

covering of 15 feet of shale under sandstone. This appears to be of the Whitesburg bed, but without the black slate roof the correlation is doubtful.

On the right of the fork, $\frac{3}{4}$ mile up it, $3\frac{1}{4}$ miles from Carr, Mrs. Madden has two entries with section as follows:

Fire-clay Coal.	
Sandstone ..	5 ft.
Shale	1 ft.
Coal ..	28"
Parting ..	7"
Hard block coal	6"
Block coal	5"
Fire clay	1 ft.
Shaly sandstone to creek	2 ft.
Altitude, 1,200.	

The parting is of uniform thickness but variable in contents, the flint clay being from 1 inch to 4 inches thick and the flint fire-clay from 6 inches to 3 inches. Bone coal was found 2 inches thick in the 28 inches of coal, 5 inches from the bottom, but it is not constant.

In the list of Flag coal openings on this creek must be added the Mullins 60 inches coal at the head of this fork given in Bulletin No. 11, page 103.

THE COALS OF THE UPPER CARR FORK AND BIG BRANCH AND BULL CREEK REGION OF NORTH FORK OF KENTUCKY RIVER.

BY

JAMES M. HODGE.

This report is in addition to the previous one in this volume giving details of the coals of Carr fork up to and including Irishman creek, and comprises all data collected early in the year 1913 regarding the coals of Carr fork and its branches above Irishman creek, as well as those of tributaries on the northwest side of the North fork of Kentucky river, above Carr fork up to and including Bull creek.

In the last decade there has been an almost complete abandonment of wood fires by the inhabitants of Eastern Kentucky, coal being now in general use. This has led to the making of many openings, which during the winter are accessible, but in summer are often banked up with water falls of earth from the mouths of entries. Exposures enough remain, however, to give, in most localities a fairly accurate knowledge of the bed best adapted to local use, and occasional other prospecting helps to carry correlations through the region and give a general knowledge of nearly all the beds of the field.

Strata above drainage in this region include about 600 feet above the Fire-clay coal bed and 250 feet below it, but only in the river hill between Big branch and Bull creek can they all be found in one locality.

The principal bed of the region is unquestionably the Fire-clay coal. On it main dependence must be placed, while other beds are regarded as the source of additional supply, wherever they provide workable areas. This coal is of workable thickness in all but a few small parts of the region, as the detailed description comprising the bulk of this report shows; its principal coal seam (the upper bench) is of exceptionally good and uniform qual-

ity and its under seam has much good coal in it, including cannel at one point; its roof is usually a good sandstone even when it appears as shale on the outcrop—so good that the farmer miner will abandon a thicker coal in preference to it, and the bed is at moderately convenient height throughout the region, covering probably over three-quarters of it.

The Whitesburg bed seems to vary in its distance from the Fire-clay coal, from about 25 feet below it to as much as 100 feet, the latter on Collins branch where it is in part cannel coal. On Little Carr it is also partly cannel, but at neither place does it add to the value of the bed. With varied section including more or less of partings its workable area is probably limited to Carr fork from Breeding to Branham creeks, with possibly half of the branches included.

The Amburgy bed, uniformly 200 feet below the Fire-clay coal, is probably workable along Carr fork from Irishman creek (where it is slightly below drainage) to Deer fork, but elsewhere it is too thin or too much cut up by partings, and such condition is to be expected of it away from the immediate vicinity of Carr fork, where it is below drainage and as yet undeveloped.

Attention is here called to a coal bed about 20 feet under the Amburgy, very thin so far as known, and unimportant, but remarkable for its persistency.

Above the Fire-clay coal, its rider and the Flag coal are the only beds known of workable thickness and sufficient area. The rider has been found especially attractive on Smith branch, $17\frac{1}{2}$ miles up Carr, and on Deer fork, but it is generally either much hurt by partings or thin.

The Flag coal continues in this field, so far as known, its condition as shown lower down Carr and on Lost creek, a good thick coal, generally without partings, under a strong sandstone roof. Wherever its area permits mining it will be most attractive, but there is probably no such area of it above Betty Troublesome.

The Hindman bed is lacking in area all through this region excepting on Betty Troublesome. It retains its height of about 530 feet above the Fire-clay coal.

The sandstone directly under the Haddix coal bed seems to be particularly favorable for obtaining good

flag-stones for local use, several quarries having been noted in that position.

For the new railway up the river good building stones were always obtained at convenient places in this region from near the level of the Amburgy coal bed.

The 20 to 30 feet of cliff-forming sandstone under the Hazard coal retains that characteristic in this region, and in that part of it between Carr fork and Bull creek its excessive hardness has been the chief cause of the unusually broad areas on or near the tops of the ridges, giving farms and habitations on their comparatively light slopes, to which is given the name of "flat-woods."

The northwest dip of strata continues, with minor variations, up Carr fork to its head, but along the river it is interrupted by a nearly level, apparently undulating, rise and fall from Carr fork to Bull creek, and a rise up Bull creek, where normally the rocks should be level, to meet the rise up Carr and its branches to opposite the heads of Bull creek.

In the following detailed description is included all observed data of strata noted with a view to obtaining not only the fullest knowledge possible under present conditions of development of all workable beds, but also of such others as may become workable in the future, or may assist in correlation.

Measurements given in inches are exact unless otherwise stated, given in feet are approximate only. Distances in yards are by estimation and in miles as obtained from maps or by report or estimation. In ascertaining distances up Carr fork from its mouth, there may be in the total a considerable error, but for approximate distances from point to point not far apart they may be relied upon.

Altitudes of mouths of streams are very nearly correct as given, recently taken levels having been carried over most of the region. Altitudes of coal openings were determined by barometer, but, with opportunities for reference to those levels usually at hand, the altitudes are far more reliable than were those of former years.

Those entries are designated wet which had water in them (usually six inches to a foot deep) which prevented access to the face of the coal. At them the beds were measured in outcrop, so far as they admitted.

CARR FORK.

The Spencer Combs 15-yard wet entry on the left, $\frac{1}{8}$ mile above Irishman creek, at altitude 1,140 (taken from Bulletin No. 11), has the following slightly corrected section:

Fire-clay Coal.

Sandstone ..	5 ft.
Coal ..	26"
Flint clay ..	5"
Coal ..	8"
Clay ..	1"
Coal ..	8"

LITTLE BRANCH.—On the right of Carr fork, $11\frac{1}{4}$ miles up Carr. Altitude of mouth, 985.

The only opening on this branch is the new Goodloe Bros. 12-yard entry at altitude 1,190, given in Bulletin No. 11, page 103. A later measurement gives this as follows:

Fire-clay Coal.

Shale.	
Coal ..	34"
Black jack ..	4"
Flint clay ..	5"
Coal ..	18"

The bottom one or two inches of coal sticks to the black jack in mining.

SMITH BRANCH.—On the right, $11\frac{3}{8}$ miles up Carr. Altitude of mouth, 985.

On the left of the first left fork, $\frac{3}{4}$ mile up it and $1\frac{1}{2}$ miles from Carr, Riley (or Hillard) Smith has two long entries in a rock-house at altitude 1,215, previously reported but with new measurements given here. On the right, $\frac{1}{4}$ mile up the second left fork and $1\frac{3}{4}$ miles from Carr, Riley Combs has a 7-yard entry at altitude 1,210, with section as follows also, both entries being in Fire-clay coal:

Smith Entry.

Sandstone ..	25 ft.
Shale ..	1 ft.
Coal ..	33"
Black jack ..	4"
Flint clay ..	3"
Coal ..	17"

Combs Entry.

Sandstone ..	10 ft.
Coal ..	34"
Black jack ..	4"
Flint clay ..	4"
Coal ..	7"
Bone coal ..	1"
Coal ..	2"
Bone coal ..	1"
Coal ..	7"

No bone coal was detected in the Smith entry but coal sticks to the black jack as on Little branch, the one merging into the other by almost imperceptible changes. The shale changes to sandstone under cover.

On the left of Carr fork, 12 miles up it, Shade Smith has a prospect on the right of the easterly small branch by his house giving the following section:

Fire-clay Coal.

Sandstone.	
Shale ..	5 ft.
Coal ..	28"
Black jack ..	4"
Flint clay ..	4"
Coal ..	10"
Bone coal ..	4"
Coal ..	5"
Fire clay ..	2 ft.
Sandstone ..	10 ft.

This opening is 200 feet above Carr and at or near this point a coal bed rises to creek level and continues with it for $1\frac{1}{2}$ miles or more up stream, and is the source from which the greater part of the coal supply of the vicinity is drawn. It is reported generally about 4 feet thick, 46 to 50 inches in one instance, and this is believed to be nearly correct. It is said to be without parting,

but, in view of the partings found in the bed where it rises above the creek this seems somewhat doubtful. Partings under water may escape discovery. Over this bed is about 50 feet of shale.

In previous reports this bed has been called the Elkhorn bed, and came to be regarded as the equivalent of the Elkhorn coal now mined at McRoberts and Jenkins, whereas it is probable that it was intended to be correlated with a higher coal—the Upper Elkhorn. Be that as it may, confusion is liable to result from the use of one name for two beds and this one is now given the entirely new name of “Amburgy” coal bed. Where in Bulletin No. 11, the Elkhorn coal is referred to 200 feet below the Fire-clay coal this name Amburgy should be substituted, but this does not include the thick coal on Boone fork and elsewhere about the head of the river, which, like the Rockhouse coal, is 400 feet below the Fire-clay and is the true Elkhorn bed.

DEFEATED BRANCH.—On the right, $12\frac{3}{4}$ miles up Carr. Altitude of mouth, 1,000.

On the left, $\frac{1}{4}$ mile up a right branch, $\frac{1}{4}$ mile up Defeated branch, C. C. Hilton has a 20-yard entry into the Fire-clay coal at altitude 1,215. Wet at the face, the measurement following was taken about half way in. On the left of a left drain, $1\frac{3}{4}$ miles up Mr. Hilton has another entry, barely under cover, into the same bed at altitude 1,310. Its section also follows:

C. C. Hilton No. 1.

Sandstone ..	3 ft.
Coal ..	20"
Black jack ..	3"
Flint clay ..	4"
Coal ..	13"
Bone ..	3"
Coal ..	4"

C. C. Hilton No. 2.

Massive sandstone.	
Coal ..	37"
Black jack ..	3 to 4"
Flint clay ..	4 to 3"
Coal ..	10"
Bone Coal ..	10"

Two miles up the creek to the forks and up the right fork, $\frac{1}{4}$ mile to a right branch and on the right, $\frac{1}{4}$ mile up this and 20 feet above it, C. C. Hilton's four-yard wet entry into the Fire-clay coal at altitude 1,300 with the section following. A half mile up the left fork two miles up Defeated, $\frac{1}{8}$ mile up the left branch there, on the right of the trail to Breeding creek, Alamanda Blair has a 20-yard entry into the same bed at altitude 1,360 with section also following:

Hilton.

Massive sandstone.	
Shale ..	3 ft.
Coal ..	4"
Shale ..	7"
Coal ..	40"
Black jack ..	3"
Flint clay ..	4"
Coal ..	6"
Bone coal ..	2"
Coal ..	4"

Blair.

Sandstone.	
Coal ..	37"
Black jack ..	3"
Flint clay ..	5"
Coal ..	18"

The bottom coal of the Blair entry may contain bone coal, it was not in condition for close inspection.

BREEDING CREEK.—(Formerly Little Carr.) On the right, $12\frac{3}{4}$ miles up Carr. Altitude of mouth, 1,000.

On the right of a left branch, $\frac{3}{4}$ mile up Breeding creek, $\frac{1}{4}$ mile up the branch, James Bass has a wet entry into the Fire-clay coal at altitude 1,225, with the following section:

Fire-clay Coal.

Shale ..	5 ft.
Coal ..	32"
Black jack ..	2"
Flint clay ..	4"
Coal ..	10"
Parting ..	1"
Coal ..	3"

On the left, $1\frac{1}{4}$ miles up is the following exposures:

Shale	10 ft.
Block coal	4"
Splint coal	5"
Black slate	4"
Shale to creek	6 ft.

At altitude 1045.

Doubtless this is a rider to the Amburgy coal bed, which then is probably not more than 10 feet below water level.

SUGAR BRANCH.—On the right, $1\frac{5}{8}$ miles up Breeding creek.

On the left of a right drain, $\frac{1}{4}$ mile up the branch, is John Buck's 5-yard entry into the Fire-clay coal, given in Bulletin No. 11. Following is a corrected section:

Fire-clay Coal.	
Shaly sandstone.	
Coal	32"
Fire clay	5"
Coal	12"

On the left at the branch, $\frac{3}{4}$ mile up it, Jesse Amburgy has a 2-yard entry into the same bed at altitude 1,305, with like section but with 2 inches of black jack added and 2 inches more coal above that.

MALLET FORK.—On the right, $1\frac{3}{4}$ miles up Breeding creek.

On the right, $\frac{1}{8}$ mile up the fork, at water level, the rider to the Amburgy coal shows 8 inches thick under 20 feet of shale at altitude 1,120. On the hill opposite this John Hale has a 25-yard entry into the Fire-clay coal at altitude 1,315. On the right of a left branch of Mallet fork, $\frac{1}{4}$ mile up it and the same distance up the branch, William Hale has an opening into the same bed at altitude 1,350. Sections of these two openings follow:

John Hale.	
Sandstone	20 ft.
Coal	27"
Bony coal	4"
Flint clay	4"
Coal	12"

William Hale.

Sandstone	5 ft.
Coal	32"
Bony coal	3"
Flint clay	5'
Coal	12"

On the left of a left branch, $\frac{1}{2}$ mile up Mallet fork, $\frac{1}{8}$ mile up the branch, Noah Gent has a 20-yard entry at altitude 1,340. On the left at the head of Mallet fork, one mile up it, Daniel Adams has a 20-yard entry at altitude 1,305, which if nearly correct, as it probably is, gives a reverse dip at the head of this fork. Sections from these two Fire-clay coal entries follow, the Gent section varying somewhat from that previously reported:

Gent.

Sandstone	8 ft.
Coal	30"
Bony coal	1"
Flint clay	4"
Coal	12"

Adams.

Sandstone	10 ft.
Coal	30"
Black jack	4"
Flint clay	4"
Coal	9"

LEFT FORK.—Two and one-quarter miles up Breeding.

On the left branch, $\frac{3}{4}$ mile up this fork, on the left, $\frac{1}{8}$ mile up it, Harlan Williams has a 4-yard entry at altitude 1,380; and on the right of a drain on the left, $\frac{7}{8}$ mile up the fork, Fraser Adams has one of 12 yards. Both are in the Fire-clay coal and they gave the following sections:

Williams.

Sandstone	4 ft.
Coal	29"
Black jack	2"
Flint clay	4"
Coal	9"

Adams.

Shaly sandstone	10 ft.
Shale	2 ft.
Cannel slate	2"
Clay	1"
Coal	25"
Black jack	1"
Flint clay	5"
Coal	10"

In a left drain one mile up, an old opening gives the bed's altitude at 1,415 and at $1\frac{1}{8}$ mile up, where it goes below drainage, it is 1,425. This rapid rise of strata is made evident also in their exposure along the stream.

On the left of a left branch $2\frac{3}{8}$ miles up the creek, $\frac{1}{4}$ mile up the branch, George Breeding has a 12-yard entry at altitude 1,350; and on a right branch, $2\frac{3}{4}$ miles up Breeding creek, on the right, $\frac{1}{8}$ and $\frac{1}{4}$ miles up the branch, William Breeding has 3-yard and 10-yard entries at altitudes 1,390 and 1,400. These three Fire-clay coal entries give the following:

1350.	1390.	1400.
Sandstone..... 10 ft.	 5 ft.	
Shale	 none	 7 ft.
Coal	 25"	 28"
Flint clay..... 5"	 6"	 6"
Coal..... 7"	 11"	 12"

The flint fire-clay of the first of these is black, of the second both brown and black and of the third brown only.

On a left branch 3 miles up Breeding creek, on the right, $\frac{1}{4}$ mile up it, beside the road to Wolf-Pen branch, William Johnson has a long entry at altitude 1,390, and on the right, $3\frac{1}{2}$ miles up, beside the road to Rockhouse creek, $\frac{1}{8}$ mile from the gap, James Breeding has one at altitude 1,395. Sections of these two Fire-clay coal openings follow:

Johnson.

Thin bedded sand-	
sandstone	5 ft.
Black slate	4"
Clay	11"
Coal	27"
Flint clay	6"
Coal	12;

Breeding.

Sandstone	5 ft.
Shale	6 ft.
Cannel coal	1"
Coal	25"
Flint clay	6"
Coal	12"

The latter entry is but 85 feet below the gap to Rockhouse creek, but the hills are high enough to give the bed large area.

In a left branch, $13\frac{1}{2}$ miles up Carr fork, $\frac{1}{8}$ mile up the branch, Samuel Francis has a pit from which, apparently 30 inches of good block coal is taken, but the lower half being hidden in water, was not seen in place. With an altitude of 1,115, it is probably of the Whitesburg bed, though, being about 70 feet under the Fire-clay coal, the interval is large for that correlation. The rock covering was not seen and cannel coal and slate may cover the bed as they do on Little Carr not far distant.

The Fire-clay coal is opened on the same branch, on the right, $\frac{1}{4}$ mile up it, where a 6-yard entry gives the following:

Fire-clay Coal.

Sandstone	8 ft.
Shale	1 ft.
Coal	30"
Black jack	3"
Flint clay	4"
Coal	10"
Shale	5"
Coal	4"
Altitude, 1190.	

On the right, 14 miles up Car, Henry Blair has a 2-yard entry, 3 feet above the creek, into the Amburgy coal, which here makes its first appearance above water level. The following section was obtained here:

Amburgy Coal.

Shale	5 ft.
Coal	3"
Shale	10 ft.
Coal	2"
Shale	6"
Coal	1"
Shale	3"
Coal	38"
Black slate	2"
Fire clay	2 ft.
Sandstone in creek.	
Altitude, 1010.	

The bed is at creek level 100 yards farther up. At $14\frac{1}{8}$ miles up, a prospect into this bed gives 37 inches of coal with an inch of black slate 3 inches from the top. At the mill, $14\frac{1}{4}$ miles up, 30 to 40 feet of shale are exposed over the coal with massive sandstone above the shale. On the left of the creek and road, $15\frac{1}{8}$ miles up Carr, the bed gives the following section:

Amburgy Coal.

Shale	5 ft.
Coal	1"
Shale	10"
Coal	3"
Slate	2"
Coal	34"
Shale	1"
Coal	3"
Altitude, 1030.	

On the right, $15\frac{1}{4}$ miles up Carr (below Little Carr) this bed has in its main seam only 27 inches of coal under 3 feet of shale and then 5 feet of sandstone. This massive sandstone can be seen for a mile down the creek, about 10 feet above the coal, but farther down its place is occupied by shale. Besides this entry a rider appears to start from the coal. It is a continuous feature farther up the creek.

A quarter mile to the left, $15\frac{1}{4}$ miles up Carr fork opposite the mouth of Little Carr, Andrew Combs has an abandoned prospect into cannel coal at altitude 1,155, from which blocks a foot thick were taken. The place

was abandoned because unsuitable for opening rather than because of thin coal. An entry into the bed has been made a half mile up Little Carr.

LITTLE CARR.—(Formerly Amburgy branch.) On the right, $15\frac{1}{4}$ miles up Carr fork. Altitude of mouth, 1,020.

On the right, $\frac{1}{4}$ mile up, H. H. Amburgy has a 12-yard wet entry, 15 feet above the creek from which the following was obtained:

Amburgy Coal.

Shale	10 ft.
Coal	15"
Shale	1 ft.
Black slate	1"
Coal	2"
Shale	2"
Coal	36"
Altitude, 1045.	

On the right of a left branch, $\frac{1}{2}$ mile up Little Carr, $\frac{1}{8}$ mile up the branch, Floyd Taylor has a 10-yard entry into the Whitesburg bed about 50 feet under the Fire-clay coal. Its section is:

Whitesburg Coal.

Shale	10 ft.
Cannel slate	12"
Cannel coal	6"
Block coal	6"
Slate and pyrite	1'
Block coal	37"
Altitude, 1200.	

The block coal is particularly bright and rich-looking; the 6 inches of cannel looks very good but its weight betrays a large amount of ash. There is no definite plane of change from the cannel to the coal below or to the slate above it, one merging into the other.

On the right, $1\frac{1}{4}$ miles up Little Carr, a lone exposure of cliff with entries 5 feet above the creek, gives:

Amburgy Coal.

Shale	15 ft.
Coal	12"
Shale with calcareous concretions.....	2½ to 4 ft.
Coal	2"
Shale	8"
Coal	30"
Shale	1"
Coal	4"
Shale and coal.....	5 ft.
Thin-bedded sandstone in creek.	

Altitude, 1070.

WOLF-PEN BRANCH.—On the right, 1½ miles up Little Carr. Altitude of mouth, 1,075.

On the right, ⅛ mile up the branch and 3 feet above it is the following in outcrop:

Amburgy Coal.

Shaly sandstone.....	5 ft.
Coal	1"
Shale	1"
Coal	2"
Shale	12"
Coal	28"
Bony coal	2"
Shale	1"
Coal	9"

Altitude, 1090.

Coal in the branch, ¼ mile up, altitude 1,120, is probably of the rider, not seen in the preceding section.

On the right, ¼ mile up Leck branch, which is on the right, 1¼ miles up Wolf-Pen, B. F. Hammond has an opening into the Fire-clay coal at altitude 1,380. On the right of Wolf-Pen, 1½ miles up, Joseph Raleigh has a 10-yard entry, into the same bed at altitude 1,400, 140 feet above the creek. The sections of the Fire-clay coal at these two places are:

Hammond.

Sandstone	5 ft.
Coal	26"
Flint clay	4 to 6"
Coal	12"

Raleigh.

Shale	6 ft.
Coal	29"
Flint clay	6"
Coal	12"

On the right, 1¾ miles up Wolf-Pen, Tandy Amburgy has a 25-yard entry with the following section, measured at the face:

Fireclay Coal.

Shale	8 ft.
Coal	32"
Black jack	6"
Cannel coal	24"

Altitude, 1395.

The impression prevails that this is the same bed that is opened into cannel coal near the mouth of Little Carr (the Whitesburg bed), and its altitude, as obtained, is indicative of that bed, but the cannel in this entry is at the bottom of the bed, whereas in the other it is at the top, and the usual black slate covering of the Whitesburg bed is wanting. Moreover the parting, though not the almost invariable accompaniment of the Fire-clay coal, the brown flint fire-clay, is just such a compound of fire-clay and black slate as is found at nearly every opening of the Fire-clay coal bed on Carr fork waters, and never but once anywhere, by the writer, in the Whitesburg bed. The conclusion then is, either that the barometric altitude is incorrect, or that a reversal of the up-stream rise of strata occurs on the head of Wolf-Pen. No reversal has been found elsewhere on Little Carr.

The cannel of this opening is fine-looking and light in weight. Analyses of bituminous coal and cannel both are taken from Bulletin No. 11:

Fire-clay Coal.	Bituminous.	Cannel.
Moisture	5.46	0.26
Volatile combustible matter	31.68	47.94
Fixed carbon	57.46	44.86
Ash	5.40	6.94
Sulphur	0.488	0.751
Specific gravity	1.385	

The cannel is said to be explosive in burning.

Across the divide at the head of Wolf-Pen, on the head of Stamper branch of Rockhouse creek, about a mile east of the preceding, Cordelia Hammon has a closed entry in which is over 5 feet of block and splint coal, (probably including 2 inches of slate found in the dump); its altitude 1,940.

This is probably of the Hindman bed, quite possibly the 77 inches coal with 4 inches parting given in Bulletin No. 11, page 108, as no other such opening was found in the vicinity. It indicates nearly level strata from the cannel opening on Wolf-Pen. Being 100 feet above the Wolf-Pen gap, with little area, its value lies only in local use.

On the right, two miles up little Carr is a 12-yard entry, 3 feet above the creek, where the following section was obtained, the lower seams measured half way in:

Amburgy Coal.	
Sandstone	5 ft.
Shale	20 ft.
Coal	5"
Shale	12 ft.
Coal	3"
Shale	20"
Coal	3"
Shale	1"
Coal	30"
Altitude, 1115.	

LITTLE DOUBLE BRANCH.—On the right, $2\frac{3}{8}$ miles up Little Carr. Altitude of mouth, 1,125.

The three sections following give the only openings now on this branch. The first is on the right of a left drain, $\frac{1}{8}$ mile up the branch; Jesse Pigman's 8-yard wet entry; the second is on the right, $\frac{3}{8}$ mile up, Jack Hammond's wet entry; and the third is on the left, $\frac{3}{4}$ mile up, William Ward's entry. They are all in the Fire-clay coal at altitudes 1,380, 1,390 and 1,400, respectively:

Pigman.	Hammond.	Ward.
Sandstone	10 ft.	5 ft.
Shale	3 ft.	0
Coal	30"	32"
Black jack	3"	3"
Flint clay	4"	4"
Bone coal	0	0
Coal	11"	13"

It is to be noted that in the third section, nearest to the cannel coal on Wolf-Pen, the flint fire-clay is absent, as in the cannel opening.

BIG DOUBLE BRANCH.—On the right, $2\frac{1}{2}$ miles up Little Carr. Altitude of mouth, 1,130.

On the left at the mouth of the branch a prospect gives the following:

Amburgy Coal.	
Shale.	
Coal.	
Shale	3 ft.
Block coal	26"
Slate	2"
Coal	2"
Altitude, 1150.	

The three sections given next are, first, from $\frac{1}{4}$ mile up left branch, $\frac{3}{8}$ mile up Big Double branch, Andrew Case's 7-yard entry; second, from the left of a left drain, $\frac{1}{8}$ mile up it, $\frac{1}{2}$ mile up Big Double, Jefferson Amburgy's 6-yard entry; third, from on the right, across the hollow from the second, 80 yards southeast of it, W. F. Amburgy's 25-yard entry. These are all in the Fire-clay coal, at altitudes 1,385, 1,350, 1,370, respectively:

Case.	J. Amburgy.	W. F. Amburgy.
Sandstone	1 ft.	1 ft.
Shale	8 ft.	0
Coal	34"	32"
Flint clay	6"	6"
Coal	12"	9"

Jenny Lewis branch is on the left, $\frac{3}{4}$ mile up Big Double. On the right of the branch $\frac{1}{4}$ mile up it, Jasper Amburgy has a 25-yard entry, its section following:

On the left of the right fork of Big Double at its head, $1\frac{1}{2}$ miles from its mouth, Lindsey Amburgy has a 15-yard entry with the section following. Both of these are in the Fire-clay coal, at altitudes 1,375 and 1,410, respectively:

Jasper Amburgy.	
Shale	10 ft.
Coal	34"
Flint clay	2"
Coal	5"

Lindsey Amburgy.	
Shaly sandstone	6 ft.
Coal	34"
Bony coal	2"
Flint clay	6"
Coal	6"

On the right of Little Carr, $2\frac{5}{8}$ miles up it, $\frac{1}{8}$ mile above Big Double, the Amburgy bed shows, at altitude 1,145, 10 feet above the creek, 30 inches of coal with a knife-edge of shale 3 inches from the top.

STILLHOUSE BRANCH.—On the left $2\frac{3}{4}$ miles up Little Carr.

The Whitesburg coal shows its covering in a thick bed of black slate up this branch the coal under it, reported two feet thick, being at altitude 1,285.

On the right of the branch, $\frac{1}{2}$ mile up it, George Gibson has an 8-yard wet entry, the main coal seam reported about 28 inches thick with parting and lower coal each about 4 inches. Two feet of shale and then 5 feet of sandstone overlie it. Its altitude is 1,350.

The top seam of the Amburgy coal goes under the creek at the mill, 3 miles up Little Carr.

LEFT FORK.—On the left, $3\frac{3}{8}$ miles up Little Carr. There are two entries into the Whitesburg bed, each $\frac{1}{4}$ mile up this fork and at altitude 1,355, one on the left, the J. W. Collins 8-yard entry, having 38 inches of coal under 10 inches of black slate, the other on the right, the Nancy Gent 5-yard wet entry, having 34 inches of coal under 3 feet of black slate.

The Fire-clay coal is opened on the right, $\frac{3}{4}$ mile up the fork in Tandy Martin's 5-yard wet entry, at altitude 1,430. More than $2\frac{1}{2}$ feet of coal was visible, under 3 inches of black slate and 20 feet of shale, in the middle of which is $1\frac{1}{2}$ feet of sandstone. This thin sandstone shows in shale or earth over the Fire-clay coal at several places in this vicinity.

RIGHT (MAIN ROAD) FORK.—On the right, $3\frac{3}{8}$ miles up Little Carr.

On the right of the fork, $\frac{1}{4}$ mile up it, Robert Collins has a 15-yard wet entry at altitude 1,450, showing 38 inches of the main seam of the Fire-clay coal under 10 feet of shale. Nine inches more coal is reported under the parting below. In the point of the hill on the way up to this entry the black slate of the Whitesburg bed crops out at altitude, 1,385.

On the left, $\frac{3}{4}$ mile up this fork, Charles Logan has a 15-yard entry into the Fire-clay coal at altitude 1,450, having 34 inches of coal under 2 inches of black slate, then 6 feet of shaly sandstone and then 3 feet of massive sandstone. The dump gave black flint fire-clay about 6 inches thick.

The Amburgy coal bed continues up Carr Fork slightly above the stream. A section of the bed as exposed beside the road, on the left, $\frac{1}{8}$ mile above the mouth of Little Carr, is given, with analyses, in Bulletin No. 11, pages 105 and 106. Its altitude is exactly 1,030.

BETTY TROUBLESOME.—On the left, $15\frac{3}{4}$ miles up Carr Fork. Altitude of mouth, 1,030.

DICE'S (OR STILLHOUSE) BRANCH.—On the left, $\frac{1}{8}$ mile up Beatty's Troublesome.

On the right, $\frac{3}{4}$ mile up this branch, W. F. Bentley has a 6-yard entry with the following section:

Fire-clay Coal.	
Shale	5 ft.
Coal	28"
Flint clay	3"
Coal	7"
Bone coal	2"
Coal	9"
Black slate	3"
Altitude, 1195.	

DEADMAN'S BRANCH.—On the right, $\frac{1}{4}$ mile up Betty Troublesome.

On the left, $\frac{3}{4}$ mile up the branch, 10 feet above it, a foot of the coal of the Whitesburg bed is exposed, under 3 feet of black slate, but no attempt to open it has been made. Its altitude is 1,180.

Thirty feet higher about the same thickness of the Fire-clay coal outcrops, altitude 1,210.

On the left, $\frac{1}{4}$ mile up a left branch, $\frac{7}{8}$ mile up Betty Troublesome, Jefferson Hall has a wet entry from which the following was obtained:

Shale	3 ft.
Coal	26"
Black jack	4"
Flint clay	3"
Coal	10"
Black slate	3"

The bottom coal and slate measure 13 inches; the proportion given of each may be slightly erroneous.

TURKEY-PEN BRANCH.—On the left, 1 mile up Betty Troublesome. Altitude of mouth, 1,088.

On the right, $\frac{1}{4}$ mile up a left branch, $\frac{1}{4}$ mile up Turkey-Pen, Noah Reynolds has a wet entry but with an exceptionally good opportunity to measure the bed at the outcrop.

On the left $\frac{3}{4}$ mile up Turkey-Pen, 20 feet above it, Reuben Amburgy (or Nicholas Combs) has a 10-yard entry. Both of these entries are in the Fire-clay coal, at altitudes 1,180 and 1,220, respectfully, and sections of them follows:

Reynolds.	
Shale	2 ft.
Coal	6"
Shale	6 ft.
Coal	26"
Black jack	6"
Flint clay	3"
Coal	1"
Bone coal	1"
Coal	11"

Amburgy's.

Sandstone.....	
Shale	3 ft.
Coal	28"
Black jack	4"
Flint clay	2"
Coal	14"

In the central peak at the head of Turkey-Pen, $1\frac{1}{4}$ miles from its mouth, Marion Tolliver has an entry into the Flag coal, at altitude 1,625, giving 54 inches of fine bright block coal, the lower half hard, under $1\frac{1}{2}$ feet of shale and 4 feet of sandstone. The area of the bed here is very small.

An attempt was made in former prospecting to get a full section of the coals on the right, $1\frac{1}{4}$ miles up Betty Troublesome, at Leander Parks'. Following are the results obtained from recent examination there: The openings were made so nearly over one another that dip may be disregarded.

	Altitude.
High peak	1865
Prospect, 2 feet coal seen, reported 88 inches.....	1675
Prospect, $2\frac{1}{2}$ feet coal seen, reported 62 inches.....	1630
Prospect, covered coal, probably thin.....	1325
Prospect, Fire-clay coal rider.....	1270
8-yard entry—Fire-clay coal (in full below).....	1240
Prospect—Whitesburg coal, $1\frac{1}{2}$ feet.....	1210
Creek	1120

The Whitesburg bed is recognized by its 4 feet of black slate covering, over which is shaly sandstone.

The Fire-clay coal bed has 28 inches of coal in its main seam, and bottom coal of about 13 inches, with black jack and flint fire-clay parting of only 5 inches. Three feet of shale is exposed over the entry. The rider appears to be thin.

The two high beds of the section are believed to be of the Flag and Hindman beds with a possible error in altitude of the latter to account in part for the proximity of the two. If such is the case the interval from the Fire-clay coal to the Flag, 390 feet, corresponds nearly with results obtained heretofore.

The higher coal still has covering enough over it to admit of mining a fairly good area in this ridge, and no where else is so large an area of this coal so near to a large stream.

On the right of a right branch, $1\frac{1}{2}$ miles up Betty Troublesome, $\frac{1}{8}$ mile up the branch, Silas Martin has an 8-yard entry into the Fire-clay coal at altitude 1,240, and a 5-yard wet entry into the Whitesburg bed 40 feet lower. The sections of these follows:

Fire-clay Coal.

Sandstone	2 ft.
Shale	2 ft.
Coal	30"
Black jack	5"
Flint clay	2"
Coal	12"

Whitesburg Coal.

Shale	5 ft.
Coal	1"
Shale	2"
Coal	4"
Shale	2"
Coal	22"
Shale	1"
Coal	5"

The total thickness of the bed measures 41 inches, leaving four inches at the bottom which could not be determined in the deep water.

On the left of a right branch, $1\frac{3}{4}$ miles up Betty Troublesome, $\frac{1}{8}$ mile up the branch, Thomas Hall has 10-yard and 4-yard entries into the Fire-clay and Whitesburg coals, at altitudes 1,260 and 1,230, respectively, with the sections following:

Fire-clay Coal.

Sandstone	5 ft.
Sandy shale	6 ft.
Coal	30"
Black jack	
and	
Flint clay	6"
Coal	10"

Whitesburg Coal.

Sandstone	15 ft.
Shale	1 ft.
Coal	1"
Shale	1 to 6"
Coal	6"
Shale	1"
Coal	24"
Shale	6"
Coal	6"

Nicholas Combs has a closed entry into the Whitesburg bed, $2\frac{1}{4}$ miles up the creek, at altitude 1,220. The Fire-clay coal shows above it at 1,250.

On the left, $2\frac{1}{2}$ miles up, is a 4-yard wet entry into the Fire-clay coal at altitude 1,245, having in its main seam 29 inches of coal and about 9 inches coal under a parting of 8 inches black jack and flint clay. Eight feet of shale is exposed above it.

In the peak at the head of the creek, three miles from its mouth, Jasper Amburgy has a 1-yard entry with the following section:

Flag Coal.

Shale	10 ft.
Coal	46"
Black slate	5"
Coal	8"

Altitude, 1650.

The broad top of the ridge about 60 feet lower is due to the cliff sandstone under the Hazard coal bed.

On the left of the road and of Carr Fork, $16\frac{1}{2}$ miles up and 20 feet above it, at altitude 1,055, the Amburgy bed has been driven under cover with top coals and partings substantially the same as follow in the section below and bottom seam of coal half covered. On the left by the road, $16\frac{3}{4}$ miles up Carr, this section was obtained:

Amburgy Coal.

Shale	10 ft.
Coal	9"
Shale	9"
Coal	2"
Shale	4"
Coal	34"

Shale to creek at 1040.

Altitude, 1055.

On the right, $16\frac{7}{8}$ miles up Carr, J. E. Stamper has an opening into the same bed at altitude 1,080, showing about $2\frac{1}{2}$ feet of coal at the bottom, 16 inches parting and 3 inches more of coal at the top, with 8 feet of shaly sandstone above it.

BUCKEYE BRANCH.—On the right, 17 miles up Carr. Altitude of mouth, 1,045.

On the right, $\frac{1}{2}$ mile up the branch, J. E. Stamper has a 6-yard entry into the Fire-clay coal at altitude 1,280. The main seam is 30 inches thick and that only has been mined. The flint clay parting is 5 inches or more thick and 8 inches of coal is reported under it. Three feet of sandstone covers the bed.

On the left, $17\frac{1}{8}$ miles up Carr, and on the right of the branch at Spider postoffice, John Banks has an 8-yard entry into the Amburgy coal at altitude 1,085, with 30 to 32 inches of coal under 12 inches of shale and with 2 inches of coal above that, and 20 feet of cliff sandstone overlying the bed. The change from the long series of exposures of apparently true clay shales, found below on the creek, to this massive sandstone is very striking. A quick return to shale follows.

SMITH BRANCH.—On the left, $17\frac{1}{4}$ miles up Carr. Altitude of mouth, 1,055.

On the right, $\frac{1}{8}$ mile up this branch, an 8-yard entry gives the following:

Amburgy Coal.	
Shale	3 ft.
Coal	3"
Shale	2 ft.
Coal	25"
Black slate	2"
Altitude, 1075.	

A little coal may be under the slate, the bottom not having been seen.

On the left of a left branch, $\frac{1}{2}$ mile up Smith branch, $\frac{1}{8}$ mile up the left branch, Benton Stampers has a 2-yard entry into the Whitesburg coal at altitude 1,240, and a 12-yard entry into the Fire-clay coal rider, at altitude 1,290. Sections of these follow:

Whitesburg Coal.

Shale	4 ft.
Black slate	$1\frac{1}{2}$ ft.
Coal	22"

Fire-clay Coal Rider.

Shale	
Coal	5"
Shale	$\frac{1}{4}$ to 1"
Coal	27"
Slate	2"
Coal	4"

The slate in the rider is soft with contained coal and may be but little deleterious.

On the same left branch, $\frac{1}{4}$ mile up it, Mr. Stampers has a 6-yard wet entry into the Fire-clay coal at altitude 1,290, on the level of the preceding rider coal opening. This entry shows about 40 inches of coal, probably including 2 inches of black jack found in the dump. A foot of shale covers the coal, on which is sandstone in a slight roll which appears not to have effected the coal.

On the right of a left branch, $1\frac{1}{2}$ miles up Smith branch, from $\frac{3}{8}$ to $\frac{5}{8}$ mile up the left branch, on Ezekiel Caudill's land, three beds show within 50 feet vertically. These are the Whitesburg, at altitude 1,205, with 24 inches of coal under 3 feet of black slate, in a slip which may not show all of the coal; the Fire-clay coal in a 15-yard entry at altitude 1,235, and the rider in a 4-yard entry at altitude 1,250. The last two give:

Fire-clay Coal.

Shale	4 ft.
Coal	28"
Flint clay	4"
Coal	11"

Fire-clay Coal Rider.

Shale	6 ft.
Coal	5"
Shale	1"
Coal	25"
Black slate	3"
Coal	2"
Black slate	1"
Coal	9"

The bottom seam of the Fire-clay coal is a good hard block with one inch splinty; the top is especially noted here as having no cleavage planes, general absent in Carr Fork openings.

On the right, $1\frac{7}{8}$ miles up Smith branch, Robert Pigman has a 10-yard entry into the Fire-clay coal rider at altitude 1,260, and two miles up, a 6-yard entry into the same bed at 1,285. Sections of these two entries follows:

Altitude, 1260.

Shale	3 ft.
Coal	2"
Clay	$\frac{1}{2}$ to 2"
Coal	5"
Clay	1"
Coal	40"
Black slate	5"
Coal	5"

Altitude, 1285.

Sandstone.	
Shale	4 ft.
Cannel slate	2"
Shale	3"
Coal	30"
Black slate.	

On the right, $2\frac{1}{8}$ miles up, the top of the Whitesburg bed, at altitude 1,250, shows a foot of coal under 4 feet of black slate.

The bed with the two entries is correlated as the rider, because of the similarity of these sections with those in this bed farther down the branch, and the Whitesburg bed because of its black slate roof. There seems to be no room for doubt in this, though it leaves little space for the intermediate Fire-clay coal.

By the road, on the left, $18\frac{1}{4}$ miles up Carr, at the mouth of an entry, at altitude 1,080, and again on the left, $18\frac{3}{4}$ miles up Carr, in J. W. Reedy's 8-yard entry, at altitude 1,095, the following sections were obtained:

Amburgy Coal.

Altitude 1080.		Altitude, 1095.
Shale	6 ft.	10 ft.
Coal	2"	0
Shale	34"	0
Coal	28"	26"
Black slate	1"	2"
Clay	0	1"
Coal	3"	2"

These sections are particularly remarkable in showing a close resemblance to the fire-clay coal rider on Smith branch, a bed 200 feet higher in the series of strata.

This coal showing in the road opposite the mouth of Deer Fork lies about 30 feet below the Amburgy bed.

DEER FORK.—On the right, 19 miles up Carr. Altitude of mouth, 1,065.

On the right, $\frac{1}{4}$ mile up this fork is a coal about one foot thick, under shale, at water level and altitude 1,075.

On the left, $\frac{3}{8}$ miles up, Mrs. Mary Amburgy has a 6-yard entry with the following section:

Amburgy Coal.

Massive sandstone	15 ft.
Coal	6"
Shale	1"
Coal	18"
Black slate	2"
Coal	2"
Altitude, 1095.	

Fifteen feet of thin bedded sandstone down to the creek, underlies the bottom clay of this opening. Again there is a change of covering to massive sandstone, which continues till it goes below drainage a half mile farther up this fork.

At $\frac{5}{8}$ mile up is a left fork. On the left of this, $\frac{1}{8}$ mile up it, Hiram Pratt has a 10-yard wet entry with the following section:

Fire-clay Coal Rider.

Sandstone	3 ft.
Shale	2 ft.
Coal	1"
Shale	3"
Coal	4"
Shale	3"
Coal	23"
Shale	1"
Coal	22"

Altitude, 1350.

Other openings into this or adjacent beds have been made on this fork, but none were in condition to measure when visited. Strata rise rapidly up stream.

On the right fork and left of the branch and road to Little Carr, $\frac{1}{8}$ mile from the gap, $1\frac{1}{4}$ miles from Carr fork, is Seymour Amburgy's 30-yard entry into 37 inches of the main seam of the Fire-clay coal bed, at altitude 1375. The floor is black jack and a foot of coal is reported under the parting. Ten feet of shaly sandstone is exposed over the entry.

On the right, $1\frac{1}{4}$ miles up the main right fork, W. B. Smith has a wet entry into the Whitesburg bed, at altitude 1375, having 37 inches of clean coal under 5 feet of shale.

Above the preceding is an 8-yard entry with the following section:

Fire-clay Coal.

Shaly sandstone.	
Shale	2"
Coal	5"
Shale	1"
Coal	15"
Mother coal	$\frac{1}{4}$ "
Coal	12"
Flint clay	5"
Coal	9"

Altitude, 1405.

This entry has been abandoned in favor of the one below it. The flint fire-clay here is black instead of the usual brown.

On the left of a left branch 20 miles up Carr, $\frac{1}{4}$ mile up the branch, George Kelly has an opening into the Fire-clay coal, probably, at altitude 1300, giving 32 inches of coal on a black jack or black slate floor and under 5 feet of shale.

BRANHAM CREEK.—On the left $19\frac{3}{4}$ miles up Carr: Altitude of mouth, 1085.

On the right at Ambrose Amburgy's, $\frac{1}{8}$ mile up the creek, is an opening into the Amburgy bed at altitude 1115 which is duplicated in the following section from a 4-yard entry at altitude 1,125, on the left of a right branch $\frac{1}{4}$ mile up the creek. The section is:

Amburgy Coal.

Sandstone	10 ft.
Coal	4"
Black slate	1"
Coal	20"
Black slate	1"
Coal	3"

Altitudes, 1115 and 1125.

Ten feet of massive sandstone underlie this coal, and under that is 15 feet of shale carrying bastard limestone boulders.

On the left, $\frac{1}{2}$ mile up, Wiley Tolliver has an 8-yard wet entry into the Fire-clay coal or rider as given in the section following:

Fire-clay Coal Rider.

Shale	5 ft.
Black slate	2"
Clay	1"
Coal	41"
Black slate	3"

Altitude, 1340.

The black slate floor, the bottom of which was not reached, seems to fix the bed as of the rider, and the coal itself has a more defined cleavage than the Fire-clay coal usually shows in this field. The two inches at the top is somewhat slaty. The Isom Sloan coal given in Bulletin No. 11, page 110, is the same as this, but was not exposed here.

BENTLEY FORK.—On the left, $\frac{3}{4}$ mile up Branham creek: Altitude of mouth, 1125.

In the branch at its mouth is a coal, probably thin, under 30 feet of shale.

On the left of a left hollow, $\frac{1}{2}$ mile up, John Bentley has a closed entry at altitude 1285, showing a coal bed 3 to 4 feet thick under thin black slate as in the Tolliver entry just preceding. Eight feet of shale and a foot of sandstone overlie the slate. The same covering is exposed over an abandoned entry, at altitude 1265, on the right at the head of the fork, $\frac{5}{8}$ mile up it.

On the left, $\frac{7}{8}$ miles up Branham, Washington Francis has a closed entry into a 3-foot coal bed with 10 feet of sandy shale above it, at altitude 1330. This is probably of the Fire-clay coal, the rider showing in an old prospect 20 feet above it.

WALNUT FORK.—On the left $1\frac{3}{8}$ miles up Branham: Altitude of mouth, 1160.

On the left of this fork, $\frac{1}{4}$ mile up it, Lewis Cook has two entries, at altitude 1325, into clean coal 48 inches thick at the mouth, 45 inches 8 yards in, on a foot of common fire-clay and under 15 feet of sandstone. Its altitude is indicative of the Fire-clay coal bed, but with other beds close to it this is quite uncertain.

On the left, $\frac{1}{2}$ mile up, Nathaniel Bentley has a 4-yard entry into the Fire-clay coal, at altitude 1345, giving 34 inches coal on 3 inches or more of flint fire-clay and under 10 feet of massive sandstone.

On the right of the left branch opposite the mouth of Walnut fork, $\frac{1}{4}$ mile up it, Nathaniel Bently has a 20-yard entry, at altitude 1315, with 35 inches of coal on what appears to be black slate, shale with calcareous concretions lying close below. "Draw slate," 4 inches thick covers the coal, on which is 8 feet of shale (making a good roof) and 5 feet of sandstone. The coal looks like Fire-clay coal, and it is not unlikely that on reaching greater depth than was practicable the black slate may prove to be black jack.

On the left of a right hollow, $1\frac{3}{4}$ miles up the creek, Hugh Anderson has a 10-yard wet entry with 39 inches of coal (the bottom 8 inches not seen) under 10 feet of massive sandstone. Its altitude is 1315, and this with its roof indicates the Fire-clay coal bed.

On the left, 2 miles up, R. B. Reynolds has a closed prospect, probably into the same bed, at altitude 1340. This is $\frac{1}{8}$ mile northeast across the ridge from the low gap through which the road to Hindman passes.

On the right $2\frac{1}{4}$ miles up and 50 feet above the creek, John Sparkman has a 15-yard entry at altitude 1355 into 34 inches of coal under 5 feet of sandstone. The floor appears to be of flint fire-clay but was not positively proven.

The numerous openings on this creek would probably suffice for correlation were they fully developed, but under present conditions this can not be done satisfactorily. The most important conclusion reached is that the Fire-clay coal rider may be the best bed on the creek, but that it has not been opened above Bentley fork. Nothing was seen of the Whitesburg bed.

MALLET FORK.—On the left, $21\frac{3}{8}$ miles up Carr. Altitude of mouth, 1095.

At the creek $\frac{1}{4}$ mile up it, is 6 inches of coal, with 6 inches parting, at altitude 1125, under 20 feet of shale. This shale, in greater part, continues to the Amburgy coal bed about 30 feet higher.

This bed has, on the left, $\frac{1}{2}$ mile up the creek, the following section:

Amburgy Coal.	
Massive sandstone	10 ft.
Coal	3"
Black slate	1"
Coal	13"
Black slate	1"
Coal	4"
Altitude, 1180.	

SHOP HOLLOW.—On the right, $\frac{3}{4}$ mile up Mallet fork.

On the left, $\frac{1}{8}$ mile up the hollow, is 24 inches of coal with 2 inches black slate parting 4 inches from the top and with sandstone roof. Its altitude is 1190 and it seems to be a remnant of the Amburgy bed.

On the right of a right drain, $\frac{1}{8}$ mile up hollow and drain, each, Samuel Williams has a 3-yard wet entry with the following section:

Whitesburg Coal.

Shale (changing to thin sandstone at bottom)	5 ft.
Black slate	1½ ft.
Coal	4"
Shale	2"
Coal	1"
Shale	18"
Black slate	3"
Coal	2"
Shale	3"
Coal	23"
Shale	2"
Coal	14"

Altitude, 1395.

The Amburgy coal is apparently thin in a rock house at the mouth of a right branch, 1 mile up, at altitude 1195.

On the left, ⅛ mile up a left branch, 1¼ miles up the creek, Mrs. S. Sloan has a new entry beginning, beside a closed one, from which the following section was obtained:

Fire-clay Coal.

Sandstone	1 ft.
Coal	45"
Black jack	3"
Flint clay	3"
Coal	10"
Shale	1"
Coal	6"

Altitude, 1380.

At the forks, 1¾ miles up the creek and in it, is 10 inches of coal and shale, covered by a foot of shale with calcareous concretions, at altitude 1225.

On the left, ⅛ mile up the left fork, 1¾ miles from Carr, E. J. Short has a wet entry into a coal bed, probably the Fire-clay coal, though the roof is quite different to that usually found, as shown by the following:

Fire-clay Coal. (?)

Sandstone	5 ft.
Shale	2 ft.
Coal	1"
Shale	3"
Black slate	2"
Shale	8 ft.
Coal bed	4 ft.

Altitude, 1385.

HAYES BRANCH.—On the left, 21¾ miles up Carr fork.

Again on this branch at its mouth appears the 6 inches coal with 6 inches parting at altitude 1,125, as on Mallet fork.

On the left, ⅛ mile up the branch, is the following:

Amburgy Coal.

Sandstone	5 ft.
Coal	4"
Cannel slate	1"
Coal	17"
Black slate	3"
Coal	3"

Altitude, 1145.

On the right, ¼ mile up, the Whitesburg bed, at altitude 1285, is reported 1½ feet thick. At the head of the right fork of the branch, on the right, ¼ mile from Carr, Lib. Hayes has a 3-yard entry into the Fire-clay coal, at altitude 1310, having 36 inches of coal on 10 inches of black flint fire-clay and bony coal, in about equal parts, and under 4 feet of soft clay shale, as it appears at the mouth of the entry.

On the left of a right branch of Carr fork opposite Hayes branch, Nelson Hayes has opened the Amburgy coal with section about the same as it was found on Hayes branch and at the same height, 1145.

On the left of a left branch, at its head ¼ mile up, 21⅞ miles up Carr fork, Robert Bates has a 20-yard entry into the Fire-clay coal with southerly dip, at altitude 1340 (or higher). It has 37 to 39 inches of coal on a black flint fire-clay floor, and under 6 feet of shale.

On the left of Carr fork, and the road, 22 miles up Carr, the Amburgy bed is opened in a rock-house with

20 inches of coal and a black slate parting 9 inches thick, 2 inches from the bottom. More coal may be under this. Its altitude is 1190.

WILLARD BRANCH.—On the right, $22\frac{1}{8}$ miles up Carr. Altitude of mouth 1125.

On the left of a left branch, $\frac{1}{2}$ mile up Willard, $\frac{1}{4}$ mile up the branch, F. H. Thomas has an entry into the Fire-clay coal, at altitude 1400, having 39 inches of coal, flint fire-clay floor, and roof of 2 feet of shaly sandstone under 4 feet of massive sandstone.

On the left, $\frac{3}{4}$ mile up the creek, the Amburgy bed is exposed, under a 10-foot massive sandstone cliff, with 27 inches of coal and 2 inches black slate parting, 7 inches from the top, its altitude 1190, 10 feet above the creek.

On the left, a mile up the creek, John B. Smith has a 15-yard entry at altitude 1390; and on the left of the middle head, $1\frac{1}{4}$ miles up, Marian McIntyre has an entry at altitude 1400. These are of the Fire-clay coal with sections as follows:

Smith.		McIntyre.	
Shale	5 ft.	Shale	5 ft.
Coal	34"	Coal	31"
Flint clay	4"	Flint clay	7"
Coal	4"	Coal	5"

In the McIntyre entry the full thickness of the bottom coal may not have been obtained. The flint clay there is black.

On a left branch, $22\frac{1}{2}$ miles up Carr fork, the Amburgy coal shows at altitude 1220, but its section is not exposed.

On the right of the branch, $\frac{1}{4}$ mile up it, Grant Honeycutt has an 8-yard wet entry into the Fire-clay coal at altitude 1405. The main seam of coal is 36 inches thick and has regular cleavage. Under it is about 4 inches of black jack and probably more coal below that. Five feet of shale is exposed over the opening.

On the right $22\frac{3}{4}$ miles up Carr, at the head of a hollow, N. G. Sturgill has a wet entry with the following section:

Fire-clay Coal.

Shaly sandstone	5 ft.
Coal	35"
Parting	5"
Coal	5"
Altitude, 1440.	

The parting is a mixture of black jack and flint fire-clay.

NEALY BRANCH.—On the left 23 miles up Carr. Altitude of mouth, 1125.

On the left of a left hollow, $\frac{3}{8}$ mile up this branch, William Franklin has an 8-yard wet entry giving the following:

Fire-clay Coal.

Sandstone	10 ft.
Coal	35"
Flint clay	4"
Bone coal	2"
Shale	6"
Coal	6"
Altitude, 1420.	

The bottom coal was not seen and it, with the coal above it, were measured approximately.

In the branch on the left, $\frac{3}{4}$ mile up Nealy, 5 inches of coal, under 15 feet of shale, lies at altitude 1190, and on the right, $\frac{1}{8}$ mile up, is the following:

Amburgy Coal.

Sandstone	10 ft.
Coal	10"
Clay	1"
Coal	4"
Shale	3"
Coal	3"
Altitude, 1215.	

On the left fork of this left branch, $\frac{3}{4}$ mile from Nealy, are two abandoned entries, with a third just started, into the Fire-clay coal at altitude 1405. The bottom coal and flint fire-clay are there, but were not open to measurement. The main coal seam is 37 inches

thick and has normal cleavage planes. It has 5 feet of shale covering.

At the same distance from Nealy up the right fork of this branch, is a 15-yard entry on the right giving the following section:

Fire-clay coal.	
Shaly sandstone	4 ft.
Sandy shale	1½ ft.
Coal	2"
Clay	1"
Coal	36"
Black slate	1"
Fire-clay.	
Altitude, 1385.	

Water prevented full examination of the fire-clay floor, but it seemed to be too hard for other than flint clay. That and the character of the roof, which is excellent, both indicate Fire-clay coal. Openings on this branch are on land of Simon Watts.

On the right of Nealy, at the mouth of this branch, James Mullins has a 10-yard wet entry into the Fire-clay coal, at altitude 1410, having about 36 inches on the main coal seam, 4 inches of flint fire-clay and 3 inches of bottom coal, no measurements exact. The roof is 10 feet or more of massive sandstone, under which is 4 inches of coal and slate and 12 inches of weak clay sandstone to the main coal. These 16 inches come down with the coal leaving a good roof above.

On the right, 1¼ miles up Nealy, Elam Pigman has a 10-yard entry into the Fire-clay coal at altitude 1425. The main coal seam is increased from 33 inches two yards in to 36 inches ten yards in. The floor is black jack or black slate. A good roof is given by 21 inches of sandy shale, above which is 2 inches of coal to massive sandstone above the coal.

On the right, 2 miles up Nealy, Mr. Pigman has another entry into the same bed at altitude 1445, giving 38 inches of coal on an inch of soft black slate. Hard black slate and flint fire-clay, 6 inches or more, provide the floor, with possible coal below. A half-foot of clay on the coal and a foot of sandstone on that, the latter inter-leaved with thin sheets of coal, make a bad roof

until they fall. Above them is exposed 7 feet of sandstone, making a good roof.

SPRING BRANCH.—On the right, 23¼ miles up Carr. Altitude of mouth, 1130.

On the left, ½ mile up the branch, 10 feet above it is the following:

Amburgy Coal.	
Sandstone	3 ft.
Coal	3"
Slate	3"
Coal	15"
Coal and shale	9"
Altitude, 1255.	

On the left, ¾ mile up, George Gibson has a 20-yard entry, and on the left a mile up Arch Gibson has a 12-yard wet entry, both into the Fire-clay coal, at altitude 1450 and 1485, respectively. Their sections follow:

George Gibson.		Arch Gibson.	
Sandstone	3 ft.	Shale	2 ft.
Coal	35"	Shaly sandstone	2 ft.
Black jack	2"	Coal	37"
Flint clay	5"	Hard bottom.	
Coal	7"		

The bottom coal where seen was perfectly good. In the Arch Gibson entry the roof scales off in thin plates, but nevertheless space 25 by 30 feet is left without props.

On the right, 1½ miles up, Edward Gibson has a 12-yard entry into the Flag coal at altitude 1880. The bed is 6 to 8 feet thick with about 5 feet of coal without parting visible, the remainder covered by falls from the roof, which is an extremely bad one, 10 feet of clay shale showing above the coal. The area of the bed here is small, though a half-mile of outcrop is in sight, with covering nowhere so much as 100 feet deep.

The cliff, 35 feet high, directly under the Hazard bed, shows below the opening; the altitude of its top, 1800.

COLLINS BRANCH.—On the right, 23¾ miles up Carr. Altitude of mouth, 1130.

On the left, $\frac{3}{4}$ miles up the branch, Russell Collins has a 3-yard entry, at altitude 1355, into a bed with section following, which appears to be of the Whitesburg, though it lies at a considerably greater distance than usual, 140 feet, below the Fire-clay coal rider, and it has not the customary black slate roof:

Whitesburg Coal. (?)	
Shale	5 ft.
Coal	25"
Shale	7"
Cannel coal	10"
Block coal	4"
Altitude, 1355.	

The cannel coal is of excellent quality, apparently, but it is reported to be explosive in burning. A flag stone quarry lies 40 feet below it.

On the right, $\frac{7}{8}$ mile up the branch, Green Craft has an abandoned prospect into the same bed (reported thick, but with bad roof) at altitude 1360.

Over this cannel opening is a 5-yard entry with the following section:

Fire-clay Coal Rider	
Shale	8 ft.
Black slate	6"
Coal	8"
Shale	28"
Coal and black slate ..	8"
Coal	27"
Shale	1"
Coal	18"
Altitude, 1500.	

On the left of the right hollow, $1\frac{1}{8}$ miles up, $\frac{1}{8}$ mile up the hollow, the Fire-clay coal is opened at altitude 1515. The main coal seam is probably of the usual thickness, about 3 feet, 2 feet being visible. Black jack and flint fire-clay in the dump prove its correlation. It has over it $2\frac{1}{2}$ feet of shale and then 2 feet of sandstone.

On the left, two miles up the branch, the Amburgy coal shows about 2 feet of coal under sandstone, at altitude 1310.

On the left, $2\frac{1}{2}$ miles up, Hazel Collins has a 12-yard entry with the section following:

Fire-clay Coal.	
Shale sandstone	5 ft.
Coal	34"
Flint clay	7"
Coal	13"
Altitude, 1540.	

The bottom coal, as well as the top, is good, and assurance of continued thickness is given by an opening on Buck branch of Rockhouse having 4 inches more coal and 3 inches less parting. The parting here is all black.

On the left of Carr fork, $23\frac{3}{4}$ miles up it, $\frac{1}{4}$ mile from it, at the head of a hollow, Robert Bates has a 5-yard entry as follows:

Fire-clay Coal.	
Sandstone	3 ft.
Coal	37"
Black slate	2"
Flint clay	4"
Coal	5"
Altitude, 1440.	

An inch of bony coal in the middle of the bottom seam impairs its value probably very little. The sticking of an inch of the top coal to the slate under it is likely to be more troublesome.

BUFFALO BRANCH.—On the left, 24 miles up Carr. Altitude of mouth, 1160.

On the right, a half-mile up this branch, Wiley Amburgy has a 12-yard entry, from which the following was obtained:

Fire-clay Coal.	
Sandstone	
Shale	6 ft.
Sandstone	1 ft.
Shale	$1\frac{1}{2}$ ft.
Coal	37"
Altitude, 1490.	

A knife edge parting, 6 inches from the top of the coal is so unusual as to be almost negligible here.

On the left, $24\frac{1}{4}$ miles up Carr, is the Alfred Amburgy entry into Fire-clay coal 40 inches thick and 6 inches parting, given in Bulletin No. 11, page 111. That and an entry into the same bed on the opposite side of the creek were both closed at the time of the last visit.

ROARING BRANCH.—On the right, $24\frac{3}{4}$ miles up Carr. Altitude of mouth, 1210.

On the left, $\frac{1}{8}$ mile up this branch, John S. Amburgy has a 5-yard entry at altitude 1475; and on the right of a right hollow, $\frac{5}{8}$ mile up, Doctor Sexton has a 10-yard wet entry at altitude 1510. Both are in the Fire-clay coal and their bed-sections follow:

Altitude, 1475.	Altitude, 1510.
Sandstone 5 ft.	Shale 3 ft.
Coal 35"	Massive sandstone 3 ft.
Flint clay 6"	Coal 32"
Coal 6"	Black jack 2"
	Flint clay 4"
	Coal 0

The bottom coal of the Amburgy entry is particularly fine-looking, half of it a rich splint coal. In the second entry the bottom was not seen. There appeared to be about a foot of it.

On the right, $24\frac{7}{8}$ miles up Carr, William Amburgy has a 2-yard entry into the top seam of the Fire-clay coal, 36 inches thick, at altitude 1470. The flint fire-clay floor, doubtless, has coal under it. Two feet of shaly sandstone makes the roof.

TURKEY BRANCH.—On the left, $25\frac{1}{8}$ miles up Carr. Altitude of mouth, 1275.

In a peak on the right, $\frac{1}{4}$ mile up a left drain, $\frac{1}{8}$ mile up this branch, William Amburgy has a 15-yard wet entry into the Flag coal at altitude 1925. The bed is 6 to 8 feet thick, of which about 2 feet was invisible, mostly block coal, but with a little splint. Fifteen feet of soft argillaceous sandstone covers the bed, and a hard sandstone caps the peak, which carries the only area of the coal.

WILDCAT BRANCH.—On the left, $25\frac{3}{8}$ miles up Carr. Altitude of mouth, 1295.

A rock-house on the right at the mouth of this branch gives the Amburgy coal at altitude 1300, just before it goes below drainage on Carr fork.

On the left, $\frac{1}{8}$ mile up the branch, the Fire-clay coal rider (probably) is opened in an 8-yard entry at altitude 1500. Sections of these two beds follow:

Altitude, 1300.	
Sandstone	10 ft.
Coal	2"
Shale	1"
Coal	12"
Shale	7"
Coal	1"
Shale	1"
Coal	1"
Sandstone.	

Altitude, 1500.	
Sandstone	6 ft.
Coal	17"
Knife edge parting.	
Coal	7"
Clay	1"
Coal	4"
Clay	2"
Coal	10

The bottom of the higher bed was not seen and there may be a little more than 10 inches of coal in that seam.

In a cliff on the left of Carr, rising from it at $25\frac{1}{2}$ miles up, is 30 feet of shale upon which is as much more sandstone, all overlying the rock house sandstone covering the Amburgy coal.

On the left branch of Carr, $26\frac{1}{4}$ miles up it, which gives a road to Beaver creek, on the left of the road and right of the branch, $\frac{1}{4}$ mile up it, Wilburn Honeycutt has a 12-yard wet entry into the Fire-clay coal at altitude 1505. The main seam of the bed appears to be 3 to $3\frac{1}{2}$ feet of coal without parting. The flint fire-clay is below and 2 feet of shale under 4 feet of sandstone is exposed on top of the coal.

On the right, $26\frac{3}{8}$ miles up Carr, Wiley Amburgy has a 20-yard entry with the following section:

Fire-clay Coal.	
Sandstone	5 ft.
Coal	36"
Flint clay	6"
Coal	14"
Altitude, 1515.	

In a right branch, $26\frac{5}{8}$ miles up Carr, $\frac{1}{8}$ mile up the branch, is 10 inches of coal on sandstone and under sandstone 15 feet or more thick; its altitude 1435. Beside the branch, $\frac{1}{4}$ mile up it, the Whitesburg bed is exposed, at altitude 1505, with the section following. On the left, $\frac{3}{8}$ mile up the branch, 20 feet above it, is Grant Honeycutt's 8-yard entry into the Fire-clay coal, at altitude 1535, with the section following:

Whitesburg Coal.	
Shale.	
Coal	10"
Black slate	1"
Coal	2"
Fire-clay	6"
Covered	1 ft.
Sandstone	3 ft.
Black slate	2"
Coal	1"

Fire-clay Coal.	
Sandstone	3 ft.
Coal	33"
Black jack	4"
Flint clay	3"
Coal	11"

Two inches of the bottom of the Fire-clay coal bed has a slightly bony appearance, but is probably harmless.

On the left, $27\frac{1}{4}$ miles up Carr, Watson Adams has a prospect into the Fire-clay coal at altitude 1615, giving the section following. On the right, in part, and partly in the creek $27\frac{1}{2}$ miles up Carr, at Omaha post-office, Green Collins has an opening into the Fire-clay coal rider at altitude 1660, its section following:

Fire-clay Coal.

Sandstone	8 ft.
Sandy shale	6 ft.
Coal	3"
Shale	$\frac{1}{2}$ to 1"
Coal	30"
Flint clay	6"
Coal	10"

Rider.

Shale	8 ft.
Black slate	8"
Coal	4"
Shale	1"
Coal	2"
Shale (with coal)....	9"
Coal	2"
Shale	1"
Coal	16"
Coal (?)	36"

The bottom seam of the Fire-clay coal has no bone in it. The bottom 3 feet of the rider being in water was not seen. The 2 feet that was felt appeared to be all coal.

The following notes are of coals above Carr fork to Bull creek, including the latter, all on the east side of the river.

On the right of left fork of a branch $\frac{1}{2}$ mile above Carr, at its head a mile from the river, Elijah Combs has an entry, at altitude 1485, into good hard block coal, 37 inches thick, under 8 feet of shale. A foot or more of coal is reported under about a foot parting now serving as floor for the entry. With the ridge 200 to 300 feet higher a considerable area of this coal is available. It is of the Flag bed, the Fire-clay coal being at altitude about 1100.

Desultory prospecting reported in this vicinity has failed to bring to light any other satisfactory coal, and no other opening was found below Felix branch, $3\frac{3}{4}$ miles above Carr fork, and $1\frac{3}{4}$ miles above Masu station at the mouth of Mace's creek.

On the right of the left fork of Felix branch, $\frac{1}{4}$ mile from its mouth, Felix Brashear has an 18-yard entry

with the following average of a somewhat variable section:

Fire-clay Coal.

Sandstone	15 ft.
Shaly sandstone	5 ft.
Coal	32"
Black jack	8"
Flint clay	3"
Coal	13"
Black slate	2"

Altitude, 1065.

The bottom coal is a good hard block coal.

On the right of the right fork, $\frac{3}{8}$ mile up the branch the top coal is 38 inches thick, the rest of the bed hidden; its altitude is 1050, about 165 feet above the river.

On the left, $\frac{1}{2}$ mile up a branch $2\frac{1}{4}$ miles above Masu, Nathaniel Brashear has a 15-yard entry with the following section:

Fire-clay Coal.

Shaly sandstone	5 ft.
Coal	39"
Flint clay	5"
Coal	5"
Black slate	5"
Shale	4"
Coal	8"

Altitude, 1100.

Only the top seam of coal is taken out.

At $2\frac{3}{4}$ miles above Masu, 23 inches of coal was taken from an entry, now closed, at the level of the railroad track, altitude 910. This coal shows near the bottom of the following section from the mouth of a branch $3\frac{3}{4}$ miles above Masu and $\frac{1}{2}$ mile below Big Branch:

Sandstone	40 ft.	
Covered shale and sandstone	20 ft.	
Shale	25 ft.	
Coal	12"	
Shale	8"	} Amburgy Coal. Altitude, 945.
Coal	1"	
Shale	3"	
Coal	3"	
Fire-clay	1 ft.	
Sandstone	18 ft.	
Coal	23"	
Fire-clay	3 ft.	
Sandstone to track level	2 ft.	

The Fire-clay coal is exposed, slipped so that its measure could not be taken, in a rock-house, $\frac{1}{2}$ mile up the branch, at altitude 1155.

BIG BRANCH.—Hombre station, 6 miles above Carr fork. Altitude of mouth, 905.

On the right of a left branch, $\frac{3}{4}$ mile up Big branch and $\frac{1}{2}$ mile up the left branch, Sampson Brashear has an 8-yard entry with the following section:

Sandstone	15 ft.
Coal	29"
Flint clay	4"
Coal	15"

The bottom coal here is all good.

On the right of the left fork, at the forks of the creek $2\frac{1}{2}$ miles from the river, the following is exposed, giving a section from the creek probably about up to the Whitesburg bed:

Sandstone	10 ft.
Shale	10 ft.
Sandstone	2 ft.
Coal	5"
Shale and coal	9"
Coal	6"
Fire-clay	1 ft.
Shale to water level	4 ft.
Altitude, 1145.	

On the right and left, $3\frac{1}{2}$ miles up, Thomas Fields has a 4-yard entry and exposure in a rock-house of the Fire-clay coal, at altitudes 1230 and 1235, giving 24 and 31 inches, respectively, of coal in the main seam. Apparently there is no coal under the flint fire-clay. To that clay taken from the entry a little of the coal adheres and so is lost.

On the right, $3\frac{5}{8}$ miles up three entries at altitude 1240 give 32 and 36 inches of coal over black jack and flint fire-clay and common fire-clay next the flint. The coal thickens up stream, but no more openings have been made further up to see if the increase continues. The last entries are about 20 feet above the creek.

On the left of the river, $\frac{1}{8}$ mile above Hombre, Richmond McIntyre has a wet entry at altitude 1120, in which the top coal is 24 inches thick, and the bottom coal perhaps as much. Five feet of shale lies on the bed.

FORD BRANCH.—One mile above Hombre. Altitude of mouth, 915.

On the left of the mouth of this branch Ellett McIntyre has a wet entry into the Fire-clay coal at altitude 1135, and on the left at the forks, $\frac{1}{2}$ mile up the branch, is a 7-yard entry into the same bed at altitude 1155, in the point of a hill and hardly under solid roof. These give the following sections:

Altitude, 1135.

Shale	2 ft.
Black slate	2 ft.
Coal	21"
Flint clay	4"
Coal	21"
Fire-clay	1 ft.

Altitude, 1155.

Earth.	
Coal	23"
Flint clay	4"
Coal	18"

On the right fork of the left fork, from $1\frac{1}{2}$ to 2 miles up from the river, on land of Solomon Caudill, the following section was obtained, the Hindman bed show-

ing on the left at the head of the branch, the bed next below being opened close by:

	Altitude.
Ridge tops, about	1700 to 1750
Hindman coal	1660
Francis coal—33 inches	1600
Flag coal—stain	1560
Cliff under Hazard coal	1480 to 1510
Young coal—reported 30 inches.....	1470

The comparatively broad tops to the hills of this vicinity give good working area to the Flag coal, which has not been opened, but higher coals are too restricted for other than local use.

On the right, $\frac{3}{4}$ mile from the river, at the head of a branch $1\frac{1}{2}$ miles above Hombre, at a closed entry on the Ira Banks farm, the following was obtained:

Hindman Coal.

Broken sandstone.	
Shale	1½ ft.
Coal and shale.....	1 ft.
Coal	2 ft.
Thin parting.	
Coal.	

Altitude, 1730.

The total thickness is reported to be 9 feet and evidently is nearly that, but the small area, bad roof and great height render the bed unattractive.

On the heads of a branch 2 miles above Hombre the cliff sandstone under the Hazard coal lies at altitude 1540 to 1570 and above this is the Flatwoods of the vicinity. Iron ore shows in small quantities at 1590. At 1625 the Flag coal is opened, showing a 3-foot bed with a 1-inch parting in its upper half, the lower half of the prospect being covered. The coal is somewhat slaty, the roof sandstone. The opening is about $\frac{1}{2}$ mile south of that of the Hindman bed just given.

A prospect in the point of a hill midway between the two openings last given shows a thin slaty coal at altitude 1725. This is of the Hindman bed, but the place chosen for opening does not give a fair exposition of

the coal, all but the hard and slaty coal having weathered away.

In the railroad cut at the point of the spur, $3\frac{1}{2}$ miles above Hombre the following is found:

Shale	15 ft.	
Coal	1 ft.	Altitude, 985.
Shale	15 ft.	
Coal	1 ft.	Altitude, 970.
Sandstone	15 ft.	

One or both of these coals, probably the upper, is of the Amburgy bed, close under which is often found a thin coal.

At Cornettsville postoffice, $3\frac{3}{4}$ miles above Hombre, S. W. Hampton has a 7-yard wet entry with the following section:

Fire-clay Coal.		
Sandstone	4 ft.	
Shale	7 ft.	
Coal	18"	
Flint clay	5"	
Coal	24"	
Black slate.		
Altitude, 1180.		

On a left branch at Elijah Sumner's, 4 miles above Hombre, the Amburgy bed has 18 inches of coal, lying on 20 feet of sandstone and under 12 feet of shale in one place and under 3 feet of shale, then 20 feet of sandstone in another adjacent. Its altitude is 975.

On the left, $\frac{1}{8}$ mile up the branch the Fire-clay coal has been opened, at altitude 1190, with possibly 3 feet of coal in the upper seam, and additional coal under a 5-inches flint fire-clay parting.

BULL CREEK.—Four and one-half miles above Hombre. Altitude of mouth, 930.

On the left at the mouth of the creek, 15 feet above it, the thin coal under the Amburgy bed shows about 8 inches thick with 15 feet of sandstone above and below it.

On the right a half-mile up the creek and 5 feet above it, the Amburgy bed is exposed, at altitude 985, with 2

feet of fire-clay and then 3 feet of thin-bedded sandstone beneath and 4 feet of sandstone above it.

On the left of a left branch a mile up the creek, 140 feet above it, $\frac{1}{8}$ mile up the branch, John Caudill has a 3-yard wet entry, the only opening found on the creek, into the Fire-clay coal. It gives in section:

Fire-clay Coal.	
Sandstone	3 ft.
Shale	6 ft.
Coal	26"
Flint clay	4"
Coal	10"
Altitude, 1165.	

The bottom coal in water was not measured exactly, and thin cannel coal was reported below it.

On the right $1\frac{3}{4}$ miles up the creek the following is exposed:

Shale	40 to 50 ft.
Coal	5"
Shale	$\frac{1}{2}$ to $1\frac{1}{2}$ ft.
Coal	7"
Shale	1 to 5 ft.
Sandstone in creek.	
Altitude, 1155.	

The upper 25 feet of this shale, with large lime boulders in it, rises from the creek on the right, $2\frac{1}{2}$ miles up it. On the shale is coal and black slate at altitude 1220, probably of the Whitesburg bed, the usual sandstone under it having disappeared. This gives a rise of strata up the creek of about 80 feet in $1\frac{1}{2}$ miles.

Opposite the mouth of the large left branch, $3\frac{1}{2}$ miles up the creek, 30 feet of shales still remain above it with 10 feet of sandstone covering them.

At $4\frac{1}{2}$ miles up, 30 feet of shale from the creek appears again with 24 inches of coal at altitude 1380 in it, 20 feet above the creek.

At $4\frac{3}{4}$ miles up this coal in shale is reduced to 8 inches, at altitude 1410.

At the school house at the forks of the creek, $5\frac{1}{2}$ miles up it, the altitude, as determined by barometer, is 1490.

At the head of the left fork, $\frac{3}{4}$ mile up from the school house and opposite the Green Combs entry on Montgomery creek, George Field has an 8-yard entry with section similar to that of the Combs entry, as follows:

Flag Coal.	
Massive sandstone.....	20 ft.
Coal	16"
Shale	5"
Coal	40"
Altitude, 1720.	

This is all block coal, the lower seam hard. The hill tops are 150 to 200 feet higher and being well rounded in this "flatwoods" region give a fairly good area to the bed.

On the right of the right fork and of the road to Defeated branch, a mile above the school house and a quarter-mile from the gap, James B. Caudill has a pit at altitude 1695, from which has been taken coal said to be 30 inches thick. This is of the Hazard bed, and it is not unlikely that a lower seam of the bed would be struck by sinking the pit a little deeper.

Above the pit is a 2-yard entry into the Flag bed, which here is somewhat farther from the Hazard than is the case where the two have been opened in juxtaposition farther down the river. Its section follows:

Flag Coal.	
Sandstone	5 ft.
Coal	16"
Shale	6"
Coal	1 ft.
Shale	13"
Coal	40"
Altitude, 1760.	

THE OOLITIC LIMESTONES OF WARREN COUNTY.

BY MALCOLM H. CRUMP.

LOCATION.—These oolitic limestones, so widely used for building purposes, are found skirting the eastern and southern edges of the western coal field in the counties of Grayson, Barren, Warren, Logan, Todd, Christian, Trigg and Caldwell, but the greatest economic and commercial developments on these deposits have been made in the county of Warren in the vicinity of Bowling Green. There are more than 200 miles of outcrop of this stone in Warren county, much of which is readily accessible to transportation by both water and rail. Barren river divides the Warren county field in two parts, with fine exposures immediately on its banks and advantage has been taken of this fact in the location of several quarries.

HISTORY.—The first quarries were opened more than three-quarters of a century ago and the stone taken from them is still to be seen in walls and monuments which have stood the test of time for nearly a hundred years. This tells the story of its durability. The Corinthian columns, with their delicately carved capitols, at the county court house in Bowling Green, are as sharply defined and as perfect as when first completed, although they have been exposed to the action of the elements for nearly fifty years.

GEOLOGICAL POSITION.—All of these oolitic beds of limestone are found immediately below the base of the Chester and usually in a vertical interval of less than 50 feet. The marked topography of the Big Clifty sandstone at the base of the Chester renders the horizon of the oolitic easily found and readily followed.

BEDS.—These are from 10 to 22 feet thick, with probably four workable horizons included within a vertical distance of 150 feet. The beds are usually without seams and often 20 feet thick, without any perceptible change in their appearance or structure from the base of the bed to the top.