GEOLOGY OF SHELBY COUNTY.

Shelby county was organized as a municipality, pursuant to an act of Legislature, in 1821, and contains an area of 408 square miles, or 261,120 acres. It is bounded on the north by Hancock, east by Rush and Decatur, south by Decatur and Bartholomew, and west by Johnson and Marion counties. Shelbyville, the county seat, is twenty-six miles southeast from Indianapolis. Sugar creek, Big and Little Blue rivers, and Flat Rock, are the principal water courses. These afford a large amount of water power, only a small part of which is properly utilized. Brooks and creeks ramify into all parts, affording stock-water and drainage to their respective districts.

The territory of which this county comprises a part was purchased from the Delaware Indians, by the government, at the treaty of St. Mary's, October 3, 1818, but by provisions of that treaty was occupied by the natives, and not offered for sale to the settlers until 1820.

In its present state of improvement and productiveness, it is hardly possible to imagine the situation at that time. The whole region was covered with a stately forest while the luxuriant soil filled every space with a tangled mass of bushes, vines and briers, almost impenetrable. The low lands and valleys, protected from evaporation by a dense shade, were wet, swampy, and in some places impassable marshes; without navigable streams or other avenues of commerce; without roads or even paths facilitating intercourse. To subdue this wilderness was the work of heroes and giants. The pioneer fathers bravely planned and planted for their descendants. Right worthily have their sons matured their schemes and made the wilderness give

way to the bloom and realization of progressive civilization. Forests have been removed; the soil, mellowed by cultivation, reduced to productive tilth; marshes drained; railways and good gravel roads built; streams bridged, and well designed churches and school houses, visible from every hill top, indicate that the men of to-day are trustful guardians of the future, with indications of still higher progress.

The early settlers of Southern, and especially Southwestern Indiana, were from Kentucky. They brought with them the pluck and spirit of their old homes, but in the unequal contest with hordes of savages, the border line was often pierced and women and children exposed to savage, brutal butchery. At every signal of danger, at every call, or even without call, Kentuckians rushed to the post of danger, shielding with their breasts the defenceless homes of their Indiana brothers and sisters, sealing their devotion with their blood on every border battle-field. This county was named in honor of one of Kentucky's best and bravest sons, Governor Isaac Shelby.

SURFACE CONFIGURATION.

To the casual visitor the surface configuration is uniform and monotonous, except in the vicinity of Flat Rock river, in the southeastern parts, where hills and boldly escarped bluffs give variety to the view. As a rule the uplands slope gently to the rivers and creeks, presenting to the observer a great plain, nearly level, but with gentle undulations hardly sufficient to discharge the rainfall, without artificial drainage. The upland divides attain a pretty uniform elevation of 900 feet above the ocean. The valley streams are usually from 100 to 175 feet lower. In some regions soils are made up from the destruction of local rocks, hence lean and thin, or, in other parts, the stiff, cold clays of unmodified glacial drift prevail. Remote from great rivers or actual beds of water, one is astonished to find almost the whole surface of the county covered with alluvium, either ancient or modern. This explains at once the uniform depth and fertility of the soil, and asks what great floods of water and ice plowed out these valleys, contrary to the usual west-south direction of the drift, and afterwards covered the hill tops and glacial drift with the clay sands of the loess?

ALLUVIUM.

The forest mould and peaty soils are caused by the decay of leaves, grass and other vegetable remains. The alluvial loams of creeks and river bottoms, are due to causes now in action. Water, in swift motion, grinds rolling rocks and pebbles to sand and clay, a slow, but sure and mighty mill, and these, by floods, are spread upon the overflowed lands, blessing them with renewed fertility. These deposits are from two to ten, and, on the larger streams, twenty feet in thickness, and make a soil of unrivaled fertility, always productive and commanding full prices.

LOESS.

Going back, in order of time, was a period when a great lake of fresh water covered southwestern Indiana, and adjoining regions in Illinois, Kentucky, Missouri, etc. A sub-tropic or tropic climate prevailed. A southern vegetation was known to exist, with the Elephant, Megalonyx, Peccary, etc. This lacustral deposit in these parts exhibits a summit level of about 800 feet above the ocean; hence, shallow on the elevated plateaus and dotted with island hills, it deeply covered with its waters the valleys previously eroded. The inflowing streams gave rise to slow currents, so that the deposits are often finely and distinctly laminated. Few or no pebbles, only fine sands are found even upon its shores, for the temperature did not permit the transporting agency of ice. The loess deposit is seen on many of the highlands of the county, and is well exhibited in the wagon road cut at the hilltop near Mt. Auburn Long exposure to rainfall and other atmospheric conditions has removed most of the deposit from the slopes, and its material modified by fluviatile action largely forms the tenacious soil of the "flat woods," or enriched by coarse sand, the loams of the river bottoms.*

GLACIAL DRIFT.

The surface features of the county are largely due to the agencies of the great Ice age. The underlying rocks by paralellism of laminae and strata, indicate that when upheaved from

*Bottoms are the meadow lands bordering on streams subjected to ancient or modern overflow.

their ocean birthplace the general surface was nearly level and now their general elevation would exhibit a line 1,000 to 1,100 feet above the ocean, drawn from the highest points in Rush, Decatur and Shelby westward to the knobs of Brown and Johnson counties; the intervening valleys being 300 to 500 feet deep. The hard-pan clays, gravel, and boulders indicate the transporting and erosive powers of that slow, solemn river of icy mystery, and its summer sluices of torrent water which has so wonderfully moulded the contour and blessed the soil of Indiana.

These phenomena have heretofore been attributed wholly to the great northern ice flow, whose foot-marks are engraved with planished surfaces, furrows and striae, on many of the enduring sand and limestones of the State, northeast and northwest of this point; and whose crest is recorded on Bean Blossom ridge of Brown county, measuring an indefinite length north, and a thickness of at least 400 feet. With resistless power this great flow of nature cut down or overrode hills and divides, filling up previous valleys and water courses, and brought an immense burden of gray and white boulders and gravel from the granitic regions of Upper Canada, conglomerate pudding stones, traps and virgin copper from Lakes Huron and Superior, coal measure sandstones and fossils from Michigan, Silurian and Devonian rocks and identifying fossils from Canada, Michigan, Wisconsin, Illinois and Northern Indiana. The line of approach can be traced as easily as the Indian follows the footsteps of his enemy, and the boon granted by this grinding intermixture of crushed material from all the paleozoic strata is indicated by the wonderful and unrivaled fertility of our modified drift soils.

As a rule the Northern ice flow filled up ancient valleys and river beds, as was determined by test bores and shafts in Knox, Clay, Putnam, Vigo, Fountain and Tippecanoe counties, and as may be recognized in the sand and gravel pits near Waldron; pushing into such valleys, dividing hills and the masses of material beneath and at the foot of the glaciers and forming innumerable lakes, which dotted the entire surface of the State. At other times the ice flow followed North and South valleys, or depressions parallel with the outcrops of the geological formations, as the rocks were more or less easily eroded by it and the existing conditions.

But all these elements and agencies, set forth more fully in previous reports, can not account for the results exhibited in this and adjoining counties.

1. The trend of the streams and valleys do not coincide with the dip of the underlying rocks. On the other hand, with slight Southern deflections, they are parallel with the Western extension of the axis of Lake Erie, and parallel with the general trend of the great valleys or benches crossing the State from East to West. In former reports* on Knox, Owen, Putnam and Montgomery counties, isolated facts were given, which, massed as cumulative evidence, seem to comfirm a first glacial time, with flow from some Eastern point of dispersion.

2. The Northern ice flow brought white, gray and black granites, and a multitude of specimens, positively indicating the line of transit by Lakes Michigan and Superior. In Shelby county few such rocks are found, but instead, massive boulders, from small, to six, eight and ten feet in diameter, are constantly, abundantly seen in the Southern parts, of red felspathic granite, enough laminated to fix their gneissic or sedementary origin, closely resembling the red granites of Lower Canada and Vermont. With them, have been found in the State, a few fragments of crystalline magnetic iron ore, similar to the Andirondack ores, near Champlain, and many biscuit-shaped fragments of Medina sandstone, so common on the shores and ancient beaches of Lake Ontario, and more frequently Devonian corals, which are held typical of the Devonian age, in the bed of Lake Erie and Canada.

These facts, taken as a whole, seem to establish the extension of a first glacial drift from an extreme eastern point along the axis of Lake Erie across the State of Indiana, although the second north-south flow blotted or deeply hid nearly all the previous land marks. The writer submits these inferences, inviting observation of more facts, which may confirm or reject his theory here set forth.

An inspection of the map of the State discloses the fact that the valleys of the actual streams crossing the county from north-east to south-west, have their sources near the eastern boundary of the State, and a water-shed, or general valley

*See Ind. Geol. Reports, 1875, pp. 305, 306, 364, 370, 424, 425. Rep. Statistics and Geol., 1880, pp. 400, 401.

extends from the dividing ridge in Rush county to a similar divide in Hendricks county, conducting a central water-shed distinct from those of the Wabash and Ohio, with bluffs at the extreme barriers 1,000 to 1,200 feet above the ocean, and with a valley depth of 300 to 500 feet. Over much, or all, the included space, at various depths are beds of gravel, sand and clays, showing that the whole included area has been subject to the denuding and modifying energy of currents of fresh water. This is especially true of Shelby county. Beds of gravel and sand are remarkably defined at Waldron and St. Paul, and in all the northwestern area; the irregularity of these pockets, of greater or less extent, often interrupted, very often partially removed, leaving mounds and knolls as the outliers at Waldron and St. Paul, indicates an inconstant stream, at one season with gentle current carrying only pebbles, sands and clays, but in the spring and summer, the season of melting ice, a mighty flood, with furious currents and sufficient volume to tear loose from the foot of the eastern glaciers great bergs and floating islands of ice, competent to bear the bowlders of red feldspathic granite, some of which contain 300 cubic feet, and would weigh from 40,000 to 60,000 pounds, and are common on denuded points in the south part of the county.

COLLETT GLACIAL RIVER.

Crossing the western bounds of the county, this great stream of water and icebergs impinges against and is obstructed, by the hilly district of Johnson and Brown counties having an elevation of 400 to 500 feet above the valley, and is deflected south perpendicular to the dip or along the strike of the rocks to the southern boundary of the State at Jeffersonville. This valley is a wonderful exhibition of energy and forces which have ceased to exist. The volume may be estimated by the amount of the erosion, which exhibits a width of five to ten miles, and depth of 300 to 500 feet as measured by the wall-like bluffs of the adjoining high lands. The mighty ships which sailed upon this river sea were silvery bergs of ice, scattering bowlders along its shore line, or in its depths as discovered in deep wells in Scott and Clark counties, its broad eastern pathway indicated by lower silurian fossils, found in Ohio and Eastern

Indiana. Economically it furnishes an inclined plane, utilized as the roadway of the railroad from Indianapolis to Jeffersonville. In the course of ages the valley was tapped by newer lines of drainage along the dip of the rocks by the east branch of White river, and the old bed silted up at and near Seymour in Jackson county, depositing during this transition period of alternate eddy and current the vast hills and ridges of sand peculiar to that vicinage.

John L. Campbell, L. L. D., of the National Geodetic survey, to whom I am indebted for many valuable suggestions and observations, on examination found this depression to exactly correspond with the line he was directed to prepare for survey, [and greatly facilitating geodetic triangulation] has given it the name of "The Collett Glacial River," and kindly furnished the following letter of explanation:

WABASH COLLEGE, December 14, 1881.

JOHN COLLETT, PH. D., *State Geologist.*

DEAR SIR:—In the spring of 1878, in discussing the field for the United States Geodetic Survey in this State south of Indianapolis, you directed my attention to the section along the general line of the Jeffersonville, Madison and Indianapolis Railroad as specially remarkable for the terminal glacial action which gave the country the general character of an extended valley.

In my first geodetic report I took the liberty of naming this section "*Collett Glacial River*," as a proper acknowledgment of your right of discovery.

An interesting question of State topography is the determination of the sources and borders of this extinct river.

The terminal line of the great glacier at the time of the formation of the river probably was not far south of Indianapolis. This glacier rested on a bed approximately 1,000 feet above the level of the sea.

The west bank of the river is well defined. The hills ten miles west of Edinburg have summits 900 feet above sea level. These hills may be taken as the starting point. Southward we find the summits west of Columbus are 950 feet above the ocean.

The summit of the sand hills in Jackson county are only fifty feet lower, while the tops of the knobs in Washington, Clark and Floyd counties rise again to 960 feet. At Spurgeon's Hill, on the line of the L., N. A. and C. railroad, the Aneroid barometer indicated 1,010 feet above sea level.

The general direction of the bank is south, with a slight bearing to the east in the southern part of the State.

The following table of hill summits, reduced approximately to sea levels, gives clearly the western bank of the river:

Woodruff's, township 11 north, range 4 east	890
Crooks', township 10 north, range 4 east	940

Taylor's, township 9 north, range 4 east	940
Conners', township 8 north, range 4 east	940
Baughman's, township 5 north, range 4 east	920
Finley's, township 2 north, range 6 east	960
Round Top, township 1 north, range 6 east	980
Top Knob, at six-mile switch L., N. A. and C. railroad	950

The outline of the eastern bank is not so well defined as the western. The limits may be approximately determined from the following altitudes:

Clarksburg, (hill north of,) township 14 north, range 5 east	870
Auburn Hill, township 11 north, range 6 east	880
Fairview, township 3 north, range 7 east	650
Guinea Knobs, lot 288, Clark's grant	750
Charlestown, lot 117, Clark's grant	600

The surface of the ground at Greensburg, on the Cincinnati, Indianapolis, Chicago and St. Louis railroad is 960. The summit level at Sunman, and westward, on the same road, is 1,015.

The flat table lands near North Madison, on the J., M. & I. R. R. is 880 feet.

The profile of the J., M. & I. R. R. shows the general character of the remarkable valley caused by this glacial river, and further modified by the present system of water courses:

Indianapolis	721
Greenwood	840
Franklin	740
Edinburg	683
Columbus	632
Seymour	600
Scottsburg	570
Henryville	500
Sellersburg	470
Jeffersonville depot	440

The elevations from Columbus to Seymour were taken by the Aneroid barometer; from Indianapolis to Columbus from the railway survey.

The difference of level between Vienna and Henryville, on the J., M. & I. R. R., is seventy feet, and the distance between the Knobs proper, on the west, and the Guinea Knobs, on the east, is only five miles. At this locality the glacial river must have been narrow and rapid. The great falls here doubtless contributed one of the grandest features of this most wonderful pre-historic river.*

This wide valley was cut in the otherwise level plane by the mighty river, wide and deep, whose life continued during the melting of the glacier, in the period intermediate between the geologic and the modern, but its tracings furnish an interesting feature in the topography of the State.

Very truly yours,

J. L. CAMPBELL.

* We propose to name this locality Campbell's Falls.—*Collett.*

GENERAL SECTION.

1.	Recent alluvium	20 to 10 ft.
2.	Ancient alluvium	50 to 10 ft.
3.	Lacustral Loess	0 to 10 ft.
4.	Glacial drift	20 to 50 ft.
	Devonian.	
5.	Magnesian limestone, upper beds of Geneva limestone, *Corniferous*	38 ft.
6.	Rubble stone of Waldron and top of St. Paul quarries, *Corniferous?*	0 to 14 ft.
	Upper Silurian.	
7.	Blue shale, Waldron fossil bed, *Niagara*	7 ft.
8.	Blue limestone, *Niagara*	9 ft.
9.	Cherty limestone, top of St. Paul quarry, *Niagara*	8 ft.
10.	Laminated quarry strata at St. Pauls, *Niagara*	54 ft.
	Total	191 ft.

RECENT GEOLOGY.

The general section is an exhibit of all the strata and deposits of the county gathered from widely separated stations. The beds of recent or ancient alluvium have been generally referred to in the preliminary topographical description of the county. For specific information the survey is indebted to Mr. David Louden for a statement of facts of high interest to science, but even more valuable economically to those who desire pure water free from organic matter from the lower beds. Mr. Louden has bored more than a thousand wells in different parts of the county. In the valley of Lewis and Slash creeks, the wells sought water above the boulder clay, and along the bluffs or edges of these valleys and were from 12 to 18 feet deep, but along the center of the valley required a depth of 25 to 35 feet, or 20 to 25 feet below the present bed of the creek, showing that the ancient valley, 2 to 3 miles wide had a riverway eroded through the boulder clay to a depth of 30 to 70 feet as compared with adjoining highlands or bluffs.

Average Section of Wells on Lewis and Slash Creeks.

Black peaty soil	6 ft.
Yellow clay	2 ft.
Sand and fine pebbles	27 ft.
Total	35 ft.

A similar state of affairs exists in the beautiful and productive valley of Blue River, as is shown by the following:

Average Section of Blue River Valley.

Alluvial loam	2 to 6 ft.
Yellow clay	2 to 6 ft.
Sand and fine gravel	30 to 23 ft.
Total	35 ft.

A well made for Jacob Henry gives the following exhibit:

Section at Manilla.

Soil	3 ft.
Yellow loamy clay	7 ft.
Loamy sand	10 ft.
Boulder drift blue clay	47 ft.
Fine quicksand	3 ft.
Snow white sand	1 ft.
Gravel and sand	2 ft.
Total	73 ft.

Water was here as usual at the bottom of boulder clay, found in large supply, neither increasing in wet years nor decreasing at time of drouth. It rises to within one foot of the surface, and indicates a perennial fountain of pure water.

A well on the adjoining farms of Arbuckle and Mills, shows the following:

Section in Drift West of Manilla.

Soil	2 ft.
Clay	33 ft.
Quicksand	3 ft.
Blue clay	5 ft.

Section in Drift West of Manilla—Continued.

Clay and gravel	3 ft.
Boulder clay	17 ft.
Sand and gravel	3 ft.
Blue boulder clay	57 ft.
Total	123 ft.

All these bores indicate a probability of an abundant supply of pure water below the glacial or boulder clay.

At the residence of W. E. Teal, in the south-west part of the county seat, a bore gave the following results—commenced twelve feet above low water in Blue River:

Shelbyville Well.

Alluvial soil	8 ft.
Gravel	2 ft.
Fluvatile silt	1 ft.
Boulder clay	40 ft.
Sand and fine gravel	1 ft.
Limestone	1 ft.
Total	53 ft.

The following section shows the depth of the ancient river valley in one of the lowest points, the farm of Wm. Rouse, S. E. ¼ Sec. 3 T. 13, R. 5, near N. W. corner of Sugar Creek Township, a region of level, rich, agricultural farm land:

Section of Ancient Alluvium.

Black soil	25 ft.
Clay and sand	2 ft.
Gray clay and gravel	10 ft.
Quicksand	3 ft.
Gravel, fine, no bottom	5 ft.
Total	45 ft.

At Waldron, an elevated station, the ancient fluviatile action is well developed.

Section in Wells at Waldron.

Soil and loam	4 ft.
Yellow clay	6 ft.
Sand and gravel—fluviatile	14 ft.
Gray clay	1 ft.
Soft eddy clay—plants	27 ft.
Sand—snow white	1 ft.
Flat biscuits—Medina sandstone	3 ft.
Total	56 ft.

In the northeast corner of the county a well bored gives the following:

Section at Gwynnville.

Soil	3 ft.
Yellow clay. Loess?	6 ft.
Sand, Lacustral	10 ft.
Bowlder clay	35 to 47 ft.
White (and black magnetic) sand	1 ft.
Gravel and sand	3 ft.
Total	70 ft.

The ancient and recent alluvium of the river beds gives this exhibit, of alluvial deposits east of the railway in the southwestern parts:

Section in Alluvium at Flat Rock Station.

Loamy soil	3 ft.
Yellow clay	10 to 15 ft.
Sand	5 ft.
Gravel	1 ft.
Gray clay	1 ft.
Silt—fine clay and sand,—Lacustral, deep, still water deposit	19 ft.
Total	44 ft.

Other wells in the same vicinity find limestone at a depth of 60 to 70 feet, passing through similar deposits, and show an extreme erosive depth here.

The "Haw Patch," a great alluvial plain of wonderful fertility in the southwestern part of Shelby and the northwestern part of Bartholomew, has been pierced by wells to a depth of 60 to 70 feet. It presents a similar general section, indicating, first, the erosive action and confluence of an ancient affluent to the great glacial river before Flat Rock river was in existence; second, the gradual silting up of the channel by decrease of water or change of current, and, thence the deposit of underlying yellow clays and loess, during the subsequent lacustral period.

Section in Warner's Well.

(Two miles west of Flat Rock Station, section 32, township 11, range 6.)

Soil	3 ft.
Yellow clay—Loess?	2 ft.
Yellow sand—Loess?	30 to 20 ft.
Black muck	2 ft.
Snow white clay	½ ft.
Dark sand	4 ft.
Dark clay	½ ft.
Gravel washed clean	3 ft.
Total	35 ft.

Section in Scott's Well.

(Near Flat Rock Station, section 27, township 11, range 6, and within ten feet of river.)

Soil	3 ft.
Yellow clay	3 ft.
Gravel and sand, level of stream	10 ft.
Gravel and dust, absolutely dried	27 ft.
Gray clay	½ ft.
White sand	½ ft.
Gravel	3 ft.
Limestone	0 ft.
Total	47 ft.

These bores show an erosion to a depth of thirty-seven to forty feet below the present deepest channel of the river. The greatest thickness of the glacial or bowlder clays are shown in the following:

Section one mile west of Mt. Auburn.

(On farm of J. M. Collins, river bottom.)

Soil	4 ft.
Yellow clay	6 ft.
Sandy clay	10 ft.
Bowlder clay	80 ft.
White sand	1 ft.
Sand gravel	7 ft.
Limestone	0 ft.
Total	108 00

This shows the ancient river bed had a depth of fifty feet below low-water mark of Blue river.

HOT WELLS.

The construction of deep wells discovered the existence of thermal water quite unexpectedly. Although this fact has not attracted much attention, it is of economic importance. It is a well known fact that at the level of perpetual spring water a constant temperature of 52° F. is maintained in this latitude; thence downward, the temperature becomes higher with regular increments, and in this State the rate of increase has been found to be 1° F. for each space of 79 feet of depth. By this law we may, without estimating the cooling effects of the stony walls of the fissure and the inflow of surface water, safely conclude that a change of 28° F. indicates the source of supply at a depth of 2,212 feet.

The Shelbyville thermal well was put down in December, 1870, in the east part of the city, near Little Blue River bridge. At a depth of eighteen feet the water was found to be warm, and at the bottom, twenty-four feet from the surface, a constant temperature, winter and summer of 76° was maintained.

The Barlow thermal well is near Barlow's Mills, Sec. 3, T. 13, R. 6, nearly four miles west of Shelbyville. An old well,

twenty-three feet deep, at the residence of Henry Barlow, had been used for household purposes, and was favorably known for furnishing cold water, 52° F. Suddenly the water became warm, and no longer desirable; the thermometer indicating 65° F. A pipe was driven in November, 1870, from the bottom, through fine sand and pebbles, resting in a bed of gravel, to a depth of sixteen feet, or thirty-nine feet from the surface. The water was found to have a temperature of 80° F., and during the next winter attained a maximum heat of 86°. These wells were excavated for potable water only, and being unfit for this use, were neglected and allowed to be filled up. If found permanent, these springs will invite the attention of those needing hot baths, and suggest that it would be cheaper (and surely more efficacious) to use the thermal waters of Shelby county, than the distant hot springs of Southern regions.

PALEOZOIC GEOLOGY.

The rocks of this county comprise a portion of the strata of the Devonian and Upper Silurian formations, and exhibit in outcrop a single group of each; the line of demarkation between the two formations will hereafter be seen to be the top of the Blue Shale fossil bed.

DEVONIAN AGE.

Corniferous Group.

The rocks of this age, although in some force, generally contain but few fossils, obscurely replaced with calc spar, as in the Magnesian limestone, No. 5 of general section, east of Flat Rock Station, at Geneva, and thence to the railway bridge at St. Paul. These rocks, although unfit for masonry, are of great economic importance, as will be later seen, furnishing a lime which invites the attention of manufacturers and architects.

At a few localities, as at Waldron and a short distance above Geneva, a rubble stone occurs, in convenient layers between the fossil beds and the magnesian limestone, of excellent quality and well suited for walls, hammered masonry, etc., and extensively used for fence posts. No fossils were seen, but it is

probably of Devonian age as well, and together they represent the corniferous group here. These rocks probably cap all the hills in the southern parts, although hidden by clays and soils; it is probable that outliers of the black Marcellus shale of the Hamilton group may yet be discovered by deep bores or wells in the extreme western parts, though now deeply covered with drift soils and consequently unseen.

At a few localities in the southeastern corner of the county and the contiguous portions of Rush and Decatur counties, the identifying fossils given in the following lists were seen:

List of Fossils found in Shelby County.

DEVONIAN AGE.

CORNIFEROUS GROUP.

RADIATA.

Amplexus yandelli	Edwards & Haime.
Blothrophyllum decorticatum	Billings.
Cystiphyllum americanum	Edwards & Haime.
Cystiphyllum sulcatum	Billings.
Cystiphyllum vesiculosum	Goldfuss.
Clisiophyllum oneidœnse	Billings;
Cyathophyllum corniculum	Rominger.
Cpathophyllum davidsoni	Rominger.
Cyathophyllum rugosum	Edwards & Haime.
Cyathophyllum juvenis	Rominger.
Cyathophyllum scyphus	Rominger.
Cladopora linnœana	Rominger.
Diphyphyllum archiaci	Billings.
Diphyphyllum straminium	Billings.
Diphyphyllum simcoense	Billings.
Favosites emmonsi	Rominger.
Favosites hemisphericus	Yandell & Shumard.
Favosites canadensis	Rominger.
Favosites limitaris	Rominger.
Favosites clausus	Rominger.
Favosites epidermatus	Rominger.
Heliophyllum exiguum	Billings.
Stromatopora tuberculata	Nicholson.
Stromatopora nodulata	Nicholson.
Zaphrentis conigera	Rominger.
Zaphrentis gigantea	Rafinesque.
Zaphrentis ungula	Rominger.

BRACHIOPODA.

Ambocelia umbonata	Conrad.
Athyris vitata	Hall.

Atrypa reticularis . . . . . Linneus.
Chonetes yandelliana . . . . . Hall.
Productus spinulicostus . . . . . Hall.
Rhynchonlla tethys . . . . . Hall.
Spirifera angusta. . . . . . Hall.
Spirifera segmenta . . . . . Hall.
Spirifera varicosa . . . . . Hall.
Spirifera oweni . . . . . Hall.
Spirifera euruteines (var fornacula) . . . . . Hall.
Strophodonta demissa . . . . . Conrad.
Strophodonta arcuata . . . . . Hall.
Strophodonta macronata . . . . . Conrad.

PTEROPODA.

Tentaculites fissurella . . . . . Hall.

GASTEROPODA.

Bellorophon patulus . . . . . Hall.
Euomphalus cyclostomus . . . . . Hall.
Euomphalus decewi . . . . . Billings.
Loxonema nexile . . . . . Phillips.

CEPHALOPODA.

Cyrtoceras . . . . . *Sp.?* . . . . . .
Orthoceras . . . . . *Sp.?* . . . . . .

LAMELLIBRANCHIATA.

Conocardium trigonale . . . . . Hall.
Nucula lirata . . . . . Conrad.
Pterinea flabellum . . . . . Conrad.

CRUSTACEA.

Phacops bufo . . . . . Green.

UPPER SILURIAN FORMATION.

Niagara Group.

This formation is seen almost exclusively in the valleys of the extreme southern part of the county. A single outcrop is reported at low water in the channel of Blue river above Shelbyville. Limited in exposure, these rocks are written all over in symbols of the "life and times" of silurian seas.

A great ocean prevailed. The cool or cold water was of sufficient depth to relieve the bottom life from the pulverizing force of surface waves. Gentle currents flowed from north to

south, as is shown by the shapes of the clay-stone concretions, without sufficient power to carry sand and coarse material. It was filled with marine life which in death built up calcareous bottoms from the crushed shells and other organic remains. At the close of this period an event transpired which shows that the occurrences of our day are but repetitions of the past. A great tidal wave swept across the quiet sea. Violent currents prostrated the plant like crinoids, or tore them from their rock-anchored roots, separating the stems in sections. Impure water came laden with death, and muddy shoal waters ended the growth of corals, burying all in a sepulchre of clay, in which they are preserved with wonderful perfection. To the geologist and student these graves give up their dead to tell in resurrection how their obedience to the laws of reconstruction, oscillation and compensation, modify and vary the surface of the earth. Life in this ocean was annihilated, or unfavorable conditions followed, as but few animal remains are seen in the superimposed rocks.

The Waldron fossil bed, No. 7 of section, is the grand paleontological bed of the district. It is found with well preserved fossils at St. Paul, near French's Mills, just below the railway track at the bridge, thence west at every exposure in the bluffs of Flat Rock, till it passes beneath low water within half a mile of Geneva, showing a dip W. S. W. of about forty feet to the mile. Outcrops still richer in fossils are found on Deer creek, and on Conn's creek from its mouth to a point a short distance southwest of Waldron. It is a "Blue Shaly Soapstone," in regular beds, obscurely laminated, weathering to a light buff. Within its homely outcrop or breast are hidden the fossils which, to a large degree, illustrate this volume; have filled with beautiful specimens the cabinets of the world, and as developed have, like some old palimpsest, disclosed the still life of the past—a new Rosetta stone giving a key to its history and culminating death. Prof. James Hall, the distinguished geologist of New York, was one of the first to recognize the importance of these beds. He has expended large sums of money in their development, and more important, has brought to bear the results of his long experience, wise reasoning, and covered Conn's creek localities with a world-wide renown. The following is full though not complete list of fossils

obtained to date, at Waldron and St. Paul, (the letters W. and St. P. indicating the localities,) in strata Nos. 7 to 10 of general section, and comprises those actually in the State Museum:

List of Fossils found in Shelby County, Ind.

UPPER SILURIAN.

NIAGARA GROUP.

PORIFERA.

Astylospongia præmorsa . . . . . Goldfuss—St. P. & W.
Astylospongia bursa . . . . . Hall.

POLYPI.

Favosites forbesi (var occidentalis) . . . . . Hall—St. P & W.
Favosites niagarensis . . . . . Hall—St. P.
Favosites favosus. . . . . . Hall—St. P.
Favosites spongilla . . . . . Rominger—St. P.
Favosites pyriformis . . . . . Hall—St. P. & W.
Streptelasma spongiaxis . . . . . Rominger—St. P. & W.
Stromatopora concentrica . . . . . Goldfuss—St. P.
Strombodes pentagonus . . . . . Goldfuss—St. P.
Cyathophyllum radicula . . . . . Rominger—St. P.
Duncanella borealis . . . . . Hall—W.
Eridophyllum rugosum . . . . . Edwards & Haime—St. P.
Chetetes consimilis . . . . . Hall—W.
Trematopora infrequens . . . . . Hall—W.
Trematopora varia . . . . . Hall—W.
Inocaulis bella . . . . . Hall & Whitefield—W.

CRINOIDEA.

Cyathocrinus polyxo . . . . . Hall—W.
Cyathocrinus pucillus . . . . . Hall—W.
Saccocrinus christyi . . . . . Hall—W.
Eucalyptocrinus crassus . . . . . Hall—W.
Eucalyptocrinus cælatus . . . . . Hall—W.
Eucalyptocrinus ovatus . . . . . Troost—W.
Rhodocrinus melissa . . . . . Hall—W.

BRYOZOA.

Lichenalia concentrica . . . . . Hall—St. P & W.
Fenestella parvulipora . . . . . Hall—St. P & W.

BRACHIOPODA.

Pholidops ovalis . . . . . Hall—W.
Eichwaldia reticulata . . . . . Hall—St. P. & W.
Anastrophia verneuili. . . . . . Hall—St. P. & W.
Retzia eva . . . . . Hall—St. P. & W.
Crania siluriana . . . . . Hall—W.
Crania setifera . . . . . Hall—W.

BRACHIOPODA—Continued.

Orthis elegantula . . . . . Dalman—St. P. & W.
Orthis hybrida . . . . . Sowerby—St. P. & W.
Rhynchonella acinus . . . . . Hall—St. P. & W.
Rhynchonella cuneata . . . . . Dalman—St. P. & W.
Rhynchonella neglecta . . . . . Hall—St. P. & W.
Rhynchonella whitii . . . . . Hall—St. P. & W.
Rhynchonella stricklandi . . . . . Sowerby—St. P. & W.
Rhynchonella indianensis . . . . . Hall—St. P. & W.
Meristina maria . . . . . Hall—St. P. & W.
Meristina nitida . . . . . Hall—St. P. & W.
Atrypa reticularis . . . . . Linneus—St. P & W.
Spirifera eudora . . . . . Hall—St. P. & W.
Spirifera crispa . . . . . Hall—St. P. & W.
Spirifera radiata . . . . . Sowerby—St. P. & W.
Strophomena rhomboidalis . . . . . Wahlenberg—St. P. & W.
Strophomena striata . . . . . Hall—St. P. & W.

PTEROPODA.

Conularia niagarensis . . . . . Hall—W.
Tentaculites niagarensis . . . . . Hall—St. P. & W.

GASTEROPODA.

Platyostoma niagarensis . . . . . Hall—St. P. & W.
Platyostoma plebium . . . . . Hall—St. P. & W.
Strophostylus cyclostomus . . . . . Hall—St. P. & W.

CEPHALOPODA.

Trochoceras waldronense . . . . . Hall—W.
Ormoceras . . Sp.? . . . . . —St. P.
Gyroceras elrodi . . . . . White—St. P.
Orthoceras annulatum . . . . . Sowerby—St. P.
Orthoceras virgulatum . . . . . Hall—St. P.

LAMELLIBRANCHIATA.

Modiolopsis subalatus . . . . . Hall—W.
Amphicœlia leidyi . . . . . Hall—W.
Pterinea brisa . . . . . Hall—W.

ARTICULATA.

Cornulites proprius . . . . . Hall—W.

CRUSTACEA.

Cyphaspis christyi . . . . . Hall—W.
Calymene blumenbachi (*var niagarensis*) . . . . . Hall—W.
Dalmanites vigilans . . . . . Hall—W.
Dalmanites verrucosus . . . . . Hall—W.
Phacops limulurus . . . . . Hall—W.
Lichas boltoni (var *occidentalis*) . . . . . Hall—W.
Ceraurus (*Cheirurus*) *niagarensis.* . . . . . Hall—W.
Homalonotus delphinocephalus . . . . . Hall—W.

The State Cabinet contains specimens of nearly every fossil here mentioned; hundreds of some species in many cases, and as crinoid roots, etc., individuals of every age, from the full-grown adult to the tiny speck, which developed with a lens, discovers the first delicate babyhood of the animal.

The "blue limestone" No. 8, is generally present, but not persistent, and is only in rare cases available for use.

The "cherty limestone" No. 9, is generally persistent, and is often an important strata, marking the floor of the fossil bed. Economically it is a drawback, and will so remain until the demand for permanent roads calls for its use.

The "laminated" quarry beds, No. 10 of section, are of high economic importance. Geologically they are an argillaceous limestone, slightly magnesian, of a pale blue color, weathering to light gray, in regular beds varying from flags two to four or five inches thick, to strata of one or two feet, all evenly bedded and readily separated at the partings. The top and bottom of each strata is thus presented, ready dressed, and nearly ready for the mason. It is easily broken with drills and wedges to dimension stone, and furnishes, cheaply, good flags, rubble and dimension stone in unlimited quantity. A thousand car loads of this stone were shipped to Chicago in a single season. Large amounts of excellent lime are calcined from the St. Paul quarries, and the whole forms one of the important industries of the State. The fossils comprise Cephalopods, Orthoceras, Gomphoceras, Cyrtoceras, etc., with but few Brachiopods.

LOCAL DETAILS.

Shelbyville, the county seat, is a thrifty young city, situated on the east bank of the beautiful, clear flowing Blue river, and is surrounded by one of the richest agricultural regions of the State. Broad valleys, with strong alluvial soils, spread out an inviting mine of wealth, richer than "true fissures" in the land of speculation. Knolls and gentle headlands give modest variety to the landscape, and first class gravel roads radiate to all points of the compass.

The public buildings, court house, churches, school houses, etc., are tasty, but at the same time show careful thrift. Dwellings are often models of elegance, with careful regard for comfort and health, avoiding extravagance. The mills, distilleries

and manufactories give employment to many, with fair returns to proprietors, and in success indicate energy, directed by thoughtful experience.

There are no outcrops of the underlying limestones near Shelbyville, and but a single one reported in the bed of Blue river. Bowlder drift, with striated gravel and rocks, build up the higher lands and plateaus near. The surface of the adjoining broad valleys are of fluviatile drift, of the present or ancient river, deeply covering the eroded bowlder drift beneath. The organic matter in these alluvial soils may explain the presence of "typhoid fevers" in some districts, and invites the use of water from deep wells or rainfall.

Cynthiana, one of the oldest settlements in the county, is situated on a ridge, which is well up to the summit level of the glacial drift. In fact, free gravel and sand containing black grains of magnetite, indicate it was probably the flood plain in the ice age, between the sluice torrents which poured down Blue and Flat Rock rivers, in their ancient volume. A landscape of quiet thrift and beauty is overlooked from the adjoining Leefers farm, along and across the valley of Conn's Creek, here ninety-five feet deep, and one or two miles wide. Manilla occupies about the same elevation, and thence to Gwinville the surface is a level, black soil, presenting the characteristics of a lake basin, sometimes still wet and peaty. It contains great elements of fertility, to be made available only by drainage. Timber is abundant and is marketed at stations on the railway. At Morristown, Blue River valley is forty to sixty feet in depth, and two to three miles in width, full of profitable farms. At Marion the earliest settlements were made, and the first courts were held under a tree, with logs for seats. The alluvial bottoms here produce full crops of corn, wheat and grass. An escarped bank of the river, seven miles northeast from Shelbyville, gives the following:

Section at Billman's Farm.

Soil	3 ft.
Yellow fluviatile clay	15 ft.
Glacial blue clay, with planished and striated bowlders and gravel	21 ft.
Total	39 ft.

About Fairland, and in fact all the northwestern part of the county, the surface is so level or gently rolling that it can only be characterized as a great farmland plain. The railway only indicates a difference of level at stations of ten to fifteen feet. Bores put down at several points find fluviatile sand gravel and alluvium to a depth of twenty to thirty feet. No further estimate of good returns and profitable farming is needed.

The southwestern and western parts of the county are characteristically valley bottoms, rich in strong, alluvial loams, and highly productive. The highlands are exceptional, limited in area and height.

Mt. McCrea, with its comrades, north of Marietta, are sharp, tumular hills, sometimes isolated by cross-flows from the northern or second glacial flow, they stand as silent monuments of past natural forces and offer interesting outlooks over broad fields of thrift.

The elevated region at Mt. Auburn invites the attention of fruit growers. Surrounded by low valleys to which the heavy cold air settles in times of sudden "cold snaps," these highlands are largely benefited by the mitigating and equalizing effects which are a constant result. It is a romantic scene. East the valleys of Lewis Creek and Flat Rock are displayed in level fruitfulness ten to fifteen miles; west the alluvial bottoms of Blue river, Sugar creek and White river extend to the terraced "Wall Bluff" of the great glacial river, in Johnson county, fifteen to twenty miles away in the blue distance. At Nibel's Mill, section 29, township 11, range 6, a mile south, the same view is enjoyed over an area forty by thirty-five miles, or 1,400 square miles. A deposit of loess sands in the road cut indicates by the red color the shore-line or shallow water of the lacustral basin, while false bedding with faces in that direction, indicate the widest and deepest water of the lake to have been west-south-west.

St. Paul, at the eastern line of the county, is noted for its extensive quarries and for the great amount of good stone and lime shipped. The level region heretofore prevailing is here varied by precipitous hills and bold outcrops which exhibit in different localities a complete series of the rocks seen in the county.

Section at Floyd's Mills.

(East part of St. Paul.)

Slope and gravel	55 ft.
Magnesian (Geneva) limestone—corniferous	2 ft.
Flinty blue limestone	5 ft.
Rubble stone	18 ft.
Waldron fossil bed, blue shale	7 ft.
Gray cherty limestone	14 ft.
To Mill Creek	.....
Total	99 ft.

This bed contains many fossils. A list is given (ante) in this report.

The quarry of W. W. Lowe & Co., a short distance northeast of the village, is in Decatur county, but shipments are made from St. Paul. They employ during the summer months fifty to eighty men, have seven derricks and a full complement of drills and other tools. The opening shows a limestone face of 1,200 feet. They furnish dimension stone for foundations, piers, steps, lintels, sills, etc., and flags and curbs for sidewalks. The chief markets are at Indianapolis, Cincinnati, Terre Haute and Chicago, where it rivals the Joliet stone. The demand for flag and curb stone is extensive and the supply inexhaustible. The dimension stones are very generally used in Ohio and Indiana for jails.

Section in Lowe's Quarry.

Chert and slope—Niagara	2 ft. 00 in.
Rubble, 4 to 8 inch beds	12 ft. 00 in.
"Milk Trough" ledge	1 ft. 08 in.
Flag	04 in.
White dimension stone	1 ft. 00 in.
White dimension stone	09 in.
White dimension stone	2 ft. 00 in.
White dimension stone	1 ft. 00 in.
White dimension stone	11 in.
White dimension stone	1 ft. 02 in.
Flag	05 in.
Light gray dimension stone	1 ft. 06 in.
Light gray dimension stone	3 ft. 04 in.

Section in Lowe's Quarry—Continued.

Flag	07 in.
Dark blue limestone	1 ft. 08 in.
Blue laminated—splits to flags, eight feet below bed of river	1 ft. 06 in.
Total	29 ft. 10 in.

In the western or Shelby county part of the village of St. Paul, John L. Scanlan employs fifty hands, two compound derricks with a good equipment of tools, drills, etc., and two powerful steam pumps, which throw 1,000 gallons of water per minute. The product is dimension and cut stone for foundations, piers, building stone, especially for jails, paving flags and curb stones. The large demand shows the extensive use, and the high estimation placed upon this material by engineers, architects and the public. The rubble stone in the upper beds is largely used for calcining. The waste of the quarry is broken to regular "egg," by a Blake crusher, driven by a forty horse power engine with a capacity of preparing one hundred cubic yards a day, suitable for metaling pikes, ballasting railways or concrete foundation. This broken stone is sold in car load lots at fifty cents per cubic yard. The proprietor has also in operation two common kilns for calcining limestone, and one "perpetual burner," having a combined capacity of over five hundred bushels a day. The lime is "hot," of good quality for masonry, and extensively used at the Cincinnati gas works. We are indebted to P. McAuliff, superintendent, for specimens and information. The following exhibit was seen:

Section at Scanlan's Quarry.

(West St. Paul.)

Slope, stripping—Niagara	6 ft. 00 in.
Gray limestone in 4 to 10 inch strata, used for calcining, ballast and rubble foundations	30 ft. 00 in.
Stratified limestone, same use	8 ft. 00 in.
Gray flag and dimension stone in strata 4, 6, 8, 10 inches	5 ft. 00 in.
White limestone—may be split	1 ft. 04 in.
White limestone	1 ft. 02 in.

Section at Scanlan's Quarry—Continued.

Blue dimension stone.....	10 in.
Choice flags.....	04 in.
Blue dimension stone, to level 3 feet below surface of river.....	1 ft. 08 in.
Total.....	54 ft. 04 in.

The fossils found in the Lowe or Scanlan quarries are almost wholly Cephalopods, with rarely a Crinoid or Coral. A full list is given (ante) in this report.

The ancient valley of Flat Rock is two to three miles wide. Many mounds or hillocks of gravel and sand exist, showing the sorting process of flowing water, and we assume that the surface clay, measuring a vertical height of 100 to 125 feet has been carried away. Great red gneiss boulders of 10, 20, 30, 50, 94 cubic feet are seen upon the surface, attesting the transporting power of glaciers or floating ice. One bowlder, near Moscow, Rush county, is nine feet long, and nearly the same in cross dimension, including nearly 700 cubic feet.

Going down Flat Rock the "Waldron" fossil bed is seen a short distance southwest of town, thence, dipping faster than the fall in the river, each of the subordinate strata pass below the surface water, and near the mouth of Conn's Creek, the fossil bed approaches the same level and the valley widens to from a half to a mile or more. The "Blue Shale" fossil bed here is pyritiferous, and on exposure decomposes, becomes soft, and was borne away by the flowing water, undermining and breaking down overhanging rocks, which in turn were pulverized by the currents and removed. This explains the breadth of the valley. At Geneva, where this bed passes under the bed of the river, precipitous bluffs close in again.

A good fossil locality was visited, and the following taken:

Section at George Wright's.

(Section 12, township 11, range 7.)

Slope, clay drift.....	40 ft.
Laminated limestone, weathering buff, Devonian.....	12 ft.

Section at George Wright's—Continued.

Blue shale, fossil bed, Niagara	5 ft.
Argillaceous cherty limestone, in river	4 ft.
Total	61 ft.

Half a mile below a quarry is worked principally for stone fence posts, etc.

Section at Cuskader's Quarry.

(Section 13, township 11, range 7.)

Slope	25 ft.
Geneva magnesian limestone, partly covered, Devonian	12 ft.
Flags—fence posts	5 ft.
Buff limestone	4 ft.
Flaggy limestone	7 ft.
Blue shale, fossil bed, Upper Silurian, Niagara	4 ft.
Covered to river	3 ft.
Total	60 ft.

A similar outcrop occurs in the same section at the falls of Dudley creek, on the farm of Mary Wurtz. Nearly opposite, on the west bank of the river, the blue shale approaches the water surface, where it is rich in small fossils. The following exposure was seen:

Section at Mitchell's Cove.

(Section 14, township 11, range 7.)

Soil	2 ft.
Geneva magnesian limestone	10 ft.
Argillaceous limestone	5 ft.
Rubble limestone	9 ft.
Blue shale fossils to cherty limestone in river	6 ft.
Total	32 ft.

A small spring brook, flowing through a crevice, has worn away a circular grotto thirty by fifty feet in diameter, forming a romantic, cool, shady nook. The perpendicular walls are wreathed with twining vines and plumed with arrowy ferns.

At Geneva, half a mile below, the fossil bed has passed out of sight, and is nine feet below the water surface in the river.

Section at Geneva.

Slope and soil, buff magnesian limestone, for calcining, *Devonian*	28 ft.
Stratified rubble limestone, cap of fossiliferous Blue Shale, to same in river	4 ft.
Total	32 ft.

The Geneva limestone calcined, furnishes a pure, white lime of superior quality, which thoroughly slakes, works "cool" under the trowel, and sets without "popping" or "crick." These qualities give an extensive demand beyond the possibilities of wagon transportation, and invite railway competition. Equal to the Utica lime, near Louisville, it possesses, besides other good qualities; the feature that it is easily and economically quarried, and being porous, is calcined with a small per centage of fuel. The output of three common kilns supplies the vicinage and the few car loads hauled to the railway at Shelbyville.

A similar outcrop, giving a thickness of thirty-two feet of magnesian limestone, is seen at Nelson's Cave Mills, S.W. ¼ Sec. 16, T. 11, R. 7. Opposite the mill, an oval opening, six feet high by five feet wide, discharges the drainage from a considerable area of rainfall. Half a mile north of the mill, a doorway four feet high, leads to a cavern with several rooms, and a dome is reported to have a height of twenty-five feet, an evidence of the solving power of acidulous rain water acting upon limestone. The Geneva limestone, with all its good qualities, is the surface rock of the high lands about Wright's, Geneva, Mt. Pleasant, and especially accessible in the uneroded hillocks, near Norristown, where it has been used for stoning a turnpike, and thence westward toward Flat Rock Station, at Ensley's ford of Flat Rock, the upper bed of this limestone is seen, forming the solid floor of the river, a little over a mile west of the railway station.

CONN'S CREEK.

Waldron is a home-like station on the Cincinnati, Indianapolis, St. Louis & Chicago Railway. One of the highest points in the county on this railway, it has promise of a salubrious air. The surrounding farmers show thrift in their well appointed farms and residences. Much of the adjoining region has a soil made loamy by a generous admixture of sand, and sometimes underlaid with valuable beds of gravel, indicating the former course of rivers or glacial sluiceways. But still more has it gained a widespread reputation, by the discovery long ago of rich beds of fossils on Conn's creek. Described and illustrated by the patient zeal and broad knowledge of Prof. James Hall, State Geologist of New York, the "Waldron fossils" are known and recognized throughout the scientific world. Hotels and equipments are found at the village, and within a mile the first "Waldron beds" are to be seen. Several cabinets of fossils may be visited, of which that of Dr. Washburn is full of choice specimens. Mr. J. T. Duty is a successful collector.

Section on Conn's Creek.

(McNeely farm, N. E. ¼, Sec. 6, T. 11, R. 8.)

Slope—with Devonian bowlders		20 ft. 00 in.
Soil—stripping	15 to	5 ft. 00 in.
Rubble, laminated limestone, Devonian?	12 to	3 ft. 00 in.
Niagara "blue shale" weathering buff, with few fossils		2 ft. 02 in.
Blue shale, as above, filled with fossils		3 ft. 00 in.
Coral crag, bryozoans, etc, pyritiferous dark		06 in.
Dark shale, pyritiferous fossils, to flags in creek		04 in.
Total		34 ft. 00 in.

At other locations the underlying strata are seen as follows:

Section beneath Waldron Fossil Bed.

Flaggy limestone	14 ft.
Cherty limestone, top of St. Paul quarry	8 ft.
Total	22 ft.

At the Major's farm on the opposite side, or east bank of the creek, although nearly a mile distant, a section is given to show the uniformity of strata.

Section at Major's Wire Bridge.

(S. E. ¼, Sec. 6, T. 11, R. 7.)

Slope, fluviatile drift	25 ft.
Rubble limestone	8 ft.
Fossil bed	6 ft.
Stratified limestone, buff	14 ft.
Total	53 ft.

Without repeating sections it is thought best to give a list of outcrops with localities, so that visitors may at once reach those not before mentioned.

LIST OF OUTCROPS OF "WALDRON" FOSSIL BEDS.

Mill Creek, N. E. part of St. Paul.
Railway bridge, St. Paul.
Sullivan's—Bailey's Mill, St. Paul.
Carlisle's, Sec. 6, T. 11, R. 7.
Cuskaden's, Sec. 12, T. 11, R. 7.
Fairbank's, on Deer Creek, Sec. 6, T. 11, R. 7.
For list of fossils, see (ante) description of general section.

The physical phenomena of Shelby county represent ages of life, centuries of energy, cycles of time, writing with mightier hand than wields pen of lead or iron, events on the rocks forever. The romantic history it tells is of a deep, cold, quiet sea, and unseen life of mollusk and radiate; it records attending astronomic changes of climate and time, and leaves a thousand log-books of wondrous ships of chrystal silver, floating on a river-sea of icy water.

ARCHAEOLOGY.

The only earthworks by prehistoric man were seen adjoining the village of St. Paul. A mound thirty-two feet in diameter, and nearly six feet high, is built on the brow of the terrace bluff, overlooking the river in the valley and com-

manding a wide view toward "sunrise" between the rocky hills. When explored it contained human bones, which on exposure, quickly went to dust. They were covered with flags, supported by a stone wall, indicating a national vault or grave. Several smaller tumuli, possibly habitation mounds, were seen near by. Many interesting stone implements have been found scattered along the valley of Flat Rock river, evincing the taste as well as skill of the ancient inhabitants, and that if not their permanent home, this was at times a favorite hunting and visiting locality.

ECONOMIC GEOLOGY.

A good soil and productive agriculture is a sure basis of prosperity. The citizens of this county ought to be prosperous and happy. There is no waste land; all is susceptible of tillage or paying use. Nine-tenths of the area is nature's garden soil, black, deep and rich, producing good crops of corn, wheat and grass. No manure is used or required. Setting to grass or an occasional crop of clover will restore or indefinitely maintain the original fertility. Farms were noticed at Marion, the earliest settlement, which produced excellent crops, although continuously tilled for over half a century. Blue grass, nature's best boon for Indiana, is indigenous and readily takes possession of fence corners and untilled out lots. Attention has been given to improved breeds of horses, cattle, swine, sheep and poultry with success. This is not the temporary home or camping place of wanderers. Well appointed, comfortable residences show that the owners intend to stay. Taste, order and comfort prevail. Churches are equal to the public need, and school houses greet each other from neighboring hill tops. Greater prosperity will follow the devotion of larger areas to blue grass, if the attention required for its cultivation is given.

DRAINAGE.

For happiness, a people requires besides prosperity, sound health. Health is followed by strength and intelligence. Morality is a consequence. These are the foundations of the republic. The tile-maker achieves all these; gives annually ten to one hundred per cent. profit; insures health, strength

and good morals; is the evangelist of progress. In this county his work is a work of wonder. Large areas have been drained with the happiest results, with no one to complain except the doctor, who is still manly enough to bless the enemy, who, preventing disease, robs him of fees for medicine and prescriptions.

WATER POWER.

The principal streams are reliable for mills. Use is made of this power, but several sites are not occupied. At some points Flat Rock could be energised in the cheap preparation of stone for shipment. Steam is employed in distilleries and in some of the furniture and other factories.

ROADS.

Highways, passable at *all* times and seasons, are absolutely necessary for a full realization of civilization, the fruits of labor and social life. This county is richly supplied with gravel from the glacial drift, which experience has shown to be the best material known. Full supplies are drawn from sorted pits on uplands, or from the river beds. Good roads and bridges are becoming common. The citizens owe a debt of gratitude to, and should cherish the memory of, Alexander Cory, deceased, to whose pioneer efforts these necessaries of civilized life are largely due.

WATER.

Water, derived from a deep, rich alluvial soil, is liable to contain organic matter. This often produces blood poisoning, which results in a weakened vitality that invites malarial and inflammatory symptoms, and develops zymotic disease. Water from the skies preserved in cisterns is pure and healthy, and below the glacial drift or "blue clay" is a general supply of great purity. As more than three-fourths of diseases and pains are avoidable, these sources of supply call for thoughtful attention.

TIMBER.

This district was originally clothed with a thick, heavy forest. Much has been removed, but enough, and more than enough,

remains, although soft woods are pretty well gone. Near Marietta black walnut was the prevailing forest tree, and miles of rail fence was observed, made of this valuable material.

CLAY.

Fluviatile and lacustral clays occur all over the county, affording abundant supplies for bricks, drain-tiles etc. The quality is good.

BUILDING STONE.

This material is an important element of industry and wealth. The supply is inexhaustible. The quality meets with the favor of engineers, architects and builders, and the demand, already large, is constantly increasing. The Niagara limestones are regularly bedded, consequently cheaply quarried, easily broken to dimension and ready dressed at top and bed for use. These advantages are favorably considered by builders, and create a vigorous demand. Flags of any size that can be transported may be obtained. Further particulars are given in local details of the Lowe and Scanlan quarries.

Car Loads of Stone from St. Paul, Indiana, for Five Years.

TO	1877	1878	1879	1880	1881	Total.
Indianapolis	620	409	1,027	812	442	3,310
Other places in Indiana	387	239	608	482	909	2,625
Ohio	190	176	297	205	226	1,094
Illinois	...	2	...	2	5	9
Kentucky	2	...	...	4	...	6
Total	1,199	826	1,932	1,505	1,582	7,044

A car load of stone contains about 6 cubic yards, or 162 cubic feet.

LIME.

This is extensively calcined at St. Paul for shipment. It is strong, "hot" lime, used for masonry, etc., and also for purifying at the Cincinnati gas works. At Geneva a stone occurs in heavy beds, which is soft and easily quarried, cheaply calcined, furnishing a cool slow setting lime. It is fully equal to the best, and will command the attention of manufacturers.

Car Loads of Lime from St. Paul, Indiana, for Five Years.

TO	1877	1878	1879	1880	1881	Total.
Indianapolis	28	20	52	60	40	200
Other places in Indiana	26	18	48	55	62	209
Ohio (Cincinnati only)	105	115	178	180	185	763
Total	159	153	278	295	287	1,172

A car load of lime contains about 325 bushels.

HEALTH RESORT.

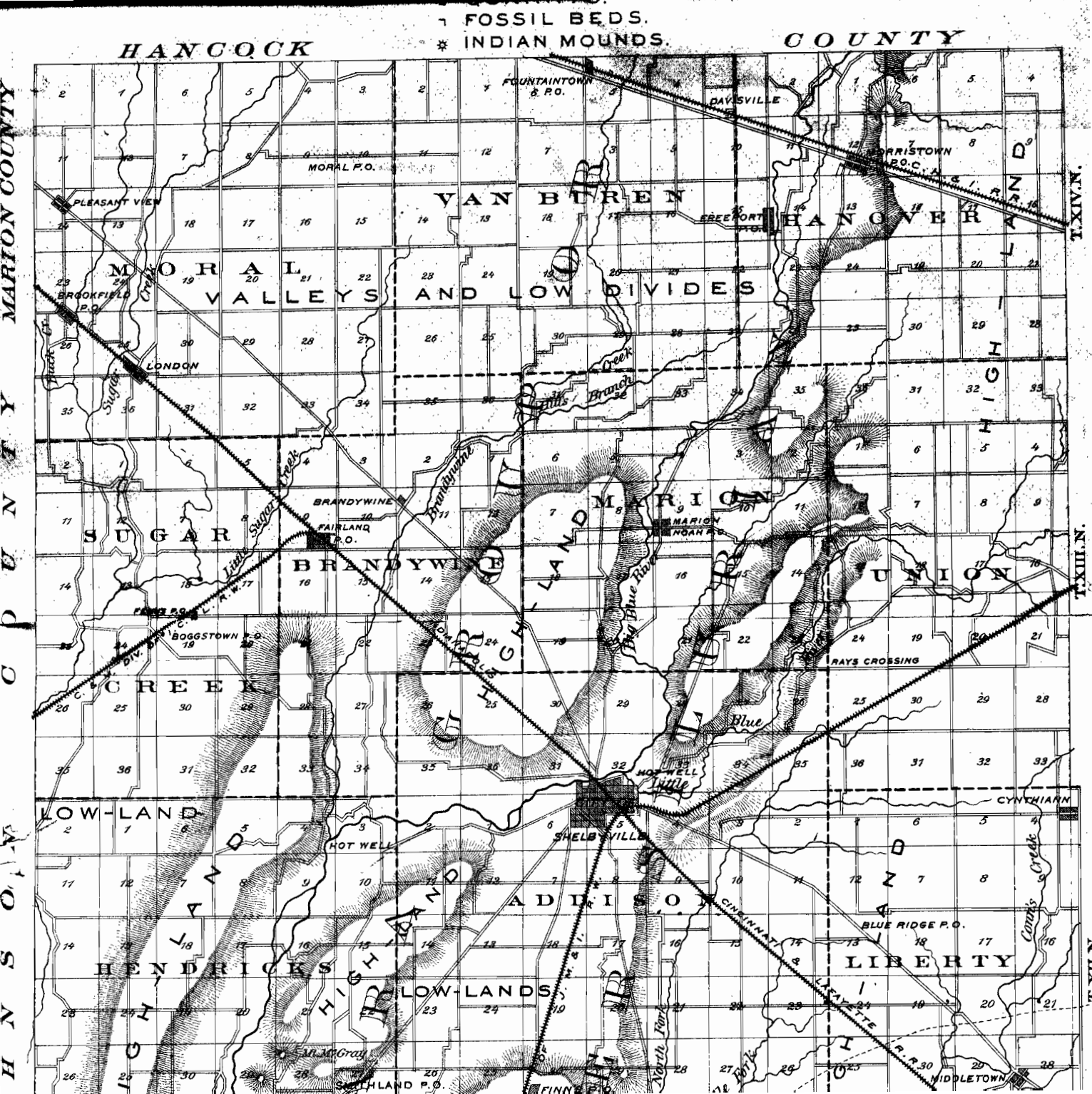
The hot wells at Shelbyville, and at Barlow's Mills, are worthy of investigation. They are not now accessible, but if, on examination, they still afford a supply of thermal white sulphur water, they will prove a health giving boon, with accessories in the way of comfort not to be found in the distant regions of the south and west.

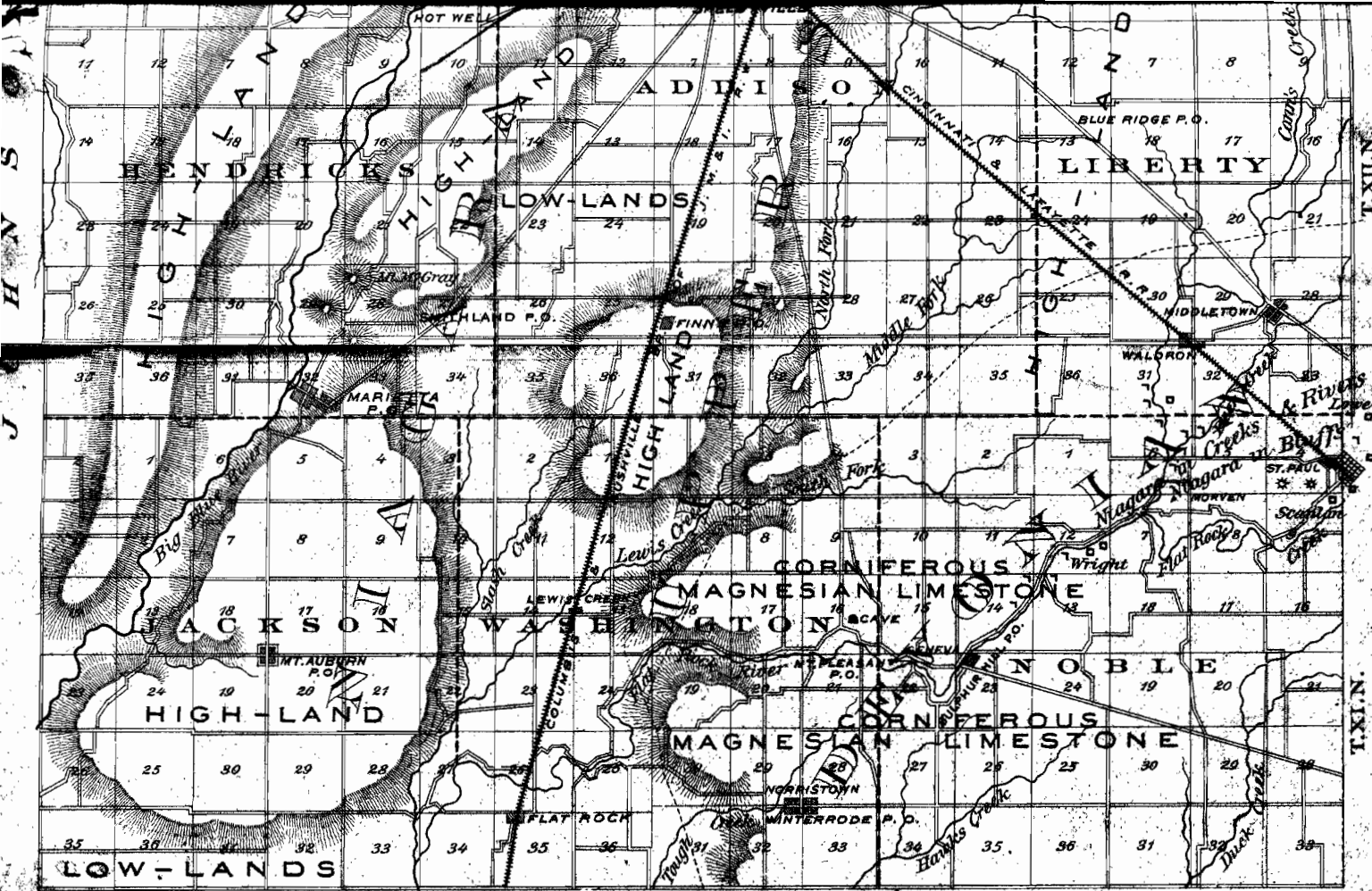
THANKS.

Acknowledgments are due to all the citizens for co-operation and assistance. Thanks for special favors are due to Dr. F. W. Howard, Dr. J. W. Howard, George Wright, John Nading, Dr. Jones, Dr. R. R. Washburn, J. T. Duty, Dr. W. G. McFadden, John H. Leefers, David Louden, Judge Majors, O. J. Glessner, and many others. Acknowledgments are made to R. H. Bishop, railroad agent at St. Paul, and to the officers of the C., I., St. L. & C. and of the J., M. & I. railroads for transportation, tables of elevation and every needed help.

NOTE.—The last report (1878) of Prof. E. T. Cox, State Geologist, was numbered 8th, 9th, 10th. Consequently it is suggested that this report (1881) should be numbered as the "Eleventh Annual Report of the State Geologist."

JOHN COLLETT, State Geologist.


FOSSIL BEDS.
INDIAN MOUNDS.
HANCOCK COUNTY
MARION COUNTY
INDIANAPOLIS
FOUNTAINTOWN P.O.
DAVISVILLE
CARRISTOWN P.O.
MORAL P.O.
PLEASANT VIEW
VAN BUREN
HANOVER
EDGEWOOD P.O.
MORAL
VALLEYS AND LOW DIVIDES
BROOKFIELD P.O.
LONDON
Sugar Creek
Buck Cr.
Hills Branch
Brandywine
BRANDYWINE
FAIRLAND P.O.
SUGAR
Little Sugar Creek
MARION
NOAH P.O.
UNION
BOGGSTOWN P.O.
RAYS CROSSING
CREEK
Big Blue River
Blue
HOT WELL
Little Blue
CYNTHIANA
SHELBYVILLE
HOT WELL
LOW-LAND
ADDISON
BLUE RIDGE P.O.
Conn's Creek
HENDRICKS
HIGHLAND
LOW-LANDS
LIBERTY
S.M. McGray
SMITHLAND P.O.
FINNEY P.O.
North Fork
Big Blue
MIDDLETOWN
CINCINNATI & LAFAYETTE R.R.
T.XIV.N.
T.XIII.N.
R.I.E.



Map of SHELBY COUNTY. Report of JOHN COLLETT, State Geologist, 1881.