

GREENE COUNTY.

This county is bounded on the north by Clay and Owen counties; on the east by Monroe and Lawrence counties; on the south by Martin, Daviess and Knox counties, and on the west by Sullivan county. In shape, it is a parallelogram, and contains five hundred and forty square miles.

The principal stream of water is the west fork of White river, which runs in a southeasterly course through the county, and divides it into two, nearly equal, parts. The main tributaries of White river, in this county, are Eel river, Latta's creek, and Black creek, on the west side; and Richland creek, Doan's creek, and First creek on the east side. Indian creek, with its tributaries, waters a portion of the eastern border of the county, and empties into the east fork of White river.

This county, east of White river, is quite broken, with hills from one hundred and twenty feet to three hundred feet in height; whereas, to the west of the river, with the exception of a ridge running from Eel river, on the north, to White river, on the south, near Fairplay, and passing a short distance to the west of Worthington, the county is generally level, or slightly undulating—a considerable part of it being prairie.

Latta's creek marsh, Bee-hunters' marsh, and Goose-pond contain, in all, about nine or ten square miles of land, subject to overflow during freshets. These marshes can be drained, and thus, by aeration, furnish to agriculture a large body of very fertile land.

Previous to the completion of the Indianapolis & Vincennes railroad, (first run in the autumn of 1869,) this county was without a direct and practicable means of communication with the distant centers of trade; consequently, up to that time there was no incentive or inducement offered to its citizens to attempt any development of its mineral resources. For this reason, the geologist has, as yet, but

little to guide him in his investigations, beyond the obscure natural outcrops of the strata, and a few imperfect openings of coal and iron mines—the former of which are only occasionally worked to supply the limited and uncertain wants of the immediate neighborhoods. It is not, therefore, to be expected that I can, at this time, have as much to say, in detail, regarding its vast mineral resources as of Clay county, where so much progress has been made in the work of development.

The geological formations represented by the succession of strata in this county are :

Subcarboniferous limestone period.

Millstone grit epoch.

Coal measures epoch.

Glacial epoch.

The continuous vertical section of the coal and subordinate limestone formation, given on page 37, in the report of Clay county, is alike applicable to Greene county, in so far as it relates to the sequence of the strata; and the coal beds and other strata found here will be referred to it accordingly.

Subcarboniferous Limestone.—At the mouth of Fish creek, in the northern part of the county, limestone belonging to the Chester group of the subcarboniferous limestone formation, outcrops in the bluff bank of the creek, and is exposed to the depth of fifteen to twenty feet, and is at this place overlaid by drift, but at a short distance to the southwest it is increased by the addition of two to five feet of shale, with an irregular bedded, thin seam of coal A and the millstone grit. Some of the layers of this limestone contain a few fossils, but they are difficult to obtain sufficiently perfect for cabinet specimens. The following comprise all that could be recognized: *Orthis umbraculum*, *Archimedes Wortheni*, *Athyris subtilita*, *Pentramites obesus*, *P. pyriformis*, *Spirifer incrassatus*, *Productus carbonarius*, *P. cora*, and an abundance of *encrinite* stems. It belongs to the upper mem

ber of the subcarboniferous limestone, and is designated by Prof. A. H. Worthen, in the Geological Report of Illinois, as the Chester group.

The greatest development of this limestone, seen in Greene county, is on Beech creek, a branch of Richland creek, on section 12, town 7, range 4, where it forms a great mural precipice, capped with a massive sandstone of the millstone grit series. The following section was obtained at this locality :

| | |
|--|---------------------|
| Brownish-gray sandstone, in thick beds, which has the appearance of being most excellent building stone, | - 25 feet 0 inches. |
| Shale, which thickens up to many feet, and in some places contains coal A, | 1 in. |
| Buff-colored limestone, in which I saw <i>Pentramites obesus</i> , <i>P. pyriformis</i> , and <i>Archimedes Wortheni</i> , | - - 20 ft. |
| Gray siliceous shales, partly covered, | 25 ft. ? |
| Blueish limestone, (in which I saw no fossils,) with intercalations of sand- stone, mostly covered by talus, | - 50 ? ft. |
| Total, - - - - - | 120 ft. 1 in. |

At the junction of the sandstone and limestone, at this locality, there gushes forth a mammoth spring of good cool water, which was, at one time, utilized to run an overshot wheel that propelled the machinery of a grist mill.

The subcarboniferous limestone makes its appearance at the base of the hills along this creek, for a distance of several miles, and is overlaid by a few feet of shale and the massive sandstone at the base of the millstone grit. It also makes its appearance at the ore banks on Ore branch of Richland creek, in section 28, town 7, range 4, and on the eastern border of the county, near the "Virginia" blast-furnace, (now abandoned,) and south from the furnace along Indian creek.

Millstone Grit.—This epoch follows the subcarboniferous in regular sequence, and is principally represented by a massive sandstone, usually in two benches, and separated from each other by a bed of shale, varying from a few inches to four feet, or more, in thickness, and at some places carries a thin coal B. This massive sandstone is, apparently, in the position occupied by the conglomerate sandstone most usually found at the base of the coal measures, yet in this part of the State it is, so far as I have been able to discover, entirely free from the admixture of quartz pebbles which gives rise to the latter name.

The millstone grit covers fully three-fourths of the county. Its boundary on the west may be approximately laid down as passing from Johnstown, on Eel river, across the county in a southwesterly direction to Marco, on the Indianapolis & Vincennes railroad, while the irregular margin of its eastern outcrop is in Monroe county, some miles east of the Greene county line.

Between this massive sandstone and the subcarboniferous limestone there is interposed a bed of argillaceous shale, varying from a few inches to thirty feet, or more, in thickness, that contains, in many places, a bed of good "block" coal A. (*See vertical section of the coals, page 37.*)

Above the sandstone are argillaceous and siliceous shales, with benches of flags and other stones of good dimensions for building purposes. In all, this group may attain a depth of three hundred feet, or more, in Greene county.

The massive sandstone, or conglomerate as it may be called for convenience, gives to the scenery of this county, on the east side of White river, a marked character. Near the tops of many of the ridges that skirt along the streams it forms conspicuous benches, and the slopes below are strewn with cyclopean blocks that have broken off and fallen from the parent mass above. In places it has a portion of the lower part worn away by the combined action of the frosts and running water, so as to form deep caverns with projecting roofs of stone, that afford an excellent protection in time of storms to wayfaring men and farm stock,

for which reason, I suppose, they have received the common name of "rock houses." In the more secluded parts of the county the "rock houses" constitute the abode of a variety of wild animals, that seek in them a friendly shelter from the inclemency of the weather.

It is at the junction of the conglomerate with the sub-carboniferous limestone that we find the great repository of limonite iron ore in this county; and, in fact, it forms the common horizon of this variety of iron ore in most of the Western States. The ore lies in pockets of various dimensions, and owes its origin, in most cases, to a metamorphism of the surrounding rocks, produced by the permeating of mineral water that is strongly charged with protoxide of iron.

On Ore-branch of Plummer's creek, section 22, town 7, range 4 west, on Mr. Heaton's land, the base of the conglomerate has been completely changed by this process into a siliceous ore that is rich in iron to the depth of ten or twelve feet. Similar ore was seen on sections 21 and 28 of the same township and range; also, in the greatest abundance at Mr. Law's place, on sections 4 and 9, town 7, range 6, where it cannot be less than twenty-five to thirty feet in thickness, and great blocks lie scattered over the side of the ridge; it is in abundance, also, on section 12 of the same township and range, and in the neighborhood of Owensboro in the south-east part of the county.

The old Virginia blast-furnace, on Indian creek, in the western edge of Monroe county, has been out of blast for many years, but when in blast the ore was obtained close at hand from large deposits, fifteen to twenty feet thick, covering several acres.

The Virginia blast-furnace cannot be more than five or six feet across the boshes, and twenty to twenty-five feet high. It is poorly constructed, and the only wonder is that it made any iron at all. However, fragments of pig-iron that were picked up around the stack, give evidence that it made a very fair quality of iron, and was abandoned only in consequence of the great expense incurred in getting the metal to market—the nearest being Louisville, on

the Ohio river, to which point the pig-iron was hauled in wagons. A characteristic specimen of ore, from the ore-banks half a mile north-east of this furnace, was analyzed, and the following result obtained:

Specific gravity, 2.56.

| | |
|--|--------------|
| Loss by ignition, water and organic matter, | 10.00 |
| Insoluble silicates, - - - - | 31.50 |
| Sesquioxide of iron, with some protoxide, and a little alumina and manganese, | 58.50 |
| Total, - - - - | <hr/> 100.00 |

Giving 40.95 per cent. of metallic iron.

This ore will give over 45 per cent. of iron after being roasted, and will make an excellent quality of cold-short pig-iron.

The principal ore used at the Richland blast-furnace, near Bloomfield, in Greene county, from Ore-branch of Plummer's creek, forms a bench on each side of a ravine, and appears to lie between the massive ore and the sub-carboniferous limestone, which shows itself in the bottom near by. An excavation was made during my stay in the county, to show the thickness of this ore-bed, which went to the depth of six feet, at which point the work was stopped, without reaching the bottom of the deposit.

Capt. M. H. Schryer, of Bloomfield, who frequently saw this bed of ore at the time it was being worked for the blast-furnace, assures me that the deposit is fully nine feet in thickness. It lies in kidney-shaped masses in a matrix of ferruginous clay, and contains less silica than the massive ore. Characteristic samples of this "kidney-ore," and of the massive siliceous "block-ore," from the Richland furnace ore-banks, were analyzed, and the following result was obtained:

"Kidney-ore" (limonite), specific gravity 2.583.

| | |
|--|--------|
| Loss by ignition, water and organic matter | |
| mostly water, - - - - - | 11.50 |
| Insoluble silicates, - - - - - | 17.00 |
| Sesquioxide of iron, with some protoxide, and a trace of manganese, - - - | 56.00 |
| Alumina, - - - - - | 2.00 |
| Carbonate of lime, - - - - - | 10.00 |
| Magnesia, - - - - - | 3.50 |
| | <hr/> |
| | 100.00 |

Giving 39.20 per cent. of iron.

This ore contains a large amount of lime, and will make an excellent quality of metal; and when roasted the percentage of metal will be increased to 45.42 per cent. Specimens of pig-iron made from this ore were found at the furnace, and have every appearance of being the best quality of mill-iron.

An analysis of the siliceous "block-ore," gave the following result:

Specific gravity, 2.585—2.694.

| | |
|------------------------------------|--------|
| Loss by ignition, water, - - - - - | 7.50 |
| Insoluble silicates, - - - - - | 34.00 |
| Sesquioxide of iron, - - - - - | 54.73 |
| Alumina, - - - - - | 2.50 |
| Manganese, - - - - - | 1.14 |
| Lime, - - - - - | .12 |
| Magnesia, - - - - - | .03 |
| | <hr/> |
| | 100.02 |

Giving 38.31 per cent. of iron.

It was tested for sulphur and phosphorus, but found no trace.

200 grains of this siliceous ore, mixed with 50 grains of limestone, were fused in a Hessian crucible, and a button

of iron was obtained that weighed 76 grains—equal to 38 per cent.; very nearly the same result as obtained by the humid analysis. The button indicated a very good quality of iron, slightly malleable, and gave a semi-crystalline fracture. The roasted ore would yield fully 40 per cent. of iron in the blast-furnace; and on account of the manganese which it contains it is admirably adapted for the manufacture of steel, either by the Bessemer process or in the puddling furnace. Iron made from the above ores alone will possess cold-short properties, but by mixing them, in the proper proportion, with the red-short specular and magnetic ores from Missouri and Lake Superior, a neutral iron may be made.

No one of whom I inquired could inform me definitely when the Richland furnace went into blast, but it is thought about the year 1841, and the final blowing-out was in 1858 or 1859. The *stack* was about forty-five feet high and nine feet across the boshes; it was worked with a hot-blast, and used charcoal as a fuel. About nine tons of pig-iron were produced daily. The cause assigned for the stoppage of the furnace was the want of a suitable and economical means of getting the pig-iron to market.

The furnace-stack had been taken down some years previous to my visit, and the stone of which it was constructed used to build a bridge over Richland creek, though the engine, boilers, and blowing-cylinders were still on the ground and in good condition; the blowing-cylinders are forty-two inches in diameter, and six feet stroke.

Good deposits of siliceous and earthy carbonates of iron are seen at quite a number of localities in this county that are not enumerated above, namely, at Gaskils, on the I & V. railroad, on section 36, town 8, range 6; on Black creek, in the south-west part of the county; at Phillips' coal-mine, and immediately around the old blast-furnace.

All the coal-beds on the east side of White river, and over a considerable strip of country on the west side of that river, are either in the conglomerate or are sub-conglomerate. For the most part, these coals are of the

"splint" or "block" variety, and though generally in thin seams, are nevertheless of good workable thickness at some localities, and will answer, in the raw state, for smelting iron.

Coal A, of the vertical section on page 37, is seen at a number of places north-east of Worthington, where it is cut through in the grade of the I. & V. railroad, and lies in close proximity to the subcarboniferous limestone; indeed it is often separated from the latter by only a few inches of fire-clay. Coal B lies from sixteen to thirty feet above coal A, being intercalated between two benches of the conglomerate, and is from four to eighteen inches thick.

At Gaskil's, on section 12, town 8, range 5, coal A lies thirty to forty feet above the railroad track, and has been partially opened, but proved too thin for mining to advantage. At Woodrow's old mill, on section 14, town 8, range 5, coal A outcrops in the bank of White river, and is twenty-eight inches thick; it is a "block" coal, but apparently contains a considerable portion of sulphur.

Immediately above the coal, and forming its roof, is black, bituminous, fissile slate, two feet; then a few feet of siliceous shale, which latter is succeeded by forty to fifty feet of massive sandstone.

About two hundred yards north of this old mill, up a short ravine, this sandstone forms a great cliff, and coal A outcrops at its base, only about ten feet above the subcarboniferous limestone, which shows itself at the foot of the ravine. Coal B, about eighteen inches thick, outcrops in Point Commerce, on the west side of the hill, at Mr. Miller's mill on Eel river, and in the sandstone bluff on the west bank of that stream, near its mouth. In excavating the foundation for his mill, Mr. Miller found beneath the bed of the river several layers of good clay iron-stone. Though rich in metal, it is barely possible that it can be found in sufficient quantity, under such unfavorable conditions for mining, to make it of value at this point.

Two and a half miles northwest of Worthington, on Mr. Joel Adams' farm, on the west half of section 7, town 8, range 4, coal A, three feet thick, is mined in the ravine by stripping off the two or three feet of super-imposed earth. The quality of the coal is good "block." On the hill close by may be seen the conglomerate sandstone, which usually lies above this coal. In digging a well at his dwelling house, on the top of the low ridge to the south of this mine, Mr. Adams passed through:

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|--|----------|
| Soil and drift, - - - - - | 13 feet. |
| Coal B, - - - - - | 1 " |
| Sandstone, in which water was found, and the work discontinued, - - - - - | 10 " |

Had the well been sunk through the sandstone, he would have reached coal A, which is only twenty or thirty feet below coal B, and is seen again at an outcrop on the south side of the property.

On Mr. Schryer's land, in the southeast corner of the same section, the Adams seam of coal also makes its appearance, and it may be traced to Johnstown mills, on Eel river, where it is struck in the wells, and as far south as Marco, on the Indianapolis & Vincennes railroad.

At Mr. McKissick's, on section 36, town 8, range 6, coal A is three feet thick, and has shale above it. The following result was obtained from an analysis of a characteristic specimen from the above bed:

Specific gravity, 1.189; a cubic foot weighs 74.37 lbs.

| | | |
|--------------------------|---|---------------------------|
| Coke, - - - 64.5. | { | Ash, white, - - - 2.0. |
| | { | Fixed carbon, - - - 62.5. |
| Volatile matter, - 35.5. | { | Water, - - - 3.5. |
| | { | Gas, - - - 32.0. |
| <hr/> 100.0. | | <hr/> 100.0. |

Twenty to twenty-five feet higher than the coal bed above referred to, there is another opening to a seam of coal that has the same depth of bed, with a roof of

sandstone, four to five feet thick, immediately under the drift which covers the slope of the hill above. The quality of the coal at both these openings is that of a good "block" coal. Notwithstanding the upper coal is in the position of coal B, with regard to relative space, still I feel quite sure that the two openings are in one and the same bed. But the nature of the locality, and the want of proper developments, prevented me from arriving at a positive conclusion. The sandstone above the upper opening has all the appearance of the conglomerate, and the openings being on opposite sides of the ravine, gives ample room for misplacement by a slide or horseback, the traces of which may be covered by debris.

McKissick's mine is one and a half miles north of the Indianapolis and Vincennes railroad, and may be easily reached by a switch from the main road, running the whole distance over a level prairie.

Under the coal at the lower opening there is considerable iron-stone of good quality for making iron. It is here found stratified with the shale.

South of McKissick's, the subconglomerate coals have not been worked on the west side of White river, its presence being known, only, by reaching it in wells at the following places:

Mr. Dixon's, on section 13, town 7, range 6.

Mr. Shelket's, on section 15, town 7, range 6.

Mr. Allison's, on section 14, town 7, range 6.

Mr. Lundy's, on section 21, town 7, range 6.

Mr. Wakefield's, on section 21, town 7, range 6.

Dr. Bennifield's, on section 25, town 6, range 7.

And at Halsted's, just south of the Greene county line, on Black creek, in Knox county.

On the east side of White river, the subconglomerate coal A is generally from thirty to thirty-six inches thick, and is also, in this part of the county, a "block" coal, similar in character to what is found above the conglomerate in

Clay county, and may be used in its raw state for making pig-iron in blast-furnaces.

The following mines have been opened and partially worked, to supply a very limited home demand, in the neighborhood of Bloomfield, between Richland creek and Ore-branch creek :

Templeton's mine, on section 20, town 7, range 4.

D. Heaton's mine, on section 2, town 7, range 4.

W. J. Heaton's mine, on section 28, town 7, range 4.

Cushman's mine, on section 28, town 7, range 4.

Holtzclaw's mine, on section 28, town 7, range 4.

Burcham's mine, on section 32, town 7, range 4.

Channey's mine, on section 32, town 7, range 4.

Ackerman's mine, on section 25, town 7, range 5.

At all the above openings the coal is of good quality, is overlaid by the conglomerate, and in places it is not more than twenty feet above the subcarboniferous limestone. In the immediate roof shales of the coal, impressions of the flattened stems and trunks of *sigillaria* and *calamites* are abundant, but the shale is of too fissile a character to admit of their preservation as cabinet specimens. Neither shells nor fish remains were observed.

Coal A underlies a broad district of country, which stretches out to the south-west from Bloomfield. At T. Hays' mine, on section 16, town 6, range 4, the character of the subconglomerate coal is quite changed, being at this mine a caking coal with two clay partings. The following section was made of the coal in this mine by Mr. R. H. Warder, of Spencer, Owen county, Indiana, who accompanied me on my trip through Greene county, and to whom I feel under many obligations for valuable assistance.

The entrance to the mine was partly filled with water at the time of our visit, but Mr. Warder waded through it, and measured the coal at the far end of the entry.

S. G. R.—7.

SECTION AT HAYS' COAL MINE.

| | |
|---|---------------|
| Slope, covered space to top of hill, | 30 ft. 0 in. |
| Coarse-grained, buff-colored sandstone, | 8 ft. 0 in. |
| Black slate, - - - - - | 0 ft. 0½ in. |
| Coal, - - - - - | 1 ft. 10 in. |
| Clay parting, - - - - - | 0 ft. 10 in. |
| Coal, - - - - - | 1 ft. 11 in. |
| Fire-clay, - - - - - | 0 ft. 6 in. |
| Coal, - - - - - | 0 ft. 6 in. |
| Total, - - - - - | 43 ft. 7¼ in. |

The total thickness of this bed, including the clay partings, is five feet seven inches; reduced to clear coal, leaves three feet eight inches. This is a fine bed of coal, and is found over a large area of country, which forms the "divide" between the waters of Doan's creek and Plummer's creek. Going south to Phillips' mine, on section 21, town 6, range 4, the same bed of coal seen at Hays' mine is *semi-block* coal, three to seven feet thick, including a five-inch clay parting. Above the coal there is eight inches of a good quality of siliceous limonite iron-ore, containing stems of coal-plants, *sigillaria* and *calamites*. A fine specimen of the *Calamites cannaeformis*, obtained from this locality, was presented to me by Capt. M. R. Shryer, of Bloomfield.

The following section will show the position of the coal, which is opened in a shallow ravine near the top of the table land. The bed is worked by stripping off the superincumbent strata of rock:

| | |
|-------------------------------|---------------|
| Soil and drift, - - - - - | 10 ft. 0 in. |
| Siliceous iron-ore, - - - - - | 0 ft. 8 in. |
| Sandstone, - - - - - | 1 ft. 0 in. |
| Blue shale, - - - - - | 1 ft. 0 in. |
| Coal, semi-block, 2 ft. 4 in. | } 3 ft. 8 in. |
| Clay parting, - - - - - | |
| Coal, - - - - - | |
| Fire-clay, - - - - - | 0 ft. 0 in. |
| <hr/> | |
| 16 ft. 4 in. | |

The same stratum of coal is also mined by W. B. King, on the line between sections 28 and 29, town 6, range 4, where it presents the same characteristics seen at the Phillips' mine.

My first impression on visiting these mines was, that the place of this bed of coal was above the conglomerate, and in the coal-measures proper; but seeing that my friend, Leo Lesquereux, in his report on the coals of Greene county, published in Prof. Richard Owen's Geological Report of Indiana, has referred to it as being subconglomerate, it is therefore thought best to make no change with regard to its position in advance of a more thorough examination.

In the neighborhood of Owensboro, and to the southwest, in Martin county, the subconglomerate coal A has been opened and mined for blacksmiths' use, at quite a number of places; it ranges from thirty to thirty-three inches in thickness, and is, at some openings, good "block" coal, while at others it is a bituminous caking-coal.

Owensboro is on the western limit of the subconglomerate coal, the place of the latter being, possibly, represented by an outcrop of excellent fire-clay for potteries, lying near the top of the hill on the west side of the town. Below the fire-clay there are large deposits of iron-ore, similar to that used at the Old Virginia blast-furnace in Monroe county.

A well dug by Mr. John Potter in the eastern part of the town, on a branch of Indian creek, passed through:

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|-----------------------------------|--------|
| Gray argo-siliceous shales, - - - | 15 ft. |
| Sandstone, - - - - - | 3 ft. |
| Blue argo-shale, - - - - - | 4 ft. |
| | <hr/> |
| | 22 ft. |

The water in this well is, no doubt, obtained from the upper part of the subcarboniferous limestone, which

| | |
|------------------------------------|--------------|
| Drift, - - - - - | 30 ft. 0 in. |
| Sandstone, - - - - - | 3 ft. 0 in. |
| Shale, - - - - - | 6 ft. 0 in. |
| Coal A, ("block,") said to be, - - | 4 ft. 6 in. |
| | <hr/> |
| | 43 ft. 6 in. |

Another opening is made to this coal on Mr. Foote's land, on the south-west quarter of section 36, town 6, range 4, and the quality is said to be the same as at Babbit's.

Going south into Martin county, coal A is also seen at Mr. Davis', where it has the character of a good "block-coal." The bed is twenty-seven inches thick, and is worked in the bank of a ravine by stripping off the superimposed strata, composed as follows: Of •

| | |
|----------------------------------|--------------|
| Soil, - - - - - | 2 ft. 0 in. |
| Sandstone, - - - - - | 1 ft. 0 in. |
| Bluish argo-shales, - - - - - | 10 ft. 0 in. |
| Coal A ("block-coal"), - - - - - | 2 ft. 3 in. |
| Fire-clay, - - - - - | ? |
| | <hr/> |
| | 15 ft. 3 in. |

Mr. Rollings has opened a mine in the same coal-bed, one and a half miles south of Davis'; the coal is two feet thick, and similar in character to Babbit's coal. It is overlaid, where mined by stripping, with four or five feet of tough, bluish argo-shale, containing an abundance of well preserved coal plants, principally, *Sphenophyllum Schlotheimii*, *Pecopteris Arborescens*, *Neuropteris Loschii*, *N. hirsuta*, *Asterophyllites Sublevis*, and stems of *Calamites cannaeformis*. A short distance back from this mine, the shale is overlaid by the conglomerate sandstone, which shows in benches along the tops of the ridges.

Half a mile south of Rollings' mine, is Todd's mine, said to be the same seam and character of coal as the former.

Passing now to the west side of Greene county, we ascend above the conglomerate or millstone grit epoch, to the place of the coal strata proper.

Coal-measures.—The three townships, 6, 7, and 8, of range 7, in the western part of Greene county, are, except where cut out by the flats of Goose-pond, Black creek, Latta's creek, and the bottoms of small streams, underlaid by the mammoth coal-bed, L, which is mined on the Terre Haute and Indianapolis railroad at Newburg, Staunton, Cloverland station, and at the Lost creek mines at Seelyville.

On the north-west quarter of section 18, town 6, range 7, Mr. W. P. O'Haver has opened, in a ravine, a mine to coal L; the bed is here from four and a half to five feet thick, has from one to two feet of black sheety slate in the roof, and no other material above except a foot or two of soil; but on the rise, at Mr. O'Haver's house, in digging his well he passed through thirty feet of siliceous shale without getting down to the coal. At his grist-mill, half a mile to the west, in the edge of Sullivan county, the well which supplies water to the boilers passed through the bed of coal worked at the mine, and is reported as being seven feet thick. In this measurement the two feet of black shale forming the roof must have been mistaken for coal. Judging from specimens of coal found around the mouth of the pit at O'Haver's mine, it is a good article of bituminous caking-coal.

The entry to the mine was not in a fit condition to admit of the coal being seen in place.

Two miles north of O'Haver's, at Mr. Bedwell's, also in the edge of Sullivan county, there had been openings made to a bed of coal that is said to be seven feet thick. On visiting this locality I felt disappointed to find that the walls of the old shaft had caved in and covered up the seam; some fragments of coal, however, found lying at the mouth of the pit, indicate its character to be a caking-coal; and from the topography of the country lying be-

tween this locality and O'Haver's, I am led to believe that the two coals belong to equivalent beds. At Mr. Purcell's, on section 24, town 6, range 7, a coal was struck in his well, that is also, in all probability, referable to the same bed.

In the neighborhood of Linton, coal K has been mined at a number of places; it is from four and a half to five feet thick, and is an excellent quality of caking-coal.

On the map or Greene county accompanying this report, the place which the coal-beds at Linton occupy in the connected section of the coals, given on page 37, is designated by the letter "K?" The accompanying mark of interrogation implies that the coal has been so referred with doubt; indeed the old openings were all filled with debris, and very little opportunity was afforded, in this part of the county, for the examination of the coals in position.

The specimens found at these mines, and left with me since the suspension of mining operations last fall, bear testimony that it is a very firm and good quality of bituminous caking-coal. At two of the openings the coal is occasionally mined for market—one on section 26, town 7, range 7, owner's name unknown; the other is at Barney McClurg's on land owned by Mr. Sharp, on section 23, town 7, range 7. This stratum of coal is said to be from four to five feet thick, and has been struck in wells at Armstrong's mill, one quarter of a mile east of Linton, on section 23, town 7, range 7, and at the residence of Dr. Humphreys, on section 22, same town and range. The country immediately around Linton is quite level, and no rocks are to be seen; but on going northward a few miles the country becomes broken, and in road-cuts along the hill-sides we find, exposed to view, siliceous shales and flag-stones in the upper part, while in the deeper parts, at the base, there lies from two to ten feet of fossiliferous limestone, underlaid by the black bituminous sheety slate, containing teeth and other fish remains, which generally forms the roof of coal K, and occasionally the coal itself is seen.

At Mr. Jonas Hanna's, on section 32, town 8, range 7, coal K outcrops in a ravine, and may be traced along the branch that cuts through it for a considerable distance. It is here divided into three beds by two partings of fire-clay, and the total depth is five and a half feet.

Mr. Hanna dug a well at his house, on the top of the ridge, which passed through this coal at the depth of sixteen feet, and found no roof above it but the drift.

The principal fossils seen in the limestone which usually accompanies this coal, are referable to the following genera and species: *Productus wabashensis*, *P. cora*, *P. semireticulatus*, *Spirifer cameratus*, *Chonetes mesoloba*, *Athyris subtilita*, *Bellerophon carbonaria*, *Nucula inflata*, and large stems of *encrinites*.

Coal K outcrops in a branch at the foot of the hill at Mr. Bledsoe's, and thirty-two feet above it, this gentleman is mining coal L, by an entry driven into the hill, a specimen of which was analyzed, giving the following result:

Specific gravity, 1.251; a cubic foot weighs 78.2 lbs.

| | | | |
|-----------------------|---|------------------|-------|
| Coke, - - 63.5 | { | Ash, fawn-color, | 0.5 |
| | | Fixed carbon, - | 63.0 |
| Volatile matter, 36.5 | { | Water, - - | 7.0 |
| | | Gas, - - - | 29.5 |
| | | <hr/> | |
| 100.0 | | | 100.0 |

The structure of the coal changes but slightly in coking, is somewhat swollen, and of a dingy, lustreless color.

At Mr. Smith's, one-quarter of a mile west of Bledsoe's, on the same section of land, the Perring bed, or coal N, outcrops, and is also worked by an entry.

The following approximate section will serve to show the relative position of these three beds of excellent bituminous caking-coal:

| | | | | | | |
|---------------------|---|---|---|---|---|--------|
| Soil and drift, | - | - | - | - | - | 18 ft. |
| Argillaceous shale, | - | - | - | - | - | 2 ft. |

| | |
|--|---------|
| Coal N, - - - - - | 4 ft. |
| Potters' clay, white, - - - - - | 2 ft. |
| Siliceous shale, with flags, - - - - - | 40 ft. |
| Coal L, equivalent of Staunton coal, - - - - - | 5-6 ft. |
| Dark fire-clay, - - - - - | ? |
| Blue argillaceous shale, - - - - - | 4 ft. |
| Bluish-gray sandstone, - - - - - | 24 ft. |
| Fossiliferous limestone, - - - - - | 2 ft. |
| Black bituminous slate, with fish remains, - - - - - | 2 ft. |
| Coal K, - - - - - | 4-5 ft. |
| | <hr/> |
| | 109 ft. |

Here, in the space of about 109 feet, we find three beds of fossil fuel that have an aggregate thickness of from thirteen to fourteen feet.

The sulphur-bands which are of common occurrence in coal L, are, at Mr. Bledsoe's, readily separated from the main part of the bed, which is one of the very best bituminous caking-coals in this part of the county.

This coal is, as a fuel, above the average, and is sought after by blacksmiths, far and near, for forging iron and welding steel.

Gamble's coal, on section 29, town 8, range 7, is the same as the lower coal K, at Bledsoe's.

In the northern part of Wright township, coal K outcrops at the following places, where it is from four and a half to five feet thick, with one or two clay partings, and overlaid by a black shale and fossiliferous limestone;

| | | |
|--------------|------------|----------------------|
| McBride's, | on section | 17, town 8, range 7. |
| White's, | " | 8, " 8, " 7. |
| Letsinger's, | " | 8, " 8, " 7. |
| Jasonville, | " | 4 or 5, " 8, " 7. |
| Lahr's, | " | 22, " 8, " 7. |

Going east it has been struck in wells at a number of places, and underlies all the high land in that direction as far as the line dividing ranges 6 and 7.

The outcrop of coal I—the main “block-coal” bed of Clay county—should be found in the townships in range 6.

GLACIAL, OR DRIFT EPOCH.

The superstrata of clay, gravel, sand, and small boulders of metamorphic rocks which cover the entire county, except where removed by denudation, belongs to this geological formation.

Various metals and ores, foreign to the stratified rocks of this county, are frequently found in this formation, but usually in such small quantities as to be of no practical value; indeed this “float” mineral of the drift serves too frequently to mislead the uninitiated, who lose both their time and money in the vain search after the parent bed or vein, which lies far to the north of the State.

The stratum of clay commonly known as “hardpan,” is generally reached at the depth of fifteen or twenty feet, and forms the horizon from which the supply of well-water is obtained throughout the county.

ECONOMICAL GEOLOGY.

The total depth of all the coal strata in Greene county is fully equal to that of Clay county, which is twenty-eight feet and nine inches, and the area which is underlaid by coal may safely be estimated at three hundred and sixty square miles, or two hundred and thirty thousand four hundred acres. Over this district, after making full allowance for outcrops, horsebacks, loss from mining, etc., etc., there exists fully six feet of coal available for market.

As the mines in this county are only worked to a very limited extent to supply blacksmiths' forges and a few families who find it more convenient and economical than wood as a fuel, there is no data, at present, by which to fix its commercial value. If, therefore, we estimate the product of one acre which, at six feet in depth, will yield—calculating one ton per cubic yard—two hundred and ninety-four thousand bushels, which, at the usual price paid as royalty, one-half cent. per bushel, gives *one thousand four hundred and seventy dollars* as the value of one acre; and

calculated at the same rate for the entire area of two hundred and thirty thousand four hundred acres, gives *three hundred and thirty-eight millions six hundred and eighty-eight thousand dollars* as the approximate royalty value of the coal in Greene county.

“Block” Coal.—The area of the “block” coal in Greene county, which is included in the above estimate, is about *one hundred and fifty square miles*, and its average depth may be taken at two and a half feet. In quality it is fully equal to the average run of “block” coal in Clay county, and can be used in the raw state for the manufacture of pig-iron.

Iron Ore.—Greene county is rich in deposits of siliceous hydrated brown oxide of iron and clay iron-stone. Many of these deposits of ore are from ten to twenty feet, or more, in depth, and will furnish a full supply of ore for a large number of blast-furnaces for many years to come. The only thing required to insure the immediate erection of blast-furnaces at these ore-banks, is a railway that will furnish means of transporting its manufactured products to market. Good “block-coal” suitable for fuel, and limestone for flux, are to be found in close proximity to the ore; and there is no quality of metal so much needed at this time, in Indiana, as the cold-short iron which the ores of this county will furnish in great perfection.

Building-Stone.—Excellent quarries of sandstone and limestone are now being opened and worked on Mr. Watson’s land, on the line of the Indianapolis & Vincennes railroad, on section 6, town 8, range 4, and on section 14, town 8, range 5.

At the time of my examination, about six feet of rock was exposed at the latter quarry, still leaving a considerable depth of good stone undeveloped. It is a fine-grained, brownish-gray sandstone, with small specks of protoxide of iron, and lies in strata that range from six to sixteen inches in thickness, and may be taken up in slabs of any required length and breadth.

Sandstone quarries have also been opened by Mr. Hamlin, on section 25, town 7, range 4, and at Mrs. Faucett's, on Plummer's creek, on section 4, town 6, range 4.

The stone at the latter quarry is moderately fine-grained, has a cream color, can readily be split to any required thickness, and is mined in large slabs from six to thirty inches thick. Stone from Hamlin's quarry is used in Bloomfield for foundations to buildings, door-steps, door and window lintels and sills, chimneys, copings, etc., etc. In quality and in color it is similar to the stone at Mrs. Faucett's quarry.

Good sandstone for building purposes is also found on Mr. Lahr's land, and at various other localities in Wright township, in the north-western part of the county. In fact there is no scarcity of good building-stone in Greene county.

Quick Lime.—The subcarboniferous limestone along the I. & V. railroad, and in the ridge skirting Richland creek and Ore-branch, will furnish material for an abundance of good white lime. The limestone which overlies coal K, in the western part of the county, will at many places furnish a dark-colored but good strong lime, in every respect suitable for making mortar.

Fire-Clay.—This valuable mineral, which forms the substratum to coal-beds, has received very little attention in this county, and as yet no effort has been made to test its refractory qualities or adaptation to the manufacture of fire-brick. The bed of fire-clay which outcrops in the hill at Owensboro, is of excellent quality for the manufacture of stone-ware, and a pottery has been established by Mr. Reynolds on section 25, town 6, range 2, in which the Owensboro clay is used. This is a small factory, and turns out daily about one hundred gallons of ware consisting of crocks and jugs.

Ochre-Beds.—Beds of clay, colored with oxide of iron, are found at Patterson's near the mouth of Fish creek, on the line of the I. & V. railroad, in the edge of Owen county, also one and a half miles south-east of Salisbury,

at Mr. Law's, on section 4, town 8, range 3. These ochres are of various shades of color, and make a good cheap paint.

Agriculture.—On the west side of White river the country is mostly level, or gently rolling, and there are quite a number of small fertile prairies. On the prairies and the broad bottoms along the streams, the soil is, with a few exceptions, a sandy loam, easy to bring into cultivation, and yields large crops of corn, wheat, oats, and grasses.

In the marshes or wet prairie lands, on Latta's creek, and at other places, the soil is a deep black muck, which is, in its present state, unproductive, but if properly drained and worked by deep plowing, in such a manner as to leave its particles well exposed to the oxidizing action of the atmosphere, will, in a few years, become one of the most productive soils in the county.

On the ridges and table-lands, the soil is, for the most part, a yellowish clay, that is not ordinarily as well adapted for growing cereals as the sandy loam soil; yet it is very productive, and with ordinary culture will yield from twenty to thirty bushels of wheat to the acre. It also produces fine crops of red clover.

That portion of the county lying on the east side of White river is quite broken, and the soil is mostly composed of yellow clay; though there are tracts of sandy loam land in the bottoms along the creeks.

The ridges on this side of the river form highly favorable locations for the cultivation of fruits, and though but little attention has yet been paid to this branch of agriculture in Greene county, some very good orchards are to be seen in the neighborhood of Bloomfield, and both apple and peach trees present a thrifty appearance.

Timber.—On the west side of White river the timber is generally small, comprising a variety of oaks and hickory. The eastern portion of the county is heavily timbered, and contains the usual variety of trees found in this latitude—such as poplar, oaks, black walnut, ash, sugar-tree, hickory, etc., etc.

makes its appearance a short distance farther up the branch.

Coal A, at Babbit's mine, is opened on the half-section line, between sections 28 and 33, town 6, range 3, one and a quarter miles south-west of Owensboro; the bed is two feet thick, and the coal is mined out in fine large cubes from twelve to fifteen inches thick. It is a caking coal, of a beautiful jet-black color, with numerous small cracks lined with scales of *selenite* not thicker than a sheet of paper. This is a remarkably pure coal, and would answer well for making gas and coke. The analysis gave the following result:

Specific gravity, 1.238. A cubic foot will weigh 77.3 lbs.

| | | | |
|----------------------|---|-------------------------|------|
| Coke, - 61.4 | { | Ash, gray, - - - | 1.5 |
| | | Fixed carbon, - - - | 59.9 |
| Volatile mat'r, 38.6 | { | Water, - - - | 3.0 |
| | | Gas, good illuminating, | 35.6 |
| <hr/> | | <hr/> | |
| 100.0 | | 100.0 | |

The coke swells but little; structure of the coal but slightly changed; color dull.

Immediately above the coal, and forming its roof, there are three feet of black bituminous shale, overlaid by five or six feet of conglomerate sandstone, which is again succeeded by a few feet of drift. This same bed of coal is opened at Mr. Baker's, on the south-west quarter of section 20, town 6, range 3, and also at Mr. Amos Dawson's, on the west half of section 23, town 6, range 3. The opening to the coal at the latter locality was filled with water, so that I had no opportunity to personally inspect the depth of the strata, which is reported to be four and a half feet. From samples of coal found at the mouth of the opening, it is here a good quality of "block-coal." The succession of strata are as follows: