

VIGO COUNTY.

This county lies on the western border and almost midway between the north and the south boundary lines of the State. It was named in honor of Col. Francis Vigo, who came from the republican land of Sardinia to St. Louis when it was a military post under the dominion of the Spanish Government. Here he early acquired the honored distinction of "Spanish merchant." Col. Vigo moved to Vincennes prior to its capture by Gen. George Rogers Clarke, and advanced sums of money to feed and clothe his suffering army. He also conveyed to that officer the information which enabled him to capture the post of Vincennes.

The money which was so generously advanced to relieve the destitute condition of General Clarke's army was not recovered from the state of Virginia, in full, until after Col. Vigo's death. He died very poor, but left a bequest in his will, in the event of his claims against Virginia being paid, that five hundred dollars should be given to the county which had honored him by the adoption of his name, to be expended in purchasing a bell for its court house.

Col. Francis Vigo had a high reputation for integrity, liberality and for his firm support of the American government. In addition to these brief notes, derived from the published sketches of Col. Vigo, it may be a matter of interest to scientists to state that he and Mr. John Badole, the first Register of the Land Office at Vincennes, and a noted Indian interpreter, were intimate friends of the celebrated naturalist, C. A. Lesueur, who lived at New

Harmony, Posey county. I can well remember seeing the three together, and have in my possession a profile portrait of Col. Vigo and Mr. Badolet, exquisitely drawn by Lesueur and lithographed by Mrs. Mezzara.

This county was organized in 1818, out of a portion of the original territory of Sullivan county, and contains about 400 square miles. The topography is not marked by any prominent hills or rugged scenery. In the northwestern part, the table land has an elevation of from 130 to 190 feet. A low amphitheatre of hills skirt along the western border and give rise to a generally level table land. Prairies occupy a large portion of the central area of the county and the townships bordering on the Wabash river. The Wabash river runs in a southwest direction through the northwest part of the county, and at the southwest corner forms the boundary between Indiana and Illinois. Numerous small streams that rise in the table lands on the east and west find their way into the Wabash river in such a manner as to furnish an abundance of running water to every township. Splunge creek and other tributaries of Eel river rise in the extreme southeast corner of the county.

Terre Haute, the county seat of Vigo county, is on the east bank of Wabash river. It derives its name from the French *terre*, land, and *haute*, high, signifying high land. The location is on a level river terrace, 45 or 50 feet above low water. The location is all that could be desired for health and beautiful surroundings. The city is regularly laid off and contains a number of large and elegant public and private buildings. The Normal School building, and the Rose Polytechnic School are buildings that display much taste and elegance of design. The latter building, with a liberal endowment of four hundred thousand dollars, is the munificent gift of Mr. Chauncey Rose to the city, and no worthier monument can be devised to commemorate his many good acts, and the firm devotion of this noble man to the city of his adoption.

The Rose Polytechnic School is destined to become one

of the most important educational institutions in the West. The philanthropy and generosity of Mr. Rose does not, however, stop with the building and endowment of this institution, for he has also furnished the means to erect an Orphan's Home and endowed it with a fund of \$350,000. Terre Haute is the seat of many large branches of manufacture. There are already here two large blast furnaces, nail works that turn out 3,000 kegs weekly, a merchant rolling mill, railroad machine shops and a variety of other manufactories. Nine railroads connect Terre Haute with the surrounding country, and the Wabash river is navigated a great portion of the year by small steamboats, that ply between it and the towns, for some miles, up and down the stream. Indeed, no city in the West is more favorably situated as regards means of transportation, and cheap fuel for the economical production of all kinds of manufactures. The population has more than doubled in the last ten years and is now estimated at 28,000 to 30,000. There are flourishing villages in each of the twelve townships forming the civil divisions of the county.

GEOLOGY.

The entire surface of this county is covered by quaternary deposits, which rest immediately on the coal measures. The latter formation, where penetrated by artesian wells bored in the city of Terre Haute, is about 450 feet thick. The first coal reached is probably referable to I, and if we add the strata, which is found above this coal, at the Seelyville mines, 86 feet less the drift, it will give 536 feet as the thickness of the coal measures of this county. At the eastern edge of Terre Haute, where the first and second wells were bored, the drift and alluvial is 150 feet thick, and the well reached probably as low as the Niagara beds. These wells, therefore, furnish important information of the strata which underlie the coal measures; and since the coals which it passes do not crop in the county, the entire section is given.

SECTION OF TERRE HAUTE WELL,

As reported by the company who had the work in charge:

	Ft.	In.
Sand and gravel.....	100	00
Soapstone	64	06
COAL I.....	6	02
Hard sandstone.....	2	03
Soapstone.....	10	00
COAL G.....	3	00
Soapstone	4	03
Gray sandstone.....	5	10
Blue soapstone	0	10
Gray sandstone	0	06
Blue soapstone.....	12	09
Soft black shale	6	00
COAL F.....	0	09
Soapstone	7	07
White sandstone, (Conglomerate).....	30	03
Blue shale.....	7	02
COAL B.....	2	03
Black shale.....	10	00
White soapstone.....	3	09
Black shale.....	15	00
White soapstone.....	8	00
Black shale.....	3	03
COAL A	3	00
Soapstone	17	09
Sandrock.....	3	00
Soapstone.....	20	00
Sandrock.....	10	00
Blue shale.....	22	00
Limestone	3	00
Blue shale	31	00
Light shale.....	5	00
Blue shale.....	60	00
Sandstone.....	7	00
Blue shale.....	24	00
Sandstone.....	3	00
White shale.....	10	00
Blue shale.....	147	00
Hard, gritty, slate rock	11	07
Hard, gray, fine sandstone.....	14	05
Hard limestone.....	11	00
White limestone.....	24	00
Gray sandstone.....	2	00

	Ft.	In.
Limestone.....	14	00
White limestone.....	82	00
Soapstone	3	00
Brown limestone.....	35	00
Soapstone	5	00
Lime rock.....	9	00
Soapstone	6	00
White limestone.....	7	00
Soapstone	2	00
White limestone.....	21	00
Gray limestone.....	5	00
Lime and soapstone, mixed.....	5	00
Gray limestone.....	5	00
White limestone.....	15	00
Blue limestone.....	2	00

STRONG SULPHUR WATER.

Gray limestone and flint.....	73	00
Light gray limestone.....	7	00
Blue gray limestone.....	7	00
Soapstone—fire clay.....	26	00
Gray limestone.....	24	00
Gray sandstone.....	3	00
Soapstone—fire clay.....	5	00
Shale and quartz, mixed.....	166	00
Slate, quartz and sandstone	3	00
Slate rock	21	00
Soapstone	33	00
Slate rock	7	00
Soapstone	235	00

STRONG SALT WATER.

Soapstone and sandstone.....	10	00
Fine sandstone.....	15	00
Blue soapstone.....	40	00
Black shale.....	15	00
Red shale.....	5	00
Black shale.....	15	00

SATURATED WITH OIL.

Lime rock.....	5	00
Black shale.....	5	00
Gray lime rock.....	149	00
Gray sand rock	23	00
Lime rock.....	73	04

SULPHUR WATER.

1912 05

It is of course very difficult to decide, with certainty, on

the correlation of strata of coal when no other means are furnished than the simple record of a bore kept by parties who possess but a limited knowledge of the specific character of rocks, even when exposed to view at the surface, much less when brought up by the sand pump in the condition of fine sediment.

At Seelyville, on the Terre Haute & Indianapolis Railroad, M. Hough, of Terre Haute, superintended the sinking of a coal shaft some years ago for the Indianapolis Rolling Mill Company, and furnished me an accurate section of what it passed through as far down as the bottom of coal L; from thence a bore was made to the additional depth of 125 feet. The following section is taken from Mr. Hough's record. In 1869 I went down this shaft and found the record reliable so far as I could follow it.

SECTION OF SEELYVILLE SHAFT,

On section 14, township 12, range 8. Mine now owned by Arbuckle & Budd:

	Ft.	In.
Drift	11	00
Quick sand	5	00
Hard pan	15	00
COAL N	2	09
Fire clay	7	06
Sandstone	1	06
Soapstone	12	09
Fossil ore	0	06
Soapstone	7	07
Slate	1	06
COAL M	0	06
Fire clay	5	08
White sandstone	4	00
Dark sandstone	5	00
White sandstone	14	06
Soapstone slate	0	10
COAL L	6	02
Fire clay	4	00
Sandstone	4	06
Black slate	1	06
Bastard limestone	2	06
Black slate	1	08

	Ft.	In.
COAL K.....	1	10
Fire clay.....	5	00
Soapstone.....	9	06
COAL J.....	0	06
Sandstone.....	4	00
Fire clay.....	7	00
COAL I.....	1	01
Slate.....	0	05
COAL.....	1	09
Fire clay.....	10	06
Black slate.....	2	00
COAL H.....	1	05
Fire clay.....	3	09
Soapstone.....	4	06
Fire clay.....	5	00
Soapstone.....	2	09
Sandstone.....	3	01
Soapstone.....	5	06
Black slate.....	0	07
COAL G.....	0	05
Soapstone.....	1	06
Sandstone.....	5	04
Soapstone.....	7	00
Sandstone.....	1	00
Soapstone.....	1	00
Sandstone.....	6	02
Slate.....	2	06
COAL F.....	1	02
Sandstone.....	7	06
Fire clay.....	1	03
Gray slate.....	5	00
	225	11

About a quarter-of a mile south of Arbuckle & Budd's mine, on the same section, is the old Perrin shaft, 43 feet to the bottom of coal N, which is here 5 to 6 feet thick. The Seelyville shaft starts from a topographical horizon, one hundred feet by railroad levels, above the mouth of the bore, at Terre Haute, and by means of the two sources of study we are enabled to make a complete section of all the strata in the county. By following coal N, from Seelyville, west, it is seen to crop on Lost creek, on Alexander McPherson's place, section 16, township 12, range 8; at an elevation of 42 feet above Terre Haute, which gives a dip of 27 feet in

a horizontal distance of one and a half miles, or about 18 feet to the mile.

It is a singular fact, that all the coal seams along the streams, both in Clay and Vigo counties, nearly conform to the fall and rise of the beds of the creeks. Along the Middle and North Forks of Otter creek, in Clay county, and along the branches of Lost creek, and the main Otter creek, in Vigo county, this fact may be observed. The coal strata also, as a general rule, rise and fall with the topography of the country, and where there is a long stretch of level table land the seams of coal and accompanying strata will be found nearly horizontal. Therefore, it will not do to estimate a uniform dip of 18 feet to the mile, over the 5 miles level territory between McPherson's and Terre Haute. But even at this rate, it would only carry N 38 feet below the surface, and L (62 feet below) to a depth of 100 feet. But, even at this great depth, both N and L would have been removed by the glacial forces which swept down the valley of the Wabash, removed pre-existing strata and left the plain between the hills on the east and west filled with erratic boulders, hard pan, gravel, clay and sand to the depth of 150 feet, as proved by the artesian bores. The hills and table lands on the east side of the Wabash are the counterpart of the hills and table land on the west side of that stream. If my deductions from the above facts are correct, and after taking into consideration the variations in space usually found in different parts of the measures between respective seams of coal, then coal I is probably the first seam of coal penetrated by the bores at Terre Haute. The coals then that lie above seam I have been removed for at least the greater part of the distance between the Wabash river and McPherson's. Five and a half miles west of Terre Haute, along the east slope of the hills, coal L is reached by shafts at about 70 feet below the level of the railroad depot at Terre Haute, and the superior seams M and N appear as thin beds in the hills above.

Coal L is the lowest seam of coal worked in the county.

The colliery at Seelyville was recently sold by Mr. Seely to Arbuckle & Budd. It has a good arrangement for hoisting and delivering coal to the cars. The shaft is only six by twelve feet, and the new company design enlarging it, since it has proved to be inadequate to meet the growing demand for the coal. The seam is caking coal, $6\frac{1}{2}$ feet thick, and has a three inch shale parting 3 feet below the top. The upper part contains numerous joints or vertical fractures that are filled with thin scales of transparent calc spar; these joints predispose it to break into cubical pieces. The color is brilliant black. The lower part of the seam contains fewer joints, is of a bright black color, and the coal is firm and hard. Though the coal, itself, contains but little sulphur, there is disseminated through the seam bands of iron pyrites (*mundic* of the miners). This mineral if mixed with the coal is highly injurious to the boilers, grate bars and fire boxes of locomotives, but being in bands it is easily separated.

ARBUCKLE & BUDD'S COAL:

	Top.	Bottom.
Fixed carbon.....	48.00	50.00
Gas	45.00	43.50
Water	3.50	3.00
Ash, white.....	3.50	3.50
Coke	51.50	53.50
Heat units.....	8007.	8031.
Specific gravity.....	1.211	1.250
Weight of 1 cubic foot.....	75.68	78.12

Coke : puffed, lustreless, amorphous.

The calculated heat units are 8031. One pound of coal will convert 12.31 pounds of water from 0°C. into steam at 150° C.

The practical evaporative power of a coal is found to be about one-third less than is indicated by calculation. Then in practice one pound of the Arbuckle & Budd coal should convert 8 pounds of water from 0° C. into steam at 150° C. These analyses show that this is an excellent coal. It will make a good coke and possesses a high evaporative value.

The immediate roof of L at this shaft is an argillaceous

shale as shown in the vertical section given above. Coal L crops on another branch of Lost creek about one mile south of Seelyville, on W. B. Dickinson's place and it might be reached by shafts over almost the entire eastern half of Lost Creek township, and over almost the whole of Nevens township in the northeast corner of the county.

On the Indianapolis & St. Louis railroad, sections 8 and 9, township 13, range 7, this seam is worked by two entries that penetrate the coal on opposite sides of the railroad and only a few hundred yards apart. The seam lies a little below the level of the railroad track, is 6 feet thick and has a shale parting similar to what is seen at Seelyville $3\frac{1}{2}$ feet below the top. The south mine was first opened and worked by Daniel Webster, who sold it to a company that have conferred upon it the name of Litchfield Coal Company. The north mine is known as Webster & Brammell Coal Company. The appearance of the coal in each of these mines is strikingly similar to Arbuckle & Budd's coal, and the analyses also agree very closely.

WEBSTER & BRAMMEL'S COAL:

	Top.	Bottom.
Fixed carbon	48.00	47.50
Gas	46.00	45.50
Water	3.00	3.00
Ash	3.00	4.00
Coke	51.00	51.50
Heat units	8098.	8013.
Specific gravity.....	1.197	1.210
Weight of 1 one cubic foot.....	74.81	75.62

Coke: puffed, lustreless, amorphous.

The calculated heat units of the top part of this coal being 8098., one pound will convert 12.42 pounds of water from 0° C. into steam at 150° C. Practical evaporative power; one pound will evaporate 8.28 pounds of water from 0° C. into steam at 150° C.

For the bottom part of the coal the calculated heat units are 8013., therefore, one pound will convert 12.3 pounds of water from 0° C. into steam at 150° C. In practice one pound will convert 8.2 pounds of water from 0° C. into steam at 150° C.

The place where these mines are located is called Webster Station; it is only half a mile west of the Clay county line at Lodi, and is situated on the main bottom formed along the north branch of Otter creek. At the old entry to coal L at Webster, the seam is about on a level with the railroad track, and the coal is raised on an inclined tressel-work tramway to the tip house which is built over the railroad at an elevation which admits of the coal being slid down into the cars; it being one of the principal coaling stations on the Indianapolis & St. Louis railroad.

Coals M and N, though not seen above L immediately at Webster, make their appearance farther up the stream on the side of the hill at Lodi, and their places are indicated in the following section:

SECTION BETWEEN LODI AND WEBSTER:

	Ft.	In.
Drift, clay and soil.....	48	00
Hard bituminous shale, (N ?).....	2	00
Good coal.....	0	08
Gray argillaceous shale.....	8	00
Black shale.....	1	00
Good coal in blocks (M).....	1	06
Siliceous shale.....	10	00
Micaceous shale.....	4	00
Argillaceous gray shale.....	1	00
COAL L.....	6	06
Bed of Otter creek.	82	08

The two seams above L lie very irregular and are in curved basins. In a space of 25 yards they are seen to dip 3 feet, and on following down Otter creek from Lodi, they make their appearance at various points along the stream and are last seen near Grant's Station, 5 miles south-west, at about the same level above the creek. The rate of dip in that direction, by railroad levels, is only 8 feet to the mile. At Grant's Station I was informed that a well was bored which penetrated a thick coal 30 to 40 feet below coal M.

Daniel Webster lives about a mile northeast of Webster

station, on southwest quarter, section 5, township 13, range 7, and 60 feet by barometric measurement above Otter creek at Lodi. In 1871 he had a well drilled on the west side of his farm nearly north of the mines at Webster. It commenced on level table land and passed through the following strata, as reported by Wilson Crossly, who had the work in charge:

BORE ON DANIEL WEBSTER'S FARM.

	Ft.	In.
Surface soil and clay.....	3	00
Sand.....	1	00
Plastic potter's clay.....	5	00
Sand.....	8	00
Hard pan.....	10	00
Sand.....	1	06
Hard pan.....	8	06
Sand.....	1	00
Hard pan.....	8	00
Plastic potter's clay.....	7	00
Sandy shale.....	13	08
COAL L.....	7	00
	73	08

The last 7 feet probably includes some of the shale roof. The depth at which the coal is found corresponds very closely to the level of the seam at Webster's Station. Coals M and N have been removed by glaciation. East of this well, and on the same farm, Mr. Webster had another well drilled in the following October, by V. Young. This well passed through:

	Ft.	In.
Surface soil and clay.....	15	08
Sand.....	8	00
Potter's clay.....	9	06
Gray shale.....	4	00
Black shale.....	13	00
Coal and shale (N?).....	3	00
Shale.....	5	00
Coal and black shale (M).....	4	06
	62	06

This well passed through the two coals that crop on the

bank of North Otter creek at Lodi, and if it had been carried to about the same depth as the first, would have penetrated Coal L.

At Fountain Station, one and a half miles southwest of Webster, Coal M is seen at the water's edge, but N has been removed by glaciation. About a quarter of a mile southwest of Fountain, G. W. Mooreland has sunk a shaft to Coal L. This shaft commences on the south bank of North Otter creek.

SECTION ON MORELAND'S FARM:

	Ft.	In.
Sand and clay.....	22	00
Coal M.....	1	04
Fire clay.....	3	00
Sandstone and sandy shale.....	4	00
Gray shale.....	8	00
Coal L.....	5	10
	44	02

In general appearance this resembles the Webster and Seelyville coals. There is a shale parting at the same distance from the top, and it contains vertical joints filled with calc spar.

MOORELAND'S COAL:

Fixed carbon.....	47.50
Gas	43.50
Water	4.50
Ash, reddish brown.....	4.50
Coke.....	52.00
Heat units.....	7829.
Specific gravity.....	1.195
Weight of 1 cubic foot.....	74.70

Josiah Lambert, who lives on a farm, which joins Fountain on the north, had two wells drilled on his place for coal. The first is situated near the centre of section 13, township 13, range 8, and only a few rods from the railroad track, and the second well in the northeast corner.

SECTION ON JOSIAH LAMBERT'S FARM :

First Bore.

	Ft.	In.
Yellow sand.....	5	00
Hard pan.....	8	00
Quicksand	24	00
Shale	1	00
COAL M.....	1	06
Fire clay.....	3	00
Black shale.....	3	00
Gray shale.....	7	00
Soapstone, (Argo. shale.).....	3	00
COAL L.....	7	00
	<hr/>	<hr/>
	62	06

The second well was situated on the table land about 30 feet above the level of the first.

Section of Second Bore.

	Ft.	In.
Yellow clay.....	4	00
Hard pan.....	24	00
Sandstone	12	00
Soapstone	10	00
Limestone.....	2	00
Soapstone	12	00
Limestone	5	00
Soapstone	5	00
Black slate.....	3	00
Coal	7	00
	<hr/>	<hr/>
	84	00

The record of the first bore corresponds so close to what is seen in the shaft, that no room is left to doubt its accuracy. The account of the second bore, however, differs from either in all but the coal at the bottom, so that one is left to question its accuracy in every particular. The limestones were not seen here in my surface examinations, though I followed up a ravine, which cuts the table land near by, expressly to look for them. There is, nevertheless, a thin limestone, sometimes over coal N, and if we are to be guided by this fact, the coal reported as 7 feet thick, has its thickness over-estimated, and the 3 feet of black shale

and 7 feet of coal may be parts of coal N and M, which are sometimes separated by only a few inches of shale.

Near Grant's Station, at the old Titcomb mine, (Coal N), coal M is on a level with the railroad track and, by railroad levels, 56 feet above low water in the Wabash river at Terre Haute. The place of coal L, as shown by the sections at Webster and Fountain, lies not more than 20 feet below M. Now, if we assume that the rate of dip continues from Grant's Station to Terre Haute, 3 miles southwest, at the same rate, 8 feet to the mile, as shown from Lodi to Grant, then the place of coal L at Terre Haute is near the level of the river, and has been removed by denudation, but makes its appearance, at about the level of low water at the foot of the hills on the west side of the stream about $2\frac{1}{2}$ miles from Terre Haute. The most southerly point where it is worked on the west side of the river is at the crossing of Sugar creek on section 30, township 12, range 9, at Barrick & Sons' mine. Here, the shaft, which is sunk on the side of the creek, is 30 feet deep and the coal is 4 feet 6 inches to 5 feet thick. It lies on a level with the bed of the creek and some trouble has been experienced by the water of the stream finding its way into the mine. Going north from Barrick & Sons' mine I followed coal L by numerous shafts and crops to the extreme northern part of the county. The following is a section of the hill and shaft :

BARRICK & SON'S.

	Ft.	In.
Drift, clay and soil.....	20	00
Schistose sandstone.....	10	00
Limestone containing <i>Productus punctatus</i>	1	00
Siliceous shale and argillaceous shale with ironstone.	30	00
Gray, light colored argo. shale.....	12	00
Black shale.....	1	06
Coal L.....	4	06
Fire clay.....	10	00
	89	00

At Mackelroy's shaft, three-quarters of a mile north of Barrick & Son's, this seam is reached at 27 feet from the surface. At Edgerton's, three-quarters of a mile north of

Mackelroy's, the shaft is 40 feet to the coal, and at McQuilkin's, on section 7, township 12, range 9, the shaft commenced above the Indianapolis & St. Louis railroad, and is 80 feet to the coal. The coal in this shaft must be considerably above the level of the bed of Wabash river, and is overlaid by a thick bed of gray argillaceous shale that contains numerous thin bands of nodular ironstones. These ironstones are so numerous in the beds of the small streams, where they have tumbled from the washed banks above, that they are gathered up and sold to the Vigo Iron Company, to be smelted into iron. This shale is seen everywhere above coal L, on the west side of the river, and in connection with a bed of limestone, which lies from ten to twenty feet below the coal, furnishes a ready means for its identity. Some years ago a shaft was sunk to coal L, on the Vandalia railroad, about 3 miles west of Wabash river, on section 24, township 12, range 10, by Bigelow & Co. It was commenced on the side of the hill, immediately beneath the sandstone, and 8 feet above the railroad track.

SECTION AT BIGELOW & CO.'S

	Ft.
Covered to top of hill.....	50
Sandstone.....	10
Gray argillaceous shale with ironstone and fossil shells..	46
Black shale.....	2
Coal.....	6
	114

The gray shale in this shaft, as well as at the shaft on Sugar creek, contains an abundance of coal measure shells: *Aviculopecten rectilateraria*, *Bellerophon carbonarius*, *Euomphalus rugosus*, etc.

The railroad grade is 57 feet above low water of Wabash river, and the shaft being 54 feet deep, makes the horizon of the coal about 11 feet above the bed of the river. A shaft was also sunk to this seam of coal at St. Mary's depot on the Indianapolis & St. Louis railroad. This shaft was 110 feet deep. It took fire in 1869 and was so completely

destroyed that no one has thought of restoring it to working order. I found the hill near St. Mary's by the aneroid to be 90 feet above the bridge at Terre Haute. The place where the shaft was sunk is probably a little higher, so that we may conclude that the horizon of the coal is here about the same elevation above the bed of the river as at McQuilkin's shaft. A boring was made for coal some years ago at Sanford, on the Indianapolis & St. Louis railroad and just on the border of Illinois. In 1858 Mr. Sanford furnished me with the following record of the strata which it passed through. I have not been able to find the railroad level for this locality but believe it is fully 200 feet above Wabash river:

SECTION AT SANFORD.

	Ft.	In.
Surface.....	15	00
Sand.....	6	00
Sand and clay.....	4	00
Hard pan.....	66	00
Brown clay.....	10	03
Blue clay.....	8	04
Sand.....	0	04
Blue clay.....	37	06
Black shale.....	1	03
Fire clay.....	4	05
Limestone.....	6	05
Red clay.....	2	00
Limestone.....	3	00
Soapstone.....	2	08
Limestone.....	0	09
Red slate.....	7	06
Hard pan.....	2	09
Limestone.....	3	00
Sand and clay.....	4	00
Limestone.....	1	09
Red slate.....	1	06
Sand and blue clay.....	5	03
Sandstone.....	3	10
Black slate.....	8	03
Black hard stone.....	0	09
Black slate.....	4	02
Bastard limestone.....	0	08
Slate.....	7	05

	Ft.	In.
Soapstone	5	03
Rotten coal	4	07
Sandstone	0	06
Fire clay	7	02
Sandstone	4	00
	240	03

It would appear from this record that no workable coal was encountered in the 240 feet penetrated by the Sanford bore. In all probability, since the drift is 148 feet thick, coal L has been removed by glacial action. About 10 miles north of Sanford, on the Indianapolis, Decatur and Springfield railroad, in Vermillion county, Indiana, coal L is reached by a shaft at the depth of 100 feet. The drift being only 94 feet as shown in the following section furnished by Charles Moore:

SECTION AT MOORE'S BORE.

	Ft.	In.
Surface, soil and clay.....	6	00
Sand and gravel.....	16	00
Hard pan	48	00
Sand.....	6	00
Hard pan.....	18	00
Soapstone	3	06
Hard rock (limestone).....	0	04
Black slate.....	2	02
Coal	4	06
Fire clay	10	00
Soapstone.....	42	06
Coal and slate.....	2	06
Fire clay.....	1	06
Hard soapstone shale.....	9	06
Hard sandstone rock	7	06
	178	00

The following are the principal localities where coal L crops or is mined in Fayette and Sugar Creek townships:

Barrick & Sons', on Sugar creek, in northeast corner section 25, township 12, range 10.

Biglow shafts, near the center of sections 23 and 24, township 12, range 10.

St. Mary's shaft, southeast corner section 1, township 12, range 10.

McElroy's shaft, section 19, township 12, range 9.

John Edgerton's shaft, section 18, township 12, range 9.

William McQuilkin's two shafts, sections 7 and 8, township 12, range 9.

J. S. Schae's shaft, section 8, township 12, range 9.

A. Conner's shaft, section 8, township 12, range 9.

A. Warner's north half, section 32, township 13, range 9.

P. W. Halleran, south part, section 29, township 13, range 9, three crops.

S. W. Case, on Coal creek, section 19, township 13, range 9.

B. Fingua, on Coal creek, section 19, township 13, range 9.

J. Hunter, on Coal creek, section 23, township 13, range 10.

J. Hennesy, on Coal creek, section 23, township 13, range 10.

J. Bolton, on branch of Coal creek, section 19, township 13, range 9.

F. Miller, on branch of Coal creek, section 19, township 13, range 9.

P. & G. Groves, on Salt creek, section 19, township 13, range 9, one mile north east of Durkey's Ferry.

D. Barbour, on Salt creek, section 8, township 13, range 9.

E. S. Rhyan, section 6, township 13, range 9.

F. Shepherd, section 5, township 13, range 9.

Indeed, coal L is seen at so many localities on the west side of Wabash river, that it may be found by shafts or bores in almost every township and section in the county north of Sugar creek. But there are reasons to believe that it will not be found in the southern part of Sugar Creek township. Coal L is readily recognized by the gray, argillaceous shale with iron-stone bands which everywhere overlies it, and the impure fossiliferous limestone which lies below it. This limestone occupies the position of the limestone which overlies coal K.

The following section made on Coal creek, section 19, township 13, range 9, will indicate the character of the strata which accompany this coal in Sugar Creek and Fayette townships, taken from the top of the hills to the bed of Coal creek:

SECTION ON COAL CREEK.

Buff, marly clay, loess, but no fossils.....	8 ft. 00 in.
Drift, sand and gravel	12 to 20 ft. 00 in.
Hard pan.....	5 to 10 ft. 00 in.
Gravel, sand and boulders.....	60 to 70 ft. 00 in.
Limestone	1 ft. 00 in.
Buff schistose sandstone, sometimes contain- ing good bands of building stone.....	10? ft. 00 in.
Bluish gray argillaceous shale with bands of ironstone in flattened spheroidal masses containing fucoids and small shells.....	10 to 20 ft. 00 in.
Black shale, with thin partings of coal and impressions of flattened trunks and stems of sigillaria, etc.....	1 ft. 06 in.
Coal L.....	3 ft. 08 in.
Shale parting	0 ft. 0 $\frac{3}{4}$ in.
Coal L.....	1 ft. 00 in.
Fire clay and shale.....	10 to 15 ft. 00 in.
Limestone with <i>Productus cora</i> , <i>P. punctatus</i> , etc.	1 ft. 6 in.
Bluish gray, micaceous sandstone, excellent building stone, in places often schistose and sometimes sandy shale with a waved surface	30 ft. 00 in.
Coal Creek.	192 ft. 8 in.

The upper part of the seam of coal is jet black, glossy, contains numerous vertical joints filled with calcite and in every respect resembles the coal at Seelyville, Webster and Fountain. Bands of pyrites are also disseminated through the seam and require attention to keep it out of the coal designed for market.

In the gray argillaceous shale which overlies coal L, two remarkable fucoids are found in great abundance, preserved in ironstone nodules. These fossil sea plants were sent to Prof. L. Lesquereux for identification. He found both species new to science and has furnished me with drawings and descriptions which will appear further along. I first saw the large fucoid at Richmond, Indiana, in the cabinets of John F. Miller and Mrs. Mary P. Haines. I believed it to be new and Mr. Miller very kindly made me a present of one of the best he had. They were purchased of a

collector who gave the locality as Bruillet creek, Vigo county, Ind. The best locality that I found for these interesting fucoids is at Mr. Rhyan's mine, on section 6, township 13, range 9, about one mile from Bruillet creek. Here they have been washed out of the shale and lie in the bed and along the shores of a branch of Salt creek.

Though I was prevented from visiting the fossil plant bed at Durkey's ferry, I am satisfied that the shales which contain them, preserved in ironstone nodules, is the equivalent of the fucoid shales, for I find these shales and coal L on Salt creek and Coal creek, within one and a half miles of the ferry, as well as in the banks of Bruillet creek.

The following section showing the relation of the fossiliferous shales to coal L, at Durkey's ferry, has been furnished by Prof. John Collett:

SECTION AT DURKEY'S FERRY.

Light colored, (clay shale), with many ironstone nodules and flattened concretionary masses containing <i>Pecopteris arborescens</i> , <i>P. callosa</i> , <i>P. sp.?</i> <i>Neuropteris hirsuta</i> , <i>N. rarinervis</i> , <i>N. collinsii</i> , <i>Hymenophyllites sp.?</i> , <i>Alethopteris niagarensis</i> , <i>A. grandiflora</i> , <i>A. sp.?</i> , <i>Lepidodendron elegans</i> with leaves and cones of <i>Lepidodendron</i> , <i>Ulodendron punctatum</i> , <i>Sigillaria</i> imperfect specimen, <i>Calamites cannaeformis</i> with leaves, <i>Cordaite borassifolia</i> , <i>C. angustifolia</i> , <i>Paleoxylis prendelli</i> , <i>P. corrugata</i> , <i>Annularia sphenophylloides</i> , <i>Sphenophyllum schlotheimii</i> , <i>Trigonocarpum olivaceiformis</i> , <i>T. triloculare</i> , <i>T. ornatum</i> , and many stems of ferns, and locally in nests, the nodules are covered with minute shells of <i>Leiaia tricarinata</i>			18 ft. 00 in.
Uncteous soapstone with leaves.....	1 ft. to	1 ft. 8' in.	
Black shaly slate	0 ft. to	1 ft. 10 in.	
COAL L, in bed of river.....		5 ft. 00 in.	
			<hr/> 100 ft. 3 in.

Coal L, on the west side of the river, has about the same chemical composition that it has on the east side, as shown by the examples here given.

BARRICK & SON'S COAL L.

Seam, 4 feet 8 inches thick.

Fixed carbon	48.20
Gas	44.50
Water	3.00
Ash, reddish.....	4.30
Coke	52.50
Heat units.....	8000.
Specific gravity	1.192
Weight of 1 cubic foot.....	74.50

MCQUILKIN'S COAL L.

Seam 4 feet 8 inches thick.

Fixed carbon.....	47.50
Gas.....	44.50
Water.....	4.50
Ash, white.....	3.50
Coke	51.00
Heat units.....	7921.
Specific gravity.....	1.210
Weight of 1 cubic foot.....	75.62

P. H. HOILLOMAN'S COAL L.

Seam 4 feet 8 inches thick.

Fixed carbon.....	42.00
Gas.....	42.00
Water	3.50
Ash, white.....	12.50
Coke	54.50
Heat units.....	7247.
Specific gravity	1.242
Weight of 1 cubic foot.....	77.62

F. RHYAN'S COAL L.

Seam 4 feet 8 inches thick.

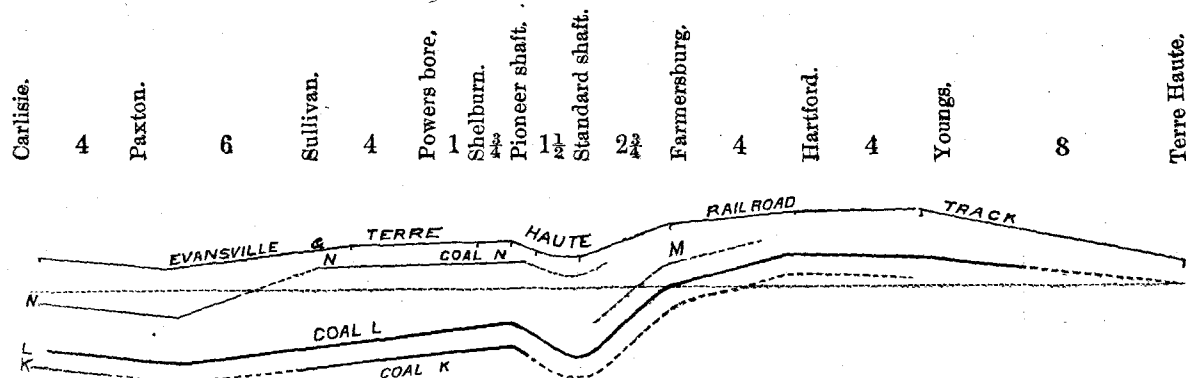
Fixed carbon.....	48.50
Gas	43.50
Water.....	2.00
Ash, flesh.....	6.00
Coke	54.50
Heat units	7910.
Specific gravity	1.226
Weight of one cubic foot.....	76.62

In the south part of Vigo county, along the Evansville & Terre Haute railroad, coal L is reached by bores and shafts. At Young's Station, 8 miles from Terre Haute, the elevation is 112 feet above the depot, or 159 feet above low water of Wabash river at the latter city; and coal L is reached at the depth of 100 feet. At Hartford, 4 miles beyond Young's, the elevation is 4 feet less and the depth to the coal is 90 feet. Farmersburg, 16 miles from Terre Haute and just south of the Vigo county line, has an elevation of 135 feet above Wabash river, and coal L is 130 feet below the surface.

The horizontal section, on next page, made along the line of the Evansville & Terre Haute railroad, from depot at Terre Haute, running south for 36 miles to Sullivan, in Sullivan county, will serve to show the topography and relative position of coal L with reference to a horizon line starting from low water of Wabash river at Terre Haute.

At Young's, it will be seen that coal L is 59 feet, and at Hartford 68 feet above low water, and since it is found at about the level of low water, on the west side of the river at the latter place, the rise of the strata, going south, will average a little over four feet to the mile. From Hartford to Farmersburg the dip is south at the rate of 3 feet per mile. From thence to the Standard shaft the rate of dip is a little more than 52 feet to the mile. In the next mile and a half to the Pioneer shaft, it rises 40 feet; from there to Shelburn, half a mile, the rise is 28 feet, or 56 feet to the mile, corresponding closely to the angle of dip on the opposite side of the trough, at the Standard shaft. From Sullivan to Carlisle there is a pretty regular dip of 4 feet to the mile. It will also be observed in this section that the rise and fall of the coal seams correspond to the surface topography. At Hartford coal M was probably removed by the drift, as it does not appear in the shaft.

HORIZONTAL SECTION FROM TERRE HAUTE TO CARLISLE, ON THE LINE OF THE EVANSVILLE AND TERRE HAUTE RAILROAD.



Vertical: 1 inch = 400 feet.
Horizontal: 1 inch = 6 miles.

SECTION OF SHAFT AT HARTFORD.

	Ft.	In.
Soil and drift.....	37	00
Solid gray sandstone.....	40	00
Gray argillaceous shale with fossil plants.....	10	00
COAL L.....	3	06
	90	06

The roof shales contain an abundance of well preserved filices and trunks of *Sigillaria*, *Lepidodendron* and *Calamites*. It is a grand sight to go down into this well arranged mine and see the ceiling in the entries, from which the coal has been removed, covered with its diversified fossil flora. Immense trunks of *Sigillaria* extend across this roof and are flanked by branching ferns that cover all the intervening spaces between the trunks of *Sigillaria* and *Calamites* with a rich foliage of glossy, black leaves on a matrix of bluish gray argillaceous shale. Indeed, the fossil flora of this mine excels in variety and perfect preservation of the plants any place that I have ever visited. A trunk of *Sigillaria* was measured, with the assistance of underground manager Duncan McCullum, and found to be eight and a half feet in diameter.

Mr. McCullum presented me with a number of fine specimens of these fossil plants which he had collected. Among them I recognized *Hymenophyllites alatus*, *H. pinnatifidus*, *Annularia longifolia*, *Neuropteris rarinervis*, *N. hirsuta*, *N. loschii*, *Sphenophyllum schlotheimii*, *Pecopteris arborescens*, *Cyclopteris elegans*, *Asterophyllites ovatus*, *Sigillaria obovata*, *S. occulta*, *S. menardi*? *Calamites cuneiformis*, *C. sp.*? *Lepidodendron sp.*?

While in the south part of the county this seam of coal is only 3 feet 6 inches to 4 feet thick, it nevertheless presents the same general characteristics noted at Seeleyville, Webster and the mines on the west side of Wabash river. It is a double seam and the upper part is glossy black coal with joints containing calc spar.

The mine at Hartford is now owned by J. S. Wyeth.

The tip-house and machinery are in first rate order. The engine being one of the best in the country for the purpose, and the entire mine is in good order for the delivery of coal into cars. Mr. Wyeth has been experimenting with his coal-slack to test its coking properties. To judge from the samples of the coke which he has made, there is but little doubt of his succeeding to make from this, at present wasted coal debris, a coke that will meet with a ready sale. The analyses of the upper and lower parts are here given:

J. S. WYETH'S COAL.

	Top.	Bottom.
Fixed carbon.....	49.00	51.00
Gas	41.00	42.00
Water.....	2.50	2.50
Ash, white	7.50	4.50
Coke.....	56.50	55.50
Heat units.....	7721.	7974.
Specific gravity.....	1.237	1.216
Weight of 1 cubic foot.....	77.31	76.00

COAL M

Is the next seam following L, in the ascending order. It is found in Arbuckle & Budd's shaft, at Seelyville, but is there too thin to be mined. The shaft on the Perrin property, a half mile south of Seelyville, did not go deep enough to reach it. On the west side of Wabash river it appears as a thin seam in the hills along the Vandalia railroad, and on Clear creek, in section 34, township 12, range 10. It is found of workable thickness on Otter creek and its branches. Here it is sometimes seen only separated from N by a few inches of shale, and in such places the two may be worked together, as at Stewart's, one and a half miles south of Fountain, on section 24, township 13, range 8; also on section 30, township 13, range 8.

SECTION AT LODI,

In the western edge of Clay county :

	Ft.	In.
Surface and drift.....	30	00
Black shale.....	1	00
COAL N.....	1	06
Gray shale.....	8	00
Under Clay.....		
Black shale.....	2	00
COAL M.....	2	06
Fire clay.....		
Siliceous shale.....	10	00
Bed of Otter creek.	55	00

The black shale forming the roof of M and N is highly bituminous and so closely resembles cannel coal that it may be easily mistaken for that valuable fuel. Some years ago, D. Titcomb sent some samples of the bituminous shale overlying coal N, at Grant station, to this office for examination, and it was found to contain in 100 parts:

Water.....	4
Volatile gas.....	25
Fixed carbon.....	39
Ash, fawn color.....	32

This shale will burn and make a very hot fire but it will not consume to a pulverulent ash; the incombustible residue is a more or less compact stone. It also contains hydrocarbon oils and gas but not in quantity sufficient to be extracted with profit. This is mainly because the residual coke will prove valueless.

Coal M has imbedded locally in the overlying shales large limestone concretions that contain numerous fossil shells of which I recognized *Productus punctatus* and *P. spinosus*. The associated black shale contains *Aviculopecten rectilaberraria*, gilt with iron pyrites, and scales and fins of fish. *Petrodus occidentalis* and similar fish remains are also found in the shales over coal N.

At Grant's station coal M is seen along the southern shore of Otter creek for several hundred yards, and the crop is just above the bed of the stream. Mr. Henry

Brayton is mining it along the bank by stripping off the superincumbent shale. It is considered a very good coal for domestic purposes. The following is the analysis of

HENRY BRAYTON'S COAL.

Fixed carbon	44.00
Gas ..	44.00
Water	3.50
Ash, red.....	8.50
Coke	52.50
Heat units.....	7592.
Specific gravity.....	1.216
Weight of one cubic foot.....	76.00

Coke: puffed, amorphous, lustreless. One pound will convert 11.6 pounds of water from 0° C. into steam at 150° C.

A bore was made to test the existence of lower seams on the north side of the creek, close to and a little below the railroad grade at Grant's Station. It commenced below M and was carried to the depth of 110 feet. Artesian water is flowing out the top of this well which has a strong chalybeate taste. The following section shows the strata in the bank above coal M and what was passed through by the bore:

SECTION OF BORE AT GRANT'S STATION.

	Ft.	In.
Drift	8	00
Hard, black bituminous cannel-like shale.....	6 to	8 00
Coal N	22 in.	} 3 10
Shale parting.....	2 in.	
Coal.....	10 in.	
Under clay and argillaceous shale with large limestone concretions	6	03
Black pyritiferous substance, with soft carbonaceous matter, resembling charcoal.....	0	04
Coal M	1	01
Under clay.....	1	00
The bore commenced above the base of this coal and passed through:		
Sand and clay.....	73	00
Argillaceous shale.....	19	03
(Place of artesian water).		
Sandstone.....	3	00

	Ft.	In.
Black shale.....	2	00
Coal I?.....	2	06
Under clay.....	1	10
Argillaceous shale.....	12	00

Everywhere seen along the north branch of Otter creek, coals M and N hold the same relation to each other as exhibited in the above section. N is divided in two parts by a thin parting of shale or clay, is overlaid by hard black bituminous shale, and is separated from M by 6 to 10 feet of gray friable clay, resembling the usual under-clay of coal seams. It has also a roof of hard black bituminous shale with large concretionary balls of impure limestone.

Where this well is bored, in the narrow bottom on the north side of the creek, coal L has been removed by the changing currents of the creek or other abrading forces. On the south branch of Otter creek, in section 30, township 13, range 7, these two seams come close together, and including the two clay partings, have a total thickness of 6 feet to 6 feet 6 inches. After leaving Grant's station and going west to Wabash river, a distance of 6 miles, the country is nearly level and coals N, M and L have been removed by the agency of the glacial drift, and the crop of stratified rocks are not met with until the hills already alluded to are reached on the west side of Wabash river, except at Durkey's ferry.

In Riley township, at Somerset, on the Terre Haute & Cincinnati railroad, and half a mile west of Lockport, the Somerset Coal Company sunk a shaft in 1873, to coal M. This shaft commenced 10 feet above the railroad grade, which is here 35 feet above Terre Haute, and the top of the shaft 114 feet above the bed of Wabash river. The coal is 44 feet below the top of the shaft, or 70 feet above the bed of Wabash river at Terre Haute.

The following section of the strata passed through at Somerset, was obtained from W. J. Jones, a partner of the Company, who assisted in the work of sinking the shaft.

SECTION AT SOMERSET.

			Ft.	In.
Soil and clay.....			17	00
Coal rotten.....	2 ft. 00 in.	} N	3	07
Fire clay.....	2 ft. 00 in.			
Coal, good.....	1 ft. 07 in.			
Fire clay.....			1	00
White sandstone.....			6	00
Black. bituminous shale.....			1	07
Impure limestone.....			6	00
Black, bituminous shale.....			9	00
Coal.....			5	04
Fire clay, hard.....			2	00
			51	06

Four inches next to the roof is inferior pyritiferous coal, and the lower part of the seam is the best. It has no partings.

Analysis of the lower part of this coal gives in 100 parts:

Fixed carbon.....	51.00
Gas.....	43.00
Water.....	4.50
Ash, white.....	1.50
Coke.....	52.50
Heat units.....	8066.
Specific gravity.....	1.210
Weight of 1 cubic foot.....	75.62

Coke: puffed.

This indicates a very good coal. One pound will convert 12.37 pounds of water from 0° C. into steam at 150° C.

The company has a good engine and dump house, and is preparing to mine all the coal that can be sold.

About one mile northeast of Somerset mine, J. S. Foote, of Terre Haute, had a bore made for coal, on section 9, township 11, range 8. He furnished me with samples of the seams penetrated, and their depth and relative positions. The bore commenced on the bottom of Honey creek, and close to the hills.

FOOTE'S BORE ON HONEY CREEK.

	Ft.	In.
Surface clay	8	00
Black shale	3	00
COAL N		?
Shale	57	00
Limestone.....	2?	00
Black shale	3?	00
COAL M.....	3	06
Space	39	00
COAL L		?

The man engaged to bore this well was inexperienced, and Mr. Foote was not sure that the thickness of the coals were accurately ascertained. The spaces are about right for this part of the county where N, M and L are quite close together, but going west the spaces augment rapidly and the upper seams, when present, are not of workable thickness, especially where seen along the Evansville & Terre Haute railroad, as shown by the sections already given.

A sample of the boring sent to me from seam M in Foote's bore, gave:

FOOTE'S BORE.

Fixed carbon.....	50.10
Gas.....	44.40
Water	3.70
Ash, light brown.....	1.80
Coke.....	51.90
Heat units.....	8123.
Specific gravity	1.217
Weight of 1 cubic foot.....	76.06

Coke: puffed, dull, amorphous.

One pound of this coal will convert 12.45 pounds of water from 0° C. into steam at 150° C. This gives promise that the seam will prove a valuable one.

Coal M may be found over a large area in Riley township.

Though variable in thickness it is of fair quality for domestic purposes, and at most places will be found sufficiently thick to justify mining.

COAL N.

This is one of the most unreliable seams in the county, both as regards persistence and thickness of the coal. It is of good workable thickness on the old Perrin property adjoining Seelyville. Here it is reached at the depth of 40 feet and was mined to some extent in 1869, but the shaft, then in good order, is now filled up and the mine abandoned. About one and a half miles a little south of west from Seelyville and near the Vandalia railroad, N has been opened on J. McPherson's land, section 16, township 12, range 8. The coal is mined by running an adit into the ridge which skirts along the south shore of Lost creek. It is 15 feet below the railroad level and the dip west from Seelyville to this place is at the rate of 18 feet to the mile.

SECTION AT M'PHERSON'S—SEELYVILLE.

	Ft.	In.
Soil and drift	20	00
Sandstone	30	00
Black shale	0	00
Caking coal..... 2 ft. 00 in. }	5	04½
Shale..... 0 ft. 00½ in. }		
Semi-block coal..... 3 ft. 04 in. }		
Under clay.....	0	00
	55	04½

ANALYSIS OF M'PHERSON'S COAL.

Fixed carbon.....	56.50
Gas.....	37.00
Water.....	2.50
Ash, white.....	4.00
Coke.....	60.50
Heat units.....	7959.
Specific gravity.....	1.239
Weight of 1 cubic foot.....	77.43

Coke: slightly puffed, amorphous, brilliant.

Coal N, the highest coal in the series, is not found of workable thickness in this county at any point west of McPhersons and Grant's station, on the Indianapolis & St. Louis railroad. It is found in the hills on the west side of

Wabash river, and at numerous places in the south part of the county, but at these localities seldom attains to more than eighteen inches in thickness; still, at the crop it may be worked in favored positions, to supply neighborhood demands, by stripping off the superincumbent shales and earth.

QUATERNARY.

This epoch includes the beds of alluvial, loess, marl, clay, gravel, sand, boulders, etc., which lie immediately over the palæozoic rocks in Indiana. In Vigo county, these deposits have been proved by the Terre Haute deep wells, to be at least 150 feet thick. The boulders which lie near the bottom of the glacial drift, are mostly crystalline rocks, that were torn loose from the parent beds, that are in situ, far to the north of the State, and transported thither by the powerful glaciers which covered the country in the arctic and temperate regions, following the close of the coal era. The gravel is a mixture of crystalline and sedimentary rocks. At the hills east of Terre Haute, on land adjoining the farms of Joseph Gilbert and A. B. Pegg, where a branch of Lost creek cuts its way through the ridge, there is a fine exposure of glacial drift. The face of the exposure is almost vertical, and the deposit is 60 feet from the bed of the branch to the top of the bluff. Springs break out from the horizon of the boulder clay in almost all localities where it is exposed. Mr. Pegg and others have taken advantage of the springs that flow from this horizon, to construct fish ponds in favorable localities, by building dams across the valleys. Some years ago a bore was commenced at the foot of the hills on Church run, for coal, but was only carried to the depth of 20 feet. Here artesian water was reached, which flows out at the top. It has a slight chalybeate taste, but otherwise appears to be free from mineral matter.

Loess forms a capping to the drift on the high ridges and is from 20 to 25 feet thick. I was unable to find in it fossil shells of any kind.

BUILDING STONE.

The sandstone above and below coal L is sometimes found of good thickness and sufficiently firm and durable to be used for making foundations to inexpensive buildings. I know of but one locality in the county where a good durable stone may be obtained. This is seen below the limestone which underlies coal L in the bluffs bordering Coal creek, Fayette township. It is a bluish-gray, fine grained sandstone, that was at one time quarried by Mr. McQuilkins. The layers are generally thin, seldom reaching a foot. It rings under the hammer and will present a handsome appearance in a building.

There are two or more horizons at which an impure limestone may be had in this county; one lies above coal N, and the other is below coal L. This rock is totally unfit for building purposes and makes an inferior quick-lime; where exposed to the weather it is decomposed and shows unmistakable signs of decay. Going west, into Clark county, Illinois, the limestone over N becomes very thick, 20 to 35 feet; is of a light blue color, and but for its unmistakable coal measure fossils, might be taken for the cavernous beds of the sub-carboniferous limestone.

BRICK AND POTTERS' CLAY.

The clay which immediately underlies the coal seams is, in most parts of the county, suitable for making coarse jugs, milk crocks, roof-tile, drain-tile, etc.

Clay suitable for brick may be had on almost every farm in the county, being especially good on the ridges or uplands.

PETROLEUM.

Three wells that reached petroleum bearing strata have been bored at Terre Haute. The principal supply of oil was probably found in the upper part of the Niagara beds. The second well bored, furnished from two to four barrels of moderately heavy oil in twenty-four hours. It did not flow out at the top, but had to be

pumped. This materially enhanced its cost and owing to the extreme low price petroleum has commanded in the market for some years, the well was abandoned and closed up. The third well bored on the bank of Wabash river, in the edge of the city, found but little oil but discharges a vast column of sulphuretted hydrogen water similar in quality to that which flowed from the first well bored in the yard of the Terre Haute House. The analysis of this water was given in the report for 1869. The well on the bank of the river is now owned by J. S. Miller. If properly tubed the water would rise a great many feet above the general surface. The temperature is 81° F. It is a saline sulphur water, contains a large amount of common salt, some glauber and epsom salts, lime, magnesia and iron. There is a copious escape of carburetted hydrogen, carbonic acid and sulphuretted hydrogen. It possesses fine medicinal properties, and is particularly beneficial in diseases of the skin and some forms of rheumatism. Mr. Miller has erected a bathing house close by, where patients may enjoy the luxury of bathing and drinking the water.

IRON PYRITES. (BISULPHIDE OF IRON.)

This yellow, metallie looking mineral, is found in great abundance at Seelyville, where it occurs in bands or strata in coal L. It is readily separated from the coal and may be seen lying around Arbuckle & Budd's colliery in vast heaps and instead of permitting it to go to waste should be turned to profitable account by the manufacture of sulphur and sulphuric acid. Iron pyrites contains one equivalent of iron and two equivalents of sulphur, its symbol being FeS_2 or $\text{FeS} + \text{S}$. Its composition in 100 parts is : Iron 46.67, sulphur 53.33.

When iron pyrites is strongly heated it may be made to give up one half of its sulphur and the residue will be the copperas or green vitriol of commerce. The quantity of sulphur actually obtained from this mineral on a large scale does not exceed 13 or 14 per cent. The most important

use to which iron pyrites can be put is for the manufacture of sulphuric acid. This acid is in almost unlimited demand for many branches of manufacture and occupies the same relation to chemical technology that mineral fuel does to metallurgy or for the generation of steam.

In order to manufacture sulphuric acid from pyrites the mineral is calcined in a peculiarly constructed kiln over which is placed grooved rollers that serve to crush the ore that it may descend in fine particles over terraces to the bottom of the furnace which is maintained at a bright red heat. The sulphurous acid formed is conveyed into a leaden chamber where the usual arrangements are made to promote its conversion into sulphuric acid. One hundred pounds of pyrites will give about 140 pounds sulphuric acid. As a general rule, acid made from pyrites is contaminated with arsenic which renders the commercial article unsuited for many branches of manufacture. I was unable to find a trace of arsenic in the pyrites from Seelyville mines, and owing to the superior economy of manufacturing sulphuric acid from this mineral rather than from Sicilian sulphur, it is to be hoped that this notice will direct attention to this important industry.

Sicily sulphur of 95 to 97 per cent. is worth thirty-five to thirty-seven dollars per ton by the ship load at New York City; 100 pounds of this sulphur will, by good management, yield 280 pounds of sulphuric acid of 1.84 specific gravity; while 100 pounds of pyrites, costing almost nothing at the mines, will yield 140 pounds of acid of the same strength.

The residue, of per-oxide of iron, is now being utilized in England as a fetting for puddling furnaces and is said to answer the purpose better than any iron ore yet tried.

IRON ORE.

The bluish gray shales over coal L on the west side of Wabash river have disseminated through them irregular layers of clay iron-stone. Where the strata have been laid bare by the washing away of the soil on the sides of the

hills this iron-stone drops to the bottom of the ravines, where it is now found in quantities sufficient to justify its being gathered up and carted to the Vigo Blast Furnace, to be mixed with the Missouri specular ores and smelted into pigs. Locally the iron-stones are very abundant. The old Indiana Furnace in Vermillion county, when in blast, obtained its supply of iron ore from these shales.

TIMBER.

Vigo county contains the usual variety of trees found in this latitude. Many of the large black walnut and poplar trees have been converted into lumber and vast tracts of timber lands are annually cleared for cultivation, but a noble forest yet remains on portions of the uplands.

ANTIQUITIES.

There are two mounds of very moderate elevation in the southeast corner of the town of Maxville. Others may have been obliterated in the building of the town, and by the plow in cultivating the surrounding land. These, with the exception of a few that are reported along the Wabash, in Prairie town and Prairie Creek township, are all the mounds that I could hear of in the county. Mr. Pidgeon, in his work on antiquities, mentions some mounds near Fort Harrison Prairie, north of Terre Haute, but these have no doubt been leveled by cultivation.

AGRICULTURE.

This county is justly celebrated for its large tracts of fertile prairie and river-bottom lands. The soil belonging to these districts is for the most part a deep, black, sandy loam, rich in organic matter and all other elements essential for plant food. It is particularly well adapted for the growth of Indian corn and grasses, but produces all the cereals in very great perfection. While some of the hill or upland soil is derived from the loess and is of a buff colored, pulverulent nature, rich in lime, the prevailing constituent

is clay. This land, as a general rule, requires good drainage but produces well and is especially suited for wheat and clover.

More than usual attention is paid to the growing of fruit, and there are few farms to be seen without orchards. Some of the largest apple orchards in the State are to be found in the vicinity of Terre Haute.

CONCLUSION.

Before closing this report I desire to express my thanks to the citizens of the county with whom it was my good fortune to become acquainted, while prosecuting the survey, for the aid and courteous treatment so uniformly bestowed. For unusual attention and assistance I am under special obligations to Hon. Harvey D. Scott, Hon. W. K. Edwards, Hon. Joseph Gilbert, C. E. Hosford, A. B. Pegg, Wm. McQuilkins and Wm. Barrick, of Terre Haute; Jonas Seely, of Seelyville; J. S. Wyeth, Hartford; and Daniel Webster, of Webster's Station.