

Unio varicosus Lea. Ohio river.

Unio ventricosus Barnes. Ohio river; lakes in northern Indiana.

Unio verrucosus Barnes. Wabash and Ohio rivers.

Unio zigzag Lea. Ohio river, Wabash river.

= *Unio donaciformis* Lea.

Summarizing the data herein presented, exclusive of synonyms and doubtful forms referred to the state by writers, we find the following totals: Of land shells, 17 genera and 58 species; of fresh water univalves, 18 genera and 47 species; of fresh water bivalves, 5 genera and 102 species. That the number of species will be largely increased on careful examination there can be no question.

Louisville, Ky., Nov. 30, 1893.

GEOLOGY.

GEOLOGICAL LITERATURE OF INDIANA—(STRATIGRAPHIC AND ECONOMIC).

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The following alphabetical list of the contributions to Indiana Geological literature includes such as deal especially with the physical and economic phases of the subject, and only brief references to the larger and more important contributions to the paleontology of the state. This list is so arranged that the student can ascertain: First, what *counties* of the state have been subject to investigation, second, *by whom* the work was done, third, *where the results are published*, fourth nature and results of the investigations. A brief statement of the contents of the more important papers, Reports, etc., is placed under the *author's name*. The references of an *economic* phase are placed under the heading *Economic Geology* which comes in its proper place in the alphabetic series. Under this heading are placed the following subdivision: *Clays, coals, gas, hydraulic cements, oil, ore (minerals), stone (building)*. The reference to the paleontology of the state are not included *in detail* in this list for the reason that they demand a somewhat different treatment in order to make the treatise the most useful to the student.

- Adams county, Geology of.** R. Owen's Rep. 1859-60.
- Allen county, Geology of.** R. Owen's Rep. 1859-60.
- Geology of. M. Thompson's Rep. 1888.
- Altitudes, table of, in Indiana and elsewhere.** Owen's Rep. 1859-60.
- Bartholomew county, Geology of.** Owen's Rep. 1859-60.
- Geology of. J. Collett's Rep. 1881.
- Benedict, A. C.** Geology of Wabash County. (See Elrod, M. N.)
- Petroleum in Indiana—S. S. Gorly (17th Annual Rep.) 1891.
- Discusses briefly the history of Petroleum, its discovery in the United States; mentions the oil fields of United States, geological distribution; describes extent of bed, and oil field in Crawford and Wells counties.
- Benton county, Geology of.** Owens Rep. 1859-60.
- Geology of. M. Thompson's Rep. 1885-86.
- Bessemer Iron, Manufacture of.** E. T. Cox, 1876-77-78.
- Beckwith, H. W.,** Indian names of water courses in the state. J. Collett's Rep. 1882; pp. 39-44.
- Bigney, A. J.,** Preliminary notes on the geology of Dearborn county. Proc. Ind. Acad. Sci. pp. 66-67.
- Notes the finding of mammoth and sloth remains.
- Beachler, C. S.** Keokuk group at Crawfordsville, Ind. Am. Geol., vol. II, pp. 407-412.
- Describes the stratigraphic features of the Keokuk rocks and gives a list of the fossils of this locality.
- Notice of some new and remarkable forms of crinoidea from the Niagara limestone at St. Paul, Ind. Am. Geol., vol. IV, pp. 102-103.
- Corrected list of fossils found at Crawfordsville, Ind. (Keokuk.) Ind. Geology and Nat. Hist. Sur., 1888.
- List of fossils found at Crawfordsville, Ind. Am. Geol., Dec., 1888.
- List of fossils from Crawfordsville rock. M. Thompson's Rep. 1888.
- The rocks at St. Paul, Ind. Am. Geo., vol. VII, March 1891, p. 178.
- Abandoned Pleistocene river channel in Eastern Indiana. Proc. Am. Geol. Society, vol. IV, p. 62.
- Blackford county, Gas.** (See Phinney, Natural Gas in Indiana.)
- Blatchley, W. S.** A catalogue of the Butterflies known to occur in Ind. S. S. Gorby (17th annual Rep.) 1891, pp. 365-408.
- Black Shale Fossils.** Whitfield, 1874.

Blackford county, Geology of. Owen, 1859-60.

Boone county, Geology of. M. Thompson, Rep. 1885-86.

Boerner, C. G. Meteorology of Switzerland county. E. T. Cox Rep. 1872.

Borden, W. W. Scott county, Geology of. (Map.) Geo. Survey of Ind. 1874.

The geological formations are the drift, knobstone, black shale (Hamilton,) and coniferous limestone; list of fossils.

—————**Jefferson county.** Geol. Survey Ind. 1874.

Geological formations were the Champlain, drift, black shale, coniferous limestone, Niagara, Clinton and Cincinnati; list of fossils.

—————**Rep. of Geol. Surv. of Clark and Floyd counties.** E. T. Cox Rep. 1873, pp. 134-189.

Gives a brief account of the geological formations in the counties (Cin. group, Niagara, New Albany black shale, probably the equivalent of the Genesee, N. Y., and Knabe stone.

Boone county, Geology of. Owen's Rep. 1859-60.

Branner, J. C. Geol. Map Ind.

Brown county, Geology of. Owen's Rep. 1859-60; also Collett's Rep. 1874.

Brown, R. T. Geology of Hamilton and Madison counties. Collett's Rep. 1884.

—————**Fish culture in Indian.** Collett's Rep. 1884.

—————**Geology of Hancock county.** M. Thompson's Rep. 1885-86.

Discusses topography, drainage, nature of glacial drifts, archæology.

—————**Geology of Morgan county.** J. Collett's Rep. 1883, pp. 76-83.

Discusses drainage, topography, extent and thickness of Paleozoic formations, glacial phenomena; gives list of fossils and connected section of the county.

—————**Geology of Putnam county.** J. Collett's Rep. 1881, pp. 89-125.

Describes the topography and stratigraphic geology; notes extent and character of the coal-seams. Refers briefly to building stone.

—————**Marion county, Geology and topographical survey of.** J. Collett's Rep. 1882, pp. 79-69.

Discusses topography and stratigraphic features.

—————**Morgan county, Geology of.** J. Collett's Rep. 1883, pp. 71-85.

Bradner, E. A partial catalogue of the flora of Steuben county. S. S. Gorby, 17th Annual Rep. 1891.

Building Stones. Thompson, 1888.

Byrkit, J. W. Catalogue and check-list of the trees and woody shrubs of America north of Mexico. E. T. Cox Rep. 1876-78, pp. 279-290.

Campbell, J. L. The Kankakee river and pure water for Northwestern Indiana and Chicago. Proc. Ind. Acad. Sci. 1891, pp. 70-73.

Describes the Kankakee channel and basin.

Carbonic (upper and lower). (See Stevenson, J. S.)

Carboniferous fossils. Owen's Rep.

Carroll county, Geology of. E. T. Cox's Rep. 1872. S. S. Gorly 17th Annual Rep. 1891.

—————Geology of. R. Owen.

Cass county, Geology of. E. T. Cox's Rep. 1872; do Richard Owen.

Chalk beds of Indiana. M. Thompson's Rep. 1885-86.

Chamberlin, T. C. The Glacial boundary in Indiana and adjacent states. (Introduction) Bull. No. 58 U. S. G. S. 1890.

—————Preliminary paper on the Terminal Moraine of the second Glacial Epoch. (Notice) A. J. S. III, vol. 28, p. 228, 1884. (From 3d Ann. Rep. of the Director of the U. S. G. S. 1881-82.)

—————Hillocks of Angular Gravel and Disturbed Stratification, A. J. S. III, vol. 27, p. 370, 1884.

Discusses structural features of these deposits, nature and analysis of contents. (Sections of gravel bank from Tippecanoe county, Ind. A long list of contributions to this subject is appended.)

—————The Bearing of some Recent Determinations and the Correlation of the Eastern and Western Terminal Moraines; A. J. S. III vol. 24, p. 93, 1882.

Cincinnati Arch. E. T. Cox's Geol. Rep. 1876-77-78; Am. Geol. vol. IV, pp. 6-20.

Cincinnati Group. A. J. S. III, vol. 17, p. 484. Question of nomenclature.

It was agreed by a committee from the Cincinnati Academy of Science that the term Cincinnati Group should not be retained.

Clark county, Geology of. E. T. Cox, Rep. 1873; also R. Owen.

Clay county, Geology of. Owen's Rep.

Clinton county, Geology of. Owen's Rep.

—————Geology of. M. Thompson's Rep. 1885-86.

Collett, John. Geology of Brown county. Owen's Rep. 1859-60.

Indicates Bean Blossom ridge as the southern drift limit; considers the deep valleys due to glacial streams and the silt to indicate a former central post glacial lake; the gold of drift origin; formations, drift, geode beds and knob stone. Report accompanied by map.

—————Geological report on Harrison and Crawford counties. E. T. Cox Rep. 1876-78, pp. 291-522.

Discusses the Stratigraphic geology (quaternary carbon, Dev. and Sil.) Gives lists of fossils from coalmeasures, and the subdivisions of subcarboniferous; also a list of fossil fish teeth (by J. S. Newberry); analyses of Harrison county meteorites; mention is also made of building stone, hydraulic cement, clays, mineral waters, oil (Crawford, county) caves, archaeology.

—————Geology of Warren county. E. T. Cox Rep. 1873, pp. 191-259.
Describes briefly the topographical features, quaternary deposits, extent and physical features of paleozoic formation (carboniferous and subcarboniferous). Mention is also made of coal, clays, gold and copper, building stone.

—————Geology of Lawrence, Knox and Gibson counties. E. T. Cox Rep. 1873, pp. 260-430.

Describes the stratigraphy, gives numerous local sections and general connected sections of each county, exhibiting especially the relations of coal-seams. Mention is also made of fossils noted in the local sections, iron ore, building stone, clays, etc.; analysis of coals, archaeological remains.

—————Geol. Rep. of Vanderburg, Owen and Montgomery counties. E. T. Cox Rep. 1875, pp. 240-422.

Describes glacial deposits, physical features and extent of Geol. formations (Carbon Dev. sections) with occasional reference to fossils (Carbonif.); also details concerning development of coal, building stone, iron ore. A list of fossils from the Keokuk rock Crawfordsville is appended.

—————Geology of southeast part of Clay county. E. T. Cox Rep. 1875, pp. 423-432.

Describes the glacial deposits, extent of paleozoic rocks (Carbonif.) as made out from borings.

—————Geological reconnoissance of the coal-measure rocks of Putnam county. E. T. Cox Rep. 1875, pp. 463-468.

—————Geological reconnoissance of Jasper, White, Carroll, Cass, Wabash, Miami, Howard, Lawrence, Knox and Gibson counties. E. T. Cox Rep. 1872, pp. 291-337.

—————Second Annual Report of the Department of Statistics and Geology, 1888.

Agricultural and health statistics, pp. 5-368.

Geology of Indiana (with outlined Geol. map), pp. 375-384.

Brief outline of geographical extent of Geological formations by counties; describes oolitic limestone and Portland cement. Indiana coal versus Pittsburg coal.

The mammoth and mastodon remains in Indiana and Illinois. Archaeology, pp. 384-396.

Geology of Putnam county, pp. 397-426.

Gives a connected section of the formations of the county (Quaternary, Carbonif., Subcarbonif.) and sections showing local details bearing on stratigraphy; fossils; tables of altitudes in Monroe and Putnam counties.

Geology of Monroe county, by G. K. Greene, pp. 426-499.

Synopsis of the Molluscan Fauna of Indiana, by Frederick Stein, pp. 453-467.

Fossils from Silurian, Devonians and subcarboniferous rocks of Indiana, by C. A. White (descriptions and plates), pp. 468-522.

—Department of Geology and Natural History (eleventh annual report), 1881. 52 pl.; maps.

Statistics concerning the production of coal, and its cost, etc.; increase in production in the coal-producing states; also notes on clays (Kaolin) Lawrence county; tabulated statements indicating the capital, labor and appliances devoted to the quarrying of stone in Indiana, and the value of the product; brief outline of the extent of the oolitic limestone of Owen, Monroe, Washington, Harrison and Crawford counties and output of the various quarries; analysis, pp. 13-33.

Experiments upon the transverse strength and elasticity of building stones, by Thos. H. Johnson, pp. 34-47.

Tables of altitudes between Indianapolis and Cincinnati, on Cincinnati, Indianapolis, St. Louis & Chicago Railroad and other roads in S. Indiana, pp. 47-54.

Geology of Shelby county, pp. 55-88.

Describes topography; glacial drift (Collet's Glacial river); Stratigraphic Geology with numerous local sections; a list of fossils found in the county from Dev. (carboniferous) and Sil. (Niagara); notes on building stone, clays, etc.

Putnam county. Geology and Geography. R. T. Brown, pp. 89-125.

Delaware county, Geology of. A. J. Phinney, pp. 126-149.

Gives a general outline of the topography; Quaternary and Paleozoic Geology (Silurian), with list of fossils found in the county; notes on clays, agriculture, etc.

Bartholomew county, Geology of. Moses N. Elrod, pp. 150-213.

Descriptions of the species of fossils found in the Niagara group at Waldron, Ind. Prof. James Hall, pp. 214-345.

Fossils of the Indiana rocks. No. 2. C. A. White, pp. 347-375.

With description and plates (37-43).

VanCleave's Fossil Corals, pp. 376-410.

Description and plates (44-55).

—Geology and Natural History Ind. (Twelfth Annual Report 1882, pp. 1-38.

In an introductory chapter the author gives observations on building stone, coal, glass, sand, clay, gas; United States surveys; growth of timber; Archaeology.

Archaeology: Indian names of water courses in the state of Indiana.

H. W. Beckwith, pp. 39-44.

Outline Geology of Ind. pp. 45-47.

Newton county Geological Survey, pp. 48-64.

Describes surface configuration, quaternary and paleozoic formations, accompanied by numerous sections.

Jasper county, Geological Survey of, pp. 65-78.

Describes recent and paleozoic geology, a list of fossils from two localities: notes on clay, iron, building stone, petroleum; table of altitudes in Jasper and Newton counties.

Marion county, Report of a Geological and Topographical Survey; R. T. Brown, pp. 79-99.

Decatur county, Geology of. M. N. Elrod, pp. 100-152.

Jay county, Geology of. D. S. McCaslin, pp. 153-176.

Randolph county, Geology of. A. J. Phinney, pp. 177-195.

Catalogue of the flora of central-eastern Indiana by A. J. Phinney, pp. 196-236.

Paleontology—Van Cleve's fossil corals, identified and compiled by Dr. James Hall, pp. 239-270. Descriptions and plates.

Descriptions of fossil corals from the Niagara and upper Helderburg groups of Ind. Prof. James Hall, pp. 271-375.

Diatoms of the waters of Ind. Rev. S. L. Curtis, pp. 377-384.

—————Geology and Natural History of Indiana 1883. (Thirteenth Annual Report). Part I Geology and Nat. Hist. Part II Paleontology. (Map.)

Report and work of the Geol. Department. Outlined Geology of Ind.; stone coals of Ind.; pp. 1-10.

Fuel values of coals. G. M. Livette, pp. 10-11.

Comparison of Ind. Block Coals with Ill. coals. E. T. Cox, pp. 35-37.

Posey county, Geology, pp. 45-70.

Describes the topography, alluvial and drift deposits and Pal. formations; gives general and local sections; notes fossils in a few sections. Economic Geology.

Morgan county, Geology of. R. T. Brown, pp. 71-85.

Rush county, Geology of. M. N. Elrod, pp. 86-115.

Johnson county, Geology of. D. S. McCaslin, pp. 116-137.

Grant county, Geology of A. J. Phinney, pp. 138-153.

Glossary of terms commonly used in Geological reports. W. T. S. Cornett, pp. 154-169.

Principles of Paleozoic Botany (Pt. II). Leo. Lesquereux, pp. 7-106.

Fossils of Indiana Rocks (No. 3). C. A. White.

—————Geology and Natural History of Ind. (Fourteenth Annual Re-

- port). Pt. I, Geology. Pt. II, Postpliocene Vertebrates of Ind. 1884.
 Outlined Geology of Ind., pp. 18-19.
 Hamilton and Madison counties, Geol. and Topographical Survey of.
 R. T. Brown, pp. 20-40.
 Fayette county, Geology of. M. N. Elrod, pp. 41-60.
 Union county, Geology of. M. N. Elrod, pp. 61-72.
 Drift deposits of Indiana. J. S. Newberry, pp. 85-98.
 Ohio river floods, pp. 99-102.
 Glossary of Terms used in Geol. Rep. pp. 103-109.
 Post pliocene Vertebrates of Ind. E. D. Cope and J. L. Wortman, pt.
 II pp. 3-41 (6 plates).
- Claypole, E. W.** Evidences from the Drift of Ohio, Indiana and Illinois in support of the preglacial origin of the basins of Lake Erie and Ontario, A. A. A. S., vol. 30, 1881, p. 147.
- Cope, E. D. and Wortman, J. L.** Postpliocene Vertebrates of Indiana. J. Collett's Rep. 1884, pp. 3-41. (6 plates.)
 Give a brief summary of some Geological facts bearing upon faunal relations in this period. (Quaternary). Describes nature of deposits in which mammalian remains are most frequently found; and some structural features of the chief groups of mammalia of quaternary times; also descriptions of a number of genera and species. Appendix, Genus Equus.
- Cope, E. D.** Faunas of Wyandotte and Mammoth Caves, E. T. Cox Rep. 1872.
 ————E. T. Cox, Geol. Rep. 1872.
 ————Faunas of Wyandotte Cave, E. T. Cox, Geol. Rep. 1876-78.
- Cox, E. T.** Second Rep. Geol. Surv. Ind. (Maps of counties) 1870.
 Gives general outline of quaternary deposits; emphasizes the importance of the coal in Indiana; gives analyses and sections from Sullivan, Daviess, Martin counties; general observations on coals of Knox, Dubois, Pike, Gibson, Warrick, Spencer, Perry, Vanderburg, and Posey counties. The Geol. formations and economic products and fossils are briefly described,
 Putnam and Vigo counties. Observations on mineral springs, coals; also paper by Dr. T. Sterry Hunt, oil wells of Terre Haute, pp. 118-163.
 Western Coal-Measures of Ind. pp. 164-187.
 Sullivan county, Geology of. J. Collett Rep. pp. 191-240.
 Jefferson county, Catalogue of the Flora of. A. H. Young, pp. 245-288.
 ————How to prepare and cook fish and other animal food. S. Collett's Rep. 1884.

- Temperature of two deep bores in Indiana. Proc. A. A. A. S. vol. 24, p.—, 1875.
- Western coal measures of Indiana. A. A. A. S. vol. 20, (B. Nat. Hist. Soc.) 236-252.
- Analysis of Peat from northern counties of Ind. T. Collett's Rep. 1883.
- Third and fourth Annual Reports of Geol. Surv. Ind. 1871-72.
Introductory chapter treats of the development of the coal seams, gives numerous analyses of samples from various parts of the area; discusses coking qualities of the coals (Sullivan, Daviess, Dubois, Pike, Spencer counties).
- Perry County, Geol. of. pp. 62-143.
Discusses especially the extent and development of the coal seams, and stratigraphy of subcarboniferous and coal measures, and economic use of the quaternary deposits; describes building stone, lime, oil wells; describes and illustrates the opening and working of coal seams.
- Geological notes of a trip from New Albany, in Floyd county, to Harrison and Crawford counties, pp. 145-182.
Describes the general geological features; Putnam and Wyandotte caves, and their fanuas (the latter, E. D. Cope).
- Dubois and Pike counties, Geology of. pp. 192-287.
Describes the Stratigraphy with numerous sections from various parts of the county, showing positions of coal seams; gives list of fossils from sections examined; mentions clays, iron, building stone.
- Jasper, White, Carrol, Cass, Miami, Wabash and Howard counties.
Geol. reconnoissance of Prof. John Collett, pp. 291-337.
- Parke county, Report of Geol. Surv. of. B. C. Hobbs, pp. 341-384.
- Dearborn, Ohio and Switzerland counties, Geology of. pp. 387-434.
Describes surface features, topography, stratigraphy, lower and upper silurian, drift, terrace, building stone, hydraulic cement, clays, iron ore.
- Meteorology of Vevay, Switzerland county. C. G. Boerner.
- Fifth Annual Report. Ind. Geol. Surv. made during year 1873, (maps and wood cuts).
Report of Vienna exposition (maps). pp. 5-12.
The Iron and Steel Industries of Rhenish Prussia and Westphalia, Germany, at the Vienna Exposition (maps), 1873. Hugh Hartmann. pp. 13-70.
Spiegeleisen manufacturing. Hugh Hartmann, pp. 71-101.
Report on iron ores of Clark and Floyd counties. p. 102.
Describes, in addition, the use of raw coal in the blast furnace; cooking qualities of Indiana block coal; hydraulic cement, mounds.
- Clark and Floyd. Report of a Geol. Surv. of. W. W. Borden. pp. 134-189.

Warren county, Geology of. John Collett. pp. 191-259,

Description of Reptilian footprints. p. 247.

Lawrence county, Geology of. John Collett. pp. 260-314.

Knox county, Geology of. John Collett. pp. 375-382.

Gibson county, Geology of. John Collett. pp. 383-430.

Dekalb, Steuben, Lagrange, Elkhart, Noble, St. Joseph, and Laporte.

Observations on. G. M. Levette. pp. 430-474.

————Annual report of the Geological Survey of Indiana for 1874, p. 287; two plates and maps. (County reports by Cox, Collett and Borden; fossil lists by Hatfield and Cornett; papers on fishes, Jordan; on botany, Coulter.)

In the chapter on geology it gives a sketch of continental development; a list of Loch's fossils; reports the discovery of Porcelain clay, and tables of analyses of clays and of iron ore.

————Geological survey of Indiana, 1875, (with maps of several of the counties appended).

Describes briefly the varieties of Indiana coals; discusses their industrial values and the method of analysis of coals, which should be followed, and reviews the Geological work accomplished during the year. Analysis of coals from Clay, Owen, Fountain, Vanderburg, Greene, Warrick, Posey, Sullivan, Daviess, Vermillion, Vigo, Parke, Montgomery, Fayette (Pa.), Mecklenburg (Ky), Lignite, Robertson county (Tex).

Geology of Vigo county, pp. 79-115.

Traces the various coal-seams and gives numerous sections from quaternary and the coal-bearing areas. Building stone, clays, petroleum, iron ore.

Huntington county, pp. 116-133.

The only rocks represented here belong to Paleozoic (Niagara), followed directly by glacial drift. Reference is made to the fossils of the Niagara to Glacial drift (quaternary.)

Species of Fossil Marine Plants from the carboniferous measures, pp. 135-145, by L. Lesquereux.

Jennings and Ripley counties, pp. 146-202.

Describes the stratigraphic features of the geol. formations represented, viz: Quaternary, Devonian (Hamilton), Up. Silurian.

Orange county, pp. 203-239, by M. N. Elrod and E. S. McIntire.

Vanderburg, Owen and Montgomery counties, Geology of. John Collett, pp. 240-422.

Clay county, Geology of. John Collett, pp. 423-462.

Geological Reconnoissance of the Coal Measure Rocks of Putnam county. John Collett, pp. 463-468.

Observations on the depths and temperatures of some lakes of Northern Indiana. G. M. Levett, pp. 469-503.

Catalogue of the Flora of the Wabash valley below the mouth of White river, and observations thereon, by J. Schneck, pp. 504-576.

—————Eighth, Ninth and Tenth Annual Reports of the Geol. Survey of Ind., made during the years 1876-78 with maps.

Discusses the nature and extent of the Cincinnati arch whether anticlinal or synclinal; the processes of development, growth of subsequent formations in Indiana, Ohio and Kentucky.

Catalogue of fossils found in the Hudson river, Utica Slate, and Trenton Groups as exposed in S. E. Ind., S. W. Ohio and northern part of Ky. S. A. Miller.

Statements of the views of eastern and western Geologists on the "Cincinnati Group" and its eastern equivalents; extent and analysis of hydraulic cement and building stone. Also brief outline of glacial theories and deposits in Indiana.

Wayne county, Geology of.

Discusses briefly the topography and hydrography and development of the geological formations.

Catalogue and check-list of the Trees and Woody Shrubs of America, north of Mexico. John W. Byrkit, pp. 275-290.

Geological Report on Harrison and Crawford counties. John Collett, pp. 291-522.

Observations on Wyandotte Cave and its Fauna. (E. D. Cope.)

Cornett, W. J. S. List of Silurian and Dev. fossils of Jefferson county, Ind. Geol. Surv. '74.

—————Glossary of Terms commonly used in Geological Reports. J. Collett's Rep. 1883.

Coulter, J. M. and Thompson, H. Origin of Indiana Flora. M. Thompson's Rep. 1885-86, pp. 253-282.

Coulter, J. M. Some Glacial Actions in Indiana Science, vol. II, p. 6, 1883.

Crawford county, Geology of. Owen, R.

—————E. T. Cox, do 1876-77-78. J. Collett's Rep. 1881.

Crinoidea, Classification of. Miller, 1888.

Curtis, J. L. Diatoms of the waters of Indiana. J. Collett's Rep. 1882, pp. 377-384.

Cystidians, Hubbard.

Dana, J. D. and Guyot, A. Artesian Well at Terre Haute, A. J. S. (Second series) vol. XLVII, p. 270.

Authors record the thickness and character of strata through which the well passed.

Daviess county, Geology of. R. Owen's Rep. 1859-60, do Cox, E. T., 1872, do 1870, do 1875. J. Collett's Rep. 1883. (Coal, see Lesquereux).

Dearborn county, Geology of. R. Owen's Rep. 1859-60. E. T. Cox's Rep. 1872. Flora of. M. Thompson's Rep. 1888. Gas. (See Phinney, Natural Gas in Indiana.)

Decatur county, Geology of. R. Owen's Rep. 1859-60, do J. Collett's Rep. 1882. Gas and oil. (See A. J. Phinney, Natural Gas in Ind.)

DeKalb county, Geology of. R. Owen's Rep. 1859-60, do E. T. Cox's Rep. 1873, M. Thompson's Rep. 1888. Gas and oil. (See A. J. Phinney, Natural Gas in Indiana.)

Delaware county, Geology of. J. Collett's Rep. 1881; M. Thompson's Rep. 1885-86. Gas. (See Phinney, Natural Gas in Indiana.)

Dennis, D. W. Analytical key to the fossils of Richmond, Ind., 1889. pp. 1-48.

Devonian. Fossils of Jefferson county. Whitfield. Cornett, 1874.

Deverneuil, M. Memoir on the parallelism of American and European formations.

Mentions the black slate of Indiana, Kentucky and Tennessee. He considers it the equivalent of the "Genêsee" of the New York series. (See also Bull. Geol. Soc. France vol. IV, 2d series.)

Dryer, C. R. Geology of Dekalb county. M. Thompson's Rep. 1888, pp. 98-101.

Describes surface features, extent and nature of glacial drift, moraines, lakes, etc., sections as exhibited by borings.

—————Geology of Allen county. M. Thompson's Rep. 1888, pp. 105-129.

Describes the topographical features and character of the drift which covers the entire county; well section at Fort Wayne.

—————Geol. Report of Steuben county. S. S. Gorby (17th annual Rep.) 1891.

Describes the physical features of the moranic deposits, associated lakes and drainage.

—————History of the Upper Maumee Valley, Chicago, 1888. Map of the drift of Northeast Indiana, 1893.

Dubois county. Geology of. R. Owen's Rep. 1859-60. E. T. Cox, 1872, do 1870.

—————Coal. See Collett's Rep. 1883, do Lesquereux.

Economic Geology.

- Clays.** Cox, E. T., Rep. 1870. Davies, Martin, Sullivan counties; do 1872, Dubois, Pike, Park counties; do. 1873 Warren county; do. Cox's Rep. 1874.
- Cox, E. T., Rep. 1875. Vigo, Orange counties.
- Cox, E. T., Rep. 1876-78. Analyses of clays.
- Collett, J., Rep. 1880. Monroe county.
- Collett, J., Rep. 1881. Bartholomew, Delaware, Shelby counties.
- Collett, J., Rep. 1882. Clays of Indiana.
- Collett, J., Rep. 1883. Rush, Grant counties.
- Thompson, M., Rep. 1885-86. Clay of Indiana; do, Marshal county.
- Thompson, M., Rep. 1888. Clays of Indiana (DeKalb county).
- Kaolin, Statistics of production, 10th census U. S., p. 842, 848-849.
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- A. GENERAL STRUCTURE.** I. *Stratigraphy*—Giving a general section and brief outline of the extent, thickness and character of each rock-series—(map); also a table showing the total thickness of the drift as obtained from borings. II. *Altitude of the strata*—Views concerning the nature and extent of the Cincinnati arch; topography of Trenton limestone, as made out from well-borings. (Hypsographic map and cross-sections of Trenton limestone.) The hypothetical “Wabash arch” is briefly described. Prof. S. S. Gorby’s views, as contained in 15th Ann. Rep. Geol. and Nat. Hist of Indiana, are quoted.
- B. CONDITIONS OF GAS ACCUMULATION.** Sec. I. Conditions of rock structure. II. Conditions of rock texture.
- C. GAS PRESSURE AND MEASUREMENT.** Defines I. Static pressure. II. Open pressure. III. Retained pressure. IV. How to measure the amount (cubic feet) of gas yielded; gives tables showing capacity of wells.
- D. THE GAS FIELD AND THE BORINGS WITHIN IT.** I. The area yielding gas and oil. II. Records of borings within the main field reviewed by counties—(Blackford, Jay, Delaware, Randolph, Wayne, Madison, Grant, Howard, Tipton, Hamilton, Hancock, Marion, Miami, Wabash, Henry, Rush, Shelby, Decatur, Franklin, Dearborne, DeKalb) giving number of wells in each county and aggregate daily flow, etc.
- E. RECORD OF BORINGS OUTSIDE OF THE GAS FIELD.** Gives record of borings in the following counties: Union, Fayette, Bartholomew, Jennings, Jefferson, Clarke, Floyd, Harrison, Washington, Jackson, Johnson, Hendricks, Montgomery, Parke, Boone, Clinton, Carroll, White, Pulaski, Cass, Miami, Fulton, Porter, Lake, Laporte, St. Joseph, Marshall, Elkhart, Kosciusko, Whitley, Noble DeKalb, Allen, Wabash, Huntington, Wells and Adams.
- F. THE CARE OF GAS WELLS.**
- Pike county Coal.** Geology. Owen’s Rep. 1859–60; Cox 1872, do 1870; coal, J. Collett’s Rep. 1883. (See also Lesquereux.)
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- Pulaski county**, Geology of. M. Thompson's Rep. 1888; do. R. Owen's Rep. 1859-60.
- Putnam county**, Geology of. R. Owen's Rep. 1859-60; E. T. Cox's Rep. 1870; E. T. Cox's Rep. 1875; J. Collett's Rep. 1880; do. 1881.
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Upper Carbonic.	{	Upper coal measures	{ Merome Sand stone.
			{ Upper coal measures.
		Middle coal measures	{ Lower coal measures.
Lower Carbonic.	{	Lower coal measures	{ Conglomerate or millstone.
			{ Grit.
Lower Carbonic.	{	Greenbrier	Mountain Limestone.
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Indiana Building Stone, pp. 26-33.

Describes the qualities and extent of I, limestones in general. II, oolitic limestones. III, sandstones.

Clays of Indiana, pp. 34-40.

Describes the nature, composition and mode of formation. Describes endianite (analysis and compares it with analysis of clays from other countries.

Indiana Chalk-beds, pp. 41-43.

Describes the probable modes of formation; gives analysis (by Dr. Hurty) of samples from Lake Maxinkuckee and Kosciuseo county.

Glacial deposits in Indiana, pp. 44-56.

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Marshall county, Geology of. W. H. Thompson, pp. 177-182.

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Hancock county, Geology of. R. T. Brown, pp. 187-197.

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Geographical Botany. W. W. Thompson, pp. 242-252.

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Pre-historic Race in Indiana. S. S. Gorby, pp. 286, 313, 334.

Natural Gas (what is it?) pp. 314.

Dissimilarities in composition, origin and accumulation; where found. "Surface signs" of its existence.

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The formation of soils and other superficial deposits, pp. 93-96.

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Describes surface features, nature and extent of drift.
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 The species described are chiefly from Iowa, Illinois and Missouri.
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SUGGESTIONS FOR THE BIOLOGICAL SURVEY.

BY JOHN M. COULTER.

[ABSTRACT.]

In studying the flowering plants of any region, they are naturally divided into two categories, namely, (1) those that are indigenous, and (2) those that are introduced. Each one of these groups presents its own special problems in addition to those which are common to both. In the modern study of collected material it has become more and more evident that collectors ought to be trained. It is not sufficient to merely collect specimens