

GEOLOGICAL AND TOPOGRAPHICAL SURVEY

OF

FAYETTE COUNTY, INDIANA.

BY MOSES N. ELROD, M. D.

1884.

GENERAL AND DESCRIPTIVE.

Fayette is one of the eastern central counties of the State. It is bounded on the east by Union, on the south by Franklin, on the west by Rush and Henry, and on the north by Henry and Wayne counties. Its area includes 225 sections of land, and has 135,302 acres reported for assessment. In 1883 the real estate was valued at \$3,835,355, and the personal property at \$3,817,009; total, \$7,652,364. The total valuation of taxables in 1884 was \$7,584,709. According to the Third Annual Report of the Bureau of Statistics, it takes rank as the third county in the State in *per capita* wealth.

The intelligence, thrift and energy of the people of Fayette county early led to investments in the construction and operation of the White Water Canal. Since the building of railroads it has ceased to be an avenue of trade, but is still utilized by various hydraulic companies in furnishing water to drive the machinery of flouring and other mill interests.

The Cincinnati, Hamilton & Indianapolis railroad crosses the county from east to west, and the White Water Valley road follows the tow-path of the old canal, from north to south. The Fort Wayne, Muncie & Cincinnati railroad forms a competing and parallel line with the Valley road from Wayne county to its junction with the C., H. & I. R. R. at Connersville. The Cambridge Branch of the Jeffersonville, Madison & Indianapolis railroad crosses the northwest part of the county through Posey township. All the railroads of the county, except the Cambridge Branch, cross and centre at Connersville.

The county is supplied with an excellent system of pikes and gravel roads, uniting the towns and villages with each other and with the county

seat. Among the leading toll and free pikes are the Connersville and Rushville, Connersville and Fairview, Connersville and Bentonville, Connersville and Brownsville, Connersville and Richmond, Connersville and Liberty, Connersville and Everton, Connersville and Waterloo, and Waterloo and Brownsville. With good country roads, many of them graveled, and railroad facilities to meet the commercial wants of the county, the various and rich agricultural products of the farmer are rapidly and cheaply marketed.

Connersville, the county seat, is a beautiful city of nearly six thousand inhabitants, pleasantly located on the second terrace of the White Water River, 30 or more feet above high water. The original town was founded by John Conner, in 1813, and early in its history took rank as one of the principal towns of the State; renowned for the energy, intelligence and national reputation of many of its citizens, whose descendants, in the city and surrounding country, are maintaining the fair fame of their fathers. In proportion to size it takes rank as one of the first manufacturing cities in Indiana; and especially so in the number and capacity of its furniture factories, machine and carriage shops. Its streets are wide, regular, well graveled and paved, lighted with gas and efficiently policed. The court house is a substantial structure, apparently of ample capacity to accommodate the business of the county. The city is supplied with water from White Water River by the Holly system of water-works. Throughout the resident part of the city are many beautifully shaded streets fronting spacious yards and fine residences. East Connersville, just over the river, and Maplewood, on the north, are thriving suburbs of the city proper.

Glenwood (Vienna), on the C., H. & I. R. R., Falmouth on the Cambridge Branch of the J., M. & I. R. R., Fairview and Fayetteville on the line and partly within the limits of Rush county, are thrifty towns surrounded by as fine agricultural lands as the heart of man could wish. Bentonville, in Posey township, is another railroad town of two hundred inhabitants, in a rich rolling country. Alquina, in Jennings township, and Everton, in Jackson township, are next in point of size, and pleasant villages surrounded by an apparently happy and prosperous people. Nulltown and Alpine on the White Water Valley R. R., and Longwood, Tyner and Lyons on the C., H. & I. R. R., are post office stations and shipping points.

TOPOGRAPHY AND DRAINAGE.

What is known to geologists as the Cincinnati arch, or axis of an upheaval of the earth's crust that took place near the close of the Hudson River period of the Silurian age, has determined the altitude and general surface configuration of Fayette county. Observation shows that the top of this anticlinal, one of nature's first efforts at mountain making, was a comparatively level plain over southeastern Indiana with an average elevation, at

this day, of over 900 feet above tide water in New York harbor. The valleys and river banks now seen are the result of forces that have acted on the surface of the old Silurian plain after its upheaval. The western border of the Cincinnati arch passes through the north part of Orange township, one and a half miles east of Glenwood, and through Posey township, two and a half miles northeast of Falmouth; which in its northern and southern extension forms the divide between the White Water and White River valleys. West of the divide the descent to the southwest is gradual and nearly corresponds to the dip of the Niagara limestone at the rate of 16 feet to the mile, while the rivers and creeks increase in fall as they gain in volume and excavating power, from small surface rivulets flowing over the clay and gravel, to large streams that cut under the dip, down and into the stone with moderate bluff banks that seldom exceed 50 feet in height. East of the divide as shown by the table of altitudes of the Cincinnati, Hamilton & Indianapolis Railroad, the descent is much more precipitous over a region of country devoid of any or but a slight dip. The Glenwood summit has an elevation of 1,116 feet, that compared with the bed of White Water River at Connersville shows the difference of altitude to be 308 feet in eight miles. On the west, the difference between the summit of the divide and the bed of Flat Rock River, at Rushville, in fourteen miles is 159 feet, making the rate of descent on the west 11.42 feet per mile to 38.52 feet per mile on the east, or as 1 to 3.5.

Whether the Cincinnati arch is higher at the western border in Fayette county than the eastern interior I could not accurately determine, but by a comparison of the junction of the Lower Silurian with the overlying Clinton group at the railroad bridge across Big Williams Creek and the Glenwood summit, I find the difference to be 160 feet in three miles. The railroad summit east of Longwood shows an eastern descent of 52 feet; that of the summit west of Connersville 156 feet, and that of the summit west of Lyons 174 feet. East of Liberty, in Union county, the summit, natural level of the country, between Lotus and Cottage Grove, has an altitude of 1,090 feet, which is only 26 feet less than that of the Glenwood divide. In this connection the tables show that the bed of East White Water River at Brownsville is 35 feet lower than the bed of West White Water at Connersville, but I do not conclude from this that the synclinal of the White Water valley is along the course of the East Fork, for the reason that the valley in the vicinity of Connersville appears to be partially filled with gravel that may cover deeply the under-lying stone. That the White Water valley had an existence early in the geological history of Indiana, long before the Drift period, is rendered highly probable by the absence of any considerable depression that might have been the bed of an ancient river crossing the divide, from Pierceville in Ripley county to Bentonville in Fayette county, and the vast amount of rocky material that has been removed from what was once a plain to form the

valley. The old Lower Silurian island which now underlies nearly the whole of Fayette county, had a system of drainage, in the main, identical with that of to-day; identically the same, except where changed by the deposits of the Drift period.

The reported elevation on the Fort Wayne, Muncie & Cincinnati railroad gives the altitude of the track, where it crosses the Fayette county line, at 881 feet, and the track at Connersville at 838 feet above the ocean, a difference of 43 feet. Surveys made for the White Water Canal in 1834 give the surface of the ground at the Connersville court house at 845 feet, and the surface of White Water River at the junction of the East and West Forks, below Brookville, at 620 feet above tide water, a difference of 225 feet. These altitudes show a gradual descent to the south at the rate of 12 feet per mile on a direct line.

The reader is prepared to understand from the foregoing observations that as a rule the surface of the country is level. The water courses and ravines running into them are bordered by bluffs that are the result of excavating forces that have carried their beds and valleys below the general surface. The creek and river front of the bluffs are steep, but very seldom rocky. Back of the bluffs the surface gradually rises to the watershed between the creeks. Those on the creeks are generally bold, while those on the White Water River are sloping or rounded and, viewed from the river valley, impress the eye as hills broken by cross valleys and ravines. From the elevated points along the valley, and from the bluffs of Big Williams Creek, delightful views of the country can be had, embracing beautiful farms dotted with fine residences, the homes of an intelligent, happy and prosperous people. On the west side of the county, including Orange, and especially Fairview and Posey townships, the land is level or slightly rolling, and in places was wet and swampy, before a system of artificial drainage was put into successful operation. Harrison township and the townships east of White Water River are rolling, with occasional slight ridges and elevations. On account of the creek bluffs the west parts of Connersville and Columbia townships are the most broken parts of the county, but here the vast body of the land is tillable with the plow, and almost every foot is available for blue grass pasture. The rounded and long sloping fronts of the bluffs are covered with a deep bed of yellow clay that is invariably fertile. From north to south through the central part of the county runs the White Water valley proper, having an average width of three miles, and bordered by fertile and in places heavily wooded bluffs that rise nearly 200 feet above the valley plateau. This body of valley land, rich and easily cultivated, is one of the garden spots of the world.

The drainage of the county is effected through numerous small streams, that, with a few unimportant exceptions, are confluent of West White Water River. In former years, before the land was underdrained and

ditched, when the primeval forest in all its grandeur covered alike the valleys, bluffs and upland, many of these little creeks were living streams of water, with mossy, fern-covered banks. Now they are changed into unsightly ditches that are flushed with muddy water only after heavy rains. The summer pools, shimmering in floating patches of shade and sunshine that stole through an arching canopy of green, with their finny inhabitants are gone. Destructive man, without due thought for the future, has exposed the relentless hand of nature, where the beautiful and useful might have been preserved, the love of sylvan haunts encouraged, and extremes of drought and flood in part averted.

Noland Fork Creek unites with White Water River just below the Wayne county line, and is consequently an unimportant factor in the drainage of the county. On the west side of White Water the principal creeks are Lick Creek, Big Williams Creek and its tributaries, Hurricane and Little Williams Creeks and Garrison Creek. Lick Creek is a small tortuous stream with low clay and gravel banks, confined in its course to Harrison township. Big Williams creek rises in Posey and Fairview townships, and before the present system of artificial drainage, was fed from swamps and ponds on the White River and White Water divide or water-shed; formerly it had quite a reputation for furnishing adequate water power to a number of flour mills. North of Connersville township its banks are low and bordered with sand and gravel; for the rest of its course its banks are high and rocky without first or second valley bottoms. The track of the C., H. & I. railroad bridge, where it crosses the creek, is seventy-five feet above the bed of the creek, and the banks grow higher until it passes out through the bluffs into the White Water valley. Hurricane Creek is a short stream that is worthy of note in this connection on account of its steep, rocky banks; its bed at the railroad crossing is thirty-two feet above the bed of Big Williams Creek at Longwood. The bed of Little Williams Creek does not reach down to the stone. Garrison Creek rises in Orange township and flows through Columbia township; for the most part of its course its channel is rocky. On the east side of the river are a number of small streams not usually given on maps of the State that have their origin on the water-shed between the east and west forks of White Water. Bear Creek, a larger creek than those referred to above, empties into White Water a mile or more below Alpine, and is quite rocky in its lower course.

TABLE OF ALTITUDES, FAYETTE COUNTY.

Cincinnati, Hamilton & Indianapolis Railroad.

Miles from Indianapolis	POINTS AT WHICH THE ELEVATIONS ARE TAKEN.	Feet above Ocean.
47.4	Glenwood (Vienna)	1,092
	Summit, 2½ miles east of Glenwood, natural surface	1,116
	Hurricane Creek, natural surface	952
	Big Williams Creek bridge, grade line	995
	Big Williams Creek, bed of stream	920
51.8	Longwood, natural surface	1,111
	Summit, natural level of surface	1,059
	Little Williams Creek, bed of stream	889
54.7	Tyner, natural surface	936
	Summit, natural surface	959
55.9	Salter's Switch, natural surface	919
57.1	Connersville	884
	West Fork White Water River bridge, grade line	840
	West Fork White Water River, bed of stream	807
	Turnpike, 1 mile east of Connersville	853
	Summit, natural level of surface	951
61.5	Lyons, natural surface	896
	Brownsville and Connersville turnpike	863
	Summit, natural level of surface	889
	East Fork White Water River bridge, grade line	802
	East Fork White Water River, bed of stream	773
71.4	Liberty	992

White Water Valley Railroad.

89	Valley Junction, level of track	511
90.7	Dry Fork Creek, bottom of stream	491
92.5	Harrison, level of track	533
108.2	Big Cedar Creek, bottom of stream	585
113.9	East Fork White Water River, bottom of stream	615
114.7	Brookville, level of track	6 7
122.8	White Water River	714
130.7	Garrison Creek, bottom of stream	747
135.8	Big Williams Creek, bottom of stream	764
139.6	Connersville, level of track	832
142.8	Lick Creek, bottom of stream	861
145.2	Beeson's, level of track	889
151.2	Simons Creek, bottom of stream	922
152.2	Cambridge, crossing P., C. & St. L. and J., M. & I	952
155.7	Nettle Creek, bottom of stream	986
155.9	Hagerstown, connection with P., C. & St. L. R. R	1,003

ALTITUDES—Continued.

Other Points in the County.

POINTS AT WHICH THE ELEVATIONS ARE TAKEN.	Feet above Ocean.
Falmouth, base of rail at station.	1,061
Highest point on Cambridge branch J., M. & I., base rails . . .	1,084
Bentonville, base of rail.	1,066
Track at Fayette county line, Ft. W., M. & C. R. R	886
Track at Connersville, Ft. W., M. & C. R. R	838
Bed of Big Williams Creek, Bunker Hill, Prof. Owens	860
Court house yard, Connersville, canal surveys, 1834	845
Junction East and West White Water, canal surveys, 1834	620
Jnction of Lower Silurian and Clinton, at Longwood	956

GENERAL GEOLOGY.

All the native rocks of Fayette county, underlying the Drift clay and gravel, that are exposed in digging wells, and the banks and beds of the creeks and ravines are referred in classification to the Silurian age, Upper and Lower Silurian divisions, and are related to each other and superimposed as shown in the following:

CONNECTED SECTION.

QUATERNARY AGE.

RECENT PERIOD.

Alluvium 5 ft.

DRIFT PERIOD.

Glacial Epoch.

Clay, gravel, sand and boulders 100 ft.

SILURIAN AGE.

UPPER SILURIAN DIVISION.

NIAGARA PERIOD.

Niagara Group or Epoch.

Niagara group quarry stone as exposed on Big Williams Creek 40 ft.

Clinton Group or Epoch.

Siliceous or bastard limestone 20 ft.

LOWER SILURIAN DIVISION.

TRENTON PERIOD.

Hudson River Group or Epoch.

Limestone, shale and marl	200 ft.
Total	<u>365 ft.</u>

HUDSON RIVER GROUP.

LIMESTONE, SHALE AND MARL.

It is remarkable that no blocks or fragments of native stone are seen scattered through the Drift clay or on the surface, except small masses seen in the channels of the creeks that have been torn from beds or detached from the banks of the stream. The entire absence of waste material of the native rocks from the Drift deposits, the result of erosive action, shows that the excavating forces acted slowly and that the formation of the White Water valley, with its network of branching creeks and ravines, existed long ages of time, perhaps thousands of years before the Age of Man.

It was not possible to obtain exact measurements determining the dip of the Lower Silurian, but from what I saw on Big Williams Creek, it is probable that as heretofore stated by Dr. Haymond in his Report on the Geology of Franklin County, Indiana Report, 1869, it is to southeast at the rate of 4 feet to the mile. Comparing 956 feet, as the elevation above the sea of the junction of the Lower Silurian with the Clinton group limestone at Longwood, just above the railroad bridge, with 953 feet as the junction of the same formations at Rossburg, in Decatur county, the difference is seen to be only 3 feet, and hence a very slight dip to the northeast. That there is no dip to the east, unless it be local, is shown by comparing 940 feet the average of seven determinations of altitudes of the top of the Lower Silurian on a line running nearly east of Fayette county, made by Prof. Orton, Geology of Ohio, Vol. I, with 956 feet the elevation of the Longwood locality. My observations together with those of Dr. Haymond show that the water-shed between the White Water and White River valleys does not follow in all its course the western border of the Lower Silurian arch. While the divide from McCoy's, in Decatur county, to Bentonville, in Fayette county, has nearly a straight course, the western border of the upheaval bears to the east from McCoy's until it touches the White Water valley near Metamora, thence west to the southeast corner of Orange township in this county, thence north on a line with the divide. As a result of this deflection from a direct line there is a depression or slight valley running east and west, and depressing the strata of both

Upper and Lower Silurian rocks in the vicinity of Clarksburg. This depression has a bearing on the exposure of the stone seen in the southwest part of Fayette county, and may to a slight degree affect the dip.

LIST OF FOSSILS FOUND IN FAYETTE COUNTY.

LOWER SILURIAN.

<i>Monticulipora</i> —several species.	
<i>Protarea vetusta</i>	Hall.
<i>Streptelasma corniculum</i>	Hall.
<i>Orthis testudinaria</i>	Dalman.
<i>Orthis biforata</i>	Schlotheim.
<i>Orthis occidentalis</i>	Hall.
<i>Orthis sinuata</i>	Hall.
<i>Rhynchonella capax</i>	Conrad.
<i>Rhynchonella ventricosa</i>	Hall.
<i>Strophomena alternata</i>	Conrad.
<i>Murchisonia bellicincta</i>	Hall.
<i>Zygospira modesta</i>	Say.
<i>Raphistoma lenticulare</i>	Emmons.
<i>Bellerophon bilobatus</i>	Sowerby.
<i>Ambonychia costata</i>	James.
<i>Orthodesma rectum</i>	H. & W.
<i>Modiolopsis pholadiformis</i>	Hall.
<i>Calymene senaria</i>	Conrad.
<i>Favosites</i>	Sp?

UPPER SILURIAN.

NIAGARA GROUP.

<i>Stromatopora concentrica</i>	Goldfuss.
<i>Lichenalia concentrica</i>	Hall.
<i>Atrypa reticularis</i>	Linnæus.
<i>Retzia evax</i>	Hall.
<i>Orthis hybrida</i>	Sowerby.
<i>Meristina maria</i>	Hall.
<i>Meristina nitida</i>	Hall.
<i>Orthoceras annulatum</i>	Sowerby.
<i>Orthoceras crebescens</i>	Hall.
<i>Gyroceras elrodi</i>	White.
<i>Calymene niagarensis</i>	Hall.

The Lower Silurian fossils are abundant in all the outcrops, but as they are generally imbedded in the solid stone, no good localities for collecting

cabinet specimens were seen by me; but that such localities exist, I have no doubt. All along the banks of Big Williams Creek from the Harrison township line and Lick Creek, good specimens of the more common and characteristic remains may be found. Fine trilobites, *Calymene senaria*, in an excellent state of preservation, have been found in the blue clay or marl, one-half mile south of the bridge across White Water, at Nulltown, on the east side of the river. Mrs. L. M. Greene, of Beeson's Station, is said to have first discovered the locality, and once had a fine collection of fossils from that place. Niagara group fossils are found in the limestone at the James Ochiltree quarry, but as a rule can not be obtained in good preservation. Miss Mary E. Martion, of Fairview, has a very fine *Calymene niagarensis* that came from the Niagara limestone beds of Garrison Creek, in Orange township. Mr. John Benedict, of Longwood, has quite a fine lot of fossils, collected by himself and Mr. Clay Benedict, in Fayette county. The list given above is by no means complete, and embraces only a few of the more common varieties.

LOCAL GEOLOGY.

LOWER SILURIAN.

The stone of this division occurs in strata varying from a few inches to a foot or more in thickness, alternating with parting of marl. In color it ranges from ochery to blue, and in texture from loose, shelly stone and clay to a hard, crystalline rock. Much of it is composed of a mass of shells and other organic remains, with scarcely enough carbonate of lime and magnesia to form a compact matrix. The partings and strata of marl vary in consistency, an occasional stratum is seen that has the hardness of stone or an indurated shale, while other layers are soft unctuous clays that are highly charged with calcium carbonate and readily effervesce with mineral acids. It is one of these soft, blue clay marl beds that constitute the famous trilobite beds of this and Union counties, and from my own observations am of the opinion that in both counties they are of the same geological horizon. No sections are given as none could be made in this connection showing the actual thickness of the different ledges. The following section taken on the old Connersville and Rushville pike, where it crosses Big Williams Creek, shows the general relation of the Lower Silurian to the overlying Niagara as exposed on the west side of the stream.

Section at Bunker Hill, Connersville Township.

Soil, yellow and blue clay	40 ft.
Niagara group limestone, top ledges cherty and thin-bedded, bedding heavy and stone massive near the middle of the outcrop and below; good quarry stone	35
Clinton group limestone, mixed with iron ore and flinty in part; portions hydraulic; some of the strata fair quarry stone	20
Hudson River (Cincinnati) group limestone, with marlite partings to the bed of Big Williams Creek	30
Total	125 ft.

In former years, while the White Water Canal was being constructed, large quantities of stone were taken from the banks of Big Williams Creek for use in building the locks of the canal, and for the foundations of the Connersville court house. From what I saw, and comparisons made, I come to the conclusion that the bulk of the stone then quarried came from the Clinton group strata. Portions of this stone seen in the locks of the canal have stood the test of time and show sharp angles and square fronts, while other portions have scaled and some have almost crumbled to dust.

The Lower Silurian outcrops in the bed of Big Williams Creek, throughout its course in Connersville township, in the bed of Lick Creek on the road from Connersville to Harrisburg, on Dillman's Creek, near Waterloo, in the banks of Bear Creek, near its confluence with White Water, and at different places on Garrison Creek, in Columbia township.

UPPER SILURIAN.

CLINTON AND NIAGARA GROUPS.

As all the quarry work now being done in the county is confined to the Niagara beds, the Clinton limestone was only seen at isolated points where only an imperfect study could be made, but there is no doubt in my mind that the strata of rough limestone mixed with more or less siliceous matter and iron ore, is referable to the Clinton epoch. Its quality as a building rock has already been discussed. Much if not all the heavy stone formerly used in the county came from the Clinton beds. The strata are generally massive, coarse grained bastard limestones that are much discolored with iron ore. Some of the ledges show heavy bands of iron ore filling the seams and adhering to the surface of the stone. I only saw outcrops on Big Williams Creek.

The Niagara group limestone overlies the Clinton, and is consequently more exposed to the surface than the other groups that are seen only in the banks of the creeks. The Niagara is the surface stone underlying the drift deposit of the county west of the White Water valley, that is struck

in sinking wells on the uplands. It is the country rock of nearly one-half of the county. It is exposed in the bluffs of Big Williams Creek, from the Harrison township line south, in the banks of Garrison Creek, and on Sein's Creek near the county line.

From the following sections it will be seen that the Niagara limestone ledges range from $1\frac{1}{2}$ to 9 inches in thickness. The bedding, like that of all the Niagara outcrops, is remarkably even and uniform for many feet in every direction, showing that the conditions under which the stone was formed were the same over a wide expanse of surface, and undisturbed by rapid or counter and conflicting currents. Some of the upper ledges are mixed with nodules and irregular plates of chert, but as a rule much the greater portion of the strata are beds of clear limestone of the finest quality and uniformity of structure. So far as I saw it, the Niagara stone of Fayette and Franklin counties with very few exceptions was of an ochery color, quite different from the gray, drab or blue color of the equivalent beds of Decatur and Shelby counties. On account of its yellowish ochery color, some of the top ledges that are in contact with the yellow clay have a sodden, rotten appearance that careful examination shows to be due to the color only. The heavy ledges are frequently relieved with patches of blue that show beautifully mottled surfaces when the stone is hammer-dressed. These soft tints so seldom seen in the hard gray limestone reminds one of the brown stone so popular for building purposes in the East.

Mr. J. T. Washam, section 30, township 14; range 12 east, has shown what can be done with this stone in a practical experiment in building a country residence where the soft tinted and variegated stone has been used in the structure. The walls are 18 inches thick, laid of 18-inch ashlar stone placed on the edge, and bound with a course of the same stone placed flat, as in the natural bedding. The building presents a massive and pleasing appearance, and will doubtless last for ages. The inside is plastered directly to the walls, and has not shown signs of dampness even in the closed closets. Before using the stone Mr. Washam tried a simple experiment to test its power to resist the influences of change of temperature and moisture by placing seasoned specimens of the stone in water for a number of years, where it was alternately exposed to the dry heat of summer and the freezing and ice of winter. After being thus tested the specimens, when broken, showed the same homogeneous dry interior as those kept continuously under cover, nor did they show signs of fracture or scaling.

In the Fayette county Niagara beds another desirable variety of building material is added to the vast store of available limestones known to exist in Indiana. The oölitic quarries of Lawrence and Monroe counties furnish the stone out of which is carved the endless variety of ornamental work used in architecture above a massive foundation of hard gray

limestone. From the Big Williams Creek quarries comes a stone which will compare favorably with the best as to durability, and be in demand as an ornamental stone for heavy masonry. Mixed with the gray stone of Decatur county the effect can not be other than pleasing to the eye, and in many styles of building, where it is desirable to harmonize tints, it will wholly supercede any other material.

To the usual chemical constituents of calcium and magnesium carbonates, as found in the Indiana dolomites, the Niagara of Fayette county seems to have added the usual amount of iron oxide in a higher state of oxidation, and it is to this that the ochery color is due.

Section at Wilson Ball's Quarry, one-quarter of a mile south of Longwood.

Soil and yellow clay	6 ft.	00 in.
Wall rock and curbstone, Niagara		4
Wall rock and curbstone		4
Flag, thin		2
Bridge and culvert stone		6
Dimension building stone		7
Dimension stone		6
Thin flag		2
Dimension stone		5
Dimension stone		9
Thin bedded soft stone, rotten at the bottom	10	00
Clay shale, lower Niagara beds	4	00
Clinton group limestone, reddish, hard and heavy bedded	20	00
Hudson River group limestone, with but little marly partings, to the bed of Williams Creek	20	00
Total	61 ft.	9 in.

Mr. Ball's quarries are on the east side of the creek. The work heretofore done has been confined to the banks and heads of the ravines, a few yards back of the creek bluff. The surroundings show that an unlimited amount of stone can be had with but little labor in stripping the stone of soil and clay. The product of the quarry is hauled on wagons to Connersville, or shipped by railroad at Longwood.

Section at J. T. Washam's Quarry—Sec. 30, Tp. 14 N., R. 12 E.

Three cherty ledges, 3 inches thick, Niagara		9 in.
Thin flags		5
Dimension stone		7
Dimension stone		6
Thin flag		2
Flag		4
Blue flag		3
Dimension stone, clouded		6
Thin shelly stone	6 ft.	00
Quarry stone in 6-inch ledges	15	00
Iron ledge, Clinton group		11
Clouded ledge of limestone		6
Blue stone		11
Blue stone		12
Rough stone to rock that will make fair lime, Lower Silurian(?)	12	00
Total	36 ft.	7 in.

This section is that of the quarry from which Mr. Washam obtained the stone for building his residence already mentioned, and includes the Clinton group stone down to the top of the Hudson River group.

Section at the Quarry of James M. Ochiltree, N. E. quarter Sec. 30, Township 14 N., Range 12 E.

Cherty ledges, Niagara group	2 ft.	00 in.
"Gudgeon," a worthless ledge	1	00
Flag		4
Rubble, cherty		6
Flag		4
Flag		4
Flag		4
Rubble that spauls		6
Dimension stone		8
Dimension stone		7
Blue flag		2
Blue flag		5
Dimension stone		10
Thin bedded stone that does not weather		12
Total	9 ft.	00 in.

This section was taken on the west side of Big Williams Creek, where a quarry has been opened in the bed and banks of a ravine that comes down the slope through a dense beech wood. The outcrop is exposed and worked for a distance of nearly 300 yards, and offers every natural advantage in operating a quarry with the least expenditure of money for stripping and disposal of the dump. The width of the ravine is favorable

to easy work, and the drainage all that could be desired; and the same is true of all the quarries seen in this vicinity. At the time of my visit to Mr. Ochiltree's quarry, a small rill was trickling over the shelving ledges, but in the banks where work was being done everything was as dry as could be wished for, considering the recent heavy rains.

Here and at Mr. Ball's quarry the work of raising the stone is effected with the usual supply of drills, bars, picks, hammers, wedges, etc., and the handling done without derricks. Better appliances for handling the output do not seem to be necessary at present, while the product is removed on wagons that can be readily driven to the place where the stone is quarried.

All the Fayette county quarries mentioned above can be connected with the C., H. & I. railroad by switches at a much less expenditure of money than has been made for the same purpose in other counties of the State, and I fully expect that such connections will be made within a few years.

QUATERNARY AGE.

DRIFT PERIOD.

All the vast accumulations of clay, sand, gravel, pebbles and bowlders found covering the country rocks of Fayette county are of foreign origin and referred to the Drift period. The black soil, and the alluvium of the valleys is referred to the Recent period or Age of Man. The relations of the various strata of Drift materials to each other and to the recent deposits of soil are shown in the following sections:

Average of Wells at Fayetteville.

Soil, black	1 ft. to 3 ft.
Yellow clay	10 to 12
Blue clay	3 to 20
Total	14 ft. to 35 ft.

Thomas Ochiltree's Well, Glenwood.

Soil, black	1 ft. 8 in.
Yellow clay	6 6
Hard blue clay	57 6
Sand, very fine	24 0
Hardpan, indurated blue clay	27 0
Stone, Niagara?	33 0
Total	149 ft. 8 in.

Well of Hon. W. W. Thrasher, Fairview.

Soil, black	3 ft.
Yellow clay	8
Blue clay	30
Sand, water bearing	
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Total	41 ft.

Well at Longwood, Connersville Township.

Soil, black	3 ft.
Yellow clay	10
Blue clay or hardpan	20
Sand, water bearing	
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Total	33 ft.

Wells at Everton, Jackson Township.

Soil, black	3 ft. to 3 ft.
Yellow clay	8 to 10
Blue clay	10 to 20
	<hr/>
Total	21 ft. to 33 ft.

These wells give a fair average for the whole county, unless it be on the water-shed between White River and White Water, where the average is doubtless higher, and the Drift deposit exceeds 100 feet or more, as in the vicinity of Glenwood.

The component parts of the Drift may be arranged in the following divisions, commencing at the bottom: 1. Sand or fine gravel. 2. Blue clay or hardpan. 3. Yellow clay. Intermixed with these, but not so uniformly present, are two others of so frequent occurrence as to demand attention, and that are clearly the product of the same forces that deposited the other Drift materials; these are the *gravel beds* and *boulders*.

1. The *sand* and *gravel* resting on the native rocks and underlying the blue clay is not of universal occurrence, but is seldom absent from the bottom of wells that reach down to the country stone. In physical appearance it is usually a bed of fine white sand, saturated with water, and is what is generally known as quicksand.

2. The *blue clay* or *hardpan* is the soft or indurated, struck in digging beneath the yellow clay. Generally it is a hardpan clay, dry and very difficult to dig, as it can not be penetrated with a spade, and the pick will detach no more than the width of the blade. The hardpan beds are impervious to water, and the imprisoned sheet of water beneath it on the slopes, when relieved of pressure, rises to the surface in the form of an artesian spring, as was the case of a well dug some years ago in the

barn-yard of Hon. W. W. Thrasher, of Fairview. When kept constantly moist by water from above it may become softened and assume the character of an unctuous clay. Occasional bowlders are found in it and show more evidence of grinding and polishing action than those of the yellow clay. I have a beautifully polished bowlder taken from the blue clay of a well 32 feet below the surface, by Mr. W. C. Moffitt, of Longwood. Intercalated beds and lenticular deposits of sand occasionally are met with, dividing the blue clay into two or more strata, as in the well of Mr. Ochiltree, at Glenwood.

3. The *yellow clay* stratum is the most generally distributed of all the Drift strata, the blue clay coming next, and everywhere present except in the creek and river valleys. Nowhere did I find it absent and the blue clay exposed on the surface. This fact has an important bearing on the agricultural interests of the county, as the yellow clay is always fertile and the blue clay only imperfectly so. As a surface clay the latter is known as the white or crawfish lands. The yellow clay contains a larger per cent. of gravel than the lower beds and a higher per cent. of bowlders and pebbles. On the high uplands of Orange, Fairview and Posey townships the ratio of gravel is diminished and replaced by fine sand.

The *black* soil of Fayette county is the only earthy matter that is of strictly local and recent origin. This is shown by its much greater accumulations over the flat surfaces and especially over portions of the county that were formerly swampy; those places most favorable to the growth and decay of rank vegetation and its accumulation at the bottom of the swamp or pond. It follows from this that the soil of Fairview and Posey townships is principally black, while that of the balance of this county is a mottled or mulatto soil; that is a soil of alternating patches of black and yellow clay with a lighter covering of black earth. The clay soil is the result of the yellow clay coming to the surface, and is the subsoil of the whole county except in the valleys.

Besides the gravel scattered through the clay beds and in greater per cent. in the slight ridges and hills on the upland, there are other accumulations in which the earthy matter is reduced to a minimum. The latter beds, aside from the vast deposits of the White Water valley, are mainly confined to the banks or bluffs of Big Williams Creek, and are of great economic value in road making. The following section, taken in the bluff bank on the west side of the creek, shows its relations and extent:

Section on Big Williams Creek, crossing of the Fairview and Harrisburg Road.

Soil and clay	5 ft.
Clean road gravel	12
Gravel and conglomerate masses to the water's edge	13
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Total	30 ft.

On the farm of W. C. Moffit, S. W. qr. sec. 18, township 14 north, range 12 east, are other valuable beds that have been opened down twenty-one feet to the water-bearing gravel.

The White Water valley throughout its course in the county, and with an average width of nearly three miles, is covered with gravel to which enough earthy matter is added to make a soil of unrivaled richness. The gravel of the valley, like that of the Williams Creek bluffs, is mostly of metamorphic origin and much water worn. At some points the gravel beds of the valley reach below the channel of the river, and are consequently more than thirty feet thick, while at Waterloo and above toward the Wayne county line the principal portion of the third terrace bottom is a bed of blue clay covered with a gravel soil. The alluvium of the first terrace is enriched by frequent overflows that are said to reach the second bottoms once in eight years. The alluvium of the higher terrace must have been deposited by the river when its expanse was much greater than at present.

Boulders are occasionally found over all parts of the county, but so far as seen by me are most frequent and largest in the west part of Connerville township. No very large ones were seen or reported. Granite, quartzite and greenstone are the most common varieties, and all show the results of erosion.

ECONOMIC GEOLOGY.

AGRICULTURE.

The agricultural resources of Fayette county are practically inexhaustible, yet they may be very much reduced by bad husbandry. The mineral matter essential to vigorous vegetable growth on any kind of land, either black or clay, may fall below that which will produce a paying crop. That there is a deal of bad farming in Indiana every one must admit; the desire to make the most out of the present condition of things, without regard to the future result, is exhausting the farm lands as well as other resources of wealth. The farming of Fayette county is neither better nor worse than that of the adjoining counties; all seem to appreciate the fact that rotation in crops and adaptation of crops to certain soils, with a liberal addition of fertilizers, are necessary to maintain the usual yield of corn, wheat and grass. As already indicated, the yellow clay stratum, together with the underlying blue clay, is not the result of the decomposition of the native stone, but of an origin foreign to the county. Notwithstanding its foreign origin, it is doubtless largely due to the disintegration of rocks, the equivalent of the Fayette county Silurian, and hence has characters more nearly resembling the famous blue grass belt of Kentucky than some other counties of the State. As a corn producing region the black lands have no superior. The mixed or "mulatto" lands produce bountiful crops of wheat, and blue grass flourishes luxuriantly on the broken or

other lands. The farming resources of the county are varied and constitute an unfailing source of wealth; nor are the present citizens likely to permit the high state of cultivation in which they have their farms to depreciate, but rather improve with years and experience.

LIVE STOCK.

Great interest is paid to the growth of cattle, horses, mules, sheep, etc., as might be expected from its luxuriant blue grass pastures. The Hon. W. W. Thrasher, of Fairview, has kept a registered herd of Short Horn cattle for the last forty years. Mr. Ed. Beaver, near Fayetteville, the Munger Brothers, of Bentonville, and the Hon. J. N. Huston, of Connersville, and others, are largely interested in breeding fine cattle. Dairying, as a profitable business, has assumed definite shape in the establishment of the Old Elm Creamery, at Connersville.

FRUITS.

Orchard products are not very abundant, and only hardy varieties seem to succeed tolerably well. One gentleman, living for years in one of the western townships, said to me that he would sue a man for damages who should put out an orchard on his farm; perhaps he had been eating crabs and was a little sour. There is no doubt but in selected localities the apple can be grown profitably. The Maiden Blush is said to be the most productive apple grown, and generally fruits well. Grapes do well; and the abundant crop of May cherries I saw in and around Everton, is evidence to my mind that if the people in that vicinity do not have cherry tarts and pies it is because they are too improvident to plant the trees.

MANUFACTORIES.

The following are some of the leading manufacturing establishments of Connersville: Indiana Furniture Association, bureaus, bedsteads and wash stands; Connersville Furniture Mfg. Co.; Munk & Roberts, Mfg. Co.; Cooley Morrison Mfg. Association; all the above are engaged in manufacturing furniture, and employ about eight hundred hands. P. H. & F. M. Roots, foundry and manufacturers of Roots' Rotary Blower. McFarlan & Sons, carriage shop, work seventy-five men. Western Hosiery Mills employ about one hundred and fifty girls. Two large flouring mills and a hominy mill.

OTHER RESOURCES.

Sand for plastering and building purposes is abundant. If lime is burned in the county I did not hear of it. There are several tile factories and clay for brick and tile is found in almost any neighborhood. The building stone has already been discussed under the head of Local Geology.

The county has two excellent papers, *The Connersville Times*, Republican, Mr. Sinks editor and proprietor, and the *Examiner*, Democratic, Mr. Higgs, editor.

TIMBER.

Much still remains of the heavy timber that formerly grew over all parts of the county. Beech, is perhaps, the most common; oak, ash and elm are not infrequent, and maple and hickory abundant in certain localities. Yellow poplar (*Liriodendron tulipifera*), a species of timber that likes a dry soil, once grew in great profusion on the high land east of Glenwood. A famous grove of yellow poplar formerly existed on the west line of Connersville township, one mile wide and six miles long.

BEEES AND FISH.

Mr. Dan. Wurth, of Fairview, and Mr. Jonas Schall, have demonstrated that the bee business can be made a financial success as an exclusive occupation. Efforts are being made, with great promise of success, to grow the German carp fish in artificial ponds, by Mr. Jasper N. Davis, Jr., Mr. Charles Brown, Mr. Thomas Brown, and Mr. Matt. Lair.

ARCHAEOLOGY.

Indian mounds, so called, are not infrequently met with, but none came under my immediate notice. From reports they seem to have been all small. Relics are common, and Mr. Milton Trussler, who resides near Everton, is said to have one of the finest collections in the State; on account of the death of his mother-in-law at the time I was in that vicinity, I was prevented from seeing his cabinet.

THANKS.

Acknowledgments are due all the citizens of the county that I met, and especially to Hon. W. W. Thrasher, of Fairview; Hon. W. H. Boadus, of Harrisburg; Hon. J. N. Huston and Mr. Sinks, of Connersville; Mr. John Benedict, of Longwood; Mr. Jasper N. Davis, of Connersville township; Mr. Thomas Ochiltree, of Glenwood; Mr. Jos. Ramsey, Jr., Civil Engineer of Cincinnati, Hamilton & Dayton R. R.; Mr. R. L. Read, Civil Engineer of White Water R. R., and especially to the kindness of Prof. E. A. Allen, of Rising Sun, who accompanied me while doing field work, and for valuable suggestions, etc.