GEOLOGY OF BOONE COUNTY.

S. S. GORBY AND S. E. LEE.

Boone County, named in honor of the heroic pioneer of Kentucky, was organized by act of the Legislature in 1829. It is situated just west of the center of the State, and is bounded on the north by Clinton County, on the east by Hamilton, on the south by Marion and Hendricks, and on the west by Montgomery. The county is twenty-four miles in length from east to west, and eighteen miles in width from north to south, and embraces an area of 432 square miles.

At the time of its organization Boone County was a dense wilderness, the total population being less than 500. The following table, taken from the United States Census Reports, shows the population of the county in the several decades since 1830:

Population in 1830	621
" 1840	8,121
" 1850	11,631
" 1860	16,753
" 1870	22,593
" 1880	25,922

There are twelve civil townships in the county, viz: Sugar Creek, in the north-west corner of the county; Washington and Clinton, in the northern part of the county; Marion, in the north-east corner; Jefferson, in the western; Center, in the central, and Union, in the eastern part of the county; Jackson, in the south-west; Harrison and Perry, in the southern, and Worth and Eagle, in the south-eastern part of the county.

Lebanon, the county seat, is in the exact geographical center of the county. The second principal meridian runs through the center of the city. The population of Lebanon in 1870 was 1,572; in 1880 it was 2,625, an encouraging increase.

Lebanon is mainly a commercial city, though manufactures receive considerable attention. Commodious and elegant churches, school buildings, and other public structures, attest the enterprise, taste, and general prosperity of the citizens. The Cincinnati, Indianapolis, St. Louis & Chicago Railroad passes through the city, running a north-west and south-east direction through the county. This road furnishes excellent facilities

for traffic. The Midland Railroad, formerly known as the Anderson, Lebanon & St. Louis Railroad, runs nearly due west from the east line of the county until it reaches Lebanon, where it crosses the C., I., St. L. & C. R. R., and then pursues a south-westerly course to the Montgomery County line. The Midland Railroad is now in process of construction, and it is expected that it will be completed at an early day. The proposed Toledo & St. Louis Air Line Railroad runs south-westerly across the north-west corner of the county, crossing the C., I., St. L. & C. R. R. at Thorntown. A considerable portion of this road was graded some years ago, but owing to a lack of funds to complete the road the work was temporarily abandoned. The Indianapolis, Bloomington & Western Railroad crosses the south-west corner of the county.

The public roads of the county are being rapidly put into the very best condition. No county in the State is at the present time showing more enterprise in the construction of gravel roads and other public improvements than Boone. With one or two exceptions the graveled roads are all free. The very best of gravel for road building is found at convenient points, and the citizens are rapidly utilizing this excellent and cheap material in every part of the county.

Thorntown, situated in the north-western corner of the county, in Sugar Creek Township, is a pleasantly situated town of nearly 2,000 population. It is an important station upon the C., I., St. L. & C. R. R.

Zionsville, the next town in size and commercial importance, is situated in the south-eastern corner of the county, in Eagle Township. The population of this town, in 1880, was 855. It is a station on the C., I., St. L. & C. R. R.

Jamestown, a station on the I., B. & W. R. R., is situated in the south-west corner of the county, in Jackson Township. This is a growing town, also, which had, in 1880, a population of 696.

Besides the towns above enumerated, there are the following named villages, many of which show remarkable evidences of prosperity:

Whitestown, on the C., I., St. L. & C. R. R., in Worth Township; Holmes Station, in the south-east corner of Center Township, on the same railroad; Eagle Village, one mile north-east of Zionsville; Northfield, in Union Township, five miles north of Zionsville; Rosston, one mile north-west of Northfield; Royalton, five miles south-west of Zionsville; Fayette, in Perry Township, three miles west of Royalton; Brunswick, six miles east of Jamestown; Millegeville, six miles south of Lebanon; Advance, nine miles south-west of Lebanon; Dover, eight miles west of Lebanon; Mechanicsburg, eight miles north of Lebanon; Elizaville, seven miles north-east of Lebanon; Ratsburg, three miles east of Lebanon; Slabtown, nine miles north-east of Lebanon, and Big Springs, three miles south-east of Slabtown.

The territory embraced in Boone County was originally the home of

the Eel River tribe of the Miami Indians, from whom it was acquired by treaty and purchase in 1828. As early as 1819 the French and Indians had a trading-post at Thorntown. It is even claimed by some historians that the trading-post at Thorntown was established as early as the year 1715. The Indians continued to occupy the county, to some extent, until 1835.

The first permanent white settler in Boone County was Patrick H. Sullivan, who located near the site of Zionsville, where he continued to reside until his death, in 1826. Jesse Lane settled in the eastern part of the county, near Northfield, in 1826. George Dye, a noted Indian scout and enterprising pioneer, with his family, settled in the same vicinity soon after. Settlements were commenced at Thorntown and Jamestown at about the same period.

Lebanon was located, named, surveyed and platted, and made the county-seat in 1830. Mechanicsburg was surveyed and platted in 1835. The Michigan Road was located through the county in 1828.

For a number of years the growth of the county was slow, compared with many other counties in the State, but recent years have shown a marked increase in the population. The material growth of the county, in the meantime, has fully kept pace with the advance in population. The farming lands of the county are of the most productive character, and susceptible of the highest state of cultivation. The best improved farm machinery may readily be operated upon any of the farm lands. The intelligent manner in which the fields are being cultivated gives evidence of the fact that the benefits to be derived from superior cultivation are fully appreciated by the Boone County farmers.

The Boone County Agricultural Society holds an annual fair at Lebanon, and the displays of stock, choice cereals, fruits and vegetables exhibited there rank with those of the very best agricultural counties of the State.

TOPOGRAPHY AND DRAINAGE.

Boone County lies wholly within the Drift area of Indiana, consequently the surface consists of level or gently rolling lands. The central portion of the county consists of a broad, slightly elevated plateau, with frequent depressed areas of considerable extent. These depressions, though now only a few feet in depth, formerly accumulated enough water and vegetable matter to form in many places swamps or bogs of considerable depth. Thorough drainage, however, has transformed these impassible swamps into fertile fields, and the numerous bogs that formerly yielded nothing but malarial poisons, now produce enormous crops of grain, grass and fruit. This plateau forms the hight of land or summit between White

River and the Wabash. It is really a low, broad ridge, or series of ridges, built up of the transported sand, gravel, bowlders and clays of the glacial period. The general direction of the ridge is from east to west.

The eastern part of the county, along Eagle Creek, is considerably rolling. Eagle Creek rises in Marion Township, in the north-east corner of the county, flows south until it reaches the Hendricks County line, whence it pursues a south-easterly course to White river, into which it flows a few miles below Indianapolis. Several small branches enter Eagle Creek from the east and west, and the modifications of the surface produced by the erosions of these small streams tend to create a diversity of surface scenery that would otherwise have maintained a monotonous outline.

The south-eastern part of the county, in the vicinity of Zionsville, and west for five or six miles, is quite rolling. Numerous small, deep valleys lie between high, prominent ridges. The general direction pursued by the small streams in this part of the county is southerly, consequently the ridges generally run north and south. The valleys are the result of local erosions since the deposition of the Drift. The depth of the valleys varies from twenty-five to one hundred and twenty-five feet. Fishback Creek, which rises near Whitestown, flows south through this region.

The north and south forks of Eel River rise in the central part of the county and flow south-westerly to the Hendricks County line, near Jamestown. The two branches unite about two miles north-east of Jamestown. The course of Eel River, after it leaves Boone County, is south-westerly, then southerly until it finally unites with the west fork of White River, at Worthington, in Greene County.

The southern part of the county is generally level, or only slightly rolling, except a considerable portion along Eel River and the smaller water courses, which, owing to erosions, is more rolling and declivitous. West of Lebanon, and south and west of Dover, and also in the vicinity of Advance, the lands are just sufficiently rolling to give suitable facilities for draining the occasional swampy tracts. Raccoon Creek flows south-westerly through Jackson Township, and Walnut Creek flows westerly through the southern part of Jefferson Township. Muskrat Creek flows westerly through the central part of Jefferson Township, while Wolf Creek flows north-westerly through the northern part of the same township, and empties into Sugar Creek about two miles west of Thorntown. These streams, with their smaller branches, receive the drainage from the swampy tracts through the surface ditches and underground tiles.

Sugar Creek rises in the eastern part of Clinton County, and flows south-westerly until it crosses the Boone County line, north of Lebanon. It then flows a westerly course through the north-west corner of Boone County. Crossing the Montgomery County line it again pursues a south-westerly course to the Wabash River. Prairie Creek, which rises in the vicinity of Lebanon, flows north-westerly through Center, Washington and Sugar

Creek townships, and empties into Sugar Creek just north of Thorntown. Mud Creek, and some other small streams, rise in the northern part of the county and flow into Sugar Creek.

The citizens of Boone County fully appreciate the benefits to be derived from a thorough system of drainage. When the swamps and bogs of the county are thoroughly drained there are no lands in the State that excel them in productiveness. The number of rods of drain tile in operation in the county in 1882 was 293,484; in 1883, 397,862; in 1884, 519,151, or 1,622 miles. During 1884 there were constructed 4,160 rods—thirteen miles of surface ditches. In a few more years a perfect and complete system of drainage will be in operation throughout the entire county.

SOIL AND PRODUCTS.

The following is the definition of "loam:" "A soil chiefly composed of silicious sand, clay and carbonate of lime, with more or less of the oxide of iron, magnesia and various salts, and also decayed vegetable and animal matter, giving proportionate fertility."

The soils of Boone County consist largely of a loam composed of the materials enumerated above. A large portion of decomposed vegetable matter enters into the composition of the soil in all of the low, swampy tracts, and the great fertility of these lands, when they are thoroughly drained, is well known to every agriculturist.

Frequent patches occur throughout the county, varying in extent from a few acres to several hundred acres, where the soil consists of a light colored or gray clay. This clay contains a large per cent. of silica, and it is probably a mass of the blue or bowlder clay exposed at the surface, and changed to a light-gray color by years of bleaching and washing. Without the liberal application of fertilizers this clay soil does not produce profitably. In some localities there is a very large proportion of sand in the soil, in others clay predominates, and in others various modifications of the two elements produce soils of great diversity. These diverse conditions of the soil enable the farmers to cultivate a greater variety of crops with success and profit. A proper knowledge of the constituent elements of the soil, and a further knowledge of the elements required to produce a particular crop, will enable the farmer to apply economically the very elements required to make his land yield the desired crop. In a county like Boone, where there is not necessarily an acre of waste land, where the land is generally level or nearly so, and where there is no waste of the fertile elements of the soil during the periodical rainy seasons, the thorough application of suitable fertilizers is attended with the most satisfactory results.

Nature has already accomplished much for the farmers of Boone by the deposition of a suitable sub-soil and later accumulations containing the

most productive elements. To retain the productive qualities of the most fertile lands, and bring the less productive areas up to the higest standard of excellence, and at the same time secure remunerative crops from his tilled land, is the ultimate object of every farmer in the management of his farm. To accomplish this he must have a perfect system of drainage in operation upon his farm; he must exercise care in securing a proper rotation of crops so as not to exhaust the soil, and then, by the continued application of those fertilizers that will restore the lost elements, and a careful cultivation of the crops, he may expect the most remunerative results.

In 1884 there were 634,438 bushels of wheat harvested in Boone County from 52,113 acres, an average of a little more than twelve bushels per acre. In the same year there were produced 1,635,763 bushels of corn from 51,189 acres, an average of about thirty-two bushels per acre. The yield of oats was 106,277 bushels from 3,339 acres. In 1882 the yield of wheat in Boone County was 852,955 bushels; corn, 2,095,-090 bushels; oats, 78,992 bushels.

In 1884 Boone County had 13,012 acres in timothy meadow, which produced 21,861 tons of hay. In the same year there were 16,029 acres in clover meadow, producing 24,483 tons of hay, and 3,609 bushels of clover seed. The yield of timothy hay in 1882 was 24,994 tons, and of clover hay 32,560 tons. The foregoing examples of crops show that the soils of Boone County are fully up to the average in productiveness.

GEOLOGY.

The surface deposits of Boone County consist wholly of sands, gravels, clays and bowlders. No exposures of solid rocks in place appear in the county. In the western part of the county the rocks are sometimes reached by the auger or drill in boring or driving wells, but they are always at a considerable depth below the surface. In a few instances limestone has been touched in the wells, and occasionally sandstone has been found, but more commonly the stone reached in the bores is a silicious shale or "soapstone." In the eastern half of the county the total depth of the Drift is unknown, as no wells have ever been bored through it. It is known, however, to be more than 100 feet thick, and in places is probably 300 or 400 feet in thickness. The blue clay generally alternates with layers of sand and gravel, but in some localities it lies in great compact, homogeneous masses, without laminations or evidence of stratification.

The elevated area, extending through the county from east to west, was evidently the summit of an ancient terminal moraine, the original hight of which far exceeded the altitude of the highest elevations now to be found in the county. It is also evidently true that a series of high ridges

occupied almost the entire area of the county. As the glaciers were gradually dissipated under the influences of a temperature which slowly increased in fervency, the waters from the melting masses of ice sought out various courses through the many depressions between the more elevated hights, and struggling on from one depression to another at last found their way to the sea. Since the transported masses of Drift were once piled up, in places, to a hight exceeding, by hundreds of feet, the greatest elevations now remaining in the Drift area, it is very probable that the valleys, or depressions between the ridges and hills, were once considerably below the level of the lowest lands of the present day. In many places, doubtless, the bare, planed surfaces of the rocks were exposed. The return of congenial seasons, with continued days of sunshine and frequent moistening showers, resulted in the spread of vegetation over a large portion of the Drift area. It is quite evident that in some localities vegetation grew in profusion, especially along the southern limits of the Drift deposit. The growing plants covered the sides of the slopes, and also the lower grounds around the margins of the lakes and streams. Even in the marshes, ponds and lakes, aquatic and semi-aquatic plants grew in wild luxuriance. Evidence of these facts abound throughout the Drift area. The continued rainfall washed the loose particles of material from the slopes of the hills and ridges and gradually filled up all the low places, completely covering the masses of vegetable matter that grew and accumulated in the low grounds, and thus underground "peat bogs" were formed. These buried masses of vegetation are quite frequently found in digging and boring wells in Boone County, and many other counties of the State. They are found at depths of from ten to sixty feet below the surface. Professional well diggers and drivers call them "swamps." The appearance of the mud and accumulated vegetable matter found in them is almost identical with that of a surface swamp. The mud is black, usually soft and miry, and consists largely of decayed vegetable matter. Leaves, twigs, and trunks and branches of trees are frequently found in them.

On the farm of Mr. John M. Shelly, in Jackson Township, four miles north of Jamestown, a well was bored, in which, at the depth of forty-six feet, a *swamp* was reached which was twelve feet in thickness. The following is the complete section of the bore:

SECTION OF JOHN M. SHELLY'S WELL.

Soil and yellow clay, mixed with sand	12 ft.
Yellow sand	2 ft.
Hard gravel	4 ft.
Hardpan—gravel	4 ft.
White sand	6 ft.
Sand and clay—bluish	18 ft.

Black muck or loam, with branches of trees and other vegetable matter	12 ft.
Blue clay	4 ft.
Gray sand, gravel, etc.	26 ft.
Total	88 ft.

On the farm of Mr. Isaac Emerts, two and one-half miles north of Jamestown, a well was bored in which the *swamp* was reached at a depth of sixty feet, A considerable layer of blue clay lies over it. The following section was obtained from Mr. James A. Ball, of Thorntown, who bored the well. At the depth of seventy-five feet the rock was reached, and the boring was continued through the shale, or "soapstone," as the workmen termed it, to the depth of 235 feet:

SECTION OF MR. ISAAC EMERTS' WELL.

Soil	2 ft.
Yellow clay and sand	28 ft.
Quicksand	1 ft. 6 in.
Blue clay	29 ft.
Black muck, leaves, twigs and branches of trees	3 ft.
Sand and clay	12 ft.
Silicious shale—"soapstone"	160 ft.
Total	235 ft. 6 in.

A well was dug on the farm of Mr. Seth W. Porter, six miles west of Lebanon, in which a walnut branch five inches in diameter was found in the blue clay a few feet below the surface. The well was only eighteen feet deep, and the following is the

SECTION:

Soil	2 ft.
Blue Clay	11 ft.
Sand.	5 ft.
Total	18 ft.

In digging a well on Main Street, just east of the Public Square, in Lebanon, the workmen passed through two feet of soil and twelve feet of blue clay, when a stratum of sand was reached in which were a large number of shells in a good state of preservation. Dr. A. G. Porter pronounced them to be fresh-water shells. About four feet lower down, in gravel, a number of Lower Silurian fossil-shells—*Rhynchonella capax*—were found.

At Witt & Klizer's flouring-mill, at Thorntown, a well was dug to the depth of 104 feet, and then continued by boring to the depth of 343 feet. At the depth of 100 feet, the trunk of tree, apparently northern cedar, several inches in diameter, was found. The trunk of the tree extended

entirely across the well. The exposed portion of the tree was nearly perfect, showing no scars nor effects of abrasion, such as would have resulted from violent contact with rocks or other hard substances.

The following is the entire section of the well, obtained from Mr. Ball, who superintended the boring:

SECTION OF WITT & KLIZER'S WELL, THORNTOWN.

Soil	2 ft.
Yellow clay	19 ft.
Quicksand	4 ft.
Blue clay	125 ft.
Silicious shale—"soapstone"	193 ft.
Total	843 ft.

A section of the same well obtained from the engineer at the mill, who assisted in digging the well and also in the work of boring, differs very materially from that given by Mr. Ball. As no notes were taken by either of the gentlemen, and the sections were given from memory, it is not to be assumed that either should be absolutely correct.

SECTION OF WITT & KLIZER'S WELL, THORNTOWN.
(Obtained from the Engineer at the Mill.)

Soil	2 ft.
Yellow clay	13 ft.
Gravel	3 ft.
Blue clay	82 ft.
Cedar tree	
Blue clay	37 ft.
"Soapstone"	60 ft.
Gray limestone	136 ft.
Total	333 ft.

It is quite probable that the carbonated hydrogen gases so frequently found in the Drift clays of northern Indiana are gases that were generated in the masses of buried vegetation so frequently occurring throughout the Drift area. The gas is found at depths varying from twenty to seventy-five feet—depths corresponding with those at which the buried vegetations occurs. The flow of gas is always much stronger when it is first struck, and it gradually diminishes in volume until it finally ceases altogether! This indicates that the gas is confined in a pocket, or limited reservoir, from which no continued supply may be expected. Confined in the ancient swamp beds beneath the impervious, massive layers of indurated blue clay, it will remain imprisoned for ages without sensible change in volume or chemical composition.

At many points throughout Boone County this gas has been found in the Drift. In a well three miles south-east of Elizaville, on the Michigan Road, which was bored by Mr. Ball, of Thorntown, gas was found at a

depth of forty-one feet. It flowed strongly for a short time from a stratum of fine, white sand, which probably accumulated on the margin of a small lake. The following is the

SECTION OF THE GAS WELL.

Soil and yellow clay	18 ft.
Quicksand	3 ft.
Blue clay	20 ft.
White sand—gas	11 ft.
Blue clay	6 ft.
Swamp muck, leaves, twigs, etc	7 ft.
Blue clay	19 ft.
Total	84 ft.

In a well bored upon the farm of Clairborne Cain, five miles west of Lebanon, gas flowed from a stratum of gravel five feet in thickness, which was reached at a depth of seventy-three feet.

SECTION OF MR. CAIN'S WELL.

Soil and yellow clay	17 ft.
White quicksand	5 ft.
Blue clay	51 ft.
Dry gravel—gas seam	5 ft.
Blue clay	165 ft.
Total	243 ft.

At the depth of two hundred and forty-three feet obstructions accumulated in the pipes, and the boring had to be discontinued. It is unfortunate that the obstructions should occur before the entire thickness of the great stratum of blue clay was ascertained.

At Jamestown, and many other localities throughout the county, gas, in small quantities, has been found in boring and digging wells. But in every instance the flow of gas is strongest when it is first reached, and it soon gradually ceases altogether. In no instance has a continuation of the bore ever resulted in developing a stronger flow of gas, and in no instance has it ever been found in bores continued into the paleozoic rocks. The futility, then, of expecting to find the great reservoir from which the gas accumulated in the Drift has escaped is very apparent. The gas of the Drift areas is merely local accumulations resulting from the decay of buried vegetable matter. Although this gas will burn, it has never yet been found in a quantity sufficient to entitle it to consideration from an economic standpoint.

The blue clays of Boone County are generally in dense, stiff, indurated masses, unlaminated, and without evidence of stratification. At many points they form the surface soil, where they may be recognized by their ash-gray or whitish color, and uniformly fine and even texture. The whitish

appearance is due to years of leaching and bleaching. In their natural state these clays form an unproductive soil, which can only be made profitable by a liberal use of manures.

The well on Washington Street, Lebanon, shows a varying condition of strata to a depth of about forty feet. The following is the

SECTION OF THE WELL ON WASHINGTON STREET, LEBANON:

Soil	7 ft.
Yellow sand	1 ft.
Yellow clay	3 ft.
Bluish sand and clay	1 ft.
Sand	4 ft.
Blue clay	3 ft.
Sand and gravel	4 ft.
Blue clay	2 ft.
Gray clay	3 ft.
Hard-pan—indurated clay	4 ft.
Blue (laminated) clay	14 ft.
Gray clay	3 ft.
Sand and clay	10 ft.
Blue clay	23 ft.
Coarse gravel	1 ft.
Blue clay	25 ft.
Total	108 ft.

The well of Mr. D. M. Burns, Civil Engineer, which is located on his farm, two miles north of Lebanon, on the Frankfort road, exhibited the following

SECTION:

Soil	2 ft.
Yellow clay	7 ft.
Gravel and sand	2 ft.
Blue clay	22 ft.
Gravel	2 ft.
Gravel and clay	3 ft.
Blue clay	50 ft.
Bowlder	1 ft.
Blue clay	23 ft.
Total	112 ft.

In the vicinity of Ratsburg no accurate knowledge of the depth or character of the Drift could be procured. Water is obtained in required quantities at from ten to twenty feet below the surface. The following section of Mr. J. M. Chambers's well illustrates the character of the deposits there so far as known:

SECTION OF MR. CHAMBERS'S WELL, RATSBURG.

Soil	1 ft. 6 in.
Gray clay	16 ft.
Sand	6 in.
Total	18 ft.

In this locality water is always found in the first layer of sand.

In the vicinity of Slabtown water is obtained at depths varying from twenty to fifty feet. The well of Mr. George Dischman, at that place, presents fairly all that could be ascertained regarding the Drift in that locality.

SECTION OF GEORGE DISCHMAN'S WELL, SLABTOWN.

Soil	2 ft.
Blue clay	30 ft.
Gravel	6 in.
Blue clay	14 ft.
Total	46 ft 6 in

In the neighborhood of Big Springs, water is abundant in wells at from eight to ten feet below the surface. The surface deposits are soil and gravel, no clay being reached at that depth. Numerous springs throughout this region flow out at the surface of the ground.

At Rosston, water is obtained at from eight to twenty feet below the surface.

SECTION OF AVERAGE WELLS AT ROSSTON.

Soil	1 ft. 6 in.
Red clay	8 ft.
Sand and gravel	1 to 10 ft.
Total	19 ft. 6 in.

At Northfield, water is obtained at from twenty to forty feet below the surface.

SECTION OF AVERAGE WELL AT NORTHFIELD.

Soil	2 ft.
Yellow clay	10 to 20 ft.
Sand or gravel	10 to 20 ft.
Total	42 ft.

The wells at Clarkstown are from fifteen to forty-five feet deep.

SECTION OF AVERAGE WELL AT CLARKSTOWN.

Soil	2 ft.
Yellow clay	6 to 10 ft.
Blue clay	10 to 30 ft.
Total	42 ft.

The wells at Zionsville are from twenty to sixty feet in depth.

AVERAGE OF WELLS AT ZIONSVILLE.

Soil	2 ft.
Yellow clay	10 ft.
Blue clay	4 to 10 ft.
Gravel	1 to 3 ft.
Blue clay	20 to 40 ft.
Total	65 ft.

At Royalton water is usually obtained at depths varying from ten to forty feet. Messrs. Foster & Leap, however, had a well bored to the depth of ninety-five feet.

SECTION OF FOSTER & LEAP'S WELL, ROYALTON.

Soil	3 ft.	6 in.
Yellow clay	17 ft.	
Gravel	5 ft.	
Blue clay, with frequent thin layers of sand and gravel	70 ft.	6 in.
Total	96 ft.	

Water is usually procured at Jamestown at depths varying from twenty-five to thirty feet. The deepest well in the town is located at the saw mill.

SECTION OF WELL AT THE SAW MILL, JAMESTOWN.

Soil	3 ft.
Yellow clay	8 ft.
Quick sand	1 ft.
Blue clay	28 ft.
Gravel	2 ft.
Blue clay	48 ft.
Total	90 ft.

SECTION OF WELL AT THE GRIST MILL, JAMESTOWN.

Soil	0 ft.	8 in.
Yellow clay	10 ft.	
Sand	2 ft.	
Blue clay	49 ft.	
Total	61 ft.	8 in.

In digging a well just south of the railroad, near the depot, at Jamestown, a few years ago, a small reservoir of gas was struck which exploded with some force, and burned with some violence, but the flow lasted only a few minutes, when it ceased altogether.

The wells at Brunswick vary from eleven to thirty-five feet in depth.

AVERAGE SECTION OF WELLS AT BRUNSWICK.

Soil	1 to 2 ft.
Yellow clay or gravel	5 to 10 ft.
Sand and gravel	1 to 3 ft.
Blue clay	4 to 20 ft
Total	11 to 35 ft.

AVERAGE SECTION OF WELLS AT MILLEDGEVILLE.

Soil	1 to 2 ft.
Yellow clay or gravel	5 to 10 ft.
Gravel and sand	1 to 10 ft.
Blue clay	5 to 20 ft.
Total	12 to 42 ft.

By digging through the soil and sand in the vicinity of Dover to the depth of seven feet an abundance of water is found. A short distance north of Dover, on the farm of Mr. Thomas McDaniel, a well was dug to the depth of twenty-two feet six inches.

SECTION OF THOMAS M'DANIEL'S WELL.

Soil	1 ft.
Yellow clay	6 ft.
Blue clay	15 ft.
Gravel	6 in.
Total	22 ft. 6 in.

Mr. Ball, of Thorntown, bored a well for Mr. Gar. Vandeveer, six miles south of Lebanon, in which a large amount of vegetable matter was found in an ancient *swamp*, now buried sixty-five feet beneath the surface.

SECTION OF MR. VANDEVEER'S WELL.

Soil	2 ft.
Yellow clay	18 ft.
Blue clay	45 ft.
Swamp muck, leaves, twigs, etc	10 ft.
Blue clay	25 ft.
Sandstone	9 ft.
Total	109 ft.

Three miles north of Thorntown Mr. Ball bored two wells on opposite sides of the road, one of which was for Mr. S. Dukes, and the other was for Mr. Al. Wetherald. The depths of the wells were 185 and 187 feet respectively. The strata were the same in both wells. The following is the

SECTION:

Soil and yellow clay	18 ft.
Quicksand	12 ft.
Blue clay	153 ft. 6 in.
Red sandstone	3 ft. 6 in.
Total	187 ft.

In the vicinity of the Montgomery County line the thickness of the Drift is much less than it is in the central part of the county. The following section of Mr. Louis Dunbar's well, just over the line in Montgomery County, is about an average of the wells in that vicinity. The paleozoic rocks are usually reached at a depth of from 20 to 40 feet.

SECTION OF MR. DUNBAR'S WELL.

Soil and yellow clay	20 ft.
Dry white sand	2 ft.
White "sandstone"—probably chert	44 ft.
Total	66 ft.

North of Sugar Creek, in Montgomery County, near the Boone County line, Mr. Ball states that the cherty layers of stone are always found at from 20 to 30 feet below the surface.

SECTION OF WELL ON MR. WM. MILLS'S FARM, ONE MILE WEST OF THORNTOWN.

Soil and yellow clay	25 ft.
Quicksand	3 ft.
Blue clay	80 ft.
Total	108 ft.

On the farm of Mr. Frank Harris, one mile south of Thorntown, a well was bored to the depth of 132 feet, which showed a great thickness of blue clay, which is underlaid by cemented gravel.

SECTION OF MR. HARRIS' WELL.

Soil and yellow clay	19 ft.
Quicksand	4 ft.
Blue clay	103 ft.
Cemented gravel	6 ft.
Total	132 ft.

West of Thorntown about one and one-half miles is a heavy deposit of dry gravel. The total thickness of the bed is not known. On the farm of Mr. Charles Moffit a well was dug through 4 feet of soil and 40 feet of gravel, when the work was discontinued without finding water. At other points in the same locality the gravel is known to be of a very great depth. Also in the vicinity of Lebanon there are numerous thick beds of gravel. Gravel occurs all over the county at points sufficiently convenient of access to be economically used for road-making.

Sand of good quality for plastering and building purposes and for the manufacture of tiles, brick, etc., is readily obtained in any part of the

county. It is often found in beds of great thickness. On the farm of Robert Woody, three and one-half miles west of Thorntown, a stratum of sand fifty-five feet in thickness was passed through in boring a well. The following is the

SECTION OF MR. WOODY'S WELL.

Soil and yellow clay	18 ft.
Fine white sand	55 ft.
Blue clay	71 ft.
Limestone	3 ft.
Total	147 ft.

Throughout the north-western part of the county quicksand almost uniformly occurs under the yellow clay. The thickness of the beds of quicksand varies from two feet to fifteen feet. The yellow clay runs from three to thirty feet in thickness. The section of a well three miles east of Thorntown, near the Union Church, illustrates the character of the deposits throughout that region:

SECTION OF WELL NEAR UNION CHURCH.

Soil and yellow clay	27 ft.
Quicksand	9 ft.
Blue clay	75 ft.
Total	111 ft.

PALEOZOIC GEOLOGY.

Since no exposure of Paleozoic rocks occur in any part of Boone County, any statements concerning the underlying formations and groups would be unreliable and gratuitous. The workmen who continued the bores in wells until the rocks were reached were barely able to distinguish the various kinds of rocks—shales, sandstones or limestones—and from the limited information obtained from them no sufficient knowledge of the strata was acquired to enable one to form definite or reliable conclusions. However, as limestones underlie the Drift in the western part of the county, it is quite likely that they are St. Louis or Keokuk—most probably the latter. It is uncertain whether the sandstone reached in a few instances is Knobstone or not. Although no bores have ever touched the rocks underlying the Drift in the eastern part of the county, it is altogether probable that they are Devonian. The particles of rock taken from the bores in different parts of the county contained no organic remains so far as observed by the workmen.

ARCHÆOLOGY.

There are no walled enclosures in Boone County, nor any mounds of great interest. Occasionally small mounds are seen, but explorations in them have not disclosed any facts other than are generally known concerning these works. Ashes, charcoal, and occasionally implements have been found in them. Granite and flint implements, while not so common as in many other counties, are still frequently found in the county. Mr. Tribbets, of Thorntown, has quite a valuable collection of stone implements, collected partly from this county, but principally from Montgomery. There are a few other small collections in the county.

THANKS.

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