PROFESSOR E. T. COX:

State Geologist of Indiana:

DEAR SIR:—In compliance with your letter of instructions of June 17th, 1874, I proceeded to make a Geological Survey of Scott and Jefferson counties, Indiana, and herewith, respectfully, submit my report on the same.

Yours truly,

WM. W. BORDEN,

NEW PROVIDENCE, IND., January 1st, 1875.

SCOTT COUNTY.

BY W. W. BORDEN.

Scott county is situated in the southeastern part of the State, eighty miles S.S.E. from Indianapolis. It is bounded on the north by Jackson, Jennings and Jefferson, east by Jefferson, south by Clarke, and west by Washington and Jackson counties, and contains 213 square miles. The outlines are very irregular; the surface of this county affords quite a variety of scenery. The north and northwestern and central parts are very flat, as about Scottsburg, Austin and especially in Johnson township; here the drainage is poor excepting in the immediate vicinity of Big Creek and north of William Davis' farm in Sec. 26, where the land is slightly rolling. The eastern part is rolling, and the southern and southwestern is very much broken by a continuation of the Knob range of hills of Clarke county, which have an elevation of from three to four hundred feet. From White-oak Point, Rocky Point, Piney Point, and many other elevations, we have a fine view of almost the entire county. Five miles south and west of Vienna, and on the dividing ridge between the headwaters of Silver Creek, in Clarke county, and the waters of Pigeon Roost fork, in Scott county, the view is very commanding. On the day of my visit to these high lands, the atmosphere was damp and in a favorable condition for the conveyance of sound, the whistle of locomotives and other noises could be heard

for many miles, and the valley through which the Jeffersonville, Madison & Indianapolis Railroad runs, could be traced beneath the overhanging mist, to the Falls of the Ohio, and to the west and north, could be seen the highest land of Jackson and Jennings counties.

The principal streams of Scott county are Big creek, with its tributaries, the Southern branch or Brushy Fork of the Muscatatuck, Woods' Fork, Home Fork at Lexington, Pigeon Roost Fork, Little and Big Ox and Fourteen-mile creek, which rises in Jefferson county and flows through the southeastern part of Scott, and through Clarke county to the Ohio river.

Big creek is the largest stream, and rises in Ripley county, and flows in the direction of the Ohio river, and forms a part of the northern and western boundary of the county. It affords a number of mill sites.

The outcrop of the Niagara limestone on this stream, in the northern part of Jefferson county, is very fine and may be followed in the direction of Bryantsburg to the Ripley county line. This outcrop will be noticed more fully in the Geological Report of Jefferson county. Big creek has a deep channel where it flows with the dip of the Niagara and Corniferous Limestone in Jefferson county and over the New Albany Black Slate in the western and northwestern part of Scott county, thus reaching a higher geological horizon where it empties into White river. This stream with many others in this section, where they flow over a persistent formation, as the Niagara, has shifted but little from its primative bed, hence the presence of very little bottom land, and frequent abrupt banks along this part of the stream; but upon reaching the Black Slate it has rich alluvial bottoms, noted for their never failing corn crop.

The rich Muscatatuck bottoms are referred to by the inhabitants of the county as a standard of comparison. This season (1874) will be long remembered as one of great drouth, yet the "flats" of Scott county and the bottom lands of Big creek have the heaviest corn crops known for years. Woods' Fork rises at the base of the New Albany Black

Slate in Jefferson county and flows over the Corniferous and Niagara limestone before reaching Big creek. The lands bordering on this stream have a limestone substratum and are very productive. Home Fork rising in the southern part of the county flows by Lexington into Woods' Fork. Along this stream there is a good exposure of Hydraulic and other Devonian limestone. Kimberland creek flows almost exclusively over the Black Slate. Pigeon Roost creek with a number of its tributaries, also Little and Big Ox creeks rise in the "Knob regions" of this county and flow into Big creek. The romantic "Knobs" in the southern and western part of the county, form the divide between the head waters of the latter streams, and the waters of Silver creek in Clarke county which flow into the Ohio river. Pigeon Roost Fork and Big Ox rise at or near the same point, and flow the same general direction, with a very narrow ridge between them. Their valleys are more than half a mile in width, at some points, and afford some of the best farming lands in the county.

Pigeon Roost creek received its name from the abundance of wild pigeons which have, within the memory of the "oldest inhabitants," sought this wild and broken region year after year, as a favorite roosting place, especially in the fall and winter season. Their favorite food, the beech nut, is found in great abundance within a radius of fifty miles. The first settlers relate that they have seen the ground in this region covered to the depth of several inches with their droppings. The roosts of the pigeons, in earlier days, was not confined to the hills, but extended to the valleys. I have on several occasions, visited the pigeon roosts, on the adjoining hills, in Clarke county, when the birds were in countless numbers and covered many square miles of territory.

The timber of this Knob region is Pine, from which tar is made in considerable quantities, Chestnut, White-, Red-, Black- and Chestnut-Oak. In the valleys, Beech, Sugar Maple, Poplar, Sycamore and Walnut are the principal varieties.

The "Pigeon Roost" defeat, or massacre, as it is called, occurred during the Indian war of 1812 and 1813 on the high lands east of or near Pigeon Roost creek, and on the land of William Collings, and from two to two and a half miles southeast of Vienna; a large sassafras tree marks the place where, in three graves, fourteen persons are buried, being a part of the twenty who were killed by the Indians. The incident was related to me by Sichy Richie, now 82 years of age, who still retains a vivid memory of those tragic days.

The geological formations of Scott county are represented in the following section; all of which outcrop on the eastern border of the county within a short space from the summit of the knobs near Vienna, to Wood's Fork creek, two miles northeast of Lexington:

AGES.	PERIODS.	EPOCHS.	STRATA.
Quaternary System.	RECENT. Champlain. Glacial.	Alluvium. Champlain. Glacial.	2 to 13 feet. 4 to 0 to 8 feet.
	Sub-Carboniferous.	KNOB SERIES. Equivalent of Chemung, (Hall); Waverly, (Ohio); Kinderhook, (Illinois).	Knob flagstones, A. S. Stone, 2 to 4 feet; Massive sandstone, 20 to 80 feet; Knob shale 100 to 180 ft. Greenish marly sh'le, N. Providence shale, 6 to 100 feet.
Devonian.	Hamilton. Corniferous.	New Albany Black Shale. Genesse, N. Y. Corniferous. Mollusk and radiate Corals.	0 to 70 feet. Hydraulic limestone, Limestone containing Sperifer gregaria fossil varieties of Favosites, Zaphrentis gigantea, etc.
Upper Silurian.	Niagara.	Niagara.	A gray crystalline limestone, 4 to 6 feet, with fossils.

The Alluvium or Recent is to be traced along the streams, and is derived from decayed and decaying vegetation and the weathering of the rocks and the washing of sand from the

clays, along Big Creek and Woods Fork. The alluvium lands rarely fail to produce an excellent corn and wheat crop; the average yield of wheat per acre on these lands during the past season, being from sixteen to thirty bushels per acre. On the Black Shale lands of this county, excepting where they have been enriched by skillful farming, as by the cultivation of clover and grasses, the average yield of wheat was not fifteen bushels per acre, and suffered greatly from the depredations of the Chinch Bug, (*Micropus leucopterus*, Say,) which had also the year previous made their appearance on the poorer grass lands of this county.

The alluvial bottom on Big Ox and Pigeon Roost fork, (branch of Big Creek,) are worthy of note. The valleys of these streams are one-half mile or more in width and among the best lands of the county, and were formerly covered with a large growth of timber, as Sugar, Black Walnut and giant Poplars.

An ancient alluvial bed of chemical and mechanical origin is seen on the Big Ox creek of from two to three feet in thickness, composed of a conglomerate mass of fragments from the iron ore, which out-crops in the knob region about the head waters of this stream. This deposit is found several feet above the present bed of the stream, and marks its former bed.

The Champlain Period, is so called from the occurence of beds of this period, on the borders of Lake Champlain New York. It includes two subdivisions: First, "Diluvium Epoch," or that of the deposition from the melting glaciers of substratified and stratified drift. The unstratified drift consists of sand, gravel and stones lying pell-mell together as they were thrown down from the melting glaciers. Second, The Alluvial Epoch, characterized by deposition of a more quiet character, and composed of clays deposited by the water after the melting of the glacier, and from the subsequent wear and decomposition of the rocks.

The boulder clays of this county are best seen in the vicinity of Vienna, where the country is somewhat broken. A section of these deposits, seen four or five miles southeast

of Vienna in an out-crop on Pigeon Roost fork, and on the land of L. F. Collings, is as follows:

1st.	Ash colored sandy clay.....	6 ft. to 10 ft.
2d.	Ochreous clay of various shades, stratified	5 ft. to 8 ft.
3d.	Blueish clays with flint gravel and granite boulders.....	2 ft. to 6 ft.
4th.	Hard-pan, siliceous gravel.....	1 ft. to 4 ft.

Good beds of sand suitable for mortar are found in these out-crops. On the road from Vienna to Lexington, boulders 2 to 3 feet in diameter, are quite numerous. They are mostly granite and conglomerates of agatized pebbles variously colored. Some of these conglomerates make beautiful cabinet specimens. A characteristic marking of the boulder clays of this region is a trace of a very dark and fine grained iron sand which adheres readily to the magnet. From six to eight miles southeast of Vienna in the Guinea Hills of Clarke county, and in the vicinity of J. Cruson's mill, in Scott county, as mentioned in the report of last year (1873) are to be found an abundance of boulders. Still farther south in Clarke county, three miles west of Charlestown, near the Sinking fork of Silver Creek, and on the land of John Carr, Jr., there is a boulder measuring four or five feet through and of several thousand pounds weight. Boulders of a large size are also quite abundant along Pigeon Roost creek. From Scottsburg to Vienna they are almost the only stones met with, as the streams have clay banks and flow over the Black Shale. The gravel which is so abundant at L. F. Collings', a few miles above Vienna, is almost entirely wanting.

In Floyd, Clarke and Scott counties we find extensive valleys reaching to the Ohio river, with their general direction North-west by South-east, and they may be traced on the opposite side of the Ohio river to the southern boundary of the knob formation in Kentucky. These ridges are not produced by an upheaval but by erosion as the rock

strata are not tilted; but dip gently to the South-west. The small valleys connecting with the larger are cut out by the streams which flow through them. The Louisville branch of the O. & M. Railway, and the Jeffersonville, Madison and Indianapolis Railway, also the Louisville, New Albany and Chicago Railways all follow these valleys and natural plains as they approach the Falls of the Ohio.

At the base of the boulder clay thoughout the county, is found a bed of hard pan, composed of clay with siliceous gravel two to three feet or more in thickness, very compact and difficult to penetrate in sinking wells, but as a general thing water is found at this depth. Rock can usually be removed by blasting, and the numerous joints and fissures found in the strata enable the workmen to break it up in large blocks; but this hard pan has neither cracks nor joints. It will not blast, and to pick it to pieces is a slow and laborious process.

PALEOZOIC GEOLOGY.

The order and average thickness of the rocks of this age having been given we will notice them as they occur. The most recent of the series found in the county are in the elevated Knobs, a noted range of conical-shaped hills that commence at the Ohio river below New Albany in Floyd county and extending across Clarke county, skirt along the south and southwest part of Scott county.

1st. *Knob Sandstone.*—Equivalent of Chemung, Hall, N. Y.; Waverly of Ohio; Kinderhook of Illinois. The upper beds are a flag sandstone, from a few inches to a foot or more in thickness, easily quarried, with straight edges and often with square corners, hardens upon exposure, and has a brown appearance on the surface by oxidation. These layers are almost bare of fossils. An occasional fucoidal impression is seen and some ripple marks that are on the under surface.

2d. *Massive* and *stratified sandstone*, easily worked, of yellow color with an occassional shading of light blue. In the sandstone are small cavities filled with white and yellow sand or a concrete of oxide of iron. These rocks are in some parts micaceous, cleaving with the stratification. In some places it is a good building stone, but in others it is liable to chip by freezing. The fossils of this bed are: *Syringathyrus textilis*, Hall; and *Streptorhynchus keokuk*, Hall; one or two species of *Productus* and an occasional *Conularia*; and large Fucoids. The knob formation is confined to the district south and west of Vienna.

3d. In the series are the shales which constitute the principal part of the knob range in this county and in Floyd and Clarke counties. There are two kinds. ne is a bluish, friable micaceous shale, with occasional thin layers of ferruginous sandstone and contains an abundance of worm tracks and some fucoidal impressions, large and small concretions of iron stone, the nucleus in most cases being a fossil. At the junction of this shale, with the sandstone above, is the spirifer bed of the knobs, in which are found: *Syringathyris textilis*, Hall; *Streptorhychus keokuk*, Hall; *Productus reticulatus*, also *Bryozoa*, and at some points *Crinoid* stems and other fossils.

4th. *Knob Shale.*—Immediately below the shale mentioned above there is a fine-grained, greenish-colored marly shale, designated in the report of Clarke and Floyd counties of last year, (1873,) as the New Providence shale. It contains the iron ore beds mentioned in that report and can be traced from the crop on Big creek two miles west of Austin, at the Jeffersonville, Madison and Indianapolis R.W. crossing to Jackson county, where the stream forms the county line, from thence to the head waters of Big Ox creek.

The Iron-stone bands crop out on all the small branches which flow into Big Ox, southwest of Vienna, as the streams cut the shale in a great number of places as high up as William Richie's eight miles southwest of Vienna, on the S. E. quarter, Sec. 21, T, 1, R. 6, E.

There is a good outcrop of the stratified iron-stone, and kidney ore on this stream four and one-half miles west of Vienna in Finley township on the land of W. L. Applegate, N. half of the N. W. Q, of Sec. 11, T. 2, R. 6, E. The land west of this is very broken as it borders the base of the Knobs. Samples of this ore have been forwarded for analysis. The mineral water noticed in the report of last year with an analysis, and found in the shale in Clarke and Floyd counties, is here as elsewhere invariably found in this shale. It has many of the properties of the mineral water of Crab Orchard, Kentucky, from which Epsom Salts is manufactured.

The following analyses show the constituents of the two mineral waters:

Alumina and Oxide of Iron.....	2.001	grains.
Sulphate of Lime.....	71.806	"
Sulphate of Magnesia.....	429.660	"
Chloride of Sodium.....	286.090	"
Sulphate of Sodium and Potash...	204.400	"
	993.947	

CRAB ORCHARD, KENTUCKY.

Sulphate of Magnesia.....	63.00
Sulphate of Soda.....	4.00
Sulphate of Potash.....	2.00
Chloride of Sodium.....	5.00
Sulphate of Lime.....	2.50
Chloride of Lithium.....	0.75
Carbonate of Lime (Magnesia) Silica, Bromide and Iron.....	2.75
Water of crystallization.....	20.00
	100.00

The iron ore deposits of this county are confined to Finley and Vienna townships, and are seen from the head waters of Pigeon-roost creek, and along that stream to Pigeon-roost summit of the Jeffersonville and Indianapolis Railroad, and some distance beyond towards Kimberland's creek. The stratified iron stone with the kidney ore outcrops on the southeastern side of Pigeon-roost creek, on the farm of L. F. Collings, where there are several strata of 4 to 8 and 10 inches in thickness. This is the western outcrop of the iron stone noticed as occurring in the Guinea Hills of Clarke county.

There are some outcrops of this ore about J. Cruson's mill, near the Clarke county line, six miles west of Henryville and on the land of L. F. Collings, section eighteen, Vienna township, and within less than one mile of the Jeffersonville and Indianapolis Railroad. A section near Pigeon creek, in an outcrop of 20 feet, from the summit to the base of the hill, shows as follows:

1.	Ash colored and ochreous clay...	5 ft. 00 in.
2.	Shale containing 5 in. band of iron stone.....4 to	5 ft. 00 in.
3.	Three to four feet shale with kidney ore.....	4 ft. 00 in.
4.	Band of iron stone.....	6 to 8 in.
5.	Shale two to four ft., with band of iron stone.....	8 to 10 in.
6.	Shale three to five feet, with band of iron stone.....	8 to 10 in.

Specimens from the 10 inch band were sent to the State collection. Many sections showing the outcrops of this iron stone might be given, but the above is a representative of what occurs in the knob region of this county, and in the less elevated hills which are found in some instances extending some distance from the base of the higher knobs.

Along Big Ox creek and at some points on Pigeon Roost creek, is to be found an outcrop of from 1 to 3 feet of

pebble bog ore, composed of the scales and weathering of the iron stone of this region. This deposit is above the present high water marks of the streams. Samples were sent to the State collection for examination.

The "Button-mold wash," so called from the disk-shaped fragments of encrinite stems which are found in it, is but another name for the greenish marly shale contained in the iron-stone banks.

The characteristic fossils of these washes are *Spirifer (Kentuckensis,) keokuk*, Hall; and some very small spirifers undescribed. Two species of *Chonetes*, very like *C. Illinoiensis*, Meek and Worthen, *Orthis michelini*, *O. penelope* and other species. There also occur imperfect specimens of crinoidea belonging to the genus *Cyathocrinus*, *Platycrinus*, *Synbathocrinus*, *Actinocrinus*, and *Forbesiocrinus*. The corals are represented by very beautiful fragments of a species of *Alopora* undescribed, and a number of *Bryozoans*, and a very diminutive, moss-like coral. The Kidney iron contains a *nucleus* of *Spirifer murchisonia*, *Goniatites* and a variety of other fossil forms. In the outcrop of this shale at the Knobs below New Albany, are found concretionary masses containing good specimens of a *Conularia*. There is also found associated with this shale specimens of transparent sulphate of lime, plates and needle-shaped crystals of this mineral were seen in this shale on Ox fork in this county.

DEVONIAN AGE. HAMILTON PERIOD.

New Albany Black Shale. Genesse Shale of N. Y.

In my survey of Clarke, Floyd and Scott counties I have invariably found a *Ferruginous Limestone*, capping the Black shale, *a true index to the shale*, from two feet to four feet nine inches thick as shown in the following section taken at Thos. Baker's mill, (at present owned by Robert Grimsley) on Big creek, below the crossing of the Jeffersonville, Madison and Indianapolis Railroad, and on the land of John Hornaday, two or three miles west of Austin.

1. Soil—alluvial—recent.....15 ft. 0 in.
2. Boulder drift, clay, sand and gravel with boulders.....6 to 10 ft.
3. New Providence shale, with iron stone.....2 to 3 ft.
4. Goniatite bed of Rockford, Jackson county, Ind..... 3 to 6 in.

Containing *Goniatite ixion*, Hall, *G. oweni*, Hall, an *Orthoceras*, and *Zaphrentes*.

5. Ferruginous limestone, variegated, without cleavage, very persistent, and in this locality contains an abundance of crinod stems, and crinoridea in crushed state, and firmly imbedded, a durable stone, and used in the piers of the R. R. bridge.....4 ft. 9 in.
6. New Albany black shale, to the bed of the creek.....6 ft. 0 in.

This Ferruginous Limestone is a very continuous formation, and is traceable throughout this State and Kentucky at this horizon, where it attains the thickness of five feet or more. This stone becomes coated with a brown oxide of iron upon exposure, and is called an "iron stone." It has a fetid odor when struck, breaks with an uneven fracture, is very compact and durable, and is extensively used at various points, where convenient to quarry, for building purposes.

NEW ALBANY BLACK SHALE.

Equivalent of Genessee Epoch, N. Y.

This shale has been so named on account of a fine exposure seen at New Albany, Indiana. It is usually of a jet

black color, but on being exposed to the weather it exhibits a thin, laminated cleavage and then assumes a variety of colors. It contains pyrites of iron in concretionary forms, needle-shaped crytals and cubes known as "fools Gold" or Sulphur balls. This slate contains some bituminous matter and gas, and yields from eight to ten gallons of oil per ton, but the present cheap supply of petroleum precludes its manufacture from these shales. It has been used for roofing when ground and spread on felt with coal tar, but this failed to give satisfaction and has been abandoned. It is imagined by the uninitiated that if followed to some distance into the hills, this shale will be changed to good coal, but this is a mistake, as it crops on a hundred hillsides and has every stratum exposed to view. I have occasionally met with thin seams of one to two inches of pure coal in the slate. This slate burns quite readily when a large quantity is once ignited, and in certain localities has been known to burn in its original bed for months. This formation embraces a wider area than any other formation in the county. It is traceable on Pigeon Roost creek below Vienna to Scottsburg, thence to Austin, where it is struck in wells, and in outcrops west of the latter place on Big Creek or Muscatatuck, at Baker's Mill, and above the mill at Slate Ford on the same stream, and is the surface rock in all the flat regions in the northwestern part of the county, where it is occasionally used for walling wells. It is met with at Wooster and in the direction of Doty's mill and is twenty to forty feet high about Holman where the Louisville Branch of the O. & M. Railway cuts it to the south of that place. It continues to Lexington, and on to Knob's Station on the Branch railway. The Black Shale outcrops in all the hillsides about Lexington, where it is from a few feet to sixty feet or more thick. On the east branch of Kimberland creek four and a half miles west of Lexington, it thickens to seventy-five or eighty feet. It is first seen near Vienna on little Kimberland creek two and a half miles east of the town. The Black Shale in the eastern part of the county is cut through by the streams which

have a bed twenty feet to seventy-five feet below the general surface. "Pot Rocks" from one to three or four feet in diameter, are occasionally met with, imbedded in the black shale. Their general form is conical, and they are very hard to remove in excavating the slate. Large and small specimens of fossil wood, and an occasional specimen of the wood containing imbedded crinoid stems are met with.

The Black Shale is extensively used in this county for mending roads, being abundant and having the good quality to make soft places firm and dry, and the testimony of the farmers is that it answers for that purpose better than any other material they can use.

It would certainly act mechanically upon clay soils and make them porous and warm, dark colors being absorbent of heat. All dark soils are warmer than light colored soils, other things being equal.

Resting on the black shale, are found large fossil trees. Some of these specimens are of great size; all are silicified and so hard that a fragment with a sharp edge will scratch glass.

The fossil tree exhumed from the black shale by J. Richardson and myself on the land of E. B. Gurnsey, near Henryville, in Clarke county, and exhibited at the Indianapolis Exposition of 1873, measured over 16 feet in length and two feet in diameter, and had a jointed structure, which is a characteristic feature of all these fossil trees. Another large specimen of tree measuring 19 feet in length and three feet in the broadest part, being somewhat flattened, was taken from the black shale, a short distance northeast of Vienna, by James Powers of Lexington, and exhibited at the Indianapolis Exposition for 1874.

This fossil wood is very closely associated with the black shale, and large specimens are found in almost every outcrop on the head waters of Silver creek in Clarke county. I have never yet met with a specimen above the summit of the black shale. A stump of one of these fossil trees is to be seen in Finley Township.

Immediately below the Black Shale is the horizon of the Crinoidal limestone of Clarke county, Ind., and the Falls of the Ohio. This formation caps the cement beds of that region, and is well marked about Lexington and on Woods' Fork; also, east of Lexington on some of the small streams. In Scott county this rock is a very hard crystalline limestone containing an abundance of fossil shells, *Tropidoleptus carinatus* and *Chonetes coronta*, Con. (Hamilton group of N. Y.) The crinoidea referred to are wanting. East of Lexington at the Branch Railroad Depot on Town Fork creek the following section occurs:

1. Light colored clay soil, terminating in ochre shales..... 2 to 15 ft.
2. New Albany Black Shale with fossils, commencing four feet from the base of the slate, as follows: "*Leiorhynchus quadricosta*, Hall, *Chonetes lepida*, Hall, *Tentaculites fissurella*, Hall, also a specimen *Cardiola radians* or allied to that species"—(Whitfield)..... 6 to 30 ft.
3. Dark gray limestone, very hard, with numerous fossils: *Tropidoleptus carinatus*, *Chonetes coronata* Con. (Hamilton group).... 2 to 3 ft.
4. Hydraulic limestone, equivalent, of the cement beds of Clarke county 2 to 3 ft.
5. White limestone, with darker shades, containing *Spirifer gregaria* in the upper part, *Spirifer acuminatis* and *Nucleocrinus*.....11 to 15 ft.

Due east of Lexington on Nicholas Murphy's land, N. W. Q. S. 2, T. 2, R. 8, the following outcrop is seen on Switzer's Fork: Strata dipping very much to the south west:

1.	Clay soil	4 to 10 ft.
2.	Black slate	5 to 6 ft.
3.	Brown oxide of iron	6 to 8 in.
4.	Hydraulic limestone	4 to 6 ft.
5.	Corniferous limestone, with fossils, *Combophyllum sulcatum* to branch	6 ft.

South of this point, on the line of Clarke county and the head waters of Fourteen-mile creek, on Mr. Barnes' land the cement beds become heavier.

On the farm of W. D. Hutchings, M. D., one and a half miles north of Lexington, on Wood's fork, on the road to Paris, the following section occurs:

1.	Clay soil with very few boulders	5 ft. to 30 ft.
2.	Black shale	5 ft.
3.	Soft magnesian limestone, dark, with fossils, *Atrypa*, etc.	4 ft.
4.	Hydraulic limestone, very light drab and soft	2 ft.
5.	Coral bed, Corniferous, to branch	4 ft.

The formations here dip very much to the southwest. The Hydraulic limestone maintains the same stratigraphical position bordering Jefferson county, but does not have the same lithographical appearance as at the Falls of the Ohio. The manufacture of cement has not yet been attempted in this section, nor is it supposed that it would pay, as the Clarke County Cement Co., have extensive mills and the control of the market, (see report for 1873). We have traced the Hydraulic cement four and a half miles east of Lexington, where it outcrops on the land of Mr. Cromwell, on the head waters of Fourteen Mile creek. This rock is only accessible to quarry in Scott county, where it outcrops on the streams. At Lexington and east and north of that place to Wood's fork, it is superimposed by thick beds of black shale.

No. 5 of the above section, on the land of W. P. Hutchings, M. D., makes excellent lime. The only limestone outcrops are in the eastern and northeastern part of the county, the Knob measures in the southern and southwestern, and black slate in the western and northwestern.

A section on the west side of the town of Lexington shows the following strata:

1.	Ash-colored clay.....	2 ft. to 15 ft.
2.	Black slate with fossils, to slate branch.....	40 ft.
3.	Hard gray limestone with fossils.....	2 ft. 6 in.
4.	Two grades of cement stone 1st light color, 2 ft 6 in., darker	3 ft. 6 in.
5.	Blue shaly crinoidal and coralline limestone, with *Combophyllum sulcatum* and other fossils.....	2 ft.

The Corniferous Limestone, which has an extensive outcrop on Fourteen-mile creek in Clarke county, and is so largely exposed about the Ohio Falls, is, perhaps, the best fossil coral bed known, and has its representative in the eastern part of this county, where the streams have cut low enough to reach it.

A good outcrop of this formation is to be seen one-half mile north of Lexington, on the land of E. G. English:

1.	Clay soil.....	3 to 12 ft.
2.	Black Slate.....	4 to 7 ft.
3.	Oxide of iron.....	6 in.
4.	A light gray shaly limestone with an abundance of fossils, *Spirifer gregaria*, *S. acuminatus* corals, etc.....	4 ft.

5.	Limestone, darker shade, with fossils.....	8 ft.	
6.	Corniferous limestone, very white, with an abundance of characteristic fossils, makes good lime.	6 ft.	

Section on Town Branch, below the Vernon depot, at the *salt well* bore, sunk many years ago:

1.	Clay soil.....10 to 16 ft.		
2.	Black Slate..... 4 to 10 ft.		
3.	Oxide of iron.....		6 in.
4.	Very hard blue limestone, with fossils.....	2 ft.	6 in.
5.	Hydraulic cement, without cleaveage.....	3 ft.	6 in.
6.	Light brown limestone, with fossils, *Spirifer gregaria*	2 ft.	6 in.
7.	Gray limestone, with fossils, makes lime.....	2 ft.	
8.	A very hard blue limestone with abundance of fossils	3 ft.	6 in.
9.	A coarse grained shaly limestone, with fossil corals and bryozoa.....	2 ft.	6 in.
10.	White limestone, with Corniferous fossils.....	6 ft.	

The lowest rocks in this county are one and a half to two miles north of Lexington, where Wood's fork has cut down four to ten feet into the Niagara limestone. At the railroad crossing of this stream the stone for the construction of the large, substantial and durable, arched viaduct was obtained. Wood's fork is one of the large tributaries of Big creek. At the Louisville Branch railroad crossing, it flows over the

Niagara at the Jeffersonville, Madison and Indianapolis crossing. Big creek is at the summit of the black slate.

The most abundant crinoidea found in the limestone beds capping the hydraulic at the Falls of the Ohio and in Clarke county along Silver creek, and on Beargrass, Kentucky, are:

Anchyrocrinus spinosus, Hall.
Actinocrinus kentuckensis, Shumard.
Elentherocrinus cassedayi, Y. & S.
Cyathocrinus sculptiles, Lyon.
Dolactocrinus, (nov. sp.)
Megistocrinus abnormis, Lyon.
M. rugosus, Lyon and Casseday.

Of the Mollusca are found:

Atrypa reticularis, Lyon.
Cryptonella leos, Hall.
Orthis livia, Billings.
Pentamerilla arata, Hall.
Platyostoma lineata, Hall.
Rhynconella tethys, Billings.
Terebratula harmonia, Hall.
Trematopora hirsuta, Hall.

In the Niagara, at Utica, Clarke county, Crinoidea:

Caryocrinus ornatus, Say.
Eucalyptocrinus cœlarus, Hall.
Melocrinus obconicus, Troost.
Lecanocrinus, (nov. sp.)

In the same rocks on the opposite side of the river:

Actinocrinus meekii, Lyon.
Saccocrinus christii, Hall.
Hapleocrinus maximus, Troost.

Pentremites reinwardtii, Troost.
Lingula subspatulata M. &. W.
Orthis livia. Billings.
Strophomena rhomboidalis, Wahl.
Strophodonta inequistriata, Conrad.
Strophodonta hemispherica, Hall.
Strophodonta perplana, Conrad.
Chonetes acutiradiata, Hall.
Chonetes yandellana, Hall.
Productella subaculeata, var. *cataracta.*
Spirifer acuminata, Conrad.
Spirifer arctisegmentus, Hall; *Spirifer duodenaria?* Hall.
Spirifer euruteines, Owen; *Spirifer fimbriata*, Conrad.
Spirifer gregaria, Clapp; *Spirifer medialis*, Hall.
Spirifer owenii, Hall; *Spirifer raricosta*, Conrad; *S. undulata.*
Spirifer segmenta, Hall; *Spirifer varicosa*, Conrad; *Cyrtina crassa* Hall; *Cyrtina hamiltonensis*, Hall.
Trematospira hirsuta, Hall; *Nucleospira concinna*, Hall.
Athyris spiriferoides, Eaton; *Athyris vittata*, Hall.
Meristella (*Pentagonia*) *unisulcata*, Conrad.
Atrypa reticularis Lin. Atrypa *aspera*, Schlotheim.

ECONOMICAL GEOLOGY.

The agricultural interests of this county appear to be prosperous, and the farmers the past season, have been favored with good crops, which can not be said of all other sections of the State. Agriculture is the chief source of wealth, and for that reason it should receive due attention. Much of the lands of this county would be improved by lime. Every one has noticed that where limestone is the prevailing rock the crops are generally good, especially wheat.

The water power of this county is very limited. The streams, in a general way, have fall enough, but of late years, from the destruction of the forests, or some other cause, the water supply is very limited, for mill purposes.

In the southern, south and southwestern part of the county, the sandstone of the Knobs is resorted to for building purposes. Where the ferruginous limestone capping the Black slate is to be had, this is also used, but the principal limestone beds are in the eastern part of the county, and while some of the beds are suitable for building, no extensive stone quarries are worked in the county. The gravel and sand from the boulder drift and the Black Slate are the principal material used for mending roads. The latter material makes a better road to drive on, and is more durable than limestone.

Iron ore is extensively exposed in the region of Vienna and Finley township by the weathering away of the Knob shales. It can be collected in all the ravines and along the streams with very little trouble; transportation being the principal item of cost. The ore is a continuation of the beds of Clarke and Floyd counties. It was analyzed by Prof. E. T. Cox and reported in the survey of last year under the head of "Manganiferous iron stone" or "Knob iron ore." The analyses of ten different bands show that it contains from 26.41 to 31.51 per cent. of iron, with from 5 to 7 per cent of manganese. The latter metal is considered a valuable addition to the ore. Two and three-quarter tons of the ore will yield a ton of pig iron. Samples have been sent from Scott county to the State Cabinet. Samples of the conglomerate, which is somewhat abundant on Big Ox, have also been forwarded.

TIMBER.

In former days this county was heavily timbered, and various sections afforded all the varieties of merchantable

lumber. The principal use made of timber at this time is to cut it up into coopers' stock. Quite a number of mills are engaged in cutting staves for "tight work," coal oil barrels and pork barrels, and for "slack work," cement and flour barrels. Wilson, Jones & Co., two miles west of Austin, cut annually 700,000 slack barrel staves, using a variety of timber, sugar, beech, oaks, etc. Mr. Gibson's "bucking" machine at Austin cuts 500,000 white oak staves exclusively for oil and pork barrels, and pays $18.00 per thousand for sound staves. J. H. McFadden cuts from 700,000 to 800,000 staves, and manufactures annually in Jeffersonville 40,000 to 50,000 barrels. Montgomery & Foster's mill at Lexington cuts 50,000 set of heading for slack work, per year.

SALT.

Several saline springs occur in the Corniferous, east of Lexington, at which salt was manufactured in early days. A spring of very salt water is found on the Lower Fork (creek) one-half mile above the Louisville Branch Depot, and two bores have been sunk in the bed of the stream to a depth of two or three hundred feet, but without an increased flow of water. A bore sunk on Switzer Fork, east of town, to the depth of several hundred feet, affords a quantity of gas (carbureted hydrogen) which may be ignited by a match.

ANTIQUITIES.

There are no very large mounds found in this county. Yet the usual amount of Indian or Mound-builders' relics are found in various localities, and occasional bone beds or kitchen heaps are met with. More evidences of a pre-historic race have been found on the larger streams.

CONCLUSION.

My thanks are returned to the citizens of Scott county for courtesy and aid, and to the following persons for special favors:

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