GEOLOGICAL SURVEY OF KENTUCKY.

JOHN R. PROCTER, DIRECTOR.

REPORT

ON THE

GEOLOGY OF LINCOLN COUNTY.

BY W. M. LINNEY.

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INTRODUCTORY LETTER.

JOHN R. PROCTER, ESQ.,

Director of the Kentucky Geological Survey:

DEAR SIR: Please find accompanying this my Report on the Geology of Lincoln County.

Thanking you for your unvarying kindness, and for repeated favors received from your hands,

I am, respectfully, yours,

W. M. LINNEY.

HARRODSBURG, KY., December, 1882.

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GEOLOGY OF LINCOLN COUNTY.

TOPOGRAPHY, &C.

Lincoln was one of the original counties created by the Legislature of Virginia in 1780; and at that time comprised about one third of the area of Kentucky. Since its first organization, it has been shorn of most of its territory by the formation of new counties, until now it comprises about one hundred and ninety-five thousand acres. It is bounded on the north by Boyle and Garrard, on the east by Garrard and Rockcastle, on the south by Pulaski and Casey, and on the west by Casey and Boyle counties.

In 1870 Lincoln county had a population of ten thousand nine hundred and forty-seven. This number had, in 1880, increased to fifteen thousand and eighty. Stanford is the county seat and the largest town, and in 1880 it contained twelve hundred and thirteen inhabitants, a gain of four hundred and sixty-one in ten years. There are a number of other small towns, among which are Crab Orchard, near Crab Orchard Springs, well known as a summer resort, and Hustonville, in the southwestern part of the county.

The Cincinnati, New Orleans and Texas Pacific Railway (Cincinnati Southern) extends through the county in a direction northwest and southeast. The Knoxville Branch of the Louisville and Nashville Railroad passes through in a more directly east and west course. The Kentucky Central Railroad has connection with the latter at Richmond Junction, and it is highly probable that it will be continued through the county, and thence to Nashville, in the near future.

A portion of the county is well supplied with turnpikes, which are substantially constructed of broken limestone, or of pebbles and gravel, which form beds in all of the streams.

Stanford has two good schools—one for males and the other for females. Hustonville and Crab Orchard have enjoyed fair facilities for educating the young, while the popular schools have been conducted with more than average success in the county.

There are no manufactories of any great extent. There are several flour mills, three or four distilleries, and a number of saw-mills, which ship a portion of their products. Grain, live stock, and lumber are the principal exports, with a limited exportation of Crab Orchard salts. The surface features of this county are varied; in general terms, it may be said that the northwestern half lies almost wholly within the commonly called Blue grass Region of the State, and includes surfaces which are either level, gently undulating, or highly rolling. These lands comprise the agricultural region of the county, and contain many fine farms and much material wealth.

Nearly the entire drainage of this part of the county is into Dix river, which stream passes partly through and partly along the eastern portion. Hanging Fork rises near the Casey county line, flows northeasterly, and enters Dix river near where Boyle, Garrard, and Lincoln counties come together. This part of the county has a perfect drainage in the great number of small creeks which unite with those larger streams.

On Dix river and Hanging Fork, near the mouth of the latter, are some perpendicular cliffs, which rise something like one hundred feet above the water. They are soon lost in going up either stream. The general surface in this part of the county does not rise high above the general drainage lines; and in this feature they are in marked contrast with the deep cañons seen but a few miles down Dix river, between Boyle and Garrard counties.

The southern and part of the western boundary of this region is encircled with a belt of isolated hills, usually termed "knobs," which rise from one to two hundred feet above it. These make a pretty and picturesque frame to the more level lands.

Beyond the knobs the elevation is somewhat higher, but slopes gently from them for a long distance towards the southeast. This part of the county is deeply cut by the drainage lines which flow partly into the Cumberland and partly into Green river. Here the surface has not been so largely cleared of its forests for agricultural purposes; consequently, the streams are clearer, and their average flow greater through the year, than in the more level farming lands where the woods have been largely destroyed.

From some of the greater elevations which mark the watershed between the tributaries of the Cumberland and the Kentucky rivers, there are extended landscape views which are not excelled in beauty from any of the altitudes which surround the far-famed Blue Grass Region. One of the finest of these may be seen from a point above Hall's Gap.

More than a semi-circle is opened from this point, and for miles and miles one may trace the salient points to where the fringe of forest and the horizon blend together. Spread out to the eye is more than half of Boyle, Lincoln, and Garrard counties, with portions of several others. The dotted dwellings, the open fields, the skirted woodlands, the sloping hills, and the winding valleys, encompassed with a rim of highlands, make a charming picture.

A few miles to the south one may gain points from which views may be had that reach far into Rockcastle, Pulaski, and Casey counties. Here one sees a country of sparkling streams and widespread forests stretching back to where hills rise like mountains in the dim distance. It is worth the walk of many summer days to reach the numerous points in Lincoln county from which nature has unrolled so many and such varied scenes.

ANCIENT GEOLOGY.

All the rocks which are exposed in Lincoln county belong to the three great ages, the Silurian, the Devonian, and the Carboniferous, which make the Paleozoic Time. Neither the beginning nor the ending of ancient time is recorded in

the exposures here, nor do the beds have the great thickness here which they attain at other places. They are, however, not without interest, as in a few miles they may be traced through many groups, and their changes noted in the rocks and soils in the surface features and in the forests.

The lowest rocks brought to view in the county are to be seen near the mouth of Hanging Fork of Dix river, and the highest near Highland Post-office. By tracing the outcrops between these two points, a thickness of over fourteen hundred feet is exhibited. Some of them are to be seen only in limited localities, and they mark but a small feature in a general way. Could these rocks all be seen together, and in their geological positions, they would exhibit nearly the following divisions and measurements:

		Feet.	Feet.
Carboniferous—			
Subcarboniferous	Upper	75	375
	Lower	300	
Devonian—			
Hamilton	Black slate	50	65
Corniferous	Corniferous limestones	15	
Upper Silurian—			
Clinton ?	Crab Orchard shale	40	75
Medina	Medina sandstone	35	
Lower Silurian—			
Hudson River	Upper beds	300	650
	Middle beds	150	
	Lower beds	200	
Trenton	Trenton limestones	175	265
	Birdseye limestones	90	
Total			1,430

LOWER SILURIAN—TRENTON EPOCH.

Birdseye Group.—The rocks to be seen in Lincoln county which belong to the Birdseye Limestones are exposed

for a few miles on the Hanging Fork and on Dix river, near where those two streams come together. They constitute the heavy walls of nearly vertical cliffs for about ninety feet above the water. Those strata are the continuation of the same beds which have been described in the Reports of Mercer and Garrard Counties. There is no change in their general character, being heavy-bedded, mostly dove-colored stones, fine-grained and brittle.

They afford no characteristic soils here, and have only been quarried to a small extent, and that for only local purposes, though good quarries could be opened in them. There is a sharp dip in the rocks here to the southeast, and they are soon carried beneath upper ones, and are seen no more in the county.

Trenton Limestones.—The limestones and shales of the Trenton, which overlie the Birdseye group, are to be seen in Lincoln county, exhibiting their usual phases; but, like the beds which underlie them, they disappear beneath the drainage from the same cause which carried the others down.

The ordinary features of the Blue Grass beds, the Granular Limestones, and the Upper Birdseye beds, are to be seen over a very limited surface. Eight or ten farms in the county are situated in whole or in part over these beds. They are all located near the Hanging Fork, and within a mile or a little more of Engleman's Mill.

These rocks, in their disintegration, produce the best of soils in the State, inferior to none, except that, in their contiguity to the cliffs and the steep dip to which they are subjected, they have been left more broken than is usual, while they form larger tracts in other counties.

HUDSON RIVER EPOCH.

The rocks formed during the Hudson River Epoch are, in Kentucky, naturally separated into three divisions, and are widely exposed to view. But in this county it is only the

upper beds which give noticeable surface features, the others being hardly seen, unless by one who knew their relations to other beds, and sought them out.

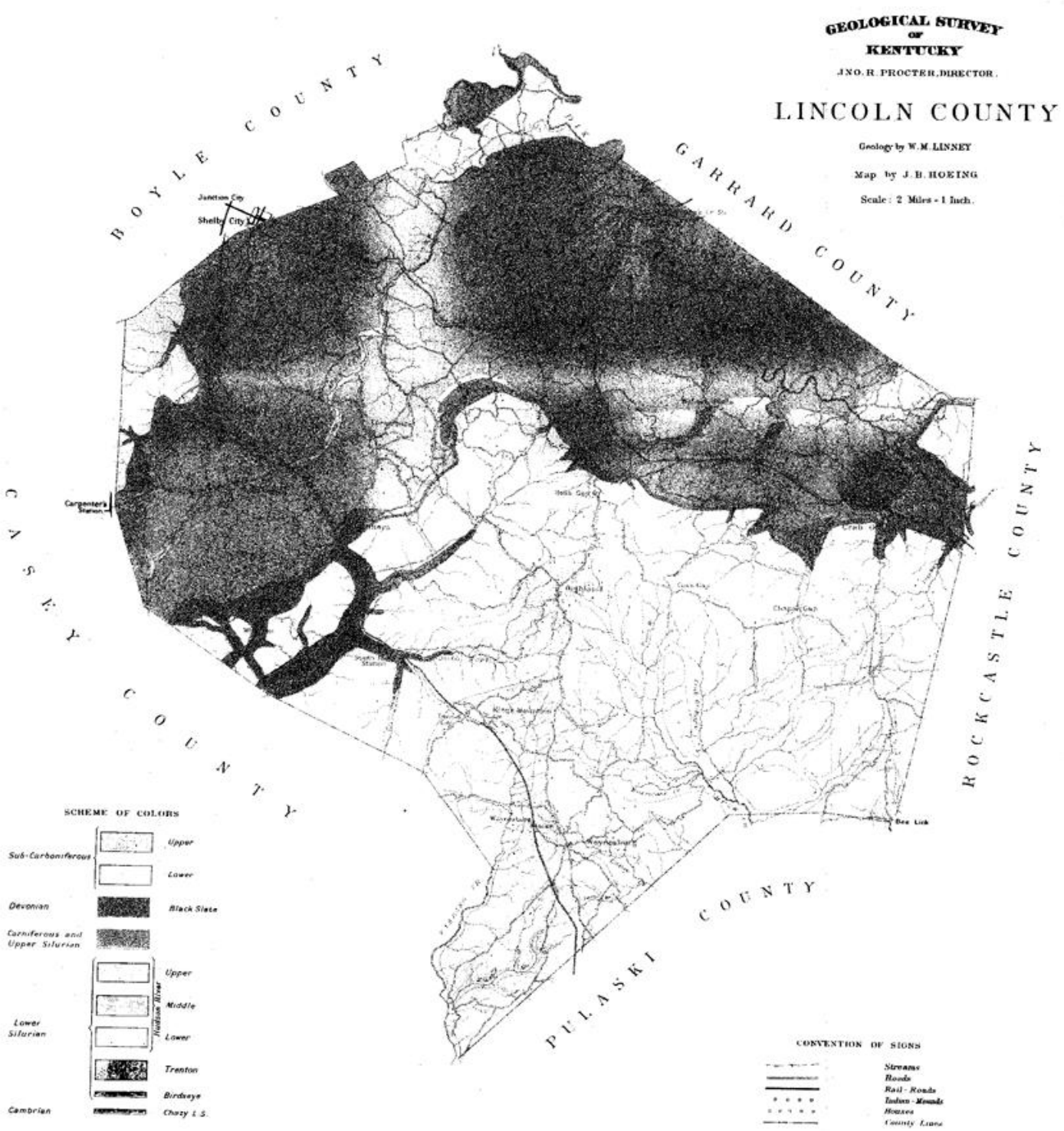
Lower Beds.—The rocks and shales of this division overlie the Trenton beds in a narrow strip, which is not over one half mile in breadth. The dip which carried the others down has become steeper, and the rocks, like the last, are soon lost to view.

The hills have the same contours which usually mark the position of those beds in other localities. Their surfaces are in part covered with the fragments of limestone, broken down by the disintegration and removal of the shales beneath. The soils are usually stiff clays, and have a disposition to cut into deep gullies. They have to be cultivated with some care to prevent injury from this cause. They are best seen in the county near and just south of the residence of Mr. R. L. White, near Hanging Fork. (See map.)

Middle Beds.—The Middle beds of the Hudson River group have, like the last, large exposures in the State, and even make up a large portion of the soils in Garrard county —those on Sugar and Back creeks. In Lincoln county their exposures are quite narrow, for the same reason which limits the groups heretofore mentioned.

East of the Danville and Stanford pikes they are better exhibited on the farms of T. Alexander and J. T. Hackley, but are seen in a narrow strip to where they cross Dix river. The sandstones and sandy shales which compose them are to be seen sometimes on the surface and again in a slight bluff on the Hanging Fork. The peculiar mulatto-colored soil, and the typical slopes to hills, are characteristic of the series in other counties. The concretionary member and the impure limestones, with their wealth of shells and corals, are present.

West of the pike mentioned above, these beds are seen from the crossing of the Knoxville Branch Railroad up the Hanging Fork for a number of miles. They only rise from


GEOLOGICAL SURVEY
OF
KENTUCKY
JNO. R. PROCTER, DIRECTOR.
LINCOLN COUNTY
Geology by W. M. LINNEY
Map by J. B. HOEING
Scale: 2 Miles = 1 Inch.
BOYLE COUNTY
GARRARD COUNTY
ROCKCASTLE COUNTY
PULASKI COUNTY
CASEY COUNTY
Junction City
Shelby City
Carpenter's Station
Box Lick
SCHEME OF COLORS
Sub-Carboniferous
Upper
Lower
Devonian
Black Slate
Carniferous and Upper Silurian
Lower Silurian
Hudson River
Upper
Middle
Lower
Trenton
Birdseye
Cambrian
Chazy L.S.
CONVENTION OF SIGNS
Streams
Roads
Rail-Roads
Indian-Mounds
Houses
County Lines

ten to fifty feet above that stream, and consequently give no characteristic soils to the county. Often large blocks are torn up in the bottom of the stream, which would make fine, smooth flag-stones. South of Hustonville, one of the branches which enters Carpenter's creek has cut down and exposed those beds for a short distance.

It will be understood that the series of rocks so far mentioned as occurring in Lincoln county are very limited in their distribution, being covered outside of narrow lines by overlapping of higher groups. In the Reports on the Counties of Madison, Garrard, Washington, Mercer, and Boyle, those series will be more fully described, and their relations discussed. The reader who is interested in them is referred to those reports for further information.

Upper Beds.—The upper beds of the Hudson River group are the superior rocks over a large part of Lincoln county, and mark, by their outcrops, all that portion termed the Blue Limestone Region, except the narrow exposures referred to in the previously described divisions. These beds are not uniform in their composition and characters; on the other hand, they are much varied.

The lower portion of these beds is mainly thin limestones, with a small proportion of clay shales between them. A few six to eight (?) inch layers are included in them. The latter are good solid stones, but the rest are disposed to be shelly, and decompose comparatively fast. These beds are seen more particularly on and near Hawkins branch, and on each side of the Hanging Fork, from Dawson's Mill to near Hustonville. (See map.)

Perhaps the soils derived from these layers are equal to any in the State when they are at their best, and are at any rate only excelled by those derived from the best portion of the Blue Grass beds. Blue-grass equal to any in the State is grown on them, and there are farmers who claim it contains more nutriment than the grass grown in better reputed localities.

The rocks are literally filled with shells and corals, which so greatly distinguish this horizon in other counties; and it is to their chemical character that the fertility of these soils is due. Among the fossils seen here may be mentioned *Ptilodictya hilli, Retepora angulata, Conchicolites corrugatus, Orthis linneyi, Streptorhyncus sinuatum, etc.*

The soils over these layers, even where they have been very badly worn and exhausted, are restored in a short time without other fertilizing agencies than being kept in grasses, which help to decompose the rocks, and thus furnish the necessary elements needed in good soils.

Above these layers are some limestones which have rather sandy shales included in them. They furnish good soils, and are mellow, but more liable to wash than the preceding, especially on lands where the surface is rolling. These layers are quite limited in extent.

Overlying the above are some limestones which have a greater proportion of earthy matters in them. The degradation of those give more clayey lands. There is some silicious matter in them; and where this is the case, they are more liable to be eroded by heavy rains. They are fertile, and, where kindly used, are much valued by their owners.

A succession of limestones, shales, and impure sandstones constitute the rest of this division. These give the usual varieties of soils seen in many other counties, as well as in Lincoln.

Some of the limestones are quite pure and evenly bedded, and are of great convenience to the people, being used for fences and common building purposes, as well as for lime-making. Some of the other beds are often quarried for those purposes, and the inferior ones soon prove their worthless character by crumbling to pieces. The beds, which contain great numbers of *Orthis lynx*, associated with many other fossil forms, outcrop in a great number of places; but they are never fit for building purposes—they fall to pieces too readily.

The beds holding the great fossil corals, usually at the top of the Hudson River group, are exposed at a number of places in the county, and I have measured specimens of *Columnaria alveolata* three feet in diameter. This coral bed is not so largely developed in Lincoln as in Marion and Washington counties; but some of the exposures are typical of its character there, and contain the same association of fossils. Hustonville and Stanford are both situated on the upper beds, and are surrounded by fine bodies of agricultural land.

During the whole period of time included in the Hudson River Epoch, there were many and marked changes which took place in the conditions existing on the floor of the old ocean where those rocks were deposited. The change from shale to limestone, from limestone to sandstone, must each have been made by some disturbance here or at some other point.

The amount of silica contained in the whole group is considerable, and much, if not all, of it must have been transported from some point where sandstones or other silicious accumulations could have furnished the supply. Time after time during this epoch was the floor of the sea raised so high that the waves which passed over it left their marks in the shifting sands and mud at the bottom. These impressions are seen at many points to-day; the ridges and furrows are as plainly marked as if made to-day on a sandy beach.

Time after time did the lime-secreting polyps rear their coral reefs in the clear shallow waters, and by some change those were broken down, and their structures buried by the mud swept over them by waves or currents. At the close of the Hudson River Period a great reef must have been here for a long time, for through county after county can be seen great accumulation of corals, many of which will weigh hundreds of pounds each; and a great time was required for so much lime to be secreted. This period closed here with an influx of sand and mud, which destroyed the existing life, and gave us a new period in geological time.

UPPER SILURIAN.

When we come to examine the rocks in the west which were deposited during the Upper Silurian age, it is found that they do not have the great thickness nor the regularity of distribution as are exhibited in the east. In many parts of Missouri they are entirely absent. In Ohio, Indiana, and Tennessee they are distributed in patch-like areas, and in Kentucky, also, their placement is very irregular.

In Central Kentucky, in those counties where they have been studied to some extent, they show some curious phases —sometimes they are one hundred or more feet thick; at other points they have thinned down to almost nothing, or are apparently absent.

It has been thought by some geologists that the Blue Limestone Region of Kentucky, Ohio, and Indiana, as well as the Lower Silurian area of Middle Tennessee, was an island during the Upper Silurian and part of the Devonian ages. Some have gone so far as to teach that the exposed Lower Silurian beds have never since that period been covered with any higher rocks. For Central Kentucky, the observations made would leave these theories unsupported by facts.

There are no evidences to show that there was any erosion of the rocks at the top of the Hudson River group. On the other hand, we have it demonstrated the great reef of corals was overlaid at different points with rocks of very distinct characters, and these within very narrow limits. These beds are more or less of a local character, and if not deposited at the same time, they were made under very dissimilar conditions.

NIAGARA PERIOD.

Medina Sandstone.—In the northeastern portion of Lincoln county there is to be seen, in a number of places, a series of buff sandstones, which sometimes show as hard concretionary shales, which are disposed to break into squares hardly more than an inch in diameter.

These beds at their thickest points are about thirty-five feet in thickness; and erosion over them is comparatively rapid, and they leave a soil which is sandy and easy to wash. These tracts have a local name of "Bald Hill Soils," from a locality in Garrard county where the rocks are exposed, and so called because they have become, in places, sterile from the amount of sand which covers them.

Internally they show yellow and green spots. Some of the layers have a small portion of lime in them. This series is well exposed on a road leading from Richmond Junction to Dudderar's Mill, on Dix river. Here, at many places in the hill-sides, can the *Columnaria* bed be seen covered up in the sand which was brought by the currents and swept over them.

A little north and east of Hall's Gap Station, and on the road thence toward Crab Orchard, they may be seen as they are presented in Garrard and Madison counties. While at nearly every point exposed the layers seem worthless for building purposes, yet locally there are some fine, durable stones among them. At Mr. J. T. Lynn's, about a mile from Hall's Gap Station, stones were quarried for foundations, steps, etc.; a very desirable stone was obtained, which has every appearance of being very durable. They are easily taken from the quarry, come out in good shape, and can be dressed with an axe, so soft is their character. They harden on exposure, and become of a deep buff color. At James' Mill, on Dix river, the stack was made of stones taken from these beds, and nothing could have suited the purpose better.

In every direction from Crab Orchard these rocks may be seen when looked for, presenting often small sterile spots; in some cases they have been built into stone fences. Some of the soils over these beds are fairly good where they have been taken care of; but too often they present the features which are mentioned in the REPORT ON WASHINGTON COUNTY.

In some of the heavier layers, at particular points, are included a few geodes filled with calcite crystals of a pinkish color. In some instances I found small masses of celestite

or *strontium sulphate* in a heavy hard layer near the top, and occasionally small nodules of zinc blende were seen.

Many of the layers are remarkably full of sea-weeds; their branching and matted stems covering layers everywhere as far as they can be traced. One bed, a few inches thick, seems to have held branching forms of *Chaetetes* corals; the cavities filled with petroleum. Fossils are very few, and exist only as very poor sandy casts. They probably include small forms of *Atrypa reticularis* and *Zaphrentis bilateralis;* but such was their condition that they could not be determined satisfactorily.

In the western portion of the county those rocks are seen between Moreland and Carpenter's Station; but here they are thinner than in the eastern part, and present no new phases. The whole series has the appearance of being a reef-like accumulation, deposited largely or entirely by currents, and sometimes probably in the face of waves, as at several points one or two layers have a wave-like structure. The life which existed in the waters before seem to have all been destroyed here at this time, and during the invasions of the Medina sand seem not to have been fitted for anything but plant-life, except in rare instances, and for a short duration.

Crab Orchard Shale.—Overlying the Medina sandstone in the eastern part of the county is a group of clay shales, which reach in several instances a thickness of forty feet, but thin down in others to a mere trace. These shales, as seen in exposed places, are gray or white, sometimes green; but when freshly excavated are black, green, olive, blue, and red. They are soft and crumbling, and are soon reduced to clay, and when tramped in wet roads become stiff and tenacious.

Within this deposit are a few hard, smooth plates of thin limestones, with sometimes obscure markings of plants; these plates are hard, and are often seen where all the shales have decomposed. These plates, and sometimes the shales, have

a curved structure, and at times some of the laminæ overlap the thinned-out edges of others.

Included in this bed are crystals of selenite (gypsum), and crystals and nodules of iron pyrites; sometimes a plate of iron shale is also seen. The whole bed seems to be impregnated with carbonate of magnesia. To the presence of those three minerals, in the form they assume, is due the peculiar character of the magnesian compound, which, under the name of Crab Orchard salts, is manufactured from these shales. These shales are placed provisionally in the Clinton until more is learned in regard to their relation. As these shales contain gypsum, soda, and potash, it would be advisable for farmers and others to make some experimental tests with them as fertilizers.

Other Beds.—Above the mouth of Flax creek, and near Dix river, the following section is presented:

Heavy corniferous limestone layer	33 inches.
Covered space	12 inches.
Drab sandstone	12 inches.
Rock weathering to olive shale	16 inches.
Sandstone with *cauda-galli* fucoids	3 inches.
Sandstone with *cauda-galli* fucoids	20 inches.
Magnesian limestone	2 inches.
Magnesian limestone	27 inches.
Crab Orchard shale	

The magnesian limestone is probably Niagara, as in it I found a species of *halysites*, *Atrypa reticularis*, *Striatapora cavernosa*, a *spirifer* two and a half inches in length, and a *favosite* coral. A heavy layer of limestone sometimes occupies this position at other places, but I have not been enabled to find any fossils in it.

The sandstones above are well marked with specimens of the cock-tail sea-weed, and are seen sometimes resting on the Crab Orchard shale, and sometimes on the Medina sandstone. They are very tough, rather more gray than drab in color, and at points in Boyle and Marion counties have included in them spines, teeth, and plates of large fishes.

The plates are tuberculated externally. These remains belong to the genera *Dinichthys* and *Macropetalichthys*, species of which have been described from the rocks of Ohio by Dr. J. S. Newberry. It would seem that those layers might represent both the Oriskany sandstone and the Cauda-galli grit.

DEVONIAN.

Corniferous Limestone.—The rocks which here have been referred to the Corniferous are not in great force, but present several distinct phases. In Lincoln, and to some extent in Boyle county, there is to be seen a very peculiar rock, which has been referred to this group, and may be a part of it, though there are no fossils by which it may be determined.

It is to be seen in a single layer, varying from two inches to twelve feet in thickness, and sometimes occupies nearly all the space between the Hudson River Group and the Black Slate. I have not seen it where either the Medina sandstone or the Crab Orchard shales are present.

At times it has very much the appearance of a breccia, having a massive gray base with fragments of brown distributed irregularly through it. At other places, while it has the same distribution of colors, it does not seem to have resulted from brecciation, but from alteration of fossils, or such like cause.

I forwarded a fragment of this rock to Dr. Robert Peter, Chemist to the Survey, as "brecciated limestone, which lies in our undetermined series between the Hudson River Group and the Black Slate." I quote his analysis and accompanying notes:

"A dark gray, fine-grained rock, mottled with whitish and light yellowish gray spots of various sizes and shapes; containing small cavities, some lined with small quartz crystals, some filled with calc. spar, and containing imbedded semi-opal, &c. It contains bituminous matter, the irregular infiltration of which has caused some of the mottling."

COMPOSITION DRIED AT 212° FAHRENHEIT.

Calcium carbonate	48.580
Magnesium carbonate	27.838
Alumina and iron and manganese oxides	8.760
Soluble silica	.180
Insoluble silica and silicates	8.480
Organic matter and loss	6.142
	100.00

I doubt that any part of this rock is brecciated. It resembles very much the description of the Water Lime as given in the Reports of the Ohio Geological Survey. I do not know that this stone has been used for any purpose in the county, except, when taken from railroad cuts, it has sometimes been broken and spread for ballast. This layer is well displayed in the railroad cut near McKinney's Station, and in the cut near Junction City, in the edge of Boyle county. Both of those points are on the Cincinnati, New Orleans and Texas Pacific Railway.

The cause which distributed this rock so singularly in the county is obscure; but the other beds of Corniferous, unlike these, were spread alike all over the county, and in a very even manner.

The Corniferous proper can be seen in its place, wherever its horizon is exposed; while the remnants of it can be seen over all the lower rocks within the limits of the county. It is usually comprised in three or four layers of heavy-bedded magnesian limestones, light buff in the interior, but on the exterior dark buff or brown.

At places it is largely filled with masses of hornstone (flint?), and this gives to it a very rugged appearance. Besides the hornstone in this condition, it is locally filled with silicified specimens of horn and honey-comb shaped corals. These all seem to assist in its decomposition, and it is not unusual to see spots where all the lime has disappeared, and the ground covered with these silicious masses. Sometimes the soft rocks beneath this series have been removed by natural causes, and the massive layers of the Corniferous have fallen in great blocks. Where there is but a small propor-

tion of silica contained in the beds, some of the layers would make good stones for massive structures. They have, however, been seldom used for any purpose.

Besides the hornstone and fossils contained in these beds, there are often druses lined with quartz crystals, while crystals of calcite and dog-tooth spar are not infrequent. Dolomite crystals are sometimes seen in them, and occasionally the cavities in corals, &c., are filled with petroleum. At several places, a small bed of iron ore is intercalated with the layers. Within the Corniferous are sometimes small caves, and in Lincoln county many of the finest springs issue from them. The soil derived from these beds is a red clay, containing a fair proportion of lime and magnesia, and a large percentage of silica. It is the finest wheat soil in the State, in several particulars. The quality of the wheat cannot be excelled, and the straw is not disposed to fall. The quantity is excelled on other soils, though good returns are received from these.

There are several outliers of the Corniferous in the county; these were once connected with the formation as now seen back of the Hudson River area, and have by erosion been cut off to themselves.

Quite a number of fossils are found in the waste of the beds, among which may be mentioned the following: *Phillipsastrea gigas*, *Zaphrentis gigas*, *Zaphrentis Raffinesquii*, *Zaphrentis corniculum*, *Cyathophyllum Halli*, *Cystiphyllum Americanum*, *Spirifer Oweni*, *Spirifer umbonata*, etc.

There is one fact which is worthy of mention here: in nearly all of the layers of the Upper Silurian and Devonian, and even in the base of the Black Slate, there are small transparent grains of quartz crystals. These are nearly microscopic in size, but well rounded. Currents must have brought them for a long time from the same locality; for they are too much alike to have different origins.

Black Slate.—The thick deposit of thin black slaty rocks which surround the Blue-grass Region of Kentucky is well

known. It has in Lincoln county its usual thickness for this part of the State—about fifty feet. Its intensely black color, and its fissile character, are so pronounced that it is easy to determine its outcrops wherever seen.

This slate contains some bituminous matter, and efforts have been made on Green river, at several points, to obtain it by the boring of wells into and through it; but while some oil has been found, as is usual in this shale, the quantity was small, and the attempts were failures as far as profit was concerned.

The small thickness of the slate here, and the unfavorable conditions which invest it, give no promise of oil ever being procured in quantities which would make it profitable. It is hard sometimes to convince some persons of this fact, which is so patent to every man who has a knowledge of the region and its geological characters.

The condition under which this shale was formed has been a puzzling question to geologists, and its solution seems as far off to-day as ever before. The theory that it was formed in deep quiet water far from land, and that its stores of oil were derived from sea-plants, and the few animals which lived amongst them, does not account for all the features which are exhibited by it.

Many remains of a large species of tree, *Dadoxylon Newberryi* (Dawson), all in a silicified condition, are seen in it in a few counties here. In some instances limestones locally were formed in it. Again, it is met with where the surfaces of the plates are covered with wave-marks. The base, in some places, as has been noticed, has quartz grains in it, and higher up, at some points, are seen accumulations of sand and mud. *Discinas*, *Lingulas*, and some other shells are found in it; also bones of fish and spines of a species of *Ctenacanthus*. Sea-plant impressions are a common feature at some horizons, and perhaps some undetermined features may be *Chaetetes* corals. Iron pyrites is a very common mineral through the entire bed.

Green River has cut its channel for some miles into and below the Black Slate, and a number of good exposures are

seen in this part of the county. This series forms the surface over a good many small tracts of land, and these are generally quite level: in fact, the most beautiful level lands in the county are based on the Black Slate. This fact, and its general imperviousness to water, has often left the tracts as wet glady places.

Where this slate has decomposed to a considerable depth, and has been well drained, the soils rank very well, and produce very fair crops. A portion of some of the most desirable farms in the county is based on these soils. Usually the narrow rims of the Black Slate, which outcrop around the Blue-grass Region, have not been cleared, or, if cleared, have not been cultivated. On steep slopes, those soils become very poor and very dry. It is only where they are level, or nearly so, they are valued at all.

SUBCARBONIFEROUS PERIOD.

The rocky series which constitute the Subcarboniferous Period are variously divided in the Western States. Sometimes they are separated into as many as five distinct groups. Beginning at the bottom, they are the Kinderhook, Burlington, Keokuk, St. Louis, and Chester. Those divisions do not distinctly appear in this part of the State; the St. Louis and Chester can be determined; the others are represented in part in the lower rocks, and are probably about the equivalent of the Waverly Group of Ohio. For any practical purpose, the divisions of the upper and the lower, or the calcareous and the silicious, are all that are necessary here.

Lower Beds.—The rocks which constitute the lower part of the Subcarboniferous cover nearly one half of Lincoln county, and form all of the southeastern and a narrow strip on the western portion, and they constitute what is usually termed the "Knob Region." They are for the larger part composed of clay shales, having other kinds of rocks distributed through them.

The first one hundred feet at the base of this division is composed of soft clay shales, and so peculiar is this soft character that, if they become uncovered of vegetation and higher rocks, they crumble and wash away so rapidly that vegetation cannot take possessior of them again. There are a great number of such denuded places in the State, and they are very interesting points for several reasons.

These "Licks," as they are called, often include many acres, and are furrowed into steep ridges and deep hollows, bare of plants, and are of a peculiar desolate appearance. The soft shales crumble beneath the feet, and the hard fragments of rocks collect in drift piles at the bottom of the slopes.

There are usually iron ores included in these shales, and where seen in place, show as red bands among the ash-gray shales. Often the beds of iron are broken down, and cover the ground in places. The quantity of ore is perhaps not large enough for commercial purposes. A great number of fragments of old plants, which grew when these shales were forming, have been replaced with iron, and strew the surface at some points.

Small pieces of petrified wood are often observed, which have been weathered out of the shales; and in the lower part are many round, oval, and other shaped rocks, from a half inch to several inches in diameter. A great number of these contain shells and other fossils. From the examination and comparison of a great number of these so-called concretions, I am under the conviction that they are coprolites, or the excrements of fishes.

In a careful search among these beds, extending over a period of nearly ten years, I have never found any part of an animal fossil that was not contained in these "concretions," except the bones, teeth, spines, and dermal tubercles of large fish. In the nodules are to be seen nothing but what would be the remains of the food eaten by such fish—bones, scales, and teeth of smaller fish, carapaces of crustaceans, and shells of mollusks.

These nodular masses can be grouped into several classes, in which there is a close resemblance in size and form, and one familiar with them can, in some cases, select specimens containing any given fossils, although no part of them may be exposed. Unlike concretions, there is no central nucleus around which the mass has gathered. A single specimen may show a number of shells or teeth distributed through it without any order, or it may contain a number of fragments from different forms of life. This unequal distribution of particles through them would seem to be sufficient to remove them from the class of concretionary structures.

Full analyses have not been made of a series of these coprolites (?); but in one specimen, sent to Dr. Peter for examination, more than eighteen per cent. of phosphoric acid was found. Described and figured by Prof. Meek, in the second volume of Palæontology of the Ohio Geological Survey, were the following fossils, which were found in this part of Kentucky, and are contained only in those coprolites (?): *Solenocaris strigata*, *Archaeocaris vermiformis*, *Ceratiocaris elytroides*, *Ceratiocaris Bradleyi*.

Sometimes "a dark olive-gray semi-crystalline mineral" is seen in those "licks," and which is distributed horizontally, and never in veins. This, on examination, was pronounced by Dr. Peter to be "barium sulphate, tinted with a little iron phosphate." This mineral I have only seen twice in this position. Iron pyrites are very common in those shales, and in their decomposition form sulphur and alum compounds, which often show as inflorescenses on the surface. Those places were formerly great resorts for wild animals, who came to lick these salts; and a number of these "licks" may owe much of their extent to the tramping of herds of buffaloes, etc., in the past.

Above these shales there is sometimes a yellow sandy mud rock, which cuts nearly as soft as cheese. It is not often seen, as it is so soft that it decomposes below the surface. In this has been seen some casts of *goniatites*, and some crinoid stems.

A succession of hard sandy shales follow this rock, marked everywhere with a species of *cauda-galli*. In places, this shale is filled with great numbers of shells, corals, etc., which mark the Keokuk Period. Above are other shales and thin limestones, which hold a great number of crinoids; but these are so badly broken that it is rare to find one that can be identified. This seems to be the horizon of the celebrated beds at Crawfordsville, Indiana, which have supplied so many specimens to the various museums of the country.

A number of layers of hard shales, impure limestones, and earthy and silicious rocks come in above; and in those are inclosed a great number of geodes—hard round silicious masses, having, usually, in the interior, crystals of quartz, and occasionally quartz and calcite. These masses, which are popularly called "niggerheads" or "bowlders,' are of all sizes, from that of a pea to two feet in diameter; the smaller have been usually formed by the infiltration of silica into the cavities of shells, crinoids, etc., while the larger ones have filled cavities left from the decomposition of inclosed forms of other kinds, some of which are very obscure.

By itself this series of rocks form rather poor soils. Often there is a deep leaf mold on the northern sides, which is very rich, and very good crops have been raised. From the steep slopes, which are the more usual character presented by these rocks, the soils are soon washed away. On some of the ridges there are level tracts, and, with care, they yield better than the larger part of these soils.

The knobs and ridges are well suited for the cultivation of fruit; the trees grow thrifty, and bear liberally, often when there is none in the country below. A heavy sandstone, or sometimes several layers of sandstone, completes the lower part of the Subcarboniferous. It is usually massive and soft, and has been worked for chimneys, door-steps, and, at one time, it was largely used for tombstone work. In other near counties it is somewhat harder, and has been used for facings for fine buildings.

Upper Beds.—It is only in fragmentary conditions that any of the upper portion of the Subcarboniferous has been left in Lincoln county. Those in place, and not broken down, are about forty feet of rather heavily-bedded gray semi-crystallized limestone, and are such as usually lie at the base of the St. Louis Group in the surrounding counties. They are seen capping the geologically higher points in the county—never continuous over large areas, but patch-like in their distribution. All the drainage lines in the portion of the county where they are seen have cut through them, and into the lower beds, so that it is only as capping the hills and ridges that they have been left.

These rocks have been used locally for building foundations and chimneys for houses and for road-making; but for the first two purposes, the sandstones beneath them have been oftener utilized. Covered everywhere nearly with the waste of higher rocks, it cannot be seen that these beds have formed any distinctive soils. A few pentremites, spirifers, fish teeth, etc., were seen in these beds, but from the nature of the limestone they are never well preserved. This limestone usually makes a very good article of lime. When the land of this part of the county is cultivated as it should be, these beds will be drawn upon for use as fertilizers.

WASTE BEDS.

Over every portion of Lincoln county are to be seen the wastes of beds which were once in position over those now seen in place. Corals and chert from the Corniferous are very common. These and the geodes from the Carboniferous are hauled off from many fields, and used for repairing roads. Blocks of sandstone and masses of conglomerate are not unfrequent over the blue limestone beds.

Over the Subcarboniferous part of the county, the remains of the St. Louis beds are seen nearly everywhere; and over these are spread, sometimes many feet in depth, the sands and pebbles of the base of the coal measures. There can be

no reasonable doubt that all the series of rocks now seen in the county were once continuous over its surface, unless we except some of the thin beds of the Upper Silurian, and that on top of these were the entire Subcarboniferous limestones and the lower portion, and, perhaps, all the coal measures.

Every tree or plant takes up more or less of the constituents of the soil; every turn of the plow, and every freeze that comes, puts some portion of the ground in condition to be washed away by the rains which follow; so that the streams have been the vehicles that have carried away the vast masses from above the present surface. The same causes are even now hurrying away the soils from many an unprotected field. Time has been long enough, and the drainage ample enough, even if they were not supplemented by other and more powerful conditions.

DISTURBANCES.

The rocks in Lincoln county owe their position at present largely to a great disturbance whose axis through the State passes a little north of the county, through Garrard and Boyle. This axis or uplift, which I have already named the KENTUCKY ANTICLINAL, gives a slope to the rocks for a long way to the southeast. This slope is so pronounced that while Stanford, ten miles southeast of Danville, has its railroad level only twenty-nine feet lower than that at the latter place, yet the rocks seen at Danville are brought down by this dip at least six hundred feet, or, in other words, the rocks seen at Danville are six hundred feet beneath those on the surface at Stanford.

There is an important line of disturbance which passes through the county, and which has controlled some of its most important features. This uplift enters the county from the east, a little south of Preachersville, passes a little north of Walnut Flat, Hall's Gap, and McKinney's Station, and leaves the county near its southeast corner. This line is well marked by the elevations and disturbances in the rocks.

This axis is not confined to this county, but is seen passing through a number of others. The position of the rocks between this uplift and the KENTUCKY ANTICLINAL is that of a trough, with its northwestern side tilted much the higher.

This trough-like depression has controlled quite an amount of drainage in this part of the State. The whole drainage of the Hanging Fork of Dix river lies in it. The southwest bend of the Kentucky river between Madison and Jessamine and Fayette counties, the valleys of Sugar creek and Boone's creek, in Garrard, and the streams which make the head waters of the Rolling Fork, in Casey and Marion counties, are all in this depression, which we name the KENTUCKY SYNCLINAL.

From this uplift in Lincoln county the rocks all slope away to the southeast again. Owing to this dip, the waters soon flow into the Cumberland and Green rivers. Besides the two principal disturbances mentioned, there are quite a number of minor ones distributed over the county. Some of these are quite local, while others can be traced for several miles. Some of them are quite old, and involve a great number of layers of rock, while others are quite recent, and have affected only one or two layers of thin rocks.

Prof. N. S. Shaler, in vol. III (pages 412–13), New Series, Kentucky Geological Survey, describes a slight disturbance produced in the bed of a branch in Lincoln county in 1877. It has been my good fortune to see scores of those places in the counties of Lincoln, Garrard, and Madison during the last two years. It seems to me that their origin is quite simple.

All of those places lie within the KENTUCKY SYNCLINAL; and, as in every trough-like depression like this, there is a pressure from each side where the rocks are tilted up; the pressures here are from the northwest and southeast. Many of the branches here have their bottoms composed of a thin unbroken layer of rock, which in a dry time has no water over it. Now this surface, often hundreds of yards long, and ten to forty feet wide, is often for days submitted to the heat of the sun, and consequently is expanded in every direction.

Part of this expansion is against the pressure exerted from the cause mentioned above. This condition would seem to be sufficient to crack a rock in a line at right-angles to the force; but another condition comes to its aid. The rocks are often softened by the action of water and easily broken; and when a rain falls upon their expanded surfaces, the contraction is rapid, and this, added to the force of the pressure, cracks them in a direction northeastwardly and southwestwardly, or parallel with the regular lines of disturbances.

There are usually three lines of fracture close together, the middle one being pushed up like a letter V inverted (Λ), which figure the whole disturbance resembles. Those disturbances are frequent, and have had much to do with the eroding out of those drainage lines. I have seen them when freshly made, and passing the same spot a few weeks afterward, have found all vestiges of them gone.

TABLE OF ELEVATIONS ABOVE SEA LEVEL.

Danville, Boyle county, Railroad	950	Trenton.
Danville, Boyle county, Centre College	974	Trenton.
Shelby City, Boyle and Lincoln counties	969	Black Slate.
Stanford, Lincoln county	921	Upper Hudson River.
Richmond Junction, Lincoln county	844	Upper Hudson River.
Gilbert's Creek, Lincoln county	820	Upper Hudson River.
Hall's Gap, Lincoln county	993	Medina Sandstone.
Crab Orchard, Lincoln county	929	Black Slate.
Gum Sulphur, Rockcastle county	878	Black Slate.
Broadhead, Rockcastle county	903	Waverly.
Mount Vernon, Rockcastle county	1113	St. Louis Limestone.
Rockcastle river, Rockcastle county	800	St. Louis Limestone.
Somerset, Pulaski county	900	St. Louis Limestone.

The map which accompanies this report will show the disposition of the various rocks and soils over the county, while the profile section will exhibit the relation and position of the rocks to each other.

MINERAL SPRINGS.

In Lincoln county there are a large number of mineral springs. Some of these, situated in and near Crab Orchard, have old and extended reputations. These springs furnish several classes of water.

The BLACK SLATE everywhere contains more or less of the sulphides of iron. These compounds, by their decomposition, furnish a variety of sulphur, and sulphur and chalybeate waters—among which, salt-sulphur and black-sulphur are the most common.

The LOWER SUBCARBONIFEROUS SHALES furnish some weak springs of chalybeate, but the best water of that kind issues from a layer in the UPPER SILURIAN, which contain oxides of iron.

In the CRAB ORCHARD SHALES are a number of springs and seeps which furnish magnesian waters. Weak alum waters are known at a few places, while salt water has been obtained in the county in boring wells for other purposes.

A table of analyses made by Dr. Peter is appended:

MINERAL WATERS. (In 1,000 grains of water.)

Number in report.	County.	Specific gravity.	Carbonate of iron.	Carbonate of manganese.	Carbonate of lime.	Carbonate of magnesia.	Sulphate of lime.	Sulphate of magnesia.	Sulphate of potash.	Sulphate of soda.	Chloride of magnesium.	Chloride of sodium.	Silica.	Total saline contents in grains.	Gases.	Name of spring.
531	Lincoln . .	———	0.021	0 005	0.195	0.041	———	0.056	0.013	———	———	0.013	0.040	0.384	Carbonic acid	Grove.
532	Lincoln . .	———	.028	.005	.117	.020	0.015	.112	.028	———	———	.018	.046	.442	Carbonic acid	Brown.
533	Lincoln . .	———	0.015		.139	.131	———	.066	.022	0.024	———	.008	.041	.446	Carbonic acid	Field.
534	Lincoln . .	1.00007	———	———	.013	065	———	.012	.008	———	———	.017	.022	.164	Sulphu retted, hy. & car. acid	Howard's.
535	Lincoln . .	1 0041	trace.	———	.673	.116	.203	3.454	.067	.774	———	.081	.060	5.428	Carbonic acid	Epsom.
536	Lincoln . .	1.0068	trace.	———	.912	.131	.185	3.520	.170	1.013	———	.304	.056	6.884	Carbonic acid	Foley's.
538	Lincoln . .	1.0060	trace.	———	.506	375	1.566	2.989	.298	.398	———	1.000	.021	7.153	Carbonic acid	Sowder's.
539	Lincoln . .	———	.007		.118	.024	———	.027	.010	———	———	.088	.017	.291	Carbonic acid	Bryant's chaly.
540	Lincoln . .	———	0.021	———	.095	.037	.010	.070	.026	———	———	.015	.046	.320	Carbonic acid	Bryant's pasture.
541	Lincoln . .	———	trace.	———	.093	048	trace.	.006	.025	———	0 042	.175	.015	404	Car. acid & sulph. hydrogen	Valley sulphur.
542	Lincoln . .	———	trace.	———	———	———	.104	.069	.016	.205	———	933	015	1 342	" "	Knob sulphur.
543	Lincoln . .	———	.026	———	.058	.116	.012	023	.007	trace.	———	———	.030	272	" "	Stone's sulphur.
544	Lincoln . .	———	.019	———	.480	.013	.966	.904	.066	.028	———	.278	.090	2.844	Carbonic acid	Well.

The above table is taken from (vol. II, page 299) Kentucky Geological Survey, Old Series.

CRAB ORCHARD SALTS.

Crab Orchard salts is a name given to a peculiar variety of epsomite—epsom salt or magnesian sulphate—which is manufactured from the CRAB ORCHARD SHALES of the Upper Silurian in Lincoln and Garrard counties. They differ from the common type of other magnesian salts, so well known to commerce as a medicine, in containing a number of other ingredients which enhance their value.

This strip of country, in which these shales predominate, and the manufacture of these salts is conducted, is an irregular one, about thirteen miles in length, and from a few hundred yards to two miles in breadth. They lie on a slope in the rocks to the southeast, and are from sixteen to forty feet in depth. Through all this line and thickness they are impregnated with the minerals which characterize the salts.

The origin of this deposit is an interesting question, worthy of investigation. That the shales and the minerals contained in them were thrown down from solution during the evaporation of the ocean water in shallow basins, raised above the sea level, is hardly to be accepted, as the differences in the shale and the interstratification of limestone would require other conditions for their formations. It seems more probable that the materials for the shales were swept in and deposited in protected places by currents, and that afterwards these minerals, which had been contained in the magnesian layers of the Upper Silurian and Devonian series, were carried down this slope, and found in those shales the conditions for their deposition and preservation.

The manufacture of these salts is a profitable business. Carried on at all seasons of the year, it gives employment to a number of families, who obtain their whole living from this industry. They have long been an article of trade, and are much used as a medicine all over the country, but more largely in the Mississippi Valley, having attained quite a reputation in the treatment of yellow fever and a number of other diseases.

Their first manufacture dates from 1826, when a Mr. Reuben Dollins lixiviated the earth derived from the shales, and boiled the solution till the salts were thrown down. They were kept at the bar at the old Davenport Hotel, in Crab Orchard, and sold at twelve and one half cents *a dose*. Dollins afterwards boiled the water from a spring. Since that time the business has grown, until now about thirty thousand pounds are annually produced.

The springs themselves furnish a very small proportion of the water used. Pits are dug in the shale, usually three to four feet wide, six to twelve feet long, and six to twelve feet deep. These are generally planked up, and covered to prevent rain from entering them. Water passing through the shales, and seeping into the pits, becomes impregnated with the minerals of the shales, but some more highly than others. Sometimes the water may be drank from the pits, but at other times the solution is too strong; and if there has been much evaporation, it becomes nearly a saturated solution.

The water is either pumped or bailed out, and then evaporated in large iron kettles or pans over wood fires. When but a small quantity is left, this is removed to a slower fire, where the evaporation is completed. The residue, when dried, appears very much like coarse brown and white sugar mixed. In the best brands, the salts are ground to give them a finer appearance. From twenty to fifty gallons of water are required to make one pound of salt.

These salts formerly brought as much as one dollar per pound, though the general price now is about fifteen cents. They are often adulterated by unscrupulous parties.

I am indebted to Mr. Geo. W. Evans, the largest manufacturer of these salts, for much of this information and for other courtesies. Mr. Evans has given much care and study to the manufacture, and now makes about eleven thousand pounds a year of a very superior quality.

Below are presented the analyses of two samples of Crab

Orchard salts, made by Dr. Peter, and taken from vol. IV, page 108, Kentucky Geolgical Survey, New Series:

COMPOSITION OF TWO SAMPLES OF CRAB ORCHARD SALTS DRIED AT 212° FAHRENHEIT.

	No. 1874.	No. 1875.
Magnesia sulphate	54.842	60.627
Soda sulphate	13 566	8.260
Potash sulphate	2.707	2.814
Lime sulphate	2.149	1.795
Lithia sulphate	.038	.028
Sodium chloride	2.954	1.874
Lime carbonate	.032	.018
Magnesia carbonate	.089	.036
Iron peroxide	.078	.028
Silica	.124	.118
Water of crystallization and loss	23.421	24.402
Total	100.000	100.000

FORESTS.

Except over the few and small barren "licks," Lincoln county was originally covered with an unbroken forest, in which all the valuable trees of this region grew to perfection. In the northern portion of this county, where the lands are given to agriculture and pasturage, the land has been largely denuded of trees; and this to as large an extent as a wise policy would allow. If some of the broken and wasted areas were planted in trees, it would be better for the general good of the county.

The southern portion was, until a few years back, covered with a wealth of trees; but the construction of the railroads near and through it opened up a trade in bark and timber, since when the timber has been rapidly and ruthlessly destroyed. As much of this region is better fitted for timber culture than for farming or grazing, the best interest of the county would be subserved by a careful protection of the young trees, and a judicious removal of the old. Such lands as these should be the reservations from which, in the future, other generations would draw their supplies of wood for every purpose.

ARCHAEOLOGY.

At several localities in Lincoln county are to be seen the remains of mounds, graves, and trenches, evidently part of the records left by the ancient and little known mound-builders. Such remains are ever interesting; and it is to be regretted that in every case where they have been destroyed, notes were not made, giving all the particulars connected with them.

On Mr. Bright's farm, near the Danville and Stanford pike, is a beautiful mound, which, it is said, has never been opened. On the farm of Dr. C. Fowler an ancient grave was opened, and from it was taken a broken circular stone. A scratched or striated crystal of galena was taken from a mound on the lands of Alex. Hicks, near Milledgeville. On the farm of N. Ware, is a row of low graves, and a few hundred yards from them, two trenches were laid open in the construction of the Cincinnati, New Orleans and Texas Pacific Railway. In those were found deer-horns, bones of various animals, broken pottery, and chippings from flints. On the lands of Mr. Bosley, on the Hanging Fork, have been picked up a number of things, among them an ungrooved axe, made from an iron ore. There was found some years ago, near Turnersville, a large steatite pipe, carved in part to represent a deer.

The most interesting locality in the county is situated two or three miles southwest of Hustonville. Here were situated two large mounds, and a number of smaller ones; all of which have been opened. The following particulars I obtained from Dr. C. Fowler:

The largest of those mounds was ten feet in height, and the second one eight feet; they were about thirty-five feet in diameter. On opening the larger one, seven skeletons were found; the upper one was only one foot beneath the surface; the head was to the east, a moon-shaped piece of copper was across the neck, and seven arrow-heads seemed to have been placed in the left hand. One of the other skeletons was very large, and on the breast was a piece of mica six inches square. With the others were found some bone

awls, some flints, a string of beads, and a copper implement. If those had been originally placed in any order with the bodies, it could not be determined when they were taken out.

The second mound contained neither bones nor tools, but in their place were some large stones, altars (?), and some charcoal. Several small mounds were opened, but they contained nothing. Several graves were opened, and found to contain skeletons, charcoal, and various implements. In one was a large sea-shell fashioned into a drinking cup. Three hundred yards southwest of these mounds, a large sugar-tree blew up by the roots, and exposed two well formed steatite kettles, each twelve inches in diameter.

APPENDIX A.

STATISTICS OF LINCOLN COUNTY, COMPILED FROM THE REPORTS OF THE 10TH CENSUS OF THE UNITED STATES, 1880.

1880. Total population	15,080
1870. Total "	10,947
1860. Total "	10,647
1880. White "	11,172
1870. White "	7,871
1860. White "	7,059
1880. Colored "	3,908
1870. Colored "	3,076
1860. Colored "	3,588
1880. Native "	14,991
1870. Native "	10,876
1860. Native "	10,544
1880. Foreign "	89
1870. Foreign "	71
1860. Foreign "	103
1880. Stanford, population	1,213
1880. Crab Orchard, population	538
1880. Hustonville, population	353
Number of farms	1,284
Acres of improved land	120,490
Value of farms, including buildings and fences	$3.246,176
Value of farming implements and machinery	$82,282
Value of live stock	$591,324
Cost of building and repairing fences, 1879	$43.614
Cost of fertilizers, 1879	$407
Estimated value of all farm products, 1879	$433,045
Assessed valuation, real estate,	$2,833.762
Assessed valuation, per'l prop'ty,	$994,384
Assessed valuation, total	$3,828,146
Taxation, State	$17.418
Taxation, county	$10,267
Taxation, town and school dist.	$899
Taxation, total	$28,584
*Miles of railroad	50.91
*Valuation of railroads in the county	$1,047,320
*Miles of turnpikes	120
*Average cost of turn'kes per mile,	$1,800
*Total cost of turnpikes	$216,000
Number of horses	3,644
Number of mules and asses	1,113
Number of working oxen	417
Number of milch cows	3,088
Number of other cattle	6,332
Number of sheep	13,391
Number of swine	18,260
Pounds of wool	55,512
Pounds of butter	166,184
Pounds of cheese	3,775
Gallons of milk	1,542
Bushels of Indian corn	628,807
Bushels of wheat	98,946
Bushels of oats	13,942
Bushels of Irish potatoes	11,201
Bushels of rye	7,792
Bushels of sweet potatoes	7,160
Bushels of buckwheat	74
Pounds of tobacco	35,214
Tons of hay	2,834
Value of orchard products	$7,317
Manufact'ing establishments, No.,	61
Capital invested in	$110,285
Hands employed in	128
Wages paid in the year	$25,947
Cost of materials	$116,166
Value of products	$174,819
Bonded debt	$24,000
Floating debt	$100
Total debt	$24.100
†Total No. of acres of land, 1881	185.326
†Average value per acre, 1881	$13.93

* Derived from other sources.

† Auditor's Report.