



**"PYRAMID MOUND"**  
near Vincennes, Knox Co., Ind.

Brady & Edwards, N.Y.

# GEOLOGY

OF

# KNOX COUNTY.

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BY JOHN COLLETT.

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This large and fertile county is situated well to the southwestern part of the State. Vincennes, the county seat, being 120 miles southwest from Indianapolis. Enclosed on three sides by the Wabash and White rivers, it is bounded on the north by Sullivan and Green, east by Daviess, south by Pike and Gibson counties and on the west by the State of Illinois. The superficial area is 540 sections or square miles. Several creeks and small streams, as Marie, Deshee and Pond creek and their affluents ramify into all parts affording some eligible sites for mills, and an abundance of water for stock and other purposes. Bottoms from one to three miles wide extend along the Wabash and White rivers, of remarkable fertility. These were originally to a small extent prairies, but as a rule were clothed with a thick growth of Walnut, Hackberry, Cottonwood, Sycamore, Oak, Cypress, Catalpa, Gum, Coffee nut and Mulberry, of largest size. Bordering these bottoms on their outer side, are higher benches and terraces built up with gravel

and fluviatil drift, from five to thirty feet above the low bottoms, former flood plains of the river.

An elevated ridge cut through by Marie creek, "Old river" and Deshee creek, extends from north to south through the central parts. The surface of this is covered with "Lacustral" loams, capped by a bed of sand from ten to forty feet in thickness upon the highest part of the divide, and was originally clothed with a forest of Poplar, Oak, Hickory, Maple, Gum, Ash, etc. The ridge is traversed or pierced by several marshes and ponds, as are also the first and terrace bottoms, which on examination prove to be old river beds.

The geological formations of this county comprise three opochs of the Quaternary, and the upper division of the coal measures.

## SURFACE GEOLOGY.

A cut commencing at the top of the highest ridge and extending to the rocky bottom of the river valleys, in fact laying bare the stone skeleton of the county, will give a full section of the recent or quaternary deposits. Such a section gathered in detail from a variety of sources is here brought together.

## GENERAL SECTION OF SURFACE DEPOSITS.

Recent alluvium "bot- toms".....	10 ft. to 40 ft. 00 in.
Terrace banks.....	5 ft. to 30 ft. 00 in.
Ancient "sandbars" on sides and top of highest ridges.....	150 ft. to 30 ft. 00 in.
Lacustral silt or "Erie clay".....	5 ft. to 170 ft. 00 in.
Loess—Lacustral.....	5 ft. to 40 ft. 00 in.
Glacial Drift.....	5 ft. to 0 ft. 00 in.
Excavations during the Glacial Epoch which constitute the valleys of the Wabash, White river, etc., extending about 100 feet below the present low water mark of the streams.....	300 ft. 00 in

The time and precedence of these beds is known from the order of their occurrence, which is invariable. The alluvial "bottoms" along the streams originating from the ordinary floods, are made up of sands and clays spread out by over-



flow, and rest upon or *against the sides* of the gravel terraces. The terraces are consequently next in age and rest upon or against the sides of the more ancient alluvium or "sand hills;" these in turn are more recent than the Loess clays, which superimpose the true Boulder or Glacial drift.

For a more full description of these beds and the *mode* of their occurrence, the reader is referred to report on the geology of Sullivan and Lawrence counties; to Prof. Newberry's report, Geology of Ohio, and Prof. Swallow's Physical Geography of Missouri. From these papers it will be seen, that at or about the close of the Glacial epoch, a powerful current of water swept under or from an icebelt reaching south of central Indiana, which by its great violence cut deep channels in the solid rocks in its southward course. This was succeeded by great lakes extending over and beyond southern Indiana and Illinois, whose low water line was at least 200 feet above the highest hills in the county. At this time the Loess or "Lacustral" \* clays were deposited in the shallows of that lake, as at Freelandville, from Bruceville south, etc., and at the same time the deep gashed channels were silted up with the unctuous clays filled with vegetable matter, known as "Noah's cattle yard," which is so constantly met in shafts and bores about Sandborn and elsewhere.

The river valleys were silted or built up at least 80 or 100 feet above the present water line, for we find, on the divide separating the Wabash and White rivers at this level, ancient river channels now marshes, ancient bars now gravel banks, ancient thoroughfares now brooks. A thoroughfare or channel leading from White river near Edwardsport to the Wabash above Vincennes, would require a ditch of but little depth † to unite the high waters of the two rivers.

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\* A name suggested Prof. C. A. White as a better term than "Bluff" or "Loess."

† Estimated at fifteen feet.

When the great Southern lake commenced emptying to the south—a slow long process,—the Wabash and White rivers began to run with an easy lifeless current, at times indifferently traversing all the region on either side and between the two, and at the eddy line between or outside of their currents depositing the heavy beds of sand found along the high hills on either side of each river. This theory is sustained as to the Wabash by the fact, that in washes on the highest sand hills in the county fine grains of magnetic iron ore of northern origin were noticed, which from the accompanying material had been sorted from the upper river drift, and was considered notice that the Wabash had been there; as to White river by the fact that geodes and other sub-carboniferous fossils, rocks and clays are found all over this region and along the bluffs north of Vincennes, some of which were characteristic of Lawrence and Brown counties, and do not occur on the upper Wabash, and show conclusively that at one time White river had discharge into the former by Marie creek.

The upland division of the county presents a notable variety of soils, none of which owe their origin to the pulverization of the local rocks, but instead are imported by drift action from regions more or less remote. The post-oak lands at Freelandville, and the ash gray "clay loams" characterized by a growth of Persimmon, Gum trees, etc., are compact impalpable sands, impervious to air and water, and subject to great vicissitudes as to drought or moisture. They are as before said of lacustral origin. Another very considerable part of this area is characterized by a growth of Poplar, Walnut, Sugar, Ash, etc., and blue grass: this soil is yellow or of a reddish brown color—the color alone would indicate its origin to be the feriferous rocks of the sub-carboniferous limestones, but in addition fossils of that formation are so frequently found as to fully settle the question, and prove conclusively that these soils and their fossiliferous pebbles were brought here by the current of a river flowing at a level much above the channel of any of the present water courses, and whose head waters were then

engaged in cutting beds in the sub-carboniferous limestones, from 50 to 80 miles to east and northeast.

Still above and well up to the summit of the high—although not the highest hills in the county—are the old sand bars or high water line of these ancient rivers. This soil is not considered first-rate in an agricultural point of view, yet from the elevated position and warmth of these sands, they have been found to be well adapted to the growth of grapes, peaches, pears and other tender fruits. and hence are of great value. Further mention of the soils and their product is made under the head of Economical Geology.

#### PALEOZOIC GEOLOGY.

The rocky formations of this county comprise the upper part of the coal measures, from coal K to the highest coals of the Indiana and Illinois coal basin, including the soft, coarse ferruginous sandstone, known as the "Merom rock," so well developed at Ft. Knox and other parts of the county.\* The principal accessible outcrops are along the bluff's of the Wabash and White river, the intervening region being covered to a great extent with drift and alluvial soils.

The following connected section presents a general view of the accessible strata gathered from isolated stations :

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\*This sandstone, for the present, is still included in the coal measures, although its lithological character and position indicates a more recent origin.

## CONNECTED SECTION—KNOX COUNTY.

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1. Soil and drift.....	
2. Red and white soft fer- riferous sandstone,— “Merom”—Ft. Knox Rock .....	30 ft. to 80 ft. 00 in.
3. Shale and “clod”.....	2 ft. to 8 ft. 00 in.
4. Bituminous limestone..	0 ft. to 3 ft. 00 in.
5. Black coaly slate.....	1 ft. to 4 ft. 00 in.
6. <i>Rash coal</i> .....	2 in. to 3 ft. 00 in.
7. Fire clay.....	2 ft. 00 in.
8. Flaggy sandstone with plates of limestone.....	5 ft. to 23 ft. 00 in.
9. Argillaceous or bitu- minous limestone.....	4 ft. to 6 ft. 00 in.
10. Black slate and Can- nel coal.....	1 ft. to 3 ft. 00 in.
11. <i>Caking Coal N?</i> .....	2 in. to 1 ft. 06 in.
12. Fire Clay.....	2 ft. 06 in.
13. Gray argillaceous flag- gy sandstone, changing to limestone in bores along the Wabash river	30 ft. to 80 ft. 00 in.
14. Yellow quarry sand- stone.....	4 ft. to 23 ft. 00 in.
15. <i>Coal M</i> , fat caking...	2 ft. to 4 ft. 06 in.
16. Fire clay.....	1 ft. to 4 ft. 06 in.
17. Gray sandy shales or hardened soapstone, changing to limestone, in bores near the Wa- bash .....	21 ft. to 35 ft. 06 in.

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18. Soft black slate, (local) or soapstone.....	08 in.
19. <i>Coal L</i> , white ash, cak- ing .....	4 in. to 4 ft. 07 in.
20. Fire clay .....	4 ft. 06 in.
21. Brown sandstone and silicious shale.....	10 ft. to 17 ft. 4 in.
22. Hard bituminous lime- stone, full of fossils.....	3 ft. to 5 ft. 01 in.
23. Calcareous and pyri- tous "clod".....	3 in. to 2 ft. 00 in.
24. Black, sheety slate, with fossils.....	5 ft. to 1 ft. 06 in.
25. <i>Coal K</i> caking or lam- inated.....	3 ft. to 6 ft. 06 in.
26. Fire clay.....	7 ft. to 4 ft. 00 in.
27. Flaggy sandstone and shales.....	6 ft. 00 in.
28. Clay iron stones and shales.....	12 ft. to 16 ft. 00 in.
29. Dark shale, with sul- phur balls.....	4 ft. to 9 ft. 04 in.
30. Black sheety slate, and Cannel coal ?.....	1 ft. to 3 ft. 00 in.
31. <i>Coal I</i> ? part block...1 ft. 8 in. to 3 ft. 00 in.	
32. Fire clay.....	4 ft. 00 in.
33. Sandstone at bottom of bores.	— —
	350 06

The foregoing section gives an average view of the rocks of Knox county, with the number and relative position of the explored coals. The spaces and thickness of strata are calculated from the best data available as found at the center and east side of the county. But in passing from the rim of the coal basin in Crawford and Orange across Dubois and Pike counties to the eastern side of Knox, we have seen that the different coals have gradually and irregularly

thickened up from a mere parting to workable seams, and at the same time with equally variable increments the spaces between the coals have been enlarged. We are justified from this to infer that in continuing west toward the deep central part of the basin, the same law will be found to govern, and as a consequence we may expect that along the Wabash river that the *spaces between the coals are doubled* and in some cases quadrupled. Again, the coals and rocks in this county dip from east to west at a rate varying from ten to forty feet, and averaging about twenty-two feet to the mile, with an increasing ratio as we approach the center of the trough in which the valley of the Wabash is situated; all these facts indicate the extreme depth at which we must look for the horizon of the workable coals along the river, where no bores of a sufficient depth have as yet been put down to fully determine their existence or absence. Such a bore is needed to definitely settle the question here hinted at, but the cost will be large, beyond the ordinary limit of private enterprise, and should be carried on under public agencies.

The "Merom"—Fort Knox sandstone, No. 2 of the section, is a prominent feature in the geology of this county and adjoining regions to the north, south and west. It consists of coarse red and white sandstones, the grains or crystals often but little rounded before deposition, slightly agglutinated with iron, so that on exposure the iron is oxidized or rendered soluble in water containing carbonic acid gas; and hence on exposure this stone generally becomes soft or disintegrates to a coarse sand. Sometimes the stone is found to have been subjected to this process by natural causes, where good drainage affords free access to air and moisture, and then the stone is apparently a deposit of coarse white, or yellow sand, so soft that the ordinary pressure of the foot will bury the whole blade of a spade in the quasi rock. A few localities afford exceptions to this rule, as at the upper ledges at Marie creek, in the bottoms west of Wolf's hills, and at Wise's quarry south of Vincennes, where the stone is more compactly cemented, and good

quarry rock is obtained in blocks of considerable size. Typical exposures are seen at the mouth of Marie creek, Fort Knox, Wolf's hills, along the Illinois side of the Wabash from the mouth of Deshee creek to the mouth of White river, at Chimney pier rock, Dixburg hills, and generally along the higher parts of the central ridge it is pierced by wells, some as far east as Freelandville.

This stone almost continuously forms the high bluffs on either side of the Wabash, but is now separated by a valley from two to twelve miles wide, which contains boldly buttressed hills, disconnected like islands in the level bottoms, as Wolf's, Dubois', Bunker's and Dixburg hills, or sharp cones and solitary pillars, as "La Mamelie" and "Chimney pier Rock." Sections taken at all these points present such uniformity of stratification and composition, that we must conclude that the Merom rock once occupied all the great intermediate area, and that the mighty mass has been eroded by action of water, (save the outliers above mentioned,) the debris carried southward to constitute the "sand barrens" which form such a prominent feature in the surface of the southern part of this, and the adjoining counties to the south and southwest. We may safely conclude that the time necessary to accomplish the removal of a mass of such stone, averaging not less than ten miles in width, and from sixty to one hundred feet in thickness, "was long" and the agency more powerful than the present force of the Wabash. It is known that the valley of this river has been cut out not less than sixty feet below the present low water line. At Vincennes the subterranean river had overhanging sides,\* as seen at Fort Knox. This great chasm was afterwards silted up with a black sandy muck, containing many logs, large vines and other vegetable matter, and is often met with in digging wells. When the Wabash became confined to its present

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\*Mr. Beard informs me that, in digging a well near the center of town, at some distance from the surface he found a soft ferruginous sandstone, and on blasting through about ten feet of solid rock, he found a bed of alluvial sand and water.



water shed, this silt was partially removed, the fine sediment sifted out was carried away by the current, the gravel and stones were left on the bars (terraces) and at the termination of "cut offs." It has been remarked by Ellet and other civil engineers that American rivers flowing from north to south cut their eastern bluff from two to three times more frequently than their western. This is the case with the Wabash, as at "Covington-point-of-Rock," Lodi, the Narrows,\* Merom, Fort Knox, etc., and being contrary to the law of gravitation which would create a tendency to the western bluffs, must be accounted for by the fact that at such points the dip of sub-jacent strata are locally reversed, or are from west to east.

A characteristic specimen of the eroding force of the ancient Wabash striking its western shore may be seen in the face of the overhanging cliff north of Fort Knox, where deep mouldings and "pot holes" mark the different levels which the river has occupied in past times.

At the base of the Merom rock the exposures generally found in this county, consisted of pyritous shales and "clod," but near Bruceville, and in adjoining regions in Sullivan county, and at outcrops visited in Illinois, this rock is bedded on a conglomeratic limestone, as if a line marking a change of epochs if not of systems.

The rash coals, Nos. 6 and 11, are found pretty constantly near the surface in the western part of the county, as at Oaktown, the mouth of Marie creek, Fort Knox, in White river near Hazelton, and thence to east they rapidly mount the sides to the crest of the hills, and make their final outcrops along a line which passes from near Freelandsville by Cox's hill and High Point to the head of Wilson's creek in the southern part of the county. These coals are not of workable thickness, and only serve as a horizon to mark the

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\*The writer is indebted to the courtesy of the late distinguished civil engineer, Col. W. J. Ball, of Terre Haute, for kindly calling his attention to the inadvertency as to data in this connection in geology of Sullivan county, 1870, page 204.

top of the coal measures, and indicate the depth only at which workable coals may be found. They are generally covered with a black, sheety slate which, containing a large amount of bituminous matter, burns with much flame, and locally affords an impure Cannel coal, but is of little or no economic value.

The limestones, Nos. 4 and 9, superinposing the coals just mentioned, are a more important geological feature than the coals which they accompany. In their usual presentation they are compact, hard, clinky rocks, especially near their outcrop on the east, as north of Freelandville, at Cox's limekiln, near High Point, and on Wilson's creek; but to west along and across the Wabash in Illinois, they change to soft, laminated beds or calcareous shales filled with magnificent specimens of *Pleurotomaria tabulata*, *P. spherulata*, *Macrocheilus fusiformis*, *M. inabilis*, *Bellerophon carbonarius*, *B. crassus*, *B. Montfortianus*, *Athyris*, *Myalina*, etc., with other fossils heretofore classified as Permian. The flaggy sandstone, No. 8, was not found well exposed, being deeply covered with drift; at adjoining localities as "Shaker quarry," in Sullivan and at Hazelton quarries, it affords flags for paving, and some grits. Calcareous matter increases to the west, and this whole bed is found, in bores, locally changed to limestone. The same remarkable fact, if reports of bores may be relied on, is true of No. 13 of the section.

The yellow sandstone, No. 14, marks the roof of coal M. Where outcrops occur it affords good quarry rock, soft from its bed, but hardening on exposure to the weather, and well suited for foundations and hammered masonry. Examples are noted east of Freelandville, near Bicknell, and in the southeastern parts of the county.

Coal M. No. 15, of the section, varies from a few inches to over four feet, with an average thickness of about three feet. It is a fat, caking coal, and generally contains considerable sulphur, but at localities the product is known as first-class blacksmith coal, sometimes pure and fat enough to invite the attention of gas companies, and always well

esteemed for grate use. The only openings are at Wheatland and near Bicknell, but the seam has been pierced in wells north of Edwardsport and east of Freelandville, and from a north and south line drawn through these points, theoretically, the seam underlies the whole region to the west.

The horizon is about the lowest point to which test bores have been put down in the western part of the county. For the remainder of the section we must rely entirely on outcrops and bores along White river.

The space between coals M and L is composed characteristically of sandy shales and soapstone, sometimes hardened into massive argillaceous sandstone. Frequently it is so compact that it has been used for foundations, but from predominance of argillaceous matter it weathers badly, and in a few years disintegrating, becomes clay and sand. Whenever argillaceous material predominates, leaves, stems, and trunks of coal plants are common, especially toward its lower division. In outcrops here observed, the usual fern bed is represented by a soft black soapstone containing much comminuted vegetable matter. Coal L, No. 19, varies from a few inches, in a bore at northeast corner of township No. 5 in range west, to over five feet at Wheatland, and will average more than three feet in thickness. It presents the characteristic features of the seam, and offers a free or semi-caking coal, which burns to a white ash. The product is usually free from sulphur, and compares well with the coals from the same seam at Shelburn in Sullivan county, or Washington in Daviess county. The only openings are at Curry's, and Shepard's new shaft at Edwardsport. A single natural outcrop was observed near low water, in White river, on Donation 135. Theoretically this seam underlies the whole area of the county with the exception of a few valleys around, north, and northeast of Edwardsport, from which it has been eroded. This coal will be found desirable to manufacturers whose business requires a pure free burning fuel, and is of superior quality for locomotive, rolling-mill or engine use.

The bituminous limestone, No. 22, of the section, which so persistently marks the roof-rock of coal K throughout the State, presents all the characteristic features at Edwardsport. In places, it is a compact massive stone, pure enough to burn, or for building purposes, but often changes within a space of five feet to calcareous shale, as was found to be the case in quarrying this stone in the bluff at the latter town. At such stations it is rich in fossils of the following genera, viz: *Producta*, *Spirifera*, *Allorisma*, *Athyris*, *Hemipronites*, *Chonetes*, *Bellerophon*, *Rhynchonella*, *Orthoceras*, *Lophophyllum*, and an undescribed coral, which is probably new to science.

A black, sheety slate, No. 24, succeeds the limestone; rich in bituminous matter, it will generally burn with much flame, and sometimes affords specimens of inferior Cannel coal. It contains scales, spines and dermal plates of the shark *Petrodus occidentalis*, *Orthocerata*, *Discina* and *Lingula*. Large boulders, or "pot stones" of pyritized iron ore are found in the lower division of this slate, some of which are eccentric in form, others of great size and weight, become an incumbrance to the proprietor.

Coal K. No. 25 of the section is the lowest surface outcrop seen in the county. It measures about three feet in the vicinity of Sandborn where it is laminated in structure and partly block. At Edwardsport it varies from three to five and a half feet, with an average thickness of nearly four feet; thence dipping south as well as west with sharp undulations, it passes below the surface of white river, just rising to low water mark at the mouth of Indian creek, and is pierced by bores north of Wheatland. At Wilson's shaft in Daviess county five miles east of Wheatland, and at Dr. Posey's bank near the southeast corner of the county, this seam is grandly developed, measuring at the former full seven feet, and at the latter bank ten feet in thickness. These facts indicate a persistent thick seam, and we may safely expect to find it underlying the eastern and central parts of the county; a source of wealth greater and better than mines of gold or silver. The product is usually a

strong fat caking coal, occasionally sulphurous, but well esteemed for grate and engine use. By reason of the great thickness of the seam this coal may be cheaply *mined*; and cheaply crushed and washed, by power obtained from White river; thus offering remarkable facilities for the manufacture of cheap coke on a large scale.

The strata below K represent the place of the Block coal seams, and have only been explored by bores put down in the vicinity of Sandborn, for full particulars of which I refer to local details at that town. The borings which came from coal I? No. 31 of the section, were a mixture of block and cannel coal. A shaft at this place was in progress at the time of my visit, the result of which I am not advised. The existence of a workable seam at this horizon is possible but not exceedingly probable.

The foregoing gives a general view of the geological structure, coals, and stone of the county, to which will be added representative sections and notes of details for local information.

## LOCAL DETAILS.

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Commencing at the northwest part of the county, a well dug by Hon. J. Alsop just north of Griswold, in the south part of Sec. 33, T. 6, R. 9, pierced at a depth of 43 feet the upper rash coal. The horizon is further indicated by the occurrence of the lower or ferruginous beds of the Merom rock below the surface in this vicinity. Bores put down at Paxton and Carlisle a few miles north in Sullivan county, found the lower coals well developed, apparently of superior quality, and we may expect to find them equally well developed in this part of Knox county. The section of the well at Carlisle throws much light on the geology of this county, and is added. It was bored in the months of April and May 1873, for Messrs. Alsop, Hills, Helm and Whipps, by Mr. Wm. Adams, to whom I am indebted for information.

### SECTION IN CARLISLE WELL.

Surface clay.....	24 ft. 00 in.
Red sandrock.....	4 ft. 00 in.
Fire clay.....	1 ft. 7 in.
Siliceous soapstone.....	2 ft. 6 in.
Soapstone and flaggy sandstone.....	30 ft. 3 in.
Gray Shale.....	12 ft. 00 in.
Calcareous shale.....	8 ft. 00 in.
Coal.....	00 ft. 7 in.
Fire clay.....	2 ft. 0 in.
White limestone.....	20 ft. 0 in.
Soft gray limestone.....	36 ft. 3 in.
Fire clay.....	4 ft. 00 in.
Sandstone .....	1 ft. 00 in.

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Black slate.....	00 ft. 6 in.
Hard gray limestone.....	26 ft. 11 in.
Gray shale .....	15 ft. 2 in.
Fire clay.....	6 ft. 3 in.
Sandstone.....	1 ft. 00 in.
Coal M.....	3 ft. 1 in.
Fire clay.....	5 ft. 00 in.
Limestone.. ..	5 ft. 00 in.
Parting .....	
Limestone.....	5 ft. 00 in.
Parting .....	
Limestone.....	4 ft. 00 in.
Parting.....	
Limestone.....	8 ft. 00 in.
Gray shale and soapstone.....	12 ft. 1 in.
Coal L.....	6 ft. 4 in.
Fire clay.....	5 ft. 00 in.
Gray flinty limestone very hard to bottom.....	5 ft. 00 in.
	— —
	254 ft 06 in.

The well was bored with a hollow drill, and gas pipes for poles, affording an excellent opportunity for accurately determining the quality and thickness of strata. The coal was brought up in cubes from a quarter to half an inch square; compact, glossy, and to the eye, of superior quality: that from M, was a fat caking coal affording much gas: that from the lower seam L was more laminated, indicating a semi-caking white ash coal.

It will be observed that the double limestone so constantly marking the space between coals L and M in Sullivan county, is here divided by partings half to an inch deep, and is thickened by the addition of one or more bands. This last feature is typical of the new and unexpected development of calcareous rocks found in all the bores along the Wabash, from this for sixty miles south, attaining its maximum development near the mouth of



White river. Limestone is supposed to be deposited in clear water. The animals (Bryozoans, Crinoids and Corals), of which it is principally composed, cannot exist in muddy water. It is possible that such conditions were not so favorable for the deposition of coals as were the muddy waters which are known to have accompanied the burial of the material which formed the persistent and regular seams. This is a hint received from recent bores. More extended research can alone settle the question, at what line on the west, the lower workable coals of Indiana cease to exist; their horizon becoming barren, as is known to be the case near the centre of the basin in Illinois.

Near Emison's mill the lower rash coal seam is seen superimposed by a heavy bed of bituminous slate. Although small samples of impure cannel coal are obtained, this bed is of no economic importance. The workable coals are two hundred or two hundred and fifty feet below.

The Wolf hills, west of Emison's station, are an isolated mass of sandstone and shales, towering aloft like a rocky island in the level bottoms. They indicate the former existence of the Merom rock across these bottoms, and the power of the erosive currents which, sweeping down the Wabash valley, have removed their companion strata. In a well near the summit of the hill, was found at thirty feet below the surface, a deposit of lacustral clays twenty feet thick, containing much vegetable matter, and which afforded a very nauseous sample of "bilge water." From the top of the hill the view embraces wide alluvial plains and prairies, lake and river, with miles of woodland, stretching north to Merom, west to the prairies of Illinois, and south to Dubois hill; a similar island knoll. A bed of hard ferruginous sandstone, west of the hill, is worked by striping, in the low bottoms on the land of Col. Finkbine. It affords good stone for rough masonry.

At Ft. Knox and the railroad bridge across Marie creek, are good exposures of the Merom rock, which is a coarse ferruginous sandstone, massive or in heavy beds and with much false bedding. Partings of iron, more unyielding than

the rock, fret the sides and overhanging arches of the precipitous wall with erratic tracery in relief. The component materials of the bed show that it was transported by a powerful current of water, along the shore of, or on the line of a sub-aqueous bench in, an ocean; the deep central part of which is located by the false bedding to the southwest in Illinois. The upper member of the rock consists of soft, laminated, slightly coherent sandstones, which on exposure, always turns to a bed of yellow sand. The more compact part at the base is from forty to seventy feet thick, and sometimes contains small irregular partings of coal or carbonaceous material of no great extent, as in Wm. Wise's well northeast, and on David Young's land, (donation 27,) three miles east of Vincennes. A bore, reported by T. H. Kerkoff, made on surveys fifty-one and fifty-two commencing at the top of the hill, gives the following section :

## SECTION AT FORT KNOX HILL.

Soil and sand.....	16 ft. 00 in.
Sandstone .....	45 ft. 00 in.
Crevice.....	6 in.
Clay shale.....	58 ft. 00 in.
Sandstone.. ..	11 in.
	— —
	120 ft. 5 in.

W. D. Bridger gives the following section of a bore made by Mr. Beard on the north side of Marie creek and east of the Evansville and Chicago Railroad, which commences near the bottom of the above, and by connecting the two, gives a view of the strata to a depth of two hundred feet below the top of Fort Knox hill :

## SECTION AT MARIE CREEK.

Coal and black slate.....	1 ft. 6 in.
Soapstone.....	20 ft. 00 in.
Black slate.....	9 ft. 00 in.

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Gray shale.....	8 ft. 00 in.
Sandstone—laminated.....	42 ft. 00 in.
Soapstone and clay.....	16 ft. 00 in.
	— —
	90 ft. 6 in.

Vincennes, the county seat, is surrounded by broad alluvial plains of great fertility, except on the east, where commanding hills, surmounted by the ruined temples of the Mound Builders give variety and interest to the scenery. By Capt. Ellet's determination, low water in the river is four hundred and seventy-four feet above tide water. Geologically it is one of the highest stations in the state, as the Merom rock is found to fill a synclinal basin, of which the city is near the centre, for a space of thirty feet below the surface; consequently the rash coals outcropping at Fort Knox, Dubois hill, Bunker Hill, etc., are at least fifty feet below the streets. A bore made by Mr. Beard, several years ago, a mile east of town, is said to have discovered a seam of coal more than four feet thick. A detailed statement of this was not obtained, and the report is given for what it is worth.

A bore on Dr. Patton's land, a mile south of town, exhibits the following strata:

#### SECTION IN DR. PATTON'S WELL.

Surface soil.....	7 ft. 00 in.
Soft sandstone.....	40 ft. 00 in.
Coal .....	1 ft. 00 in.
Fire clay .....	3 ft. 00 in.
Hardstone (limestone?).....	3 ft. 00 in.
	— —
	34 ft. 00 in.

Similar strata were passed in Mr. Fay's well near "Sugarloaf Mound," viz:

## SECTION IN FAY'S WELL.

Sand.....	10 ft. 00 in.
Soft sandstone.....	65 ft. 00 in.
Gray shale.....	9 ft. 00 in.
Blue limestone.....	8 ft. 00 in.
	— —
	92 ft. 00 in.

Dr. Mantel furnished the following statement of a well bored on his land, east of the city, on upper prairie survey No. 10, viz:

## SECTION IN DR. MANTEL'S WELL.

Surface soil, Vincennes plain.....	3 ft. 00 in.
Merom rock sandstone.....	45 ft. 00 in.
Coal .....	3 in.
Sandstone.....	2 ft. 6 in.
Soft soapstone.....	14 ft. 8 in.
Coal .....	2 in.
Soapstone .....	15 ft. 00 in.
Sandstone.....	10 ft. 00 in.
Soft stone.....	10 in.
Hard limestone.....	10 ft. 5 in.
Black slate.....	5 ft. 00 in.
Soft stone.....	18 ft. 00 in.
Sandstone.....	50 ft. 5 in.
Sandstone, soft.....	10 ft. 3 in.
Coal .....	8 in.
Fire clay.....	2 ft. 10 in.
	— — in.
	188 ft. 00 in.

Bunker Hill is of historic interest. Around this mound-like promontory, General George R. Clarke marched his little band of men, until "an army with banners" bewildered the British commandant at Fort Sackville into a surrender that signalized with victory, the only battle of the Revolu-

tion on Indiana soil. Like its namesake at Boston, here an initial blow was struck which wrested an empire from the crown of England.

The following section was taken, to which is added a statement for which I am indebted to Mr. Thomas Carr, of strata passed in shaft and bore, viz:

#### SECTION AT BUNKER HILL.

##### Outerop—shaft and bore.

Slope .....	30 ft. 00 in.
Red Sandstone—Merom rock.....	22 ft. 00 in.
Silicious iron stones in shale.....	3 ft. 00 in.
Black sheety slate.....	5 ft. 00 in.
Gray argil. shale.....	2 ft. 00 in.
Dark bituminous shale.....	4 ft. 00 in.

##### Top of shaft 4 feet above high water.

Dark limestone.....	5 ft. 00 in.
Soft sandstone.....	7 ft. 00 in.
Dark shale.....	4 ft. 00 in.
Soft dark limestone.....	2 ft. 00 in.
Fire clay.....	6 in.
Flaggy limestone or silicious shale...	11 ft. 00 in.
Silicious soapstone.....	6 ft. 00 in.
Dark slate.....	5 ft. 00 in.
Gray limestone.....	2 ft. 00 in.
Calcareous shale.....	1 ft. 6 in.
Coal—rash.....	11 in.
Fire clay.....	3 ft. 6 in.
Sand rock, compact.....	7 ft. 00 in.
Gray soapstone.....	8 ft. 00 in.
Sandstone.....	3 ft. 00 in.
Dark, soft limestone.....	1 ft. 06 in.
Sandstone .....	5 ft. 00 in.

## (BORE.)

Soft gray limestone.....	8 ft. 00 in.
Dark gray shale.....	10 ft. 00 in.
Soapstone.....	6 in.
Coal parting.....	1 in.
Soapstone .....	1 ft. 6 in.
Hard limestone.....	2 ft. 00 in.
Sandstone .....	8 ft. 00 in.
	— —
	169 ft. 00 in.

These sections exhibit some variety, but are sufficiently uniform to indicate a common horizon in the upper coal measures at and below the base of the Merom rock. The place of coals M., L. and K, must be sought at a depth of from 250 to 500 feet below

On the land of Mr. Wm. Wise, one-fourth of a mile east of Pyramid Mound, is an outcrop of the Merom rock, the upper division soft like the Fort Knox sandstone, but below, becoming more compact it affords good rock of a dark reddish color. It has been worked with results satisfactory to the proprietor.

The overflowed bottom south of town, formerly "Vincennes common," has been leveed shutting off the high water of the Wabash. The city for sanitary reasons has opened a long ditch which drains the extensive lakes and ponds lying to the southeast. The discharge through the levee is by a stone culvert guarded by a skillfully arranged iron trap door, which keeps out the floods of the river, but at all other times allows free egress to the surface water. This automatic door works admirably and the project if carried to completion will result well. At a sluice where the "raised road" crosses the upper end of this ditch, the water was darkened by bushels of black crawfish, a writhing mass of hooks and claws migrating to an upper pond; a few red-clawed "hard shells" were treated as enemies by their dusky brethren, and were compelled to flee

to dry land for refuge. A swale extending from southeast of town by Deckers and thence by several outlets to the Wabash, was formerly an old bed of that river. At several stations in its course pits sunk at a dry term discovered vast deposits of white fluviatile sand.

The district in the southwest part of the county west of the E. & C. Railroad, and between the two rivers, is a low level alluvial plain that is relieved by a few ridges and knolls of small extent as Bunker hill, Dixburg hills, Rapids ridge, etc.; or solitary rocks, as LaMamelle a mound so named on account of its conical shape, and Chimney Pier, which was formerly of considerable height and is mentioned in Maj. Bowman's manuscript journal of Clarke's expedition (one of the papers of the Vincennes Historical Society), as the "*Chimbley rock*." These are remains of the Merom sandstone which once occupied this whole area, with a thickness of fifty to seventy feet. The bottom lands are very fertile and produce grand crops of the most profitable cereals as corn, wheat, etc., on the higher or well drained levels. They are traversed by numerous bayous and swampy basins overflowed by high water, and some permanent ponds, which are probably old river beds being underlaid with white fluviatile sand. About 20,000 acres of these swamps are covered with a fine forest of Cyrpress (*Taxodium distichum*); the large size, drooping boughs, and curious conical knees sent up from the roots of which are interesting. Other trees, shrubs and grasses, as Sweet Gum, Pecan, Persimmon, Catalpa, Cane, etc., are of southern affinity. These with several animals and reptiles of like affinity, indicate a sub-tropical climate; and are surviving representatives of the flora and fauna of the Lacustral period: it is probable that here existed one of the last remnants of the Great Southern Lake.

The Dicksburg hills are a range extending two miles from northeast to southwest, composed of red Merom sandstone, capped with lacustral and fluviatile loam. Owing to the high water in White river a section connecting this sand rock with the rash coal and calcareous beds, exposed at low



water, could not be made. At an unofficial visit the latter beds were noticed as containing *Athyris*, *Bellerophon*, *Pleurotomaria*, *Macrocheilus*, *Lophophyllum*, *Myalina*, etc., the latter of great size.

East of Purcell station, on Harbin's survey, lot 8, T. 2, R. 9, a fine bed of gravel was noted, composed of the hardest stones of the glacial drift, as quartz, jasper, green stone, and occasional geodes so much worn by running water as to nearly or quite obliterate the warty excrescences usually on their surface. This bed is valuable for road making, and ought to be purchased and used by the authorities. The gravel is partly conglomerated by percolation of a lime-bearing spring, which now finds an outlet at a lower level. This spring was a favorite camping ground of the savages; it was a point on the great war path from the Wabash to Kentucky, and is known as the Indian Spring.

At Earle's (Johnson's Mill,) the following section was taken, indicating the horizon of the upper rash coal:

## SECTION AT EARLE'S MILL.

Red sandstone.....	4 ft. 00 in.
Shelly sandstone.....	8 ft. 00 in.
Black slate.....	2 ft. 6 in.
Coal, rash .....	3 in.
Fire clay .....	3 ft. 00 in.
Sandstone and covered, to creek .....	30 ft. 00 in.
	— —
	47 ft. 9 in.

A short distance south of this, the high ridge dividing the watershed of Wabash and White rivers terminates. Vast beds of fluviatile sands, white as if newly washed by the rushing waters, mark the ancient confluence of these rivers at a level more than one hundred feet above their present channel.

The limestone superimposing the rash coals, outcrops near Spauldingville, on the lands of L. Thorn and Mrs. C. Ray, one hundred paces north of the district school house,

N. W. qr. Sec. 36, T. 2, R. 8. It is from two to three feet thick, and although argillaceous, has been burned, furnishing a strong dark-colored lime. Thin outcrops of the rash coals are seen on Thornton William's land, Sec. 1, T. 1, N. R. 9, and on Snyder's land, northeast quarter Sec. 5, T. 1, N. R. 8. They are of no great extent.

Allen and Foulk's bank, N. E. qr. Sec. 9, T. 1, N. R. 8 W., has long been worked by stripping. Entries of small extent have been driven. The coal is bright, lustrous, pure, semi-caking, burns to a white ash, and bears a good reputation for household and smiths' use. It is very similar to Alexander's coal near Petersburg. Sufficient developments have not been made to fully determine the position of this seam nor to estimate the amount of coal. The mine was not in work, and the openings had all fallen in except one. The following section was noted, viz.:

SECTION AT ALLEN & FOULK'S BANK.

(N. E. qr. Sec. 9, T. 1, N. R. 8.)

Slope .....	
Laminated sandstone.....	3 ft. 00 in.
Soapstone.....	5 ft. 00 in.
Bituminous parting.....	4 in. to 0 ft. 1 in.
Soapstone, fern bed, with <i>Alethopteris Serlii</i> , <i>Sphenophyllum Schlotheimi</i> , <i>Pecopteris arborescens</i> , <i>P. (Sp ?)</i> , <i>Neuropteris hirsuta</i> , <i>Cordaites borassifolia</i> .....	2 in. to 0 ft. 5 in.
Coal N ?.....	1 ft. 6 in. to 3 ft. 6 in.
Fire clay.....	4 ft. 00 in.
	<hr/>
	16 ft. 00 in.

A short distance east Mr. Albion McCray reports finding in his well, on N. E. qr. Sec. 10, T. 1, N. R. 8, a quantity of asphalt; a subterranean gas flow, bearing oil once had discharge here, and the volatile parts had evaporated and left the dry bitumen. Such occurrences are not uncommon;

but the stratum from which petroleum has origin is not of sufficient thickness in Indiana to justify the belief that here or elsewhere in the State paying oil wells will be found.

Hon. J. D. Williams, at Pond Creek Mills, devotes the greater part of his uplands, good "poplar land," to grazing. The sward of bluegrass covering his home pasture is a demonstrative example, showing that with persistent effort and intelligent direction this is one of the most lucrative branches of agriculture. Good crops of clover were seen on the adjoining farms. To the east the White river bottoms, nearly three miles wide, gleaming with midsummer corn blades, gave promise of the usual crop of eighty bushels to the acre. A tract of land was pointed out, lately sold at \$20, which produced the current year a crop of corn on each acre worth twice that sum. Just below the mills in the bottom of Pond creek is a deposit of geodes, of the subcarboniferous formation, natives of Lawrence or a more distant county, they indicate a low water bar of some stream flowing at this level, the head waters of which were then cutting channels through the Keokuk limestones not less than fifty miles distant to east or northeast. More than sixty wagon loads (forty tons) have been removed for stoning roads and gateways, and the supply is still abundant. Outcrops or rather partings of coal have been seen on Autler's and McCoy's lands, S. E. qr. and S. W. qr. Sec. 20, T. 2, N. R. 8, in a coarse sandstone, well up on the side of the hill. The deposit is part of one of the upper rash coals and probably of small extent.

A bore was put down by Mr. Williams near the center of Section 35, T. 2, N. R. 8, which added to a section taken of the outcrop gives the following stratigraphic exhibit, viz.:

SECTION AT J. D. WILLIAMS' BORE.

Red clay soil—slope.....	20 ft. to 30 ft. 00 in.
Fire clay—coal?.....	2 ft. 00 in.
Shaly sandstone.....	8 ft. 00 in.
Compact sandstone.....	3 ft. 00 in.
Shaly sandstone.....	12 ft. 00 in.

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Shaly soft sandstone.....	10 ft. 00 in.
Massive quarry sandstone...	15 ft. 00 in.
Heavy bedded sandstone...	10 ft. 00 in.

## (Top of bore.)

Sandstone.....	2 ft. 00 in.
Shale.....	5 ft. 00 in.
Blue sandstone.....	21 ft. 00 in.
Black slate.....	4 in.
Coal M?.....	4 ft. 00 in.
Fire clay.....	4 ft. 00 in.
Sandstone.....	5 ft. 00 in.
Gray shale and soapstone...	21 ft. 00 in.
Black slate.....	25 ft. 00 in.
	<hr/>
	177 ft. 4 in.

It is unfortunate that the bore was not put down deeper, as one if not two, thick workable seams are believed to exist within a short distance below. On the same section beds of massive sandstone outcrop with precipitous or overhanging walls, and afford excellent quarries. The stone is yellow, comes soft and easily dressed from the quarry, but hardens on exposure.

Nashville is situated in a depression of the ridge dividing the water shed between the two rivers. At the time of my visit a storm black with billowy clouds flecked with lightning was passing up the valley to west. The ground was full of electricity as is often the case on mountain peaks. A little girl standing in a position elevated a few feet from the surface, unconsciously became a natural electrometer. Her loose, otherwise curly hair, by the influence of the fluid was standing erect and wild, with transfigured "glory."

South of town bog iron ore of excellent quality, and apparently in masses of considerable size was observed on Phil. Cooper's land. A sufficient exposure to determine the quantity was not seen. Under the same circumstances ore occurs on the Teverbaugh and the Stucky farms in that vicinity.

Lucky Point east of the village, is a sharp promontory which extends into Montour's pond, an old river bed; marks of erosive currents may be seen high up on the hill side. Sandstone of fair quality has been quarried here for foundations. Coal M. may be found not far from 50 feet below the base of the point. North of town Mr. Bonawitz on Donation No. 59, has stripped a thin seam of coal and reports the product well suited for blacksmiths use. The opening was covered and not seen; the horizon is well up to the rash coal, and the existence of a workable seam near the surface at this level is impossible.

Wheatland on the O. & M. Railroad is surrounded by an easily won coal field, and is the commercial center of a good agricultural region. Large amounts of corn, wheat, fattened hogs and cattle, and walnut lumber are shipped from this station. To south, White river bottoms extend down the stream ten miles with a width of nearly three miles comprising some of the best corn lands in the world. Coal M. was formerly worked for local use by stripping on Nicholson's land in a branch just west of town; it is pierced by the well at the steam mill at 37 feet below the surface—outcrops are also seen north and east of town on E. R. Steen's land W.  $\frac{1}{4}$  Donation 110, and E. H. Dunn's land, S. E.  $\frac{1}{2}$  Additional Donation 221. At these points the seam varies from one to two and a half feet thick. A bore put down by S. L. Niblack nearly to the horizon of coal L., gives the following section, viz.:

## SECTION IN NIBLACK'S BORE.

Drift.....	17 ft. 00 in.
Red sandstone.....	7 ft. 00 in.
White sandstone.....	6 ft. 00 in.
Dark soapstone.....	16 ft. 00 in.
Coal M.....	2 ft. 06 in.
Fire clay.....	3 ft. 00 in.
Dark coarse rock.....	20 ft. 00 in.
White sandstone.....	10 ft. 00 in.

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Blue hard rock.....	8 ft. 00 in.
Dark hard rock .....	4 ft. 00 in.
White fine rock, argillaceous sand- stone .....	4 ft. 00 in.
	— —
	95 ft. 00 in.

Since my visit a bore has been put down in the eastern edge of town on the land of E. R. Steen to L, having a reported thickness of over five feet.

A slope made by Clark, Nutting & Co., on the east side of the river in Daviess county, together with adjacent outcrops, develops the following section, which is given as a connected view of the rocks and coals of this vicinity :

SECTION AT CLARK, NUTTING & CO.'S SLOPE.

Yellow lacustral clay.....	15 ft. 00 in.
Brown sandstone.....	15 ft. 00 in.
Dark pyritous shale.....	2 ft. to 5 ft. 00 in.
Coal M.....	1 ft. 06 in.
Fire clay.....	3 ft. 00 in.
Argillaceous sandstone..	5 ft. 00 in.
Soapstone and gray shale..	15 ft. 06 in.
Coal L.....	4 ft. 7 in.
Fire clay .....	4 ft. 06 in.
Gray shale and sandstone..	10 ft. 00 in.
Gray limestone.....	2 ft. 04 in.
Blue limestone with fossils	5 ft. 00 in.
Black limestone.....	2 ft. 00 in.
Calcareous shale.....	2 ft. 00 in.
Black sheety slate, with fish teeth scales etc., <i>Pro-</i> <i>ductus</i> , <i>Chonetes</i> , <i>Athyris</i> , <i>Spirifers</i> and <i>Crinoid</i> stems .....	12 ft. 00 in.
White soapstone .....	1 ft. 00 in.
Coal K, laminated coal...	1 ft. 03 in.



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Good coal.....	3 ft. 00 in.
Best coal.....	2 ft. 07 in.
	— — 6 ft. 10 in.
Fire clay.....	7 ft. 00 in.
	— —
	117 ft. 3

The working superintendent, Mr. Wilson, to whom I am indebted for the above section, informed me that the company have put down nine bores on their territory, fully establishing persistent development of the coals here indicated. The upper coals, L and M, near the tops of the surrounding knolls are not worked, though it would certainly pay well. In the mine, coal K varies from five feet nine inches to six feet ten inches, with an average of over six feet; at one bore the seam measured seven feet ten inches; from actual levels K dips to the northwest twenty-eight feet within half a mile, but rises to the south two feet in one-fourth of a mile.

The Weaver bank, north of Wheatland, was formerly worked by five drifts. Coal M is here three feet four inches thick; the product, a fat, caking coal, full of gas and bitumen and of fair quality for steam and household use. It is overlaid by a soft, yellow quarry sandstone, which is found at the same horizon, and traced continuously from Sullivan county to this point. The bluff outcrop gives the following exhibit, viz.:

## SECTION AT WEAVER BANK.

Slope .....	
Quarry sandstone—soft part...	15 ft. 00 in.
Gray shale—pyritous.....	4 ft. to 2 ft. 00 in.
Coal M.....	6 in. to 3 ft. 04 in.
Fire clay.....	3 ft. 06 in.
Soapstone, with iron stone nodules.....	16 ft. to 25 ft. 00 in.
Slate.....	4 in.
Coal L.....	4 ft. 5 in.
Fire clay.....	3 ft. 00 in.
	— —
	56 ft. 07 in.



The Weaver Coal Company having leased and purchased a large amount of contiguous land, explored their territory by putting down seven test bores; and in the extreme northern corner found the horizon of coal K at a depth of thirty-seven feet; three bores found M at a depth of from forty-seven to seventy-eight feet, while the third, and probably the fifth bore passing coal M as a mere parting of slate, found L at from sixty-seven to one hundred and eight feet.

For a full statement of these bores and a neat map, I am under obligations to E. N. Wild, treasurer of the Company. A shaft was put down which corresponds almost exactly with these bores, and gives the following strata, viz :

SECTION AT WEAVER COAL CO.'S SHAFT.

(*N. gr. Don. 131.*)

Drift.....	20 ft. 00 in.
Hard sandstone.....	41 ft. 00 in.
Fine grained sandstone.....	16 ft. 00 in.
Gray slate.....	2 in.
Black slate.....	4 in.
Coal M.....	4 ft. 6 in.
	— —
	82 ft. 00 in.

The specimens seen from this shaft were an excellent article of pure fat caking coal. If this quality is persistent it will invite tests for gas making and coking. Coals which were not seen, are met in wells on R. Stevenson's land on Donations 135 and 136 from three to four feet thick. Fragments from the latter station, after fifteen years exposure to the air, indicate a superior stocking coal. The seam in the bed of the river at Apraw ford was not visible on account of high water. It was long worked for local demand, and quantities were hauled in wagons for blacksmiths' use. The seam is reported more than four feet thick.

At the mouth of Indian creek, coal visible in the bed of the stream at low water was not seen for similar reasons.

L is thinly developed in the banks near the bridge. On donations 242, 243 and 245, coal is reported in wells, ranging in thickness from two to three and a half feet, and is four feet thick at Simonson's bore in S. W. qr. Sec. 26. These coals are generally in isolated knolls, and to some extent have parted with gaseous as well as sulphurous matter, and consequently are, in some respects, purer if not better. Entries have been driven on Swick's and Hooper's lands, S. E. qr. and N. E. qr. of Sec. 27, T. 4, R. 8. The product is a good caking coal, remarkably pure, though liable to "slake." The following section in outcrop and bore occurs at Kelty's and Swick's, viz.

## SECTION AT KELTY'S &amp; SWICK'S BANKS.

Slope .....	20 ft. 00 in.
Shelly sandstone.....	6 ft. 00 in.
Laminated sandstone.....	15 ft. 00 in.
Quarry sandstone.....	14 ft. 00 in.
Laminated sandstone.....	4 ft. 00 in.
Sil. shale, with iron nodules..	9 ft. 00 in.
Coal.....	3 ft. to 3 ft. 09 in.
Bore reported by Dr. Keith with limestone at base.....	30 ft. 00 in.
Coal.....	4 ft. 00 in.
	— —
	105 ft. 09 in.

A bore put down in the thriving village of Bicknell, found coal two feet thick at 82 feet from the surface; not being furnished a section, I am unable to determine the position of the seam.

In Mills Prairie and the old river bed leading from White river to Marie creek a muck soil is found, which to a depth of from 10 to 16 feet contains much vegetable matter, at a greater depth sand and fine gravel occurs, while beds of sand along the sides are frequent. The banks of this Prairie lake and "old river" are distinct—unmistakably marked, for wells dug on such banks do not expose sands

and muck, but instead clays and loes loams. It is probable that "the great denuding current" mentioned by Prof. Cox, Geological Report 1870, as sweeping from east to west across Daviess county, had its outlet for a time by this "thoroughfare" to the Wabash.

Edwardsport is situated upon a high bluff, which affords a wide view over the surrounding bottoms, and in the opinion of the citizens also complete protection from the malaria of the low lands. Coal L. outcrops in a thin seam along the top of the bluff and has long been worked in the western part of town by Curry & Co., where the following section was noted:

#### SECTION AT CURRY'S MINE.

Clay.....	12 ft. 00 in.
Shelly sandstone.....	18 ft. 00 in.
Argillaceous sandstone.....	1 ft. 6 in.
Soapstone .....	8 in.

#### *Coal L:*

Fat coal.....	1 ft. 8 in.
Parting.....	
Cubic coal.....	6 in.
Parting.....	1 in.
Laminated coal.....	2 ft. 00 in.
Parting.....	1 in.
Coal.....	10 in.
	— — 5 ft. 2 in.
Fire clay.....	3 ft. 00 in.
	— —
	40 ft. 4 in.

This coal is highly esteemed by all who have used it; it presents a bright, glossy, appearance and burns to a white ash. Before the advent of railroads, this coal was coked and hauled to Vincennes in wagons, a distance of 19 miles, to supply a foundry. The coke was bright, lustrous and worked well in melting iron.

North of, and adjoining town, Shepherd & Hazlett put down five test bores on lands belong to Messrs. Simonson and Hewland. On northeast quarter Section 35, at a depth of 42 feet they found L three feet two inches thick—a short distance south at a depth of 33 feet L was found five feet eight inches; and still twenty rods south at 19 feet below the surface, L was found five feet and two inches thick. The company have since put down a shaft. The coal is fully equal to Curry's, and it is believed will fairly compete with the Washington coals of Daviess county.

The fifth bore on Simonson's land commencing at the fire clay of L, was put down to the lower seam K, and developed the following strata, viz:

## SECTION IN SIMONSON'S BORE.

*S. E. qr. Sec. 35, T. 5. R. 8.*

Clay at level of coal L.....	12 ft. 00 in.
Clay and shale.....	12 ft. 00 in.
Silicious shale.....	14 ft. 00 in.
Limestone.....	1 ft. 2 in.
Calcareous shale.....	4 ft. 4 in.
Black slate.....	3 ft. 6 in.
Coal K <sup>1</sup> .....	6 ft. 00 in.
Fire clay.....	1 ft. 00 in.
	— —
	54 ft. 00 in.

The borings from this test were reported free from sulphur.

South of town Shepherd, and Hazlett work coal K by a slope on the land of Dr. B. F. Keith where the following strata are seen, viz:

## SECTION AT DR. KEITH'S MINE.

*N. E. qr. N. W. qr. Sec. 12, T. 4, R. 8.*

Soil and loess.....	12 ft. 00 in.
Argillaceous sandstone.....	8 ft. 00 in.

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Soapstone .....	08 in.
Coal L.....	2 ft. 6 in.
Fire clay.....	3 ft. 00 in.
Sandstone, laminated.....	3 ft. 00 in.
Sandstone, laminated.....	14 ft. 00 in.
Bituminous limestone.....	3 ft. 00 in.
Black sheety slate.....	6 in. to 1 ft. 6 in.

*Coal K:*

Laminated coal.....	1 ft. 6 in.
Parting, pyrite and smut.....	00 ft. 00½ in.
Compact coal, part block .....	1 ft. 4 in.
Smut parting.....	0½ in.
Blacksmith—fat coal	1 ft. 6 in.
— —	4 ft. 5 in.
Fire clay (in bore).....	4 ft. 00 in.
White sandstone and shale.....	30 ft. 00 in.
Soapstone becoming darker.....	27 ft. 4 in.
— —	113 ft. 5 in.

The Company elevate their coal by steam engine and have a capacity for 40 miners and 100 tons of coal per day. The partings in this coal contain considerable pyrite, which being banded, may and should be separated in mining, to supply chemical works. This coal may be washed and coked with profit. The black slate roof of the seam contains massive boulders of pyrite weighing from one hundred to one thousand pounds surrounded by a black "clod" filled with *Productus*, *Chonetes* and *Athyris*.

On southeast quarter of Section 12 belonging to Dr. Keith, coal L shows a thickness of thirty inches on the side of the bluff, and at low water he has drifted in fifty feet on K, where the seam is full five feet thick with the bottom and middle divisions remarkably pure and free from sulphur.

A section very similar to the one given in Dr. Keith's

slope was taken on the bluff in front of town. A repetition is here unnecessary.

The following fossils occur in the limestone and calcareous shale, overlying coal K along the river landing, viz: *Productus costatus*, *P. punctatus*, *P. semireticulatus*, *P. longispinus*, *Spirifer cameratus*, *S. lineatus*, *S. Kentuckensis*, *Allorisma* (sp.?), Crinoid stems and spines, *Hemipronites crassus*, *H. crenistria*, *Chonetes mesoloba*, *C. spinulifera*, *C.* (sp.?), *Bellerophon carbonarius*, *Rhynchonella Osagensis*, *Orthoceras Rushensis*, *Lophophyllum proliferum*, and an undescribed coral. Half a mile south of town the loess loam exposed in a railroad cut contained characteristic shells, a list which is given in geology of Sullivan county—Indiana Report 1870. This bank offers good specimens of the tubes found traversing *exposed faces* of this deposit, and which furnishes ground for illustration and chemical analysis in the report on Geology of Missouri 1855. Here an opportunity was afforded of seeing these tubes excavated by a sand wasp, which, after completing the burrow, cementing the sides and a projecting crown to ward off the rain, utilized the home so constructed for the deposit of her eggs and a supply of food for the coming race of young. The same facts were noted by one of the editors of the American Naturalist at Merom, Indiana.

A short distance northwest of town coal M. outcrops or is found in wells, having an average thickness of over three feet; so that the combined thickness of the coals in the vicinity of Edwardsport, including K and L amounts to nearly twelve feet.

Sandborn is surrounded by broad alluvial lowlands traversed by many wide prairie like swales, with occasional knolls and ridges covered with Lacustral and fluvatile sands. In the "old river" swale, which has an elevation of thirty feet above low water in White river, two bores, one east, the other west of town, were put down to a depth of eighty feet, or fifty below the present rock bottom of the river, in which mucky quicksands containing much vegetable matter were found extending to that depth and

which may extend to a still greater depth. Similar deposits are also found in digging wells at least fifty feet higher than the surface of the swale.

Putting these two facts together, we may safely conclude:

1st. That this valley was eroded to a depth of fifty or more feet below the bottom of the present water courses by the sheet of water, which resulted from the glacial iceflow that was stranded a short distance to the north.

2nd. That afterwards this deep chasm, cut down through solid rock, was silted up with muck, light unworn sands and vegetable matter, (*Erie clay*) to a thickness of more than one hundred feet during the period when a great lake occupied southern Indiana, etc..

3rd. Since that time, the rivers have been removing these materials until they have reached their present channels.

Coal K. was formerly worked east of town. The roof slate, containing fish teeth, scales and spines (*Pretrodus occidentalis*), is well developed, and when broken up in great slabs, exposes a coal which, from a few fragments picked up, is bright, solid, semi-caking and well suited for stocking. It is reported as well liked by blacksmiths, and over two feet thick. The seam was covered with water. On the adjoining hill, northeast quarter, southwest quarter, Section 2, T. 5, R. 7, a bore was made for C. E. Crane by E. L. Ferguson with following results, viz:

#### SECTION IN CRANE'S BORE.

Soil and sand.....	14 ft. 00 in.
Yellow clay.....	7 ft. 00 in.
Soft sandstone.....	10 ft. 00 in.
Compact sandstone.....	5 ft. 00 in.
Soapstone (cal. slate?).....	4 ft. 06 in.
Black sheety slate.....	6 ft. 04 in.
Coal K—part block.....	3 ft. 00 in.
Fire clay.....	3 ft. 00 in.
	<hr/>
	52 ft. 1 in.



Russel, Crane & Co., then bored near the railroad track, northeast quarter, northwest quarter, Section three T. 5, R. 7, and found the following:

## SECTION IN RUSSEL, CRANE &amp; CO'S BORE.

Soil, sand and muck.. .. .	42 ft. 00 in.
Sandstone .....	12 ft. 00 in.
Rash coal.....	3 ft. 02 in.
Soapstone parting.....	5 ft. 00 in.
Coal K?.....	1 ft. 6 in.
Hard sandstone.....	6 ft. 00 in.
Clay and iron balls.....	16 ft. 00 in.
Black slate.....	9 ft. 04 in.
Slaty cannell.....	3 ft. 00 in.
Coal I?—part block.....	3 ft. 00 in.
Fire clay.....	1 ft. 00 in.

— —  
102 ft. 00 in.

Encouraged by this bore Messrs. Crane & Co., were excavating a shaft, which at the time of my visit had been sunk to a depth of forty-two feet through dark clays and quick sands, and was being prosecuted with energy. Levels carefully made by an engineer between the different bores at Sandborn, show that K has a local dip to southwest of twenty-four feet per mile. A bore made by Hill Bros. north of town on northeast quarter, southeast quarter, Section 34, T. 6, R. 7, shows the following section from their record:

## SECTION IN HILL'S BORE.

Clay and sand.....	16 ft. 00 in.
Sandstone.....	10 ft. 00 in.
Soapstone .....	5 ft. 00 in.
Slate .....	10 ft. 00 in.
Coal L .....	8 in.
Fire clay.....	1 ft. 06 in.
White sandstone.....	26 ft. 04 in.

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Soapstone .....	7 ft. 00 in.
Sandy shale.....	3 ft. 06 in.
Black slate.....	03 in.
Coal K .....	06 in.
Clay parting.....	09 in.
Coal K .....	2 ft. 08 in.
Fire Clay.....	3 ft. 04 in.
Potters' clay.. ..	5 ft. 06 in.
Sandstone.....	5 ft. 00 in.
Hard limestone.....	3 ft. 05 in.
Limestone .....	21 ft. 06 in.
Coal I .... ..	10 in.
Fire clay.....	3 ft. 00 in.
Potters' clay.....	6 ft. 00 in.
Argillaceous sandstone.....	6 ft. 07 in.
Blue limestone.....	2 ft. 01 in.
Soapstone .....	04 in.
Blue limestone.....	05 in.
Sandstone.....	13 ft. 00 in.
Bituminous soapstone.....	25 ft. 00 in.

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180 ft. 02

Seven other bores made in this vicinity, discovered from one to three seams of coal in each, but as the results do not vary very materially from the sections here given, they will not be repeated. We may conclude that the existence of workable areas in this vicinity are possible, but searchers will often meet with disappointment.

Freelandsville is located well upon the summit of the divide which separates the White and Wabash rivers; and at an elevation of one hundred and fifty-two feet above the latter. The town and vicinage is noted for comfortable homes, surrounded by gardens stocked with vegetables shrubs and flowers, and well kept farms, combining the pleasures and thrift characteristic of Holland, from whence a majority of the citizens hail. Immunity from malarial diseases is claimed with truth; and it is suggested that the use of filtered rain water would, in some degree, procure

exemption from the inflammatory diseases which sometimes prevail here, as elsewhere on loess soils. Wells dug in the northern part of town, pierce the Merom sandstone, as will be seen by the following section, viz.:

## DR. FREELAND'S WELL.

Soil.....	12 ft. 00 in.
Soft, white and red sandstones.....	51 ft. 00 in.
Silicious shale.....	1 ft. 00 in.
	— —
	64 ft. 00 in.

North and south of town, along the sides of the divide, detached blocks of limestone are noted, indicating the horizon of the thin rash coal seams.

At Cox's hill, Sec. 8, T. 4, R. 8, this stone is well developed, and has been burned profitably for lime.

## SECTION AT COX'S HILL.

Clay soil.....	5 ft. 00 in.
Laminated Merom sandstone. ....	5 ft. 00 in.
Thick bedded Merom sandstone.....	10 ft. 00 in.
Soft, friable, white sandstone.....	15 ft. 00 in.
Argil. limestone—conglomeratic.....	3 ft. 00 in.
Clay parting.....	1 in. to 04 in.
Dark limestone, containing crinoid stems, corals, <i>Athyris subtilita</i> , <i>Productus punctatus</i> , <i>P. semireticulatus</i> , <i>P. longispinus</i> , <i>Chonetes mesoloba</i> , <i>Spirifer lineatus</i> , <i>Orthis carbonaria</i> and <i>Rhynchonella Osagensis</i> .....	4 ft. 00 in.
Place of rash coal.....	
Fire clay—potters' clay.....	1 ft. 06 in.
	— —
	43 ft. 10 in.

A similar section was noted on the Horn farm; donation one hundred and fifty-two, near High Point; with the

addition of a carbonaceous clod at the "place of the rash coal." The stone at this station is four to six feet thick, and when burned, produces strong dark colored lime.

It may here be mentioned that this *double limestone* has been seen in almost continuous outcrop, marking the horizon of the upper rash coals, in a belt one hundred and fifty miles long; commencing at Snake Knob in Warrick county, thence continuing north along the western boundary of Pike, and through near the center of Knox, thence northwest through Sullivan county crossing the Wabash river near the Narrows above Graysville, and again nearly north by Marshall, Paris, and Garrett's Mills to Fairmont, in Vermillion county, Illinois; which shows that the limestones are more persistent than the rash coal seams, which are often absent, or very slightly developed. At several of the localities mentioned, this stone is from ten to thirty feet\* in thickness, and is rich in fossils.

At Bruceville, the horizon of the rash coals is seen in the valleys near town, but ascending against the dip to the east. In the hills and at the railroad cut four miles east, the Merom sandstone develops a thickness of ten to eighty feet. Mr. Willis' well at the hotel in town, pierces this deposit to a depth of fifty feet; the stone appears compact, but on exposure to air, is soon resolved to sand. Denuding forces of great intensity have exerted their power in excavating valleys and depressions in this vicinity, some of which had their origin before the loess or lacustral period, while others plainly indicate fluvial origin. Messrs. Witherspoon & Emison put down a bore in the valley south of town, and for the following report I am indebted to Dr. Witherspoon:

#### BRUCEVILLE BORE.

Soil, and fluvial drift.....	20 ft. 00 in.
Soft, red, Merom rock.....	20 ft. 00 in.

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\*Marshall and Paris, Illinois.

Silicious shale.....	2 ft. 00 in.
Hard ferruginous, argillaceous, conglomeratic limestone.....	2 ft. 00 in.
Black slate—upper rash coal.....	02 in.
Fire clay.....	1 ft. 00 in.
Soapstone and silicious shale.....	20 ft. 00 in.
Coarse sandstone.....	8 ft. 00 in.
Bituminous soapstone.....	4 ft. 00 in.
Hard rock (limestone) in layers, with partings of clay.....	42 ft. 10 in.
	— —
	120 ft. 00 in.

East of town the surface coals are covered with two to three feet of bituminous slate, some of which approaches in a small degree to Cannel coal, and will burn. Coal N? has been worked on the Denny land, lot one hundred and forty-three, and Willis,' lot one hundred and twenty-three. The seam was covered with water, but was reported from two to three feet thick.

At Mr. S. Hoffman's, lot one hundred and eighty-three, a mile southwest of Bruceville, occurs a heavy bed of slaty cannell. An entry was driven by Mr. Hoffman, twenty-five feet under the hill, which had fallen in at the time of my visit. He reports a considerable thickness of cannell, and specimens presented by him were fair to good samples of that kind of coal. The horizon, however, does not justify the hope that a workable bed may be found at this level.

The following section was taken, viz.:

#### SECTION AT HOFFMAN'S BANK.

Slope.....	30 ft. 00 in.
Red and white Merom rock.....	18 ft. 00 in.
Silicious shale and iron nodules.....	3 ft. 00 in.
Flaggy sandstone .....	4 ft. 00 in.
Silicious shale and shaly sandstone...	25 ft. 00 in.
Conglomeratic sandstone.....	2 ft. 04 in.
Pyritous soapstone.....	08 in.

*Lower rash Coal:*

Slaty coal.....	08 in.		
Cannel slate.....	2 ft. 02 in.		
Coal, caking .....	2 in.		
	—	—	3 ft. 00 in.
Fire clay.....			3 ft. 00 in.
			—
			89 ft. 00 in.

A bore put down by Messrs. Sheperd & Hazlett on the adjoining hill to the south, discovered, as I am informed by Mr. Sheperd, great irregularities in the level as well as the thickness of this coal. A search for coal at this point, should be directed towards the lower seams, M and L, which probably underrun the surrounding region.

## ECONOMIC GEOLOGY.

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Alluvial bottoms are so prevalent in Knox county, that they give character to its agriculture. The fertility of these soils is proverbial. Corn is King. Good crops of sorghum, potatoes and wheat are also produced. The upland soils are generally thinner, yet with careful cultivation, return a fair yield of wheat, oats and hay. Considerable areas, characterized by an original growth of sugar trees, poplar, walnut, ash, etc., are well suited to the growth of Indiana bluegrass. Being situated rather to the south of the grazing zone, exemption from the effect of hot suns and drought may be procured by underdraining and the growth of alfalfa. The vigorous roots of the latter, pierce the ground to a depth of from four to ten feet, which renders this great hay and grazing plant independent of sun or drought. It is especially adapted for the sandy barrens, and ash gray clays, and grows luxuriantly on alluvial soils.

### FRUIT.

Fruit growing is an important interest. Favored by a genial climate which protects from the biting blasts of winter, the tender fruits such as peaches, pears, grapes and berries, mature with superior flavor and brilliant color. Lake-like ponds, and the surrounding rivers and swamps, farther regulate and modify sudden atmospheric changes. Almost perfect immunity from untimely frosts and "severe snaps" is enjoyed on the promontory-like ridge which passes north-south through the central parts, especially along the belt of fluvial sands which cap the high bluffs of the Wabash. In autumn the air on the highlands is burdened with the fragrance of the ripening fruitage.



Pear and apple trees are endowed with great longevity, and grow to wonderful size. The orchard planted by Col. Vigo, who was an effectual aid to the patriot cause in the Revolutionary war, still survives in good bearing. Apple trees, two to nearly four feet in diameter, were seen and measured. A pear tree, on the Ockiltree farm now owned by Wm. Wise, Esqr., has become historical. Rev. H. W. Beecher visited the tree many years ago, then in the full vigor of its fruitfulness, and published an interesting and graphic account of this "*giant of its race*." The "Great Pear Tree" was twelve feet in circumference near its base, one hundred and twenty feet high, with a lateral spread of sixty feet from the trunk, and bore an average crop of fifty bushels. Riven by lightning, it survives only in history and tradition, after a life of nearly three score years and ten.

Mr. S. Burnett, one mile east of, and at an elevation of only 60 feet above Vincennes Plain, has devoted 183 acres to the production of fruit, 40 acres of which contain 1,100 choice grafted apple trees in bearing; Winesap, Rawls' Janet, Yellow Bellflower, Fall Pippin, Carolina Red June, and Early Harvest, are standard varieties, and generally bear a full crop of well colored, fragrant and palatable fruit, which commands a good market—the earliest varieties any price asked. He has six hundred budded peach trees and will plant the coming spring of 1874, at least 500 more to repair the damage of the excessive winter of 1872-3; he relies on having three good crops successively—has had an entire failure but three times in the last twenty-one years, viz: 1856, 1864 and 1873. The extreme winter of 1872 damaged this orchard greatly, except on the highest ground.\* His peaches are reported as highly colored,

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\*Careful observation has determined that practically, nature accords with the theories of science. Cold air is heavier than warm air, and will consequently settle to the low lands, hence we find that hills surrounded by deep valleys will afford protection in proportion to their height, against sudden "cold snaps." I have often observed that a knoll fifteen to twenty feet high in an orchard, will draw

sweet and fragrant. "Hale's Early" proves hardy, a reliable bearer, ripens from 4th to 20th of July, and is highly remunerative. Mr. Burnett has a vinyard of six acres; the Catawba proves a failure, but the Concord and Ives Seedling are hardy, good bearers and pay at the rate of \$300 per acre. His grapes command a ready market at Indianapolis, Toledo, Cleveland and Buffalo. Strawberries, raspberries and blackberries grow kindly under his management, and maturing early command highly remunerative prices. Gooseberries are produced at the rate of forty to fifty bushels per acre, and sell at \$2 per bushel.

Mr. F. M. Fay's farm of four hundred and forty acres adjoins the city on the east. The bluffs here attain an elevation of one hundred feet above Vincennes Plain. Still twenty-seven feet higher towers "Sugar Loaf Mound,"

Mr. Fay, taking advantage of his favorable soil and situation, has devoted two hundred acres to fruit production; he has five thousand five hundred choice grafted apple trees, one thousand five hundred budded peach trees and two thousand five hundred Concord and Ives Seedling vines. The above mentioned vines succeed well, but he has found the Catawba an utter failure. His fruit creates a demand beyond his ability to supply, and competes triumphantly with that grown in southern Illinois, being more vividly colored, sweeter, and free from stings of curculio or other insects. This experience establishes a proud preeminence to the fruit growers of Knox county. The numerous railroads intersecting at Vincennes give competing rates north, south, east and west. The current prices in 1870 for peaches was \$2 40 per bushel, for apples \$1 90 per barrel, and Mr. Fay's farm that year gave an income from peaches sold of \$10,000, from apples of \$2,000.

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the narrow line between the life or death of peach trees; which perish at—18° Fah. As a general rule, subject to local variations, it has been found that, an elevation of fifty feet in case of sudden atmospheric change, will mitigate the cold 3°, one hundred feet 5°, and one hundred and fifty feet about 8°.

M. D. Bowman has a farm of two hundred acres, Donation one hundred and six, five miles southeast of Vincennes. The soil is a bright mulatto loam, almost as rich as river bottom. It was originally covered with Poplar, Walnut and Sugartree timber, and maintains a sward of blue grass almost equal to the upper Wabash grass lands. He has 37 acres in small fruits and melons, as follows, viz:

Strawberries .....	10	acres.
Raspberries .....	6	acres.
Blackberries .....	7	acres.
Currants .....	4	acres.
Grapes .....	2½	acres.
Cherries.....	2½	acres.
Nutmeg Melons.....	5	acres.
		—
		37 acres.

Strawberries and raspberries make the most satisfactory returns; it costs \$50 per acre to bring a plantation in bearing which yields \$100 per acre per annum. A strawberry plantation (Wilson's) will live four to eight years, and while making good returns, will loosen and fertilize the soil equal to a set of clover. A raspberry plantation is good for about twenty years; he plants Red and Black Cap; all other varieties not succeeding. His plantation shows thought, persistent care, and thrift, and is a model "berry farm."

A short distance north, the highly ornamented grounds of J. H. Simpson & Bros. Donation No. 4, are an attractive feature in the landscape. Their nursery, heavily stocked with the *hardy* varieties of apples, peaches, pears, vines, and a large quantity of evergreens and ornamental shrubbery, covers *one hundred acres*. Their twenty-five acre orchard contains fifteen hundred apple, and five hundred pear trees. The sales made by the brothers amounted to \$20,000 in the year 1873: the present year their facilities will enable them to increase their business to \$40,000. The above mentioned fruit farms are merely representative. Many others

noted as Alexander & Roseman, J. G. Miller, John Alexander, E. Smith, J. Ewing etc., have orchards comprising many thousand bearing trees.

The choice quality of these fruits, the certainty of the crop and the facilities for cheap transportation, justifies the belief that at Vincennes fruit could be profitably canned or preserved on a large scale.

#### VINEYARDS.

Much attention has been given and a large area devoted to vineyards. Persons with long experience in Europe declare that this is the Rhine land of America, and insist that their products compare favorably with the wines of fatherland. The Concord and Ives Seedling are standard varieties, hardy and prolific. The Hartford and Delaware are largely grown; but Norton's Virginia makes the best wine, fairly rivaling good European brands in brilliancy, bouquet and body.

M. DeBuysseret's vineyard comprises about ten acres. He makes wine a specialty and produces in superior quality from twelve hundred to fifteen hundred gallons annually. Wm. Schappacher and M. D. Wendling have each about four acres in bearing from which they make wine. M. T. Bailey's vineyard in area equals the last mentioned and he has thirty barrels of red wine ripening in his cellars.

George Omode makes red wine from his vineyard of ten acres on the Bishop's land. He considers Norton's Virginia as superior. Messrs. Underwood and Hill, three miles northeast of Decker's, have ten acres planted. They market their grapes with profit. These vineyards and many others of equal or greater extent are noted as demonstrative experiments, showing that here a mild climate and fertile soils offer a combination of favorable circumstances worthy the attention of the unfortunate millions being driven from the old Rhineland by results of war.

## TIMBER.

This county is noted for the great size of the original forest trees, consisting of Poplar, Walnut, Burr, Post, White and Overcup oaks, Elm, Ash, Gum, Cottonwood, Sycamore, Mulberry, Hackberry, Catalpa and Pecan. Poplar, Walnut and Cottonwood trees with trunks sixty feet long and from five to eight feet in diameter were not uncommon, and Sycamores ten and even twenty feet in diameter are reported. James E. Baker, county Surveyor, measured a Sassafras four feet in diameter on Section 1 T.1 south of R. 12: a Sycamore eleven, and a Mulberry over two feet in diameter, on the southwest quarter Section 1, T. 2, R. 8. He notes a Pecan tree near Sandborn eight feet in diameter, while many Cypress trees two, four and five feet, and Catalpas two to three feet were seen. One of the latter twenty-five inches in diameter had thirty-seven annual rings of growth, indicating an increase of size during a third of a century of more than .67 of an inch per annum. A mulbury stump tested in the same way, indicated a growth of .45 of an inch per annum. These facts show that waste lands may be planted to these valuable trees with an annual profit of from five to eight dollars per acre. The fine original forests are mostly destroyed, and a tangled undergrowth is thrust up by the fertile soil to take its place. Sufficient timber for local purposes still exists with a large surplus of the common kinds to spare.

## DURABILITY OF TIMBER.

A Catalpa gate post set in the ground by Col. Decker in 1780 near the school house on Deshee creek was cut up for firewood in 1871 and found in fair condition after doing service for nearly a century. President Harrison on his visit to Vincennes in 1840, publicly called attention to the fact that a picket fence built by him along the river in front of his former residence, was in good order after forty years service. This fence was cut away for firewood, but on

examination the portion of the posts (Mulberry and Catalpa) buried in the earth was found sound as if cut yesterday. Catalpa posts set by General Harrison about the Governor's house in 1808 were taken up, Mr. Pidgeon informs me, a few years ago and being sound, were reset in another place. At the Parke homestead now the residence of Mr. John Wise, a picket fence made by Judge Parke in 1809 still constitutes a sufficient protection against stock on the river front.\* It is of Mulberry wood, generally set with tops down; those planted in that way are in the best preservation. The Sapwood of course is gone, but the balance is sound as "heart of hickory" after sixty-four years service. The endurance of this timber is certainly wonderful. I have seen no similar experience recorded. The examples mentioned can be seen at this day, and if allowed to remain undisturbed, will survive to tell the same tale of endurance after this generation of man has passed away.

#### DRAWBACKS.

The sandy oak barrens, covered with scrubby black jack oaks, are unsightly, yet this thin soil produces a comfortable supply of watermelons and sweet potatoes. The large ponds and swamps are a serious evil. For sanitary as well as economic reasons, they may, can, should and *must* be drained. When private enterprise is not sufficient the public should offer a helping hand.

Monteur's pond can be drained by Pond creek, or better, by direct route to White river; and the river bottom ponds and swamps may be tiled with a "trap outlet" which would reject the flood waters of the rivers; or when the bottoms are leveed as they should be, windmill pumps can be used

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\*A row of Sycamore and Cottonwood trees planted at the same time and place averaged three feet in diameter: three of the largest were measured, as follows:

No. 1 Cottonwood.....	11 ft.	2 in. girth.
No. 2 Cottonwood.....	11 ft.	7 in. girth.
No. 3 Cottonwood.....	13 ft.	7 in. girth.

Making an average of over four feet in diameter.



with advantage. The uplands are considered healthy; but malarial diseases are not unusual on the low lands and bottoms; this may be avoided by contriving to have the living and sleeping rooms, occupied after night, not less than ten or fifteen feet above the surface, as malarial gases are heavier than common air, and rarely accumulate to a greater depth than ten feet even in the lowest lands.

#### ROAD MATERIALS.

Well developed beds of terrace gravel are found south of Emison's, in the vicinity of Vincennes, in the bottoms to the southwest, and at Indian Springs. This is the best known material for road making, and should be freely utilized. Good roads are a necessity in progressive civilization.

#### COAL.

From the foregoing examinations it will be seen that the great, reliable seams K, L and M are well developed along the whole eastern side of the county, or in the adjoining counties of Pike and Daviess within half a mile of the Knox line. We may say grandly developed with thick seams varying from fair to extra caking and semi-caking coals. Enough has already been opened or tested by bores at Edwardsport, Bicknell, Indian creek, Wheatland, Pond creek and Brush creek, to supply the hearths of an empire; surely enough to warrant the opinion that with only twelve to fifteen miles of transportation Vincennes can promise manufacturers the necessary fuel to drive their engines as cheap if not cheaper than any western city. These seams pass beneath the surface going west with a dip, variable but heavy. The upper rash coals (not workable in this State) are alone seen in the western half of the county; but reasoning from experience in similar localities, we may expect to find these lower seams, K, L and M, with a combined thickness averaging over ten feet, underlie more than one-half of the whole county.

Barren areas will be met here as elsewhere in the coal



measures. The occurrence of heavy and massive beds of limestone in the deep bores, made within the last six months along the Wabash river, presents new and anomalous features. Noting the fact that the horizon of the lower seams is barren in Central Illinois to the west, it is possible that even along the Wabash thin or barren areas may prevail, the conditions suitable for the deposit of heavy limestone not being favorable for the production of thick seams of coal. Enough, however, is seen, to say that Knox county is rich in coal.

#### IRON AND OTHER MINERALS.

The nodular ores of iron found in connection with the coal seams are not in sufficient quantity to be valuable. The bog ore south of Nashville is of good quality, and examinations should be made to ascertain the quantity. The pyrite which falls from the roof shales of coal K is of value and should be manufactured into sulphuric acid, or used at home for deodorizing cesspools, etc. Minute nuggets of copper, lead and gold, imported by the boulder flood, are rarely found. Interesting as relics, they are of no economic value.

#### STONE FOR BUILDINGS.

Beds of red sandstone, suitable for foundations and rough masonry, occur west of Wolf hills, in the "bottoms," and on Wise's land east of Pyramid Mound. The Merom sandstone is generally too soft for building purposes, and is more valuable, after sufficient exposure to wash out the iron, for glass making. Good brown sandstone, adapted for hammered masonry, and in unlimited quantities, is found on Williams' land Sec. 35, T. 2, R. 8, and Sec. 2, T. 1., R. 8. The limestones which accompany the horizon of the rash coals is generally argillaceous or pyritous; in the first case, on exposure, chipping or breaking into cubes; in the other, disintegrating. Local exceptions to this rule are seen, and in such cases the stone may be burned, producing good

strong dark colored lime, which requires months to set, but forms a compact cement.

#### CLAY.

Clay for bricks is found in abundance and of excellent quality. The under clays of the coals are plentiful, worth nearly as much as the coals, and are suitable for the manufacture of fire brick, tiles, terra-cotta and potters' wares.

#### MANUFACTURES.

At Vincennes are several first-class grist mills, foundries and machine shops, railway repair shops, planing mills, breweries, etc. Negotiations are pending for the erection of a blast furnace and extensive rolling mills. These last establishments, giving new life to business, will require such an amount of fuel as to justify the city in refusing any additional subsidies to railroads, unless they will contract to transport coal at a cent a ton per mile.

#### CORN SYRUPS.

The Vincennes Starch and Sugar Manufactory, Keyt, Thompson & Co, proprietors, in the northern suburb of Vincennes, deserves mention on account of the novelty of the enterprise and as a tribute to the inventive genius of an Indianian. Five hundred bushels of corn are used each day. The grain is first soaked in water about one week; by this time all suitable elements have been changed, according to accurate analysis, into thirty-six pounds of starch per bushel, but by the process here carried on, twenty-three to twenty-four pounds are realized. The grain is then ground, and by an addition of sulphuric or tartaric acid, or barley malt, the starch is converted into syrup (glucose). The acid performs this work without waste, and is then neutralized by use of lime until the product no longer tinges litmus paper. The product is boiled slowly four to six hours, until the lime and extraneous matter is precipitated. The syrup, by this time, reduced to 20° Baume,

is filtered and the process is completed by boiling to the standard of 40° Baume. The syrup is now ready for market, is similar in flavor to maple molasses, and meets with a quick sale. The yield is two and half gallons per bushel, or thirty barrels per day. The manufacture is highly remunerative. The offal, containing fifty per cent. of the fattening element of the grains, is fed to cattle and hogs with profit. Mr. Wm. H. Key, of Vincennes is inventor and patentee of the process.

#### TRANSPORTATION.

The Wabash and White rivers are navigable for steamboats a small part of the year. The Evansville and Chicago Railway traverses the county from north to south; the Ohio and Mississippi Railway from east to west, and the Indianapolis, Vincennes and Cairo Railway passes from northeast to southwest. A company is organized and intends building a road from Vincennes by Petersburg to the Ohio river, and I am informed that a short line is proposed from Edwardsport to Petersburg. These roads, actual and prospective, will afford ample facilities for commercial intercourse.

#### FAUNA.

The early French missionaries, in their journals, mention the abundance of wild animals in this county, especially those now extinct, as buffalo, elk, deer, beaver, porcupine and bears, also paroquets\* and turkeys, all in great numbers. Many small circular depressions, often filled with water, are recognized as buffalo wallows.

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\*Paroquets migrated West about 1845-6.

ARCHÆOLOGY, ETC.

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Although just siezing the confident pulse-beat and promise of to-day's young manhood, Vincennes is venerable with antiquity. Her history reaches back to the infancy of American civilization. French explorers, in 1688, found here the populous Piankashaw-Miami town, Chip-kaw-kay. In 1702 a band of Missionaries, S. J., returned to plant a post which has long exerted a controlling influence over the great valley, and remains a monument to their heroic deeds. Rejoiced to find new worlds for ransom, they came without guides or interpreters, without arms or armor, bearing only the story of the cross, peace and good will to men. Rival creeds have delighted to honor and appreciate the sublime devotion which clusters so many holy memories about the "Old Post," and the Missionary brotherhood.

In 1763 this region was ceded with the Canadas to England. In 1779 the British establishment at Vincennes (Fort Sackville), was besieged and captured dy the Patriot forces under General Geo. R. Clark. This event transferred the whole territory northwest of the Ohio to the American Union. In 1800 the territory of Indiana was organized, and Governor Harrison established the seat of government here\*. At each transfer to France, to England, to the

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\* Vincennes was still an outpost, surrounded by merciless savages and depending alone on military trains for communication with the world. The lumber for the Government House had to be sawed by hand and the nails and hinges were made at a smith's forge. The Governor knowing the possibilities of war and the horrible death awarded prisoners by the Indians, placed the powder magazine of this command immediately beneath the family room in his residence. The town might be overpowered, but the Indians would never practice their fiery tortures on himself and family.

United States, Vincennes brought the domain of an empire to endow her new sovereign.

When first approached by Europeans, the Miami Confederacy claimed and possessed the region watered by the Wabash and its affluents, and the contiguous territory now constituting the State of Indiana, parts of Illinois, Ohio and Michigan. Chip-kaw-kay was one of their most populous and perhaps their most permanent town; not a trace of which remains at this day, except a few heaps of ashes exposed the current year (1873) in preparing a roadway. Erratic and averse to labor, their polity did not affect permanent homes or fixed habitations. Their towns and villages were merely favorite camping-grounds.

But extensive *Shell heaps* are found at many stations along the Wabash and its tributaries containing fluvial and land shells and the bones of a few animals, which signify the *permanent* residence of a people relying on agriculture and aquatic life for sustenance; hence we infer, that the people whose existence is indicated by these shell heaps were not related to our savages. Again, stone cists and vaults containing the bones of many persons of all ages and sexes irregularly mingled with remains of funeral fish food, are often found, sometimes as intrusive sepulchers on sides or tops of the mounds; we conclude that these are the remains of the conquerors of the most ancient people who were afterwards themselves dispossessed by the Indians—An *intermediate littoral "Race of Fishermen,"* who to some extent adopted the habits, usages and even religion of the conquered.

The extensive shell heap at Edwardsport, one hundred and fifty feet long sixty feet wide and over two feet deep, containing shells of *Unio Paludina* and *Helix*, the bones of fishes birds animals and man, with chips and fragments of flints and pieces of pottery, are referred to this age; also similar heaps at the west end of the wagon bridge, another at the side of the levee near the railroad bridge, both on the west bank of the Wabash opposite Vincennes. Tradition

tells no story of this people, but we have a near type in the Nazches and Choctaws of the south.

#### THE MOUND BUILDERS.

More ancient than these shell heaps, dating back beyond the thousand years noted by the annual growth of our forests, are numerous monumental remains of which the past is silent. "Not entirely voiceless," they tell of a people who once possessed the valley of the continent. Peaceful and law-abiding, they were skilled in agriculture and the arts of the "Stone age," and executed works that required the united and persistent effort of thousands, under the direction of a well matured design. In the comparative absence of warlike implements, we conclude that this work was a labor of love, and not of fear; that it was inaugurated and directed by a Regal Priesthood, to erect votive temples in honor of the Sun, a visible Creator of comfort, food and life.

The works seen in Knox county consist of mounds of habitation, sepulchral and temple mounds, and number over two hundred with probably as many more not yet visited.

*Mounds of habitation* are found in the north and southwest parts of Vincennes, along the summit of the high river bluff south of Edwardsport, on the wagon road between the latter town and Sandborn and on the top and sides of the Dixburg hills. A group of fifty-two mounds on the Vaulting farm six miles southeast from Purcell showed more attention to regularity than is elsewhere seen, being arranged somewhat in regular lines from north to south and from east to west.

*Sepulchral mounds* are rare. The only one certainly identified was situated centrally in the last mentioned group. Explored by Mr. Samuel Jordan, it was found to contain human skeletons and round-bottomed pottery. Plumb-bobs, stone shuttles, spinnerets and numerous fragments of pottery have been found on S. Catt's land (Sur-



vey 22) adjoining. Other *tumuli* of this character will reward the future explorer.

*Temple Mounds.*—This region was well to the center of the Mound Building Nation. Remote from the dangers incident to a more exposed situation and encircled by a bulwark of loving hearts—forts, walled enclosures, and citadels were unnecessary, and not erected as at exposed points on their frontier. Perhaps the seat of a Royal Priesthood, their efforts essayed to build a series of temples which constituted at once capitol and holy city—The *Heliopolis of the West*. Three sacred mounds thrown upon or against the sides of the second terrace or bluff east and southeast of Vincennes are the result, and in size, symmetry and grandeur of aspect, rival if not excel any prehistoric remains in the United States. All three are truncated cones or pyramidal; and without doubt, erected designedly for sacred purposes, the flat area on the summit was reserved for an Oratory and Altar as in the *Teocalli* of Mexico.

The *Pyramid Mound* (on the Miller farm common lot 83, Div. B.), one mile south of Vincennes, is placed on a slightly elevated terrace surrounded by a cluster of small mounds. It is oblong, with extreme diameter from east to west at the base of three hundred feet, one hundred and fifty feet wide, and is forty-seven feet high. The level area on the summit fifteen by fifty feet is crowded with intrusive burials of a later race. The plate facing page 315, is a good representation of the present appearance of this ancient temple.

The *Sugar Loaf Mound* on Mr. Fay's land, just east of the city line, is built against and upon the side of the bluff, but stands out in bold relief with sharply inclined sides. Diameter from east to west two hundred and sixteen feet, from north to south one hundred and eighty feet, and towering aloft one hundred and forty feet above Vincennes Plain, it commands by twenty-seven feet the high plateau to the east. Area on top sixteen



by twenty-five feet. The following section was developed by sinking a shaft centrally from the top:

*Structure of Sugar Loaf Mound.*

Loess sand.....	10 ft. 00 in.
Ashes, charcoal and bones.....	10 in.
Loess sand.....	17 ft. 00 in.
Ashes, charcoal and bones.....	10 in.
Loess sand.....	9 ft. 00 in.
Ashes charcoal and bones.....	2 ft. 00 in.
Red altar clays, burned.....	3 ft. 00 in.
	— —
	42 ft. 08 in.

This shaft closely approached or actually reached the former surface of the hill. It settles decisively the artificial origin of the mound, and indicates a temple three stories high.

The *Terraced Mound* on Burnett's land, one mile E. N. E. of Vincennes court house, has an east and west diameter of three hundred and sixty-six feet, from north to south two hundred and eighty-two feet, and rises to an elevation of sixty-seven feet above the plain, with a level area on top, ten by fifty feet. A winding roadway from the east furnished the votaries of the sun easy access to the summit.

The Dicksburg hills, towering like a pyramid one hundred and fifty feet above the surrounding plains, required no additional elevation to secure ample outlook to greet the sunrise, the coming of their deity. The tops of these hills are moulded into shape and covered with sacred and other mounds.

MOUND-BUILDER LAPIDARIES.

Implements of wrought stone so often found elsewhere, were rare. Those seen in private collections exhibited symmetrical forms and a perfection of finish which could scarcely be equalled by our mechanics if deprived of steel implements, the emery wheel and diamond dust. They

consisted of hoes, spades, awls, knives, saws, and spear and arrow points of flint and quartz; axes, chisels, hammers and pestles of drift granite; pipes, beads and ornamental gorgets of greenstone, jasper and carnelian; and plumb-bobs (pendants), made from the specular ores of Missouri; all the last are harder than steel, and indicate a maturity of skill that is never possessed by a "ferocious brute," but is the result of stable society and a considerable degree of civilization.

THANKS.

In conclusion my heartiest thanks are returned to citizens of Knox county for their kind assistance and co-operation. Acknowledgments are due to the following gentlemen for special favors, viz: Messrs. Jno. and Wm. Wise, Hon. H. S. Cauthorn, W. F. Pidgeon, James E. Baker, Messrs. Sheperd and Haslett, Drs. Thomas and Patton, Messrs. Caddington and Noble and Dr. Mantel, at Vincennes; Hon. J. D. Williams, of Pond Creek Mills; Dr. Martin, at Nashville; E. R. Steen and S. L. Niblack, at Wheatland; Messrs. Hill, C. Crane and E. L. Ferguson, at Sandborn; Dr. Keith and A. Simonson, at Edwardsport; Dr. Witherpoon and H. Ball, at Bruceville; and the Drs. Freeland at Freelandville.

## ANALYSES OF KNOX COUNTY COALS.

### CURRY COAL L.

Near top of hill at Edwardsport, seam five feet thick, vitreous luster, cubical fracture.

Specific gravity, 1.310. One cubic foot weighs 81.87 lbs.

Coke,	-	-	61.50	{	Ash, white,	-	-	4.50
				{	Fixed carbon,	-	-	57.00
Volatile matter,			38.50	{	Water,	-	-	4.00
				{	Gas,	-	-	34.50
<hr/>								
100.00				<hr/>				
				100.00				

Coke slightly puffed, laminate, vitreous.

This is a superior caking coal, excellent for steam, house use, coking and the manufacture of gas.

### WEAVER'S COAL M.

Weaver Coal Company, Donation one hundred and thirty-four, near White river, one mile north of the Ohio and Mississippi railroad.

Specific gravity, 1.277. One cubic foot weighs 79.81 lbs.

Coke,	-	-	56.50	{	Ash, brown,	-	-	4.50
				{	Fixed carbon,	-	-	52.00
Volatile matter,			43.50	{	Water,	-	-	5.00
				{	Gas,	-	-	38.50
<hr/>								
100.00				<hr/>				
				100.00				

Coke not swollen, laminate, lusterless.

This is a compact, hard coal, good for steam, household use and for making coke.

## WEAVER COAL L.

Donation one hundred and thirty-four, two miles north-east of Wheatland, four feet five inches thick, lusterless, deep black, caking coal, laminae distinct, without soft carbon partings.

Specific gravity, 1.286. One cubic foot weighs 80.37 lbs.

Coke, - -	58.00	{	Ash, red, - - -	5.00
		{	Fixed carbon, - -	53.00
Volatile matter,	42.00	{	Water, - - -	3.50
		{	Gas, - - -	38.50
	<hr/>			<hr/>
	100.00			100.00

Coke slightly puffed, laminate, lusterless.

## WEAVER COAL CO., COAL M.

Borings; seam four feet six inches.

*Upper part:*

Coke, - -	62.50	{	Ash, white, - - -	3.50
		{	Fixed carbon, - -	59.00
Volatile matter,	37.50	{	Water - - -	3.50
		{	Gas, - - -	34.00
	<hr/>			<hr/>
	100.00			100.00

Coke puffed, vitreous and amorphous.

*Lower part:*

Coke, - -	63.50	{	Ash, white, - - -	4.00
		{	Fixed carbon, - -	59.50
Volatile matter,	36.50	{	Water, - - -	3.50
		{	Gas, - - -	33.00
	<hr/>			<hr/>
	100.00			100.00

Coke same as upper part.

## JOHN HOOPER'S COAL M.

Sec. 22, T. 4, R. 8, caking coal, cubical fracture, 4 ft.

Specific gravity, 1.261. One cubic foot weighs 78.81 lbs.

Coke, - -	58.00	{ Ash, red, - - -	6.50
		{ Fixed carbon, - -	51.50
Volatile matter,	42.00	{ Water, - - -	3.50
		{ Gas, - - -	38.50
	<hr/>		<hr/>
	100.00		100.00

Coke slightly swollen, lusterless.

This is a good coal.

#### DR. KEITH'S COAL K.

Sec. 12, T. 4, R. 8, one-half mile south of Edwardsport.  
Caking coal, four feet.

##### *Upper part:*

Specific gravity, 1.292. One cubic foot weighs 80.75 lbs.

Coke, - -	54.50	{ Ash, gray, - - -	5.00
		{ Fixed carbon, - -	49.50
Volatile matter, -	45.50	{ Water, - - -	6.00
		{ Gas, - - -	39.50
	<hr/>		<hr/>
	100.00		100.00

Coke puffed, amorphous.

##### *Middle part:*

Specific gravity, 1.311. One cubic foot weighs 81.93 lbs.

Coke, - - -	55.00	{ Ash, white, - - -	6.00
		{ Fixed carbon, - -	49.00
Volatile matter,	45.00	{ Water, - - -	6.00
		{ Gas, - - -	39.00
	<hr/>		<hr/>
	100.00		100.00

Coke puffed, glossy, amorphous.

##### *Lower part:*

Specific gravity, 1.305. One cubic foot weighs 81.56 lbs.

Coke, - - -	55.50	{ Ash, brown, - - -	6.50
		{ Fixed carbon, - -	49.00
Volatile matter,	44.50	{ Water, - - -	5.50
		{ Gas, - - -	39.00
	<hr/>		<hr/>
	100.00		100.00

Coke puffed, amorphous.

A good steam coal.

## E. W. MCKENNA,

Near Edwardsport; borings, four feet ?

Coke, - -	61.50	{ Ash, white, - - -	4.00
		{ Fixed carbon, - - -	57.50
Volatile matter, -	38.50	{ Water, - - -	3.50
		{ Gas, - - -	35.00
<hr/>		<hr/>	
100.00		100.00	

Coke vitreous, not much puffed.

This indicates a good quality of caking coal.

## SANBORN COAL K.

Block coal, brilliant, laminate, with soft carbon partings, cleavage lines filled with calc spar.

Specific gravity, 1.287. One cubic foot weighs 80.43 lbs.

Coke, - -	51.50	{ Ash, brown, - - -	3.50
		{ Fixed carbon, - - -	48.00
Volatile matter, -	48.50	{ Water, - - -	4.00
		{ Gas, - - -	44.50
<hr/>		<hr/>	
100.00		100.00	

Coke puffed, brilliant, amorphous.

A fair quality of coal.

So-called cannel coal, a bituminous shale overlying the Sanborn coal K.

Specific gravity, 1.601. One cubic foot weighs 100.07 lbs.

Coke, - -	63.50	{ Ash, brown, - - -	25.00
		{ Fixed carbon, - - -	38.50
Volatile matter, -	36.50	{ Water, - - -	3.50
		{ Gas, - - -	33.00
<hr/>		<hr/>	
100.00		100.00	

Coke compact, unchanged, lusterless.

Contains too much ash to burn freely.

## SHEPARD &amp; HAZLETT'S COAL K.

Near Edwardsport, seam six feet, glossy black, laminated, without soft carbon partings.

Specific gravity, 1.304. One cubic foot weighs 81.50 lbs.

Coke,	-	-	55.50	{	Ash, blue,	-	-	-	6.50
				{	Fixed carbon,	-	-	-	49.00
Volatile matter,	-	44.50		{	Water,	-	-	-	5.50
				{	Gas,	-	-	-	39.00
			<hr/>						
			100.00						
				<hr/>					
				100.00					



*Lower part :*

Specific gravity, 1.253. One cubic foot weighs 78.31 lbs.

Coke,	-	-	51.50	{	Ash, pink,	-	-	3.00
				{	Fixed carbon,	-	-	48.50
Volatile matter,			48.50	{	Water,	-	-	3.00
				{	Gas,	-	-	45.50
			<hr/>					<hr/>
			100.00					100.00

Coke much puffed, amorphous.

This is a good coal for steam, furnace, house use, gas and coke.

## SIMONSON &amp; HULAN, COAL K.

Sec. 36, T. 5, R. 8, north of Edwardsport; six feet glossy black caking coal, with cubical fracture and obscure laminae.

*Upper part :*

Specific gravity 1.281. One cubic foot weighs 80.06 lbs.

Coke,	-	-	50.50	{	Ash, white,	-	-	5.00
					Fixed carbon,	-	-	45.50
Volatile matter,			49.50	{	Water,	-	-	4.00
					Gas,	-	-	45.50
			<hr/>					
			100.00					<hr/>
								100.00

Coke puffed, vitreous, amorphous.

*Middle part :*

Specific gravity 1.276. One cubic foot weighs 79.75 lbs.

Coke,	-	-	52.50	{	Ash, white,	-	-	3.50
				{	Fixed carbon,	-	-	49.00
Volatile matter,			47.50	{	Water,	-	-	4.50
				{	Gas,	-	-	43.00
			<hr/>					<hr/>
			100.00					100.00

Coke slightly puffed, lusterless, amorphous.

*Bottom part :*

Specific gravity 1.286. One cubic foot weighs 81.00 lbs.

Coke, - -	59.00	{ Ash, red, - - -	7.00
		{ Fixed carbon, - - -	52.00
Volatile matter,	41.00	{ Water, - - -	3.50
		{ Gas, - - -	37.50
<hr/>		<hr/>	
100.00		100.00	

Coke slightly puffed, lustreless, amorphous. Excellent coal for steam and domestic use and for gas and coke.

## SWICK'S COAL M?

SEC. 23, T. 4, R. 8, near Bicknell on Indian creek. 3 ft. 6 in. seam, a glossy, brownish black, caking coal, with conchoidal fracture.

Specific gravity 1.276. One cubic foot weighs 79.75 lbs.

Coke, - -	51.50	{ Ash, red. - - -	5.50
		{ Fixed carbon, - - -	46.00
Volatile matter,	48.50	{ Water, - - -	3.00
		{ Gas, - - -	45.50
<hr/>		<hr/>	
100.00		100.00	

Coke slightly puffed, laminate.

This is a good coal for steam and blacksmith uses.

## JAMES D. WILLIAMS, COAL M?

Near Pond Creek Mills, seam 4 ft. thick, analysis from borings.

Coke, - -	58.00	{ Ash, brown, - - -	4.00
		{ Fixed carbon, - - -	54.00
Volatile matter,	42.00	{ Water, - - -	3.50
		{ Gas, - - -	38.50
<hr/>		<hr/>	
100.00		100.00	

Coke slightly puffed, vitreous, laminate.

This is an excellent quality of coal.