institutions in the State as the Governor shall direct. And the Governor is further authorized to appoint, from time to time, as the exigencies of the case

may require, competent persons to act as assistants, under the direction of the geologist.

Sec. 2. A sum not exceeding two thousand dollars for the year A. D. eighteen hundred and fifty-nine, and a sum not exceeding three thousand dollars for the year eighteen hundred and sixty, is hereby appropriated. . . .

Sec. 3. The geologist appointed by the Governor shall make a report to the Legislature whenever the same is in session, setting forth generally the progress made in the survey hereby authorized.

Amended by Act 186, P.A. 1861.

Act 64, P.A. 1861, approved February 25, 1861.

An act to provide for the continuance of the state geological survey. Appropriations of \$4,000 for 1861, 1862. "The State Geologist is directed to restrict his labors to the geological department exclusively, except so far as the collection of specimens in botany and natural science may not materially interfere with the same."

Act 186, P.A. 1861, approved March 15, 1861.

Amends act of 1859, that encouraged the manufacture of salt in Michigan. Provides that property used in salt manufacture be exempted from taxation. Bounty of ten cents a bushel to be paid if company manufactured 3,000 bushels salt from brine.

Repealed by Act 50, P.A. 1869.

J.R. 7, 1861, approved February 14, 1861.

Joint resolution to provide for the printing and distribution of the report of the state geologist.

Resolved by the Senate and House of Representatives of the State of Michigan, That the State printer be authorized and directed to print and bind in a suitable manner, under the direction of Professor Winchell and Professor Miles, five thousand copies of the State geological report, and deliver the same in manner and number as follows: to the State Geologist, for distribution by him among the public libraries of the United States and of foreign countries, and such persons as he may elect, five hundred copies; to the Assistant State Geologist, for distribution by him, two hundred copies; to the Superintendent of Public Instruction, for distribution among the township and district libraries of the State, a sufficient number to supply one copy to each of the same; to the publishers of each paper in the State, and to members and officers of the present legislature a copy each, and the remainder shall be delivered to the State library for the use of the State; and that two thousand additional copies be printed, in stitched form, for distribution by the members and officers of the legislature.

Act 212, P.A. 1863, approved March 20, 1863.

An act to provide for a special geological survey of portions of the state, and the collection, arrangement and preservation of geological specimens.

"Sec. 1. . . . the Governor is authorized and directed to appoint a competent person, whose duty it shall be to visit the salt localities of the State and make a special survey thereof, with direct reference to the feasibility of salt boring therein; also, to collect and arrange suitable specimens of the different strata obtained from the borings of the salt wells of the State, and arrange the same in a cabinet, suitable for the same, in some room of the capitol."

Three thousand dollars appropriated for 1863, 1864.

Act 50, P.A. 1869, approved March 22, 1869.

Repealed the "Salt Laws" of 1859, 1861 and removed the bounty on salt.

J.R. 27, 1869, approved March 30, 1869.

Joint Resolution asking an appropriation to aid the geological survey of this state. Requests Federal co-operation to survey Federal lands in Michigan.

A Board of Geological Survey Established

Act 65, P.A. 1869, approved March 26, 1869.

An act to provide for the further geological survey of the state. Established a board of Geological Survey: the Governor, the Superintendent of Public Instruction, and the President of the State Board of Education, to control and supervise the geological survey and to appoint a director of the survey. The director empowered to select his assistants with approval of the Board, and further:

"Sec. 4. It shall be the duty of the director to make or cause to be made, a thorough geological and mineralogical survey of the State, embracing a determination of the succession, arrangement, thickness, and position of all strata and rocks; their mineral character and contents, and their economical uses; an investigation and determination of the organic remains of the State; a general examination of the topography, hydrography, and physical geography of the State, an investigation of the soils and subsoils, and the determination of their character and agricultural adaptation; the investigation of all deposits of brines, coal, marl, clay, gypsum, lime, petroleum, metals and metallic ores, building stone, marble, grit-stone, materials for mortar and cement, mineral paint, and all other productions of the geological world within the limits of this State capable of being converted to the uses of man.

Sec. 5. ". . . to collect ample materials for the illustration of every department of the geology and mineralogy of the State, and to determine, catalogue, and label the same, and prepare them for exhibition to the citizens of the State, in suitable cases, in the museums of the State University and State Agricultural College, at the State Normal School, and such other colleges of the State as may make application to the board prior to the taking of the geological survey, and obligate such college to pay the extra expense necessarily incurred in furnishing such specimens.

Sec. 6. ". . . to furnish annually, to the board, a report of the progress of the survey, and as often as possible, a condensed statement of important and interesting facts for general circulation, and as soon as the progress of the work will permit, to begin, and on the completion of the survey, to finish a complete memoir upon the geology of the State, under the direction of the board, embracing such an account of all its mineral and agricultural resources as is usual in works of that character, and a delineation of its geology upon the map of the State, and such other diagrams and illustrations as may be needed to set forth in a creditable, intelligible, and as far as possible, popular manner, the nature, location, and extent of the geological and agricultural resources of the State.

Sec. 7. The one-half part of all appropriations made, shall be expended in the Upper Peninsula; and such one-half shall be devoted, among other things, to the collection of statistics, and history of the mineral, manufacturing, and transportation interests; to the compilation and preparation of full and accurate maps, showing the topography, geology, and timber, as also the position of mines, furnaces, roads, and improvements; to the determination of the position and structure of the minerals and mineral rocks; to compiling and collecting all useful knowledge that would be of practical value in finding and extracting ores, and in mining, and smelting in those districts of the Upper Peninsula known as the iron and copper regions.

Sec. 8. All notes, memoranda, compilations, collections, specimens, diagrams, and illustrations that may be made in the progress of such survey by the persons engaged therein, shall be the property of the State; shall be under the control of the board, and in case of the death, or termination of connection with such survey, of any such person, shall be deposited in the State University, subject to the order of the board.

Sec. 9. To carry into effect the provisions of this act, the sum of eight thousand dollars for each year is hereby appropriated, to be drawn from the treasury as needed, on the warrants of the Governor, which appropriation shall be in full for all expenditures under this act, exclusive of the printing of the reports hereby provided for.

Sec. 10. This act shall take immediate effect.

Sections 1, 3, 4, 5, 6, 8, 9, amended and Sections 2 and 7 repealed by Act 179, P.A. 1871. Section 9 amended by Act 133, P.A. 1895. Act 17, P.A. 1921 creating the Conservation Department, abolished the Board of Geological Survey and transferred powers and duties to the Conservation Department.

Act 179, P.A. 1871, approved April 17, 1871.

An act to amend and/or repeal parts of Act 65, P.A. 1871 and to transfer the duties of the Director to the Board of Geological Survey and in addition:

"Sec. 6. It shall be the duty of said board to furnish an annual report of the progress of the survey, and, as often as possible, a condensed statement of important and interesting facts for general circulation, and, as soon as the progress of the work will permit, to begin, and on the completion of the survey, to finish a complete memoir upon the geology of the State, embracing such an account of all its mineral and agricultural resources as is usual in works of that character, and a delineation of its geology upon the map of the State, and such other diagrams and illustrations as may be needed to set forth in a creditable, intelligible, and, as far as possible, popular manner, the nature, location, and extent of the geological and agricultural resources of the State . . ."

Section 6 amended by Act 48, P.A. 1881.

J.R. 11, 1871, approved February 27, 1871.

Joint Resolution instructing "The State Geological Board" to furnish information as to the suitability of stone within our state for the construction of a state house.

Resolved by the Senate and House of Representatives of the State of Michigan, That the "State Geological Board" be instructed to call the attention of its "Director" to the subject of building material within our State suitable for the construction of a State House, and that he be required to furnish the requisite information upon the subject, showing the capabilities of the different stones to resist pressure, abrasion, and disintegration, under the action of frost and other meteorological agents: Provided, That no additional expense be made to the State.

Office of Commissioner of Mineral Statistics Established

Act 9, P.A. 1877, approved February 8, 1877.

An act to authorize the appointment of a commissioner of mineral statistics, and defining the duties and compensation of the same.

Required the commissioner to make an annual report to the Governor, setting forth in detail the mineral statistics for the year; with the progress and development of its mining and smelting industries; to make such geological and other surveys needed; to observe, and to record by maps and plans, especial facts developed in the progress of mining and exploration; to collect each year, typical suites of specimens of the copper, iron, and other ores, and rocks from

the Archean formations, not less than ten in number, of the State; examine them microscopically; name and classify them; show by geological sections their stratigraphical positions. Such collections at the disposal of the State Board of Education, to be distributed among the educational institutions of the State.

Fifteen hundred dollars appropriated to cover the compensation and expenses of Commissioner for all necessary surveys and explorations and for publication of one thousand copies of his report.

Section 4 amended by Act 74, P.A. 1883. Section 1 amended by Act 29, P.A. 1895. Repealed by Act 7, P.A. 1911. Duties of Commissioner continued by Board of Geological Survey.

Act 180, P. A. 1879, approved April 29, 1879.

An act amending section 4 of Act 9, P.A. 1877 by providing that the annual reports of the Commissioner of Mineral Statistics be distributed by the Board of Geological Survey. It also authorized the commissioner to demand of all corporations or individuals engaged in mining to make reports under oath of their operation and production.

The act required the commissioner to report annually to the auditor general the amount of copper, iron, coal, or other mineral produced by each and every corporation or individual engaged in mining in Michigan, the reports to be used for taxation purposes. In case any corporation or individual neglected or refused to make the reports the duty of commissioner of mineral statistics was to report the amount of specific tax chargeable against such delinquent corporations or individuals.

Section 1 amended by Act 29, P.A. 1895.

Act 48, P.A. 1881, approved March 26, 1881.

An act to amend section 6, being compiler's section 825 of chapter 17 of the compiled laws of 1871, entitled "Geological Survey of the State."

Removes the provision of Act 179, P.A. 1871 that the completed report of the geology of Michigan be published in three octavo volumes.

Act 74, P.A. 1883, approved May 3, 1883.

An act to amend section 4 of act number 9 of the session laws of 1877, appointing a commissioner of mineral statistics. Increased the appropriation to \$2,500 and permitted the Commissioner to publish, without cost to the State, and sell as many copies as he chose.

Act 29, P.A. 1895, approved March 21, 1895.

Defined the term of Commissioner of Mineral Statistics.

Act 133, P.A. 1895, approved May 10, 1895.

Appropriations.

Act 132, P.A. 1897, approved May 13, 1897.

An act to regulate the mode of plugging abandoned salt wells, and providing a penalty for the violation thereof.

Act 78, P.A. 1899, approved May 17, 1899.

An act making an appropriation for the printing of certain reports and maps under the direction of the State Board of Geological Survey.

Act 231, P.A. 1901, approved June 6, 1901.

An act providing for the extension of the work of the State Board of Geological Survey, making an appropriation to meet the expenses thereof, and providing for a tax to meet the same.

Act 178, P.A. 1903, approved June 4, 1903.

An act making appropriations for the State Board of Geological Survey for 1904 and 1905, for printing reports \$1,250, for initiating a topographic survey \$1,000, for purchase of a lot and office building in Houghton \$500.

Act 107, P.A. 1905, approved May 10, 1905.

An act to regulate the use of artesian and other wells: to prevent the waste of waters therefrom, and provide a remedy therefor.

Biological Survey Established

Act 250, P.A. 1905, approved June 16, 1905.

An act to provide for a biological survey of the State, making appropriations therefor, and to provide a tax to meet the same.

The People of the State of Michigan enact:

Sec. 1. That the Board of Geological Survey as constituted by act number sixty-five of the laws of eighteen hundred sixty-nine, as amended, is hereby authorized and required to make under the general direction of the State Geologist, appointed by them, a thorough biological survey of the State, embracing a determination of the range and distribution of the various plants and animals inhabiting the State and the relation to their environment and the welfare of man.

Sec. 2. The powers and duties of said board relative to the expenses incident to such biological surveys, and the publication thereof shall be the same as they now are relative to the geological and mineralogical survey of the State.

Sec. 3. The annual report of progress now required of the Board of Geological Survey shall include an account of the progress of said biological survey and there shall be printed of the same, the same number as, and under the same conditions as, the report of the Board of Fish Commissioners as provided in act number two hundred twenty-five of the public acts of nineteen hundred three.

Sections 4 and 5 declared obsolete and repealed by Act 267, P.A. 1945.

Topographic Survey Established

Act 251, P.A. 1905, approved June 16, 1905.

Board of Geological Survey authorized to confer with the director or representative of the United States Geological Survey and to accept co-operation in a topographic survey of the State. Appropriated two thousand dollars for 1906 and three thousand dollars for 1907.

Act 297, P.A. 1905, approved June 17, 1905.

Part of act provided for printing 1,200 copies of the Annual Report of the State Board of Geological Survey.

Act 245, P.A. 1907, approved June 27, 1907.

Appropriated \$2,000 for biological survey, \$4,000 for the topographic survey.

Act 217, P.A. 1909, approved June 2, 1909.

Appropriations for the State Board of Geological Survey for special purposes for 1910 and 1911.

Act 7, P.A. 1911, approved March 13, 1911.

Transferred the duties of the Commissioner of Mineral Statistics to State Board of Geological Survey.

Sections 1 and 4 declared obsolete and repealed by Act 267, P.A. 1945.

Act 42, P.A. 1911, approved April 5, 1911.

Provided for numbers of printed reports.

Act 51, P.A. 1911, approved April 7, 1911.

An act to provide for the assessment, valuation and taxation of mineral, coal, gas, salt, gypsum, oil, mining or other rights reserved in or to any lands

in this State or to the ores, minerals, coal, gas, salt, gypsum and oil contained therein against the owner thereof as an interest in real property in any and all cases where any mineral right in or to the ores, oils, mine, valuable deposits, minerals contained therein, shall be or shall heretofore have been reserved to the grantor or any other person in any conveyance thereof.

Repealed by Act 119, P.A. 1915.

Act 98, P.A. 1911, approved April 18, 1911.

An act to provide appropriations for the State Board of Geological Survey for special purposes (biological survey \$1,000, topographic survey \$2,000) for 1912 and 1913.

Act 114, P.A. 1911, approved April 25, 1911.

An act to authorize and direct the Board of State Tax Commissioners to investigate, examine into, inventory and appraise all mining properties and mineral rights in the State of Michigan and to define their powers and duties in relation thereto, and to report the result of their investigation, examination, inventory and appraisal to the State Board of Equalization on or before the third Monday of August in the year 1911, and to make an appropriation therefor (\$30,000), and to provide a penalty for the violation of this act. The Board was authorized to employ experts. The State Geologist was employed.

Act 341, P.A. 1913, approved May 13, 1913.

An act to provide appropriations for the State Board of Geological Survey for 1914 and 1915, for the geological and biological surveys, collection of mineral statistics, assistance to the Board of Tax Commissioners, topographic survey.

Act 84, P.A. 1915, approved April 27, 1915.

Provided appropriations for the State Board of Geological Survey for 1916 and 1917, for geological, biological and topographic surveys and assistance to Tax Commission and for a relocation and monumenting of the Ohio-Michigan boundary line.

Act 119, P.A. 1915, approved April 29, 1915.

An act to repeal act number 51 of the public acts of 1911, entitled "An act to provide for the assessment, valuation and taxation of mineral, coal, gas, salt, gypsum, oil, mining or other rights reserved in or to any lands in this State, or to the ores, minerals, coal, gas, salt, gypsum and oil contained therein against the owner thereof as an interest in real property in any and all cases where any mineral right in or to the ores, oils, mine, valuable deposits, minerals contained therein, shall be or shall heretofore have been reserved to the grantor or any other person in any conveyance thereof," and to authorize and direct the auditor general to cancel all taxes heretofore or hereafter assessed and all sales heretofore or hereafter made under the provisions of said act.

Act 361, P.A. 1917, approved May 11, 1917.

To provide appropriations for the State Board of Geological Survey for 1918 and 1919.

Act 373, P.A. 1917, approved May 11, 1917.

An act to provide for a soil and economic survey of certain lands in this State, to require the making of reports thereon, and to provide an appropriation therefor.

Sections 8 and 9 declared obsolete and repealed by Act 267, P.A. 1945.

Act 128, P.A. 1919, approved April 25, 1919.

An act providing appropriations for State Geological and Biological Survey for 1921.

Sec. 1. There are hereby appropriated from the general fund for the State Geological and Biological Survey for the fiscal year ending June thirty, nineteen hundred twenty, the sum of forty-five thousand three hundred forty-four dollars and ninety-four cents, and for the fiscal year ending June thirty, nineteen hundred twenty-one, the sum of forty-seven thousand eight hundred forty-four dollars and ninety-four cents, for the purposes and in the following amounts:

| | For the Fiscal Year 1919-20 | For the Fiscal Year 1920-21 |
|---|--------------------------------|--------------------------------|
| Personal service (salaries and wages): | | |
| State Geologist | \$ 5,000.00 | \$ 5,000.00 |
| Other personal services, salaries and wages | 22,235.00 | 22,335.00 |
| Totals for personal service | \$27,235.00 | \$27,335.00 |
| Supplies | 300.00 | 250.00 |
| Equipment and furniture | 675.00 | 375.00 |
| Stationery, books and paper | 497.50 | 497.50 |
| Printing and advertising | 3,110.00 | 5,610.00 |
| Transportation, telephone and telegraph | 8,445.00 | 8,695.00 |
| Fixed charges | 2,182.44 | 2,182.44 |
| Materials | 400.00 | 400.00 |
| Aiding Michigan Securities Commission, as authorized by act two hundred fifty of Public Acts of nineteen hundred five | 2,500.00 | 2,500.00 |
| Totals | \$45,344.94 | \$47,844.94 |

Each of said amounts shall be used solely for the specific purposes herein stated.

Sec. 2. The amounts hereby appropriated shall be paid out of the State treasury, and the disbursing officer of the State Geological and Biological Survey shall render his accounts therefor, at such times and in such manner as is or may be provided by law.

Establishment of Department of Conservation

Act 17, P.A. 1921, approved March 30, 1921.

An act to provide for the protection and conservation of the natural resources of the State; to create a conservation department; to define the powers and duties thereof; to provide for the transfer to said department of the powers and duties now vested by law in certain boards, commissions and officers of the State; and for the abolishing of the boards, commissions and offices the powers and duties of which are hereby transferred.

Section 5 declared obsolete and repealed by Act 267, P.A. 1945.

Act 392, P.A. 1925. Topographic mapping. Approved May 27, 1925.

An act to authorize the State Department of Conservation to cooperate with the director or representative of the United States Geological Survey or other authorized federal agency in the preparation and completion of a contour topographical survey map of this state, making an appropriation to meet the expenses thereof and providing a tax to meet the same.

Section 2 declared obsolete and repealed by Act 129, P.A. 1947.

Act 65, P.A. 1927. Supervisor of Wells. Approved January 2, 1927.

Designates the Director of Conservation as Supervisor of Wells, with the duty of preventing waste in sinking, drilling and abandoning oil, gas, or test wells. Requires operators to secure drilling permits from the Supervisor, to secure approval before plugging and abandoning wells, and to file logs of all wells drilled if called for by the Supervisor. Failure to comply with the law or order of the Supervisor of Wells was declared a misdemeanor.

Repealed by Act 15, P.A. 1929.

Act 15, P.A. 1929, approved March 27, 1929.

Redesignated the Director of Conservation Supervisor of Wells. Declared his duties are to prevent waste in locating, drilling, casing, deepening, sealing and operating of oil and gas wells. Requires permits for drilling wells, approval of abandonment operations. Requires that well logs be filed with the Supervisor.

Amended by Act 185, P.A. 1931. Repealed as amended by Act 61, P.A. 1939.

Act 247, P.A. 1929. Aerial Mapping.

An act to provide for and authorize aerial photographing and preparing of base maps of certain portions of the state; to authorize cooperation with the federal government and joint contract therewith for certain purposes; and to provide regulations for paying necessary expenses incident to such work.

Act 185, P. A. 1931. Performance Bond.

Requires a performance bond to assure compliance with law, regulations or orders to prevent waste in drilling, casing, sealing, operating, or plugging oil and gas wells.

Repealed, with Act 15, P.A. 1929 by Act 61, P.A. 1939.

Act 248, P.A. 1937. Aerial Mapping. Approved July 22, 1937.

An Act to provide for and authorize aerial photographing and preparing of base maps of certain portions of the state; to authorize cooperation with the federal government and joint contract therewith for certain purposes; to provide for making an appropriation to meet the expenses of the same; and to provide regulations for paying necessary expenses incident to such work.

Section 3 declared obsolete and repealed by Act 129, P.A. 1947.

Act 326, P.A. 1937. Supervisor of Wells. Approved July 24, 1937.

An act to provide for a supervisor of natural dry gas wells; to prescribe his powers and duties; to provide regulations for the locating, sinking, drilling, casing, deepening, operating, abandonment and plugging of natural dry gas wells and test holes; to provide for and regulate the payment of fees, issuance of permits and payment of money received under the provisions of this act; to provide for an appeal board; to prohibit waste in the development, production and handling of natural dry gas and to define waste and other terms used herein; to provide for public hearings and notice thereof, and procedure upon appeals; to prescribe penalties for the violation of this act, and to repeal act number fifteen of the public acts of nineteen hundred twenty-nine, as amended, being sections five thousand six hundred ninety-six to five thousand seven hundred twelve, inclusive, of the compiled laws of nineteen hundred twenty-nine.

Amended by Act 216, P.A. 1951.

Act 61, P.A. 1939. Advisory Board. Approved May 3, 1939.

An Act to provide for a supervisor of wells; to prescribe his powers and duties; to provide for an advisory board and an appeal board; to prescribe their powers and duties; to provide for the prevention of waste and for the control over certain matters, persons and things relating to the conservation of oil and gas, and for the making and promulgation of rules, regulations and orders relative thereto; to provide for the enforcement of such rules, regulations and orders and of the provisions of this act, and to provide penalties for the violations thereof; to provide for the assessment and collection of certain fees; and to repeal Act No. 15 of the Public Acts of 1929, as amended.

Amended by Act 190, P.A. 1951.

Act 194, P.A. 1939. Inland Lake Levels. Approved June 8, 1939.

An Act to provide for the determination and maintenance of the normal height and level of the waters in inland lakes of this state, for the protection of the public health, safety and welfare and the conservation of the natural resources of this state; to authorize the building and maintenance of dams

and embankments to accomplish such purposes; to authorize the acquisition of lands and other property by gift, grant, purchase or condemnation proceedings; to authorize the acceptance of gifts and grants of funds for the construction and maintenance of such dams and embankments; to authorize the raising of money by taxation and by special assessments for the purposes of this act; to prescribe the duties and powers of boards of supervisors, the conservation commission of Michigan and county drain commissioners with reference hereto; and to repeal certain acts and parts of acts.

Section 14 amended by Act 69, P.A. 1941; Section 22 declared obsolete and repealed by Act 267, P.A. 1945; Section 4 amended by Act 198, P.A. 1947; Title and Section 14 amended by Act 116, P.A. 1952; Title and sections 1 and 20 amended by Act 128, P.A. 1952; Sections 1 and 3 amended by Act 121, P.A. 1954; Section 14 amended by Act 194, P.A. 1954.

Act 69, P.A. 1941. Inland Lake Levels. Approved May 12, 1941.

An Act to amend section 14 of Act No. 194 of the Public Acts of 1939.

Act 319, P.A. 1941. Lake Levels. Approved June 17, 1941.

An act to provide for the establishment and maintenance of the waters in certain inland lakes in this State at a certain height above sea level for the protection of the public health and safety and the conservation of the natural resources of this state; To provide for the establishment of a level for each such lake that is for the best interest of land owners abutting on the lake; to authorize the raising of money by taxation and by special assessment for the purposes of this act; to prescribe the powers and duties of county drain commissioners with respect thereto; and to declare the effect of this act.

Act 159, P.A. 1945, approved May 16, 1945.

An Act to amend sections 24, 25 and 53 of Act No. 206 of the Public Acts of 1893. Provides for the valuation and assessment of metallic mining and mineral lands.

Amended by Act 93, P.A. 1947.

Act 276, P.A. 1945, approved May 25, 1945.

An Act to define private inland lakes and public inland lakes; to empower boards of supervisors to authorize the county drain commissioner or county road commission, in counties having no drain commissioner, to establish the levels thereof; to prescribe the procedure and forms and method of appeal from the establishment of any such levels; to specify the court having jurisdiction thereof, and the duties of public officers in connection therewith; to specify the method by which the findings become final; to provide for the penalty for changing the level; to limit the provisions of this act to counties having a population of not less than 250,000 nor more than 500,000; to authorize the exercise of eminent domain and to repeal acts or parts of acts inconsistent therewith.

Section 23 declared obsolete and repealed by Act 129, P.A. 1947.

Title and sections 21 and 26a amended by Act 253, P.A. 1955.

Act 93, P.A. 1947, approved May 13, 1947.

An act to amend parts of act No. 206, P.A. 1893, providing for valuations and taxation of mineral properties.

Act 138, P.A. 1947. Interstate Oil Compact. Approved May 28, 1947.

An act enabling this State to cooperate with other states in producing oil and gas; ratifying and approving the interstate compact to conserve oil and gas as herein set out; authorizing and empowering the governor of this state to execute any agreement to enable this state to continue to be a member thereof; authorizing the governor of this state to execute agreements for the further extension of the expiration date thereof; authorizing and enabling the governor of this state to determine if and when it shall be to the best interest of this state to withdraw from the compact; designating the governor

of this state as the authorized representative upon the interstate oil compact commission and authorizing and enabling the governor of this state to appoint assistant representatives.

Act 198, P.A. 1947, approved June 12, 1947.

An act to amend section 4 of Act 194, P.A. 1939, relating to dams and sites; acquirement and construction by boards of supervisors to maintain normal height and level of lakes; maintenance.

Act 267, P.A. 1947. State Boundaries. Approved October 11, 1947.

An act defining the boundaries between Minnesota, Michigan and Wisconsin, adopting an interstate compact in relation thereto and directing the governor to execute and witness the compact in the name of the state, and to appropriate moneys therefor.

Act 77, P.A. 1951, approved May 28, 1951.

An act providing for the determination of the value, for purposes of taxation, of low grade iron ore mining property, of copper or other metal mining property, and of rights to minerals in lands containing low grade iron ores, copper or other metallic ores; to provide for the assessment of mining property after production on a commercial basis; and to prescribe the powers and duties of the state tax commission, the state geologist and assessing officers with respect thereto.

Act 190, P.A. 1951, approved June 8, 1951.

An Act to amend the title of Act No. 61 of P.A. 1951.

The title was amended to read:

An act to provide for a supervisor of wells; to prescribe his powers and duties; to provide for an advisory board and an appeal board; to prescribe their powers and duties; to provide for the prevention of waste and for the control over certain matters, persons and things relating to the conservation of oil and gas, and for the making and promulgation of rules, regulations and orders relative thereto; to provide for the plugging of wells and for the entry on private property for that purpose; to provide for the enforcement of such rules, regulations and orders and of the provisions of this act, and to provide penalties for the violations thereof; and to provide for the assessment and collection of certain fees.

Act 216, P.A. 1951, approved June 14, 1951.

Permits entry to property and authorizes Supervisor of Wells to case, plug, or repair any abandoned test holes or wells drilled for gas if the owner or operator has failed to do so, and to assess costs against the well owner or operator. Provides penalty against owners or operators who fail to properly plug and abandon any gas well or test hole after production is abandoned as full test data is received.

Act 116, P.A. 1952. Inland Lakes. Approved April 17, 1952.

The title of Act 194, P.A. 1939 was amended to read:

An act to provide for the determination and maintenance of the normal height and level of the waters in inland lakes of this state, for the protection of the public health, safety and welfare and the conservation of the natural resources of this state; to authorize the building and maintenance of dams and embankments and the installation, maintenance and operation of pumps, weirs, locks, gates, tubes, ditches, or any other devices or construction to accomplish such purposes; to authorize the acquisition of lands and other property by gift, grant, purchase or condemnation proceedings; to authorize the acceptance of gifts and grants of funds for the construction and maintenance of such dams and embankments and the installation, maintenance and operation of pumps, weirs, locks, gates, tubes, ditches, or any other devices or construction; to authorize the raising of money by taxation and by special assessments

for the purposes of this act; to authorize the issuance of special assessment bonds; to prescribe the duties and powers of boards of supervisors, the conservation commission of Michigan and county drain commissioners with reference hereto; and to repeal certain acts and parts of acts.

Act 128, P.A. 1952, approved April 17, 1952.

Amends Act 194, P.A. 1939 to read:

An act to provide for the determination and maintenance of the normal height and level of the waters in inland lakes of this state, for the protection of the public health, safety and welfare and the conservation of the natural resources of this state; to authorize the building and maintenance of dams and embankments and the installation, maintenance and operation of pumps, weirs, locks, gates, tubes, ditches, or any other devices or construction to accomplish such purposes; to authorize the acquisition of lands and other property by gift, grant, purchase or condemnation proceedings; to authorize the acceptance of gifts and grants of funds for the construction and maintenance of such dams and embankments and the installation, maintenance and operation of pumps, weirs, locks, gates, tubes, ditches, or any other devices or construction; to authorize the raising of money by taxation and by special assessments for the purposes of this act; to authorize the issuance of special assessment bonds; to prescribe the duties and powers of boards of supervisors, the conservation commission of Michigan and county drain commissioners with reference hereto; and to repeal certain acts and parts of acts.

Act 121, P.A. 1954, approved April 19, 1954.

Amends Act 194, P.A. 1939. Defines the normal level of an inland lake.

Act 194, P.A. 1954, approved May 5, 1954.

The act amends Act 194, P.A. 1939, by providing for assessments for improvements of certain inland lakes.

Act 253, P.A. 1955, approved June 29, 1955.

The act amends the title of Act 276, P.A. 1945, to read:

An act to define private inland lakes and public inland lakes; to empower boards of supervisors to authorize the county drain commissioner or county road commission, in counties having no drain commissioner, to establish the levels thereof; to prescribe the procedure and forms and method of appeal from the establishment of any such levels; to specify the court having jurisdiction thereof, and the duties of public officers in connection therewith; to specify the method by which the findings become final; to authorize the issuance of special assessment bonds; to provide for the penalty for changing the level; to limit the provisions of this act to counties having a population of not less than 100,000 nor more than 1,000,000; to authorize the exercise of eminent domain and to repeal acts or parts of acts inconsistent therewith.

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Valuation of mineral lands: Acts 18, 1839; 159, 1945; 93, 1947; 77, 1951.

See Public Lands.

Water conservation: Act 107, 1905.

Zoologist, State: Acts 49, 1838; 75, 1840.