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COAL DEPOSITS OF PIKE COUNTY, KENTUCKY

BY

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ABSTRACT

Most of the rocks in Pike County are nearly flat-lying strata of Pennsylvanian age. These rocks are grouped as the Pottsville formation, but the base of the Allegheny formation may be present on the high hilltops in the northwestern part of the county. The rocks consist of lenticular sandstone, shale, limestone, and coal beds, mostly of continental origin, although some thin marine beds are present. No persistent limestone beds were found. Some Mississippian and perhaps Devonian rocks occur in the overthrust block of Pine Mountain along the southeast edge of Pike County. These rocks were not included in this investigation.

The Pennsylvanian rocks dip to the northwest at about 100 feet to the mile. The dip is interrupted by a few broad, low folds. Minor irregularities of individual beds, the swells and swales encountered in mining, are very local features, probably due mostly to differential compaction and deposition on irregular surfaces.

Thirteen coal beds are being mined commercially in the county, and there are about 48 other coal beds, generally thin, but some are locally a few feet thick. The coal is mostly of high-volatile bituminous rank, predominantly of the common type, but there are a few localities of cannel. About 75 shipping mines besides country banks have been operated in the county. In 1933, the latest year for which statistics of production are available, the mines produced nearly 4,500,000 tons of coal, but in 1927 the production was about 7,500,000 tons. Since 1922 Pike County has produced considerably more than 1 percent of the United States total. Since 1909 the county has produced more than 110,000,000 tons of coal.

The county contains an estimated reserve of about 8,000,000,000 tons of coal in beds 12 inches or more thick that are minable by drift mines. In addition probably several times this quantity is available to shaft mining in the lower Pennsylvanian rocks below the level of the streams.

INTRODUCTION

LOCATION AND EXTENT OF AREA

Pike County, the easternmost and largest county in Kentucky, includes nearly 800 square miles of mountainous land lying within and forming a substantial part of the eastern Kentucky coal field (fig. 1). It adjoins Mingo County, W. Va.; Buchanan and Dickenson Counties, Va.; and Letcher, Knott, Floyd, and Martin Counties, Ky. (pl. 48).

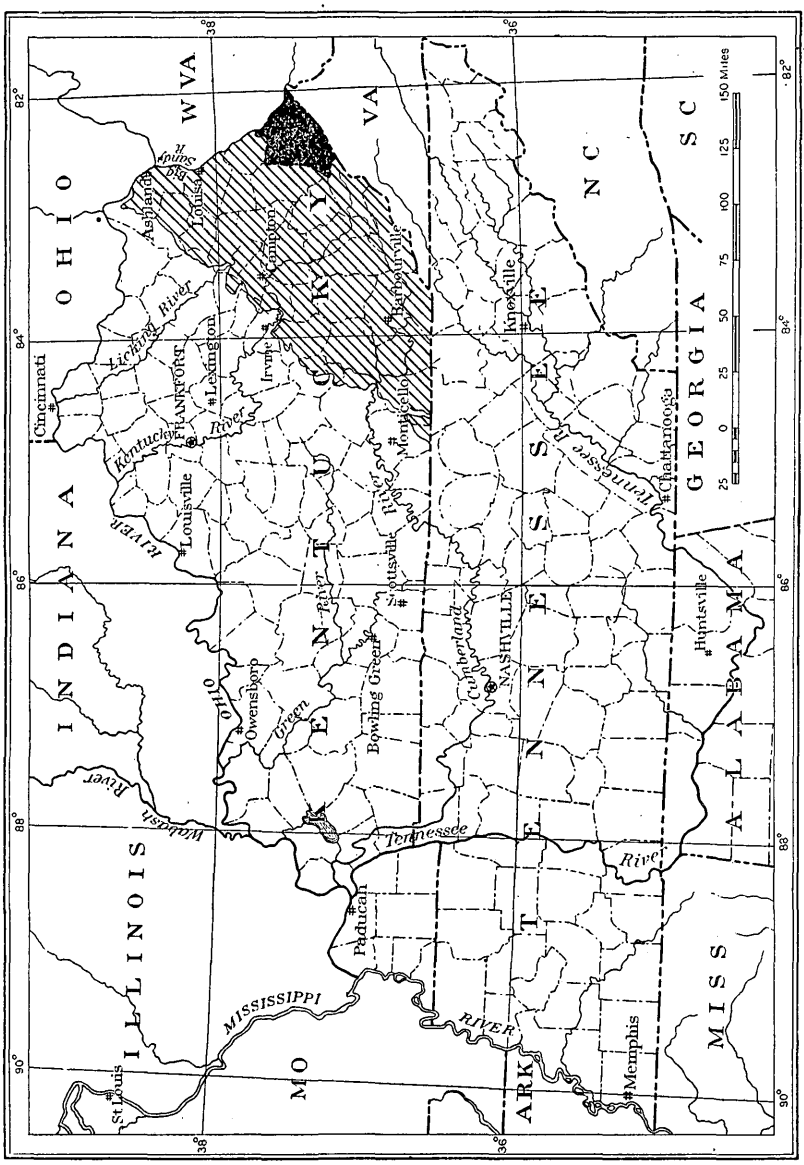


FIGURE 1.—Index map of Kentucky showing the location of Pike County (black area) and its position in the eastern Kentucky coal field (ruled area).

PREVIOUS INVESTIGATIONS

Many reports containing the results of previous investigations of the coal resources and geologic features of Pike County and adjacent areas have been published. Those on Pike County, as well as those of adjacent areas that bear on Pike County, are listed below.

1. Crandall, A. R., and Hodge, J. M., Preliminary reports on the southeastern Kentucky coal field, pp. 1–114, Kentucky Geol. Survey, 1887. Gives numerous measurements of coal beds, their general location, and reconnaissance correlation of the beds.

2. Brown, C. N., Mineral wealth of the Big Sandy Valley from Louisa to the head of navigation: Kentucky State Inspector of Mines Ann. Rept., 1900, pp. 203–273. Several detailed measurements of coal beds and some analyses are given.

3. Crandall, A. R., The coals of the Big Sandy Valley: Kentucky Geol. Survey Bull. 4, pp. 48–122, 1905. Numerous measurements of coal beds and analyses are presented in the text, and sketch maps show the location and altitude above drainage level of many coal openings.

4. Stone, R. W., Coal resources of the Russell Fork Basin in Kentucky and Virginia: U. S. Geol. Survey Bull. 348, pp. 9–78, 1908. The text gives measurements of coal beds, and some analyses and discusses correlation of the principal beds. The maps show the locations of coal openings and the approximate outcrop of the principal beds.

5. Hennen, R. V., and Reger, D. B., Logan and Mingo Counties, pp. 81–83, West Virginia Geol. Survey County Repts., 1914. Map with topographic base shows the locations of openings and approximate outcrop of principal coal beds in a part of West Virginia that adjoins Pike County.

6. Butts, Charles, The coal resources and general geology of the Pound quadrangle of Virginia and Kentucky: U. S. Geol. Survey Bull. 541, pp. 25–31, 54–69, 1914. Discusses coal beds in southernmost tip of Pike County.

7. Hinds, Henry. The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, pp. 1–250, 1918. Describes in detail the coal beds of Buchanan County and discusses their extension into Pike County.

8. Giles, A. W., The geology and coal resources of Dickenson County, Va.: Virginia Geol. Survey Bull. 21, pp. 1–224, 1921. Describes the coal beds of Dickenson County and their extension into Pike County. A chapter by C. K. Wentworth describes the Russell Fork fault and the associated Pine Mountain thrust fault, which extends into Pike County.

9. Wentworth, C. K., Russell Fork fault of southwest Virginia: Jour. Geology, vol. 29, no. 4, pp. 351–369, 1921. Describes the Russell Fork fault and its relation to the Pine Mountain overthrust fault, which extends into Pike County.

10. Hudnall, J. S., Map of the structural geology of Pike County, Ky., Kentucky Geol. Survey, 1923. Structure map based on reconnaissance mapping and aneroid elevation of coal beds.

11. Hudnall, J. S., The Elkhorn coal field: Kentucky Geol. Survey, ser. 6, vol. 27, pp. 131–133, 1925. Briefly discusses the regional correlation of the Elkhorn coal bed.

12. McFarlan, A. C., Carbon-ratio map of the eastern Kentucky coal field, Kentucky Geol. Survey, 1926. General map showing approximate changes in carbon ratios in the eastern Kentucky coal field.

13. Rich, J. L., Mechanics of low-angle overthrust faulting as illustrated by Cumberland thrust block, Virginia, Kentucky, and Tennessee: Am. Assoc.

Petroleum Geologists Bull., vol. 18, pp. 1584–1596, 1934. Presents a very interesting and plausible interpretation of the development of the Pine Mountain overthrust block.

14. St. Clair, Stuart, Oil and gas in Kentucky and Tennessee, Problems of petroleum geology (Sidney Powers memorial volume), pp. 515–520, Am. Assoc. Petroleum Geologists, 1934. Refers very briefly to eastern Kentucky in a regional discussion of oil and gas problems.

15. Eby, J. B., The geology and mineral resources of Wise County and the coal-bearing portion of Scott County: Virginia Geol. Survey Bull. 24, 1923. Presents a regional map, including Pike County, showing carbon ratios.

16. Postley, O. C., Natural-gas developments and possibilities east of the main oil and gas fields of Appalachian region: Am. Assoc. Petroleum Geologists Bull., vol. 19, pp. 853–875, 1935. Refers briefly to gas wells drilled in eastern Pike County.

17. Analyses of Kentucky coals: U. S. Bur. Mines Tech. Paper 308, 1922. Contains a description of the coal-bearing rocks of the Kentucky fields, general use and distribution of the coal produced, chemical analyses of mined samples from the coal fields, with a few analyses of Pike County coals.

18. Thiessen, Reinhardt, Sprunk, G. C., and O'Donnell, H. J., Microscopic study of Elkhorn coal bed at Jenkins, Letcher County, Ky.: U. S. Bur. Mines Tech. Paper 506, 1931. Describes and illustrates various microscopic components of the coal bed and stresses the so-called "opaque matter" regarded to be characteristic of "splint" coal.

19. Fieldner, A. C., Davis, J. D., Thiessen, Reinhardt, Kester, E. B., Selwig, W. A., Reynolds, D. A., Jung, W. F., and Sprunk, G. C., Carbonizing properties and constitution of Chilton bed coal from Boone No. 2 mine, Logan County, W. Va.: U. S. Bur. Mines Tech. Paper 542, 1932. Describes microscopic examination of the bed (correlated with the Taylor bed) and experimental studies of the coking property of various components.

FIELD WORK AND PREPARATION OF THE REPORT

The coal resources of Pike County were investigated in 1934 by a party of the United States Geological Survey, to which an allotment had been made for this purpose by the Public Works Administration. The object of the investigation was to acquire such information on the extent, thickness, character, and other features of the coal beds as would be of value in the proper development of future mining operations. Field work was carried on from April 1 to October 31, 1934, and the report was prepared during the following winter, spring, and summer. The senior author, a member of the regular staff of the Geological Survey, was in immediate charge of the project and during the field season was engaged chiefly in coordinating the field work being done in various parts of the county. Most of the field data were collected by the other members of the party—Phil Aswerus, Paul Averitt, Guy H. Briggs, Jr., Jack Hirsch, Joseph H. Mills, Arthur C. Munyan, Herbert Parker, J. Basil Preston, and George R. Wesley. Most of these geologists were with the party during nearly all of the field work. Briggs, Munyan, and Wesley assisted in preparing the report.

Good topographic maps with a scale of about 1 inch to the mile for all of Pike County have been published by the Geological Survey and were used as base maps during the investigation. The altitudes of the coal openings were determined by hand-level measurements from the valley bottoms. Many measurements involved the carrying of such a line of levels up the mountain sides to openings several hundred feet above the streams. The recorded altitudes, therefore, are at best only approximations. Despite the uncertainties, determination of altitudes by hand-level measurements is preferable to the use of an aneroid barometer, because it is usually impracticable to keep aneroid observations adjusted to hourly variations in barometric pressure.

Rock outcrops are scarce in the region, and only incomplete information could be obtained concerning the rocks between coal beds. The party endeavored to locate every coal opening in the county, and caved as well as open coal pits were located for purposes of correlation. Many of the coal beds were followed and correlated by walking along topographic benches on the hillsides between the openings. This method of tracing assumes that the topographic bench is at the same stratigraphic position at each opening, but because the beds of sandstone that hold up the benches are lenticular, the use of this method required considerable discrimination. Wherever possible the correlation thus established was checked by noting whether benches above or below or across the valley dip with the bench that was followed. Although the method has its limitations, it nevertheless provides the most satisfactory substitute for actual tracing of the beds themselves. The correlation of coal beds by their appearance, partings, and other characters was found to be unreliable, because, with few exceptions, these features are too variable to be useful except for short distances. The method of showing on the coal-section charts (pls. 1–46) the altitude of the coal openings and the apparent correlation of the beds was adopted in the course of the field investigation and proved a very helpful guide to the correlations.

The charts and the map (pl. 48) attempt to distinguish observed facts from interpretations. The coal openings that afford definite information about the coal are shown by appropriate symbol on the map. The altitude of each opening, as determined by hand leveling, is shown on the charts. The correlation lines on the charts have been drawn solid, dashed, and dotted—solid lines to indicate fairly definite correlations, dashed lines to indicate less certain correlations, and dotted lines to indicate considerable uncertainty. The charts show not only the positions of the coal beds represented on the map but also those of other coal beds that are close to the principal beds.

In preparing the coal-section charts the county was divided into 46 divisions, each outlined on the map and designated by the number of

the plate that shows the thickness, altitude, and correlation of coal beds within that division. Included on the charts are detailed measurements of the thickness of the coal beds wherever they could be obtained. Many of the recorded measurements were not made by members of this party. Earlier published reports and private company surveys that were made available give coal thickness and locations of openings, many of which are now caved or flooded.

On plate 48 the general structure of the coal beds is shown by contours drawn on the Pond Creek (Lower Elkhorn) coal bed. The interval between contours is 50 feet.

In the course of the investigation about 250 coal samples for analysis were collected from many mines in all parts of the county. Analyses of the samples have been made by the United States Bureau of Mines, and the results are included with this report (pp. 57–90).

The Pine Mountain overthrust block, along the southeast edge of the county, was not studied. This belt of country affords interesting geologic problems, but because it lies outside the coal-bearing area of Pike County time and therefore opportunity were not available for its study.

ACKNOWLEDGMENTS

The field work was greatly facilitated by the cordial cooperation of coal operators' associations, officials of coal and gas companies, and individuals, all of whom contributed a great amount of information. Four extensive private surveys were especially helpful. E. V. d'Invilliers, of Philadelphia, about 1905 mapped several of the coal beds in nearly half of the county for the Big Sandy Co. In 1924 Howard N. Eavenson and associates (now Eavenson, Alford & Hicks), of Pittsburgh, mapped three of the important coal beds in the northern part of the county. A few years ago engineers of the Consolidation Coal Co., at Jenkins, made a particularly thorough survey of the extent and thickness of two of the most valuable coal beds in the southwestern part of the county. In 1934 engineers of the Kentland Coal & Coke Co. surveyed the coal beds in a large area in the eastern part of the county.

Thanks are due to the United States Bureau of Mines for expeditious analysis of the coal samples. Miss Taisia Stadnichenko, of the Geological Survey, assisted in interpreting the analyses.

GEOGRAPHY

DRAINAGE AND SURFACE FEATURES

The principal streams of Pike County are Tug Fork, Johns Creek, Levisa Fork, and Russell Fork, which flow northwestward across and beyond the county to form the Big Sandy River, a tributary of the Ohio River. These streams and their tributaries flow in deep, narrow meandering valleys and form an intricate drainage pattern. The

streams are confined between the steep slopes of narrow, knifelike mountain ridges that are as crooked as the valleys. The relief in the county is more than 2,500 feet, the altitude ranging from about 625 feet to about 3,125 feet. The low point is along Tug Fork where it leaves the north edge of the county, and the high point is on Pine Mountain, across Elkhorn Creek from the mouth of Sycamore Creek. The Pine Mountain ridge, however, is higher than the hilltops in the rest of Pike County, which have an average altitude of not quite 2,000 feet.

The hillsides of Pike County are covered with a deep soil that supports a considerable and varied forest. Grasses, small shrubs, and vines abound in the forested areas but give way to brier and berry bushes and thistles along the margins of the forest where the land has been cleared. The valley bottoms generally are too narrow to provide sufficient farm land for the population. Over much of the county the timber has been cut or burned away, and the land has been cleared of brush, plowed, and used for cornfields far up the steep hillsides, locally even to the tops. The cultivation of the hillsides is a picturesque feature of the country and is accomplished in spite of the fact that the grade of the slopes is very near the angle of repose of the soil. Large boulders occasionally roll down the slopes to the valley bottoms, and landslides are common. The cultivation of the slopes loosens the soil and destroys the vegetation that helps hold the soil in place. Erosion therefore quickly becomes effective in the fields, washing down the soil and dumping it into the streams, keeping them muddy and partly filling their channels. The flood hazard is thus increased, because water more readily runs off the cleared areas to increase the flow in the partly filled channels.

POPULATION AND ROUTES OF TRAVEL

The population of Pike County as given by the census of 1930 was 63,267. About 97 percent was native white, and most of the remainder negro. A third of the gainful workers were engaged in coal mining, another third in agriculture, and the remaining third distributed among all other occupations. The population is chiefly rural. Pikeville, the county seat and largest town, had a population of 3,376.

Three railroad systems serve Pike County. The main line of the Norfolk & Western Railway follows Tug Fork, mostly on the West Virginia side, along the northeast border of the county. Three short branch lines extend southward into Pike County into the valleys of Blackberry, Peter, and Poplar Creeks. Another branch line connecting Devon, W. Va., with Grundy, Va., follows Knox Creek across the eastern part of the county, and still another branch extends from Williamson, W. Va., up Pond Creek to McVeigh, in Pike County. A very active branch line of the Chesapeake & Ohio Rail-

way connects central and southern Pike County with the main line at Ashland, Ky. This branch follows Levisa and Russell Forks and terminates at Elkhorn City. Branches from this line extend up Shelby, Greasy, and Marrowbone Creeks. The Carolina, Clinchfield & Ohio Railroad, connecting with southwestern Virginia, extends down Russell Fork a short distance into Pike County to its terminus at Elkhorn City.

Most of Pike County is readily accessible by automobile. Pikeville is on United States Highway 23, an arterial north-south highway, well marked and paved in this county. State Highway 82 connects Pikeville with the West Virginia highway system at Williamson. This road is paved most of the way between Pikeville and Williamson. Another paved road extends from the mouth of Marrowbone Creek down Russell and Levisa Forks to Shelby, where it connects with United States Highway 23. A good graded road extends from the mouth of Marrowbone Creek up Russell Fork to Elkhorn City and eastward into Virginia. A good graded road, paved in part, extends down Levisa Fork from Grundy, Va., to the junction of Levisa and Russell Forks, where it connects with the Russell Fork paved road. Good graded roads connect near the top of Bent Mountain with State Highway 82 and lead respectively to Varney, on the Left Fork of Brushy Creek, and down Rockhouse Fork and Big Creek to Tug Fork. A paved road from Williamson extends up Pond Creek to McVeigh. A good graded road extends from Freeburn up Tug Fork to Poplar Creek, and another extends up Peter Creek and its right fork and connects with unimproved roads at the head of Johns Creek. A graded road is planned to connect Peter Creek with Big Creek, a tributary of Levisa Fork. These improved roads connect with unimproved roads that extend up most of the main valleys and larger tributaries. Practically all the improved roads have been built in the last few years, and considerable progress is now being made in extending them throughout the county.

GENERAL GEOLOGY

EXPOSED ROCKS

The exposed rocks in Pike County include only sedimentary rocks of Pennsylvanian age except on Pine Mountain, along the southeast edge of the county, where Mississippian and possibly some Devonian rocks crop out. The Pennsylvanian rocks are all included in the Pottsville formation, but the highest hilltops in the northernmost part of the county may be capped with rocks that should be assigned to the Allegheny formation. These two formations can be separated only by their fossil floras, and no data are available concerning the fossil content of the beds that may possibly belong to the Allegheny formation in Pike County. In adjoining parts of Virginia the rocks

of Pottsville age are called Pottsville group, and are divided into the following formations, the oldest named first: Lee formation, Norton formation, Gladeville sandstone, and Wise formation. Beds corresponding to the Lee formation, composed mostly of clastic deposits, underlie Pike County but are not exposed except in Pine Mountain. Equivalents of the Norton, Gladeville, and Wise formations are present over most of Pike County, but the Norton and Wise are entirely similar, and the intervening Gladeville sandstone, although persistent, possesses no characteristics that distinguish it from the sandstones that are found in the section both above and below the Gladeville.[1] No attempt has been made to show these units separately, because any persistent bed, whether sandstone or coal, would serve equally well for subdividing the Pottsville in Pike County. The rocks in Pike County are nearly everywhere concealed by soil, conglomerate, or alluvium, probably mostly of Recent age, formed during the present erosion cycle. (See p. 12.)

The Pennsylvanian rocks exposed in Pike County measure about 2,500 feet in thickness. They consist mostly of sandstone and shale, with numerous beds of coal and a few of limestone and clay. Nearly all the sandstone beds are lenticular, thinning or thickening or changing in lithology within short distances along the outcrop. Not one of them is known to retain a distinctive lithologic character for sufficient distance to be useful as a mappable unit. However, a few of the sandstones are fairly persistent over broad areas, even though irregular in thickness and lithology. The Millard coal bed overlies a sandstone that not only persists over most of Pike County but is extensive also in Buchanan and Dickenson Counties, Va., where it is known as the Gladeville sandstone.[2] The Pond Creek (Lower Elkhorn) coal bed similarly overlies a persistent sandstone. Practically all the natural exposures in Pike County are of sandstone, because of its resistance to erosion. Even the sandstones are generally concealed by soil, but they form topographic benches that are exceedingly helpful in the correlation of coal beds (p. 5). Hinds[3] estimated that in Buchanan County, Va., sandstone forms about one-third of the Pennsylvanian rocks. This estimate seems approximately correct for Pike County also.

The sandstones are commonly arkosic, with flakes of light-colored mica, presumably muscovite, and decomposed feldspar supplementing the quartz grains. Locally the quartz grains exceed 0.03 inch in diameter but generally the diameters are less than 0.01 inch. Most of

[1] Hinds, Henry, The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, pp. 10, 19, 1918. Giles, A. W., The geology and coal resources of Dickenson County, Va.: Virginia Geol. Survey Bull. 21, pp. 10, 14, 1921.

[2] Hinds, Henry, Geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18 p. 18, fig. 2, 1918. Giles, A. W., The geology and coal resources of Dickenson County, Va.: Virginia Geol. Survey Bull. 21, p. 14, pl. 14, 1921.

[3] Hinds, Henry, op. cit., p. 11.

the very coarse grained sandstones are loosely cemented. The beds are irregular, commonly several feet thick, and thoroughly cross-bedded. The medium-grained sandstones are locally cemented with calcium carbonate; the beds are irregular though generally less than 2 feet thick, and these also are thoroughly cross-bedded. The fine-grained sandstones are locally cemented with calcium carbonate, silica, or clayey material, and the beds are generally even and rarely more than a few inches thick. More or less iron oxide stains the quartz grains, and the colors of the sandstone are buff, tan, gray, or white, depending upon the extent of staining. Plant impressions, irregular streaks of coaly material, and finely disseminated carbonaceous materials are abundant in most of the sandstones.

The slopes between topographic benches presumably have been eroded chiefly across beds of shale. On this assumption the Pottsville formation in Pike County consists mostly of shale, but it is rarely exposed except in excavations. The shales are generally blue gray. They are sandy and contain carbonaceous material and abundant minute flakes of mica. The shale can be classed in two groups on the basis of evenness of bedding. Some shale beds, typically the "draw slate" between a coal bed and its roof rock, are very irregularly bedded, locally grading to massive clay. These shale beds generally contain abundant plant impressions, some of which are beautifully preserved. The beds are commonly very sandy but contain little mica or calcareous material. Other shale beds are very evenly bedded, with minute mica flakes abundantly distributed along bedding planes, producing a pseudoschistosity. These beds are generally rich in calcium carbonate, part of which is disseminated through the shale, part in thin lenticular limestone beds, and part in concretionary masses. Thin layers of fine-grained sandstone are locally interbedded with the shale. The evenness of the bedding in these shale beds is suggestive of deposition in quiet water, presumably marine or at least brackish. The suggestion is strengthened by the fact that rocks of this lithologic type yielded the only marine invertebrate fossils found in the county.

Limestone is a common rock type but like the other lithologic units is very lenticular. The presence in nearby parts of West Virginia of fossil-bearing limestone beds has aroused considerable interest in the beds as guides in correlation. The members of the party searched carefully but found only nonfossiliferous and discontinuous beds of limestone in Pike County. Lateral gradation of the limestone to shale and even to sandstone can be seen at most excavations where the relations can be examined. Limestone beds are numerous but generally thin and unimportant as guides to correlation. Calcium carbonate, however, is abundant in both shale and sandstone as a cementing material.

The coal beds are the principal subject of this report and are described in detail on pages 14–90. Thirteen valuable coal beds were mapped over wide areas in Pike County. In addition, there are at least 48 less extensive beds that are generally thin but locally valuable.

Each of the intervals between coal beds varies considerably in composition but the thickness is not as variable as has been reported for adjoining areas.[4] The thickness of the interval between any two coal beds generally varies less than 20 percent across the entire county. Furthermore, these variations are local only, and no regional thickening or thinning has been found. They are attributed chiefly to deposition of the original sediments upon irregular surfaces and to differential compaction of the strata between the coal beds. The intervals are very useful in correlating the coal beds, but they must be used with caution because variations are known to exist as shown on the coal-section charts (pls. 1–46).

STRUCTURE

The strata in most of Pike County dip gently to the northwest at about 100 feet to the mile. The northwesterly dip, however, is interrupted by broad, low folds, such as the anticline southwest of Pond Creek, and by very local small folds, such as the swells and swales encountered in mining operations. Pine Mountain, along the southeast edge of the county consists of more sharply folded strata that were thrust northwestward onto the strata of gentle dip.

The dip of the strata in Pike County is shown on plate 48 by contours drawn at vertical intervals of 50 feet on the Pond Creek (Lower Elkhorn) coal bed. These contours show the northwest dip and the broad folds but not the very local folds. These local irregularities are important in mining operations but generally cannot be determined in advance of mining or core drilling. It should be noted that the structure contours are not wholly consistent with the altitudes shown on plates 1–46. This discrepancy occurs because the contours were drawn by averaging the altitudes of several localities rather than accepting the hand-level determined altitudes of individual localities.

At several places in the county the beds dip from the principal interstream divides toward the major stream valleys (pl. 48). The Marrowbone Creek and Pond Creek drainage basins are examples. These creeks flow down the plunge of structural troughs, and the beds rise along the tributary valleys to the divides bordering the drainage basins. This is an important and highly beneficial feature of the structure. It assists in the prevention of mine flooding and contrib-

[4] Hinds, Henry, The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, p. 10, pl. 5, 1918. Giles, A. W., The geology and coal resources of Dickenson County, Va.: Virginia Geol. Survey Bull. 21, p. 10, pl. 8, 1921. Hennen, R. V., and Reger, D. B., Logan and Mingo Counties, W. Va., pp. 136-222: West Virginia Geol. Survey County Repts., 1914.

utes to less costly mine operations by permitting down-grade movement of loaded mine cars. To be sure, the local swells and swales interfere with these benefits, but the difficulties introduced by the swells and swales would be far more serious if the general dips were not so favorable.

GEOMORPHOLOGY

There are several interesting problems involved in working out the development of the topography and drainage of Pike County.

The meanders of the stream bottoms are almost certainly inherited from an earlier drainage cycle whose old meanders have been preserved as the streams cut downward from a higher surface. Had the meanders developed as the stream became incised, there should be slip-off slopes on the valley walls inside of the meanders and steepened slopes along the outside. Locally such slopes can be found, as along Tug Fork a mile above Devon, W. Va., and again possibly at Matewan, W. Va. Russell Fork enters Pike County on the outside of what appears to be a slip-off slope. The wide valley bottom at Elkhorn City suggests considerable lateral cutting by both Russell Fork and its tributary Elkhorn Creek. Levisa Fork has apparently eroded laterally along the outside of the meander a mile above the mouth of Marrowbone Creek and at Pikeville. These relations and some of the cut-off meanders in the county indicate more or less lateral erosion by the streams as they were cutting downward. But these are distinctly local features and are exceptions rather than the rule. Commonly there is no appreciable difference between the slopes on the inside and outside of meanders, a relation which implies down-cutting without much change of the stream courses. It follows, therefore, that the present meanders are largely inherited from the drainage developed on a higher surface, presumably an erosion surface at roughly the position of the present hilltops. The general parallelism of the four principal streams suggests that they are consequential on the erosion surface and drained northwestward from a highland southeast of Pike County.

The tributaries of Pond Creek above Stone are unusually straight and parallel, suggesting that their development may have been partly controlled by the attitude of the rocks in the region which they drain. (See pl. 48.)

Elkhorn Creek, a tributary of Russell Fork, follows the valley eroded along the front of the Pine Mountain overthrust block. Elsewhere in Pike County the development of the drainage apparently was not determinably influenced by the attitude of the underlying rocks.

There are several interesting examples of cut-off meanders. The most conspicuous of these are along Elkhorn Creek at the mouth of Ashcamp Branch, at the mouth of Little Branch, and on Shelby Creek

at Yeager. At the mouth of Ashcamp Branch an isolated hill about 175 feet higher than the valley stands on the northwest side of the creek. Presumably the hill was once connected with the Pine Mountain foothills, and Elkhorn Creek flowed around it in a meander to the northwest. This change of stream course occurred very recently, because the cut-off channel is not very much higher than the present channel. At the mouth of Little Branch of Elkhorn Creek a meander to the northwest was apparently cut off while the stream was flowing at least 150 feet above its present position. Along Shelby Creek at Yeager the earlier channel apparently went past Yeager and Sukey Branch, as it does now, but at benchmark 714 Shelby Creek turned and flowed around the south side of the now isolated hill between the benchmark and Yeager. The interesting feature of this cut-off is the low gap between the present creek at Yeager and the cut-off meander. Presumably Shelby Creek had very nearly eroded through this low gap when the cut-off was effected at benchmark 714.

At the head of Shelby Creek there is a gap less than 50 feet high connecting with the valley of Elkhorn Creek. The water of these two streams comes together at the mouth of Shelby Creek, but Elkhorn Creek follows a circuitous course to the junction. It appears unlikely, therefore, that Elkhorn Creek has robbed the head of Shelby Creek. The more probable interpretation is that Shelby Creek is in the process of cutting off the head of Elkhorn Creek. This interpretation is strengthened by the fact that Agie Branch and the tributary across from it join Shelby Creek, as if they originally flowed southeastward as tributaries of Elkhorn Creek. Gravel derived from the older rocks exposed on Pine Mountain is abundant along Elkhorn Creek but conspicuously absent from the bed of Shelby Creek.

In practically all the valleys there has been more or less deposition of silt to form alluvial flats. In the main valleys the accumulated alluvium is so thick that it suggests an interruption to an earlier erosion cycle. Commonly the streams are entrenched about 25 feet into the alluvium. The flood plains are apparently old and no longer being aggraded, for their surfaces have many local irregularities.

The gradient of each of the streams is very low, and alluvial fans have been built onto the valley bottoms at the mouths of many tributary hollows. Locally a fan has been extended completely across the valley and is trenched only by a narrow channel through which the stream flows. Generally a fan forces a stream against the far side of the valley, and so it is of interest to note that at some localities, as in Ratliff Creek, the stream channel has been cut across the highest part of the fan.

COAL BEDS IN PIKE COUNTY

Pike County contains 13 valuable coal beds that have been mined for interstate shipment. These beds are generally 4 to 5 feet thick but locally exceed 5 feet. In addition to these there are at least 48 other coal beds that are generally thin but locally thick enough to be minable under present economic conditions.

All the coal is of medium-volatile or high-volatile bituminous rank. The lowest fixed-carbon content—53.2 percent—was found in the Upper Elkhorn No. 2 bed where that bed is chiefly cannel; the highest—69.4 percent—was found in the Pond Creek (Lower Elkhorn) bed. The fixed carbon in most of the samples is between 60 and 65 percent, in general increasing southeastward. The amount of ash in the coal samples is very low, the sulphur is generally low, and the moisture content is generally between 2 and 4 percent, rarely rising higher and in a few samples apparently rich in canneloid material falling to 0.7 and even 0.5 percent. These features combine to make the coal of excellent quality.

Most of the coals have refractory ash, softening above 2,600° F.; some have ash of medium fusibility, softening between 2,200° and 2,600° F.; and only a few samples fall into the class of easily fusible ash, softening below 2,200° F.

Although the quality of the coal is generally high, it varies from place to place and from one bed to another. The quality at any one place is largely determined by the amount of ash-forming materials in the coal, for with increased ash content the heating value is relatively lowered. The Pond Creek (Lower Elkhorn), Alma (Upper Elkhorn No. 1), Upper Elkhorn No. 2, and Upper Elkhorn No. 3 beds, and the coal bed 70 feet above the Williamson bed contain small quantities of ash, except at a few places, and are high in heating value (about 14,000 British thermal units) and low in sulphur. Ash is present in moderate quantities in the Williamson and Flatwoods beds and the beds 140 feet and 310 feet above the Flatwoods. The heating value of these coals averages about 13,600 British thermal units, and the sulphur is low except in the Williamson bed, where it averages about 2.5 percent. The ash is generally high in the Elswick bed and the bed 50 feet above the upper Elkhorn no. 3; and the heating value is generally low in comparison to that of the coals of lower ash content. The sulphur in these coals is low and does not appear to be related to the amount of ash present. In the remaining beds (the bed 90 feet above the Elswick and the Auxier, Millard, Bingham, Bevins, and Taylor beds) the ash is highly variable and the heating value varies correspondingly. In samples of these coal beds the heating value ranges from 9,090 to 14,530 British thermal units and averages about 13,500. In the bed 90 feet above the Elswick bed and in the Millard, Bevins, and Taylor beds the sulphur is generally low, although the

ash is variable. In the other beds the sulphur content generally varies directly with the ash content.

Bands of cannel are common in the coal beds of the county. The bands are rarely as thick as 20 inches, but at the mine of the Purity Cannel Coal Co., in division 31, there is 3 feet of cannel. The apparently humic type of coals probably contain a considerable and irregular admixture of canneloid material, which is not easily recognized without microscopic examination. This admixture of high-volatile canneloid material is believed to account for the irregular variation of fixed-carbon content of the coal as shown by the analyses.

Two maps (pls. 49 and 50) have been prepared showing changes in fixed-carbon content (pure-coal basis) of coal beds in the county. One of the maps shows changes of fixed-carbon content in the Pond Creek (Lower Elkhorn) bed, the other shows changes in fixed-carbon content in all the beds. Obviously the isocarbs (lines of equal fixed carbon) shown on the maps are drawn arbitrarily, for despite the number of analyses the isocarbs could be drawn at an infinite number of positions. An attempt has been made to present a simple rather than complex interpretation by drawing the isocarbs as straight as possible and isolating the irregularities as closures. The interpretation probably errs toward oversimplification, but despite this the irregular fixed-carbon content is striking, and there can be little doubt that if more analyses were available even greater and more numerous irregularities would be found. They cannot be wholly attributed to errors in sampling and analysis, for many of them exceed the generally conceded limit (2 percent) of such errors and are based on more than one analysis.

There is no relation between the irregularities and the local structure. The gentle northwest dip of the coal beds is interrupted by a few broad, gentle folds that bear no uniform relation to the fairly evenly distributed irregularities of the carbon ratios.

The irregularities are not inconsistent with the theory of David White [5] that lateral pressure is a major causal factor in the metamorphism of coal. The crustal pressures directed northwestward during the Appalachian orogeny may have devolatilized the coal at every locality in Pike County and produced greater devolatilization at the more southeasterly localities, but the increase in fixed carbon toward the southeast would not be orderly if the composition of the original materials was not uniform.

According to the theory first proposed by Hilt,[6] coal beds low in the stratigraphic section in Pike County, which have been subjected

[5] White, David, Some relations in origin between coal and petroleum: Washington Acad. Sci. Jour., vol. 5, pp. 189–212, 1915; Metamorphism of organic sediments and derived oils: Am. Assoc. Petroleum Geologists Bull., vol. 19, pp. 589–617, 1935.

[6] Hilt, Carl, Die Beziehungen zwischen der Zusammensetzung und den technischen Eigenschaften der Steinkohle: Ver. deutscher Ing. Zeitschr., Band 17, Heft 2, pp. 194–202, 1873.

to greater weight of overburden, should be more metamorphosed (have a higher fixed-carbon content) than coal beds high in the section, which have been subjected to the weight of less overburden. Reeves [7] concluded that there is an average increase of 0.69 percent of fixed carbon per 100 feet of increase in thickness of overburden. However, if the analyses of two or more beds at localities less than a mile apart are compared for all of Pike County, it is found that more than a third of such comparisons show that the lower coal bed has lower fixed carbon than the high bed. If the comparison is further restricted to localities less than half a mile apart, it is found that nearly half of such comparisons show that the low coal bed has lower fixed carbon than the high bed; a few comparisons show the fixed carbon practically equal in the low bed and in the high bed; and less than half of the comparisons show higher fixed carbon in the low bed than in the high bed. These facts are not necessarily inconsistent with Hilt's theory, because if the effect of differences in original composition could be properly evaluated it is possible that lower coal beds would show a greater proportionate devolatilization than higher coal beds.

COAL BEDS BELOW DRAINAGE LEVEL

Probably about 1,000 feet of coal-bearing strata lie below the drainage level of most of Pike County. The logs of some of the wells drilled into these strata report coal beds, and these are shown on the coal-section charts (pls. 1–46), but their thickness, extent, and correlation are generally not known. The coal beds are not yet important commercially, but they constitute a large reserve that can be mined by shafts when the more accessible reserves are exhausted.

COAL BEDS ABOVE DRAINAGE LEVEL

COAL BED 60 TO 80 FEET BELOW THE ELSWICK BED

A coal bed 60 to 80 feet below the Elswick has been opened at a few localities in divisions 33 and 34. (See p. 48.) This is the lowest coal bed that outcrops in the county. The bed is reported to be 2 feet thick at locality 2899, in division 33, but no other data are available regarding it. If this investigation is correct in correlating the Elswick with the Upper Banner coal bed of Buchanan County, Va. (see below), this coal is probably equivalent to the Lower Banner of Buchanan County.

ELSWICK COAL BED

The lowest valuable coal bed exposed in Pike County is the Elswick, named from the Federal mine no. 1 of the Elswick Coal Co. (locality 2956), at the mouth of John Moore Branch, about a mile below Elk-

[7] Reeves, Frank, The carbon-ratio theory in the light of Hilt's law: Am. Assoc. Petroleum Geologists Bull., vol. 12, pp. 795–824. 1928.

horn City. The bed is exposed only in the deepest valleys in the easternmost part of the county. Hinds[8] places the Elswick coal between the Kennedy and Lower Banner coal beds of the Buchanan County section. The results of the present investigation, however, indicate that the Elswick is more nearly equivalent to the Upper Banner coal bed in Buchanan County although the analyses of the Elswick coal as given in this report do not agree very well with those of the Upper Banner coal bed as given by Hinds. There are no analyses listed for beds between the Kennedy and Lower Banner.

Several samples of Elswick coal were analyzed, and the results are given in the tables of analyses at the end of this report.

COAL BEDS BETWEEN THE ELSWICK AND AUXIER BEDS

At least three coal beds are known in the sequence of rocks, about 180 feet thick, separating the Elswick and Auxier beds. They are probably very lenticular.

A 2-foot coal bed 25 feet above the Elswick was found in division 34.

A coal bed locally 2 feet thick midway between the Elswick and the Auxier (90 feet above the Elswick) was found in several divisions (pl. 47). If the Elswick and Auxier have been correctly correlated with coal beds in Buchanan County, Va., this coal bed probably is equivalent to the Splash Dam of Buchanan County. Hinds,[9] however, correlated the Splash Dam with the Auxier. The coal analyses of the Splash Dam bed as given by Hinds are very similar to the analyses given in this report for the bed 90 feet above the Elswick.

A thin coal bed about 45 feet below the Auxier was found in several of the divisions.

AUXIER COAL BED

The type locality for the Auxier coal bed is the Federal mine no. 2 of the Elswick Coal Co. (locality 2957), at the mouth of John Moore Branch, about a mile below Elkhorn City. The Auxier is about 180 feet above the Elswick, and its outcrop accordingly extends farther west but still is confined to the eastern part of the county. Hinds[9] has correlated the Auxier with the Splash Dam coal bed of Buchanan County, Va., but this investigation indicates that the Auxier is more nearly equivalent to the Hagy of Buchanan County. The analyses of the Auxier bed, as given in this report, are very different from analyses of the Splash Dam coal as given by Hinds. No analyses of the Hagy are given in Hinds' report.

The Auxier coal bed is generally about 3 feet thick. Ten samples of the coal were analyzed; and the results are given in the tables.

[8] Hinds, Henry, The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, fig. 2, 1918.

[9] Hinds, Henry, op. cit., fig. 2.

COAL BEDS BETWEEN THE AUXIER AND MILLARD BEDS

Locally two coal beds occur in the 180-foot interval between the Auxier and Millard beds (pl. 47). Probably they are very lenticular. The upper bed is generally about a foot thick, but the lower bed is locally 2 feet thick. These beds are so thin that there are not enough openings on them to determine their extent and the correlation of the coals between the openings.

MILLARD COAL BED

The name "Millard" was given by Stone[10] to the coal bed exposed in several domestic mines (localities 1814, 2623, 3423, and 3424) about 175 feet above the junction of Levisa and Russell Forks. This coal bed is about 180 feet above the Auxier coal bed and is above drainage level over most of the southern and eastern parts of the county. The present report agrees with Hinds[11] in correlating the Millard with the Glamorgan coal bed of Buchanan County, Va.

In most of Pike County the Millard coal bed is thin, but there are some considerable areas where it is 2 to 3 feet thick. The analyses of 13 samples of Millard coal are given in the tables.

COAL BEDS BETWEEN THE MILLARD AND BINGHAM BEDS

At least four coal beds occur in the interval, generally about 180 feet thick, between the Millard and Bingham beds (pl. 47). Probably they are very lenticular. They are generally about 1 foot thick, but locally some of them reach 2 feet or more. There are not enough openings on these beds to determine their extent accurately.

BINGHAM COAL BED

Stone[12] first used the name "Bingham" for a coal bed opened on the E. B. Bingham property, on Ferrell Creek. There is some uncertainty regarding the location of the opening referred to by Stone, but the existence of a valuable coal bed at the stratigraphic position he described is perfectly definite. In this report the name "Bingham" is retained for the coal bed at locality 2301, in division 27, near the point where the bed passes beneath Grapevine Creek. The Bingham coal bed is also known as the Feds Creek coal bed. It is about 180 feet higher than the Millard and about 180 feet below the Pond Creek (Lower Elkhorn) coal bed. This report agrees with Hinds[13] in correlating the Bingham with the Clintwood coal bed of Buchanan County, Va., and the Matewan coal bed of Mingo County, W. Va.

[10] Stone, R. W., Coal resources of the Russell Fork Basin in Kentucky and Virginia: U. S. Geol. Survey Bull. 348, p. 38, 1908.

[11] Hinds, Henry, op. cit., fig. 2.

[12] Stone, R. W., op. cit., p. 35.

[13] Hinds, Henry, op. cit., fig. 2.

The Bingham coal bed is commonly 3 feet or more thick in the eastern part of Pike County but thins toward the west and north. Twelve samples of the Bingham coal were analyzed, and the results are given in the tables.

COAL BEDS BETWEEN THE BINGHAM AND POND CREEK (LOWER ELKHORN) BEDS

There are at least five coal beds in the 180-foot interval between the Bingham and Pond Creek (Lower Elkhorn) beds in Pike County (pl. 47). Probably these beds are very lenticular. They are generally only about a foot thick but locally attain a thickness of 2 to 3 feet. Openings on them are too few to determine their extent and correlation accurately.

POND CREEK (LOWER ELKHORN) COAL BED

The name "Pond Creek" has long been used to designate the coal bed now being mined by the Fordson Co. in Pond Creek. The bed is also known as the Freeburn and Warfield coal bed in divisions 9, 10, and 11. The name "Lower Elkhorn" is used for the same bed in the southern and central parts of the county. In this report the term "Lower Elkhorn" refers to the lower of the two beds being mined at the Henry Clay mines in division 36. This is the same designation used by Stone,[14] and Butts[15] also used it for a coal bed at the same stratigraphic position in the southern part of Pike County. The Lower Elkhorn is about 180 feet higher than the Bingham coal bed. This report agrees with Hinds[16] in correlating the Lower Elkhorn coal bed with the Campbell Creek coal bed of Buchanan County, Va., and the adjoining parts of West Virginia.

The Pond Creek (Lower Elkhorn) coal bed is 4 to 5 feet thick in most of Pike County, but the top few inches of the bed is commonly laminated and has a high ash content. The bed thins westward and in the westernmost divisions of the county it is generally only about 18 inches thick. In some of the western divisions several thin coal beds were found at the approximate position of the Lower Elkhorn, and which of these beds represents the Lower Elkhorn is not known (pl. 47).

About 85 samples of the Pond Creek (Lower Elkhorn) coal have been chemically analyzed, and the results are given in the tables. The coal contains very little sulphur, commonly less than 0.7 percent. The usual mining practice is to exclude the laminated coal, which contains 20 to 30 percent of ash. The main part of the bed has a very low ash content, generally about 5 percent, but locally as low as 2½ percent. The ash is generally refractory; in about 50 of the samples its fusibility exceeds 2,600° F. and in some approaches 3,000° F. A small-scale

[14] Stone, R. W., op cit., pp. 35–37.

[15] Butts, Charles, The coal resources and general geology of the Pond quadrangle of Virginia and Kentucky: U. S. Geol. Survey Bull. 541, pp. 54–55, 1914.

[16] Hinds, Henry, op. cit., fig. 2.

map (pl. 49) has been prepared to show the general changes in carbon ratios of this coal bed across Pike County.

COAL BEDS BETWEEN THE POND CREEK (LOWER ELKHORN) BED AND UPPER ELKHORN COAL ZONE

At least three coal beds are present in the interval, generally about 100 feet thick, between the Pond Creek (Lower Elkhorn) bed and the Upper Elkhorn zone. These beds are very lenticular. Generally they are only about 1 foot thick but locally attain a thickness of 2 to 3 feet. There are not enough openings on them to determine their extent in Pike County, but their general relations are shown on plate 47.

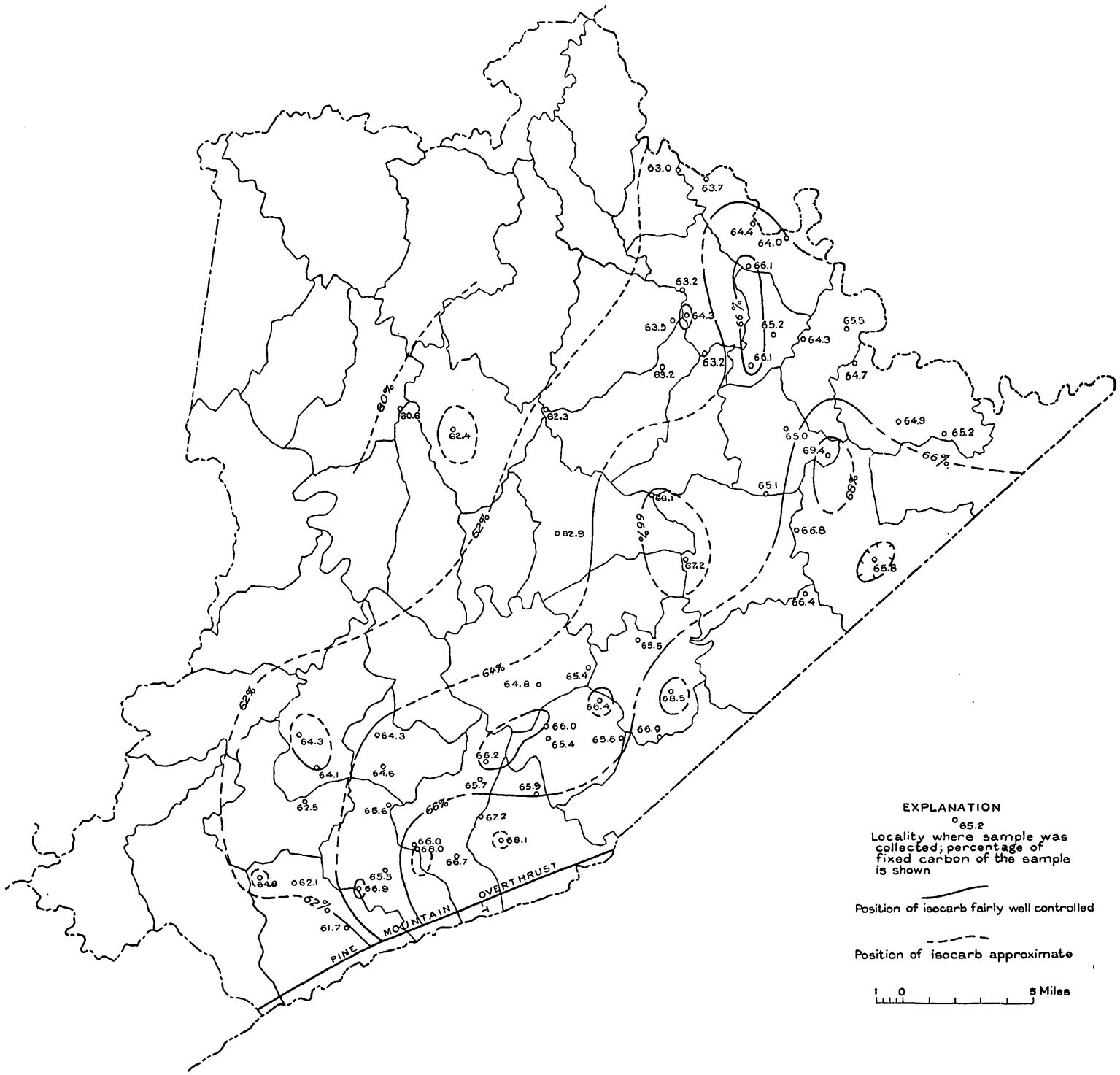
UPPER ELKHORN COAL ZONE

About 100 feet above the Pond Creek (Lower Elkhorn) coal bed is the base of the Upper Elkhorn coal zone, which is about 150 feet thick and contains several coal beds. Locally there are as many as six coal beds in the zone, and at numerous places three of the beds are thick. Although the thickness and character of these beds are widely variable, and the beds are closely spaced, an attempt has been made to distinguish three coal beds in the zone and correlate them across Pike County (pl. 47). No reason was found to doubt the correlation of the zone across broad areas in the county, and the correlation of the individual beds within any one division is probably fairly accurate. The correlation of individual beds from one division to another, however, is subject to considerable error.

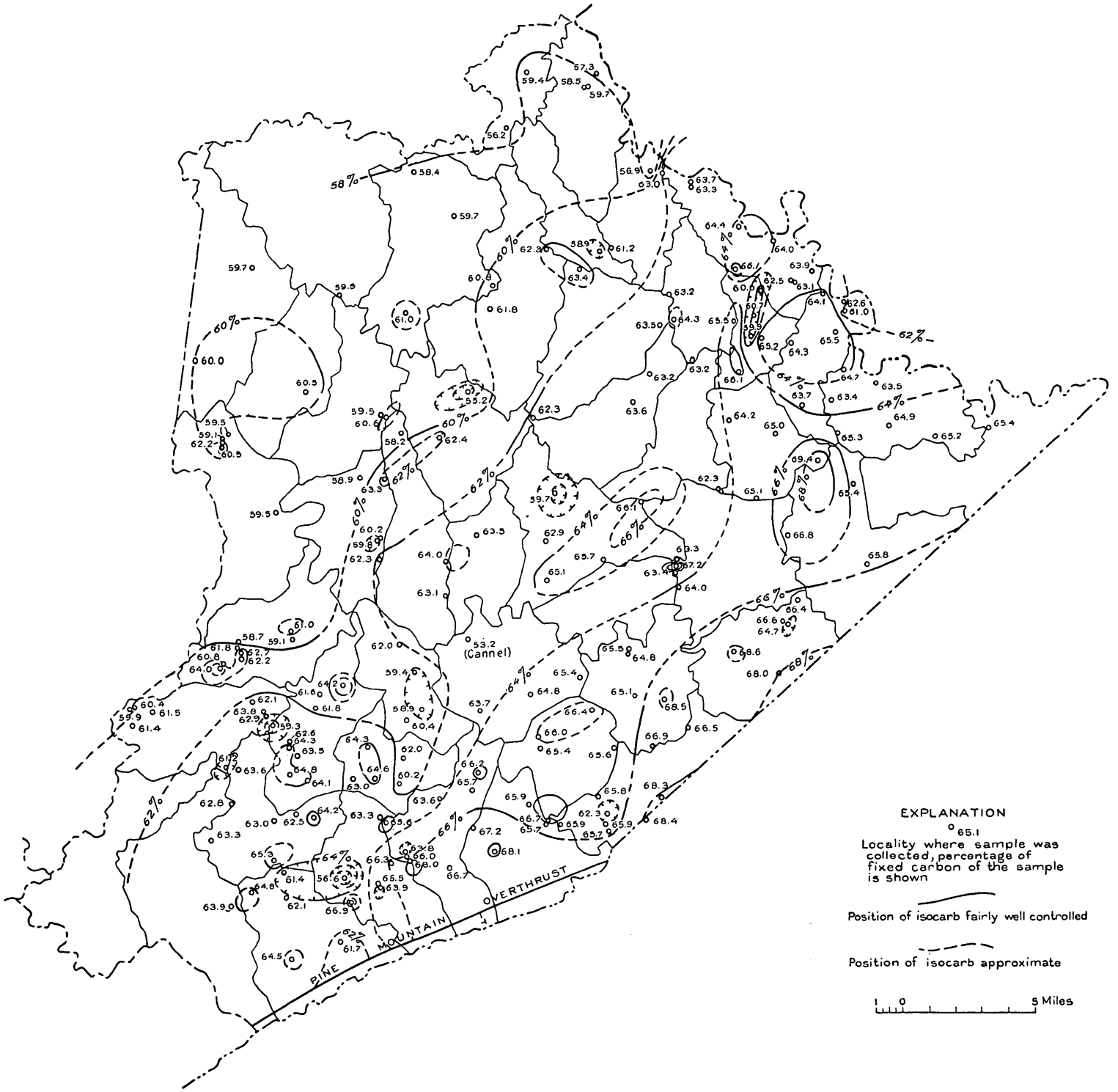
Nearly 100 samples of the Upper Elkhorn coal beds were collected and chemically analyzed. The results are given in the tables.

Alma or Upper Elkhorn No. 1 coal bed.—The type locality for the Alma coal bed is at locality 446, on the West Virginia side of Tug Fork, half a mile northeast of Sprigg, where it was first named and described by the West Virginia Geological Survey.[17] The coal bed is at the base of the Upper Elkhorn coal zone and about 100 feet above the Pond Creek bed. The correlation of the Alma coal bed over the northeastern part of the county is fairly certain, but its indicated equivalent (pl. 47) to the Upper Elkhorn No. 1 on Johns Creek and Levisa Fork is questionable. At the head of Johns Creek and on Grapevine Creek near Levisa Fork the Upper Elkhorn No. 1 is 110 feet above the Lower Elkhorn and is probably equivalent to the Alma. Down Johns Creek the interval remains fairly constant, and the correlation is believed to be correct. Along Levisa Fork, however, the Upper Elkhorn No. 1 has been correlated with the Upper Elkhorn No. 2, which in turn can be traced northward to Johns Creek, where it overlies the Upper Elkhorn No. 1. This inconsistency was recognized by the party in the field, and a concerted but futile effort was made to

[17] Hennen, R. V., and Reger, D. B., Logan and Mingo Counties, p. 177: West Virginia Geol. Survey County Repts., 1914.



MAP SHOWING GENERAL CHANGES IN PERCENTAGES OF FIXED CARBON (PURE-COAL BASIS) IN THE POND CREEK (LOWER ELKHORN) COAL BED, PIKE COUNTY, KY.



MAP SHOWING GENERAL CHANGES IN PERCENTAGES OF FIXED CARBON (PURE-COAL BASIS) IN THE COAL BEDS OF PIKE COUNTY, KY.

locate the error. It is probably in the Levisa Fork drainage basin west of lower Pompey Creek, an area where the Lower Elkhorn is thin and rarely opened and therefore cannot be used for a reference datum.

The Alma (Upper Elkhorn No. 1) bed is generally about 3 feet thick. About 25 samples of the coal were collected and chemically analyzed, and the results are given in the tables. The coal generally has less than 1 percent sulphur and in many samples only 0.5 percent. The ash content is commonly less than 5 percent and locally as low as 2½ percent. The ash is generally refractory, softening at more than 2,600° F.

Upper Elkhorn No. 2 coal bed.—The designation "Upper Elkhorn No. 2" is adopted in this report for the upper coal bed being mined at the Henry Clay mines, in the Marrowbone Creek Valley. This bed was designated simply "Upper Elkhorn" by Stone,[18] but other authors [19] and mining companies have widely used the term "Upper Elkhorn" for this bed and other beds now known to be higher than the Upper Elkhorn No. 2. The Upper Elkhorn No. 2 is generally about 175 feet above the Lower Elkhorn and is probably equivalent to the Lower Cedar Grove coal bed, locally also known as the Lower Thacker bed, in Buchanan County, Va.,[20] and Logan and Mingo Counties, W. Va.[21]

The cannel coal bed at the Purity cannel coal mine (locality 2619), in division 31, has been questionably correlated with the Upper Elkhorn No. 2 bed (pl. 31). There is a 105-foot interval between this coal and the coal bed at locality 2618, which is probably the no. 1 bed. The inhabitants report that no coal has been found in this interval. The cannel coal is above the expected position of the no. 2 bed and perhaps should be correlated with the no. 3 bed (p. 47). So far as now known, the cannel coal is restricted to the most northwesterly divide in division 31.

The no. 2 coal bed is generally about 3 to 4 feet thick. About 50 samples of the coal were collected and analyzed, and the results are given in the tables. The coal as a rule has less than 1 percent of sulphur and commonly 0.6 percent or less. The ash content is generally less than 5 percent and at several localities is 2 percent or less. The softening temperature of the ash shows a wide range but averages lower than that of the no. 1 bed.

Upper Elkhorn No. 3 coal bed.—In this report the designation "Upper Elkhorn No. 3" is adopted for the highest bed mined at Shelbiana

[18] Stone, R. W., Coal resources of the Russell Fork Basin in Kentucky and Virginia: U. S. Geol. Survey Bull. 348, p. 37, 1908.

[19] Butts, Charles, The coal resources and general geology of the Pound quadrangle of Virginia and Kentucky: U. S. Geol. Survey Bull. 541, p. 26, 1914. Hudnall, J. S., The Elkhorn coal field: Kentucky Geol. Survey, ser. 6, vol. 27, p. 131, 1925.

[20] Hinds, Henry, The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, p. 76, fig. 2, 1918.

[21] Hennen, R. V., and Reger, D. B., Logan and Mingo Counties, p. 174: West Virginia Geol. Survey County Repts., 1914.

(locality 3494). This is probably the same bed that is now being mined by the Consolidation Coal Co. at Jenkins, south of Pike County. The Upper Elkhorn No. 3 is about 60 feet higher than the Upper Elkhorn No. 2 and is probably correlative with the Cedar Grove coal bed of the adjoining parts of Virginia and West Virginia.

The no. 3 bed is commonly 4 feet thick in the southern part of Pike County but apparently thins toward the north and northeast. About 20 samples of this coal were collected and analyzed. (See tables.) The bed generally has about 1 percent of sulphur, but the ash is generally less than 5 percent. The softening temperature of the ash shows a wide range but averages a little lower than that of the no. 1 bed.

WILLIAMSON COAL BED

The Williamson coal bed was named by the West Virginia Geological Survey.[22] It is about 290 feet above the Pond Creek bed and about 70 feet above the Upper Elkhorn No. 3.

The Williamson bed is generally about 4 feet thick in the northern part of Pike County but apparently thins southward and is 2 feet or less in most of the county. Five samples of the Williamson coal collected in the northern part of the county were analyzed, and the results are given in the tables.

COAL BEDS BETWEEN THE WILLIAMSON AND BEVINS BEDS

At many places in Pike County there are three probably lenticular coal beds in the zone, generally about 120 feet thick, between the Williamson and Bevins beds (pl. 47). These beds are commonly thin but locally a few feet thick. Their extent is not known.

BEVINS COAL BED

The Bevins coal bed is named from the opening (locality 1270) near the store of J. Mont Bevins, on Bent Branch of Johns Creek. It is about 120 feet above the Williamson coal bed. The bed can be followed fairly satisfactorily in the northwestern part of the county, where it contains a distinctive parting of halloysite, a clay mineral, 1 to 3 inches thick 3 to 12 inches above the base of the coal. To the east and south it is so high on the hillsides that few openings have been made on it, and correlations there are very uncertain. No openings on this bed were found along Tug Fork, and correlation with the West Virginia section is therefore speculative. The stratigraphic position suggests the Hernshaw coal reported by Hennen and Reger [23] about 120 feet above the Williamson coal bed at Chattaroy.

In most of the county other coal beds are closely associated with the Bevins bed, above and below it, and these cannot be distinguished

[22] Hennen, R. V., and Reger, D. B., Logan and Mingo Counties, pp. 29, 75-76; West Virginia Geol. Survey County Repts., 1914.

[23] Hennen, R. V., and Reger, D. B., op. cit., pp. 166-168.

everywhere. The correlation line for the bed therefore should be regarded as representing a zone of generally three beds and not the Bevins alone. The Bevins is generally the thickest of the beds and at most localities is about 3 feet thick.

Seven samples of the Bevins coal were collected and analyzed, and the results are given in the tables. Most of the samples show low sulphur and only moderate ash content, and the ash is refractory. The sample collected at locality 1361, in division 17, however, shows a high content of sulphur and of relatively nonrefractory ash. The analysis is sufficiently different to suggest that this is not the Bevins coal bed but probably one of the beds closely associated with it.

COAL BEDS BETWEEN THE BEVINS AND TAYLOR BEDS

There are at least four coal beds, probably lenticular, in the interval, generally about 170 feet thick, separating the Bevins and Taylor beds (pl. 47). In the northwestern part of Pike County some of these beds are 3 feet and more in thickness. Their extent and correlation, however, are not known, because the beds are high on the hillsides and not opened at many places in other parts of the county.

TAYLOR COAL BED

Mining engineers working in northern Pike County have long used the name "Taylor" for a coal bed about 175 feet above the Bevins coal bed. The name is adopted for this report, and locality 137, on Taylor Fork (division 2), is taken as the type locality. The Taylor coal bed has been extensively prospected on the lower part of Big Creek, but little is known of the bed elsewhere because it is high on the hillsides and therefore not frequently opened in most of the central and eastern parts of the county. Correlation with beds in adjoining areas is thus very uncertain. The stratigraphic position of this bed, however, is suggestive of the Chilton coal bed, described by Hennen and Reger [24] in their section at Chattaroy, W. Va.

The bed is generally about 3 feet thick. Samples of the coal collected at three localities in the county have been analyzed. (See tables.)

COAL BEDS BETWEEN THE TAYLOR AND FLATWOODS BEDS

At least two coal beds are present in the zone, generally about 100 feet thick, between the Taylor and Flatwoods beds in Pike County (pl. 47). At a few localities these beds are as much as 3 feet thick. Their correlation and extent, however, are not known.

FLATWOODS COAL BED

The name "Flatwoods" has long been used for a thick coal bed about 700 feet above the Lower Elkhorn in the Flatwoods region

[24] Idem, pp. 29, 75.

of southern Pike County. Except in the Flatwoods region this bed is seldom found in the central, southern, or eastern parts of the county, because it is very high on the hillsides and is therefore rarely prospected. A thick coal bed on lower Big Creek in the northwestern part of the county has been prospected extensively, is well known, and locally is referred to as the Winifrede coal bed. It is 120 feet above the Taylor and 700 feet above the Pond Creek and therefore is probably correlative with the Flatwoods bed.

The Flatwoods coal bed is commonly more than 3 feet thick. Six samples of the coal were collected and analyzed, and the results are given in the tables.

COAL BEDS ABOVE THE FLATWOODS BED

At least nine coal beds above the Flatwoods have been opened in various parts of Pike County (pl. 47). Some of these are thick, but they are so high topographically and so seldom prospected that their correlation and extent are practically unknown. Two samples of these high coal beds were analyzed, and the results are given in the tables.

MINES, PRODUCTION, AND MINING METHODS

Probably about 75 commercial mines have produced coal in Pike County for interstate shipment. Nearly half of these mines have continued production despite recent economic conditions. In addition to these large mines there are more than a thousand active small domestic mines serving the local demand.

The commercial mines are grouped along the railroads. The county therefore contains portions of two coal fields—the northern one served by the Norfolk & Western Railway, and the southern one by the Chesapeake & Ohio Railway and the Carolina, Clinchfield & Ohio Railway.

The northern part of the county was first developed and has more extensive operations than the southern part. In 1933, the last year for which statistics are available, the northern part produced nearly 3,000,000 tons of coal, and the southern part produced nearly 1,500,000 tons.

The following table shows the development of Pike County coal production since 1901:

Coal produced in Pike County, 1901–33

[Data compiled from publications of the U. S. Geological Survey and Bureau of Mines]

Year	Tons	Approximate percentage of United States total	Year	Tons	Approximate percentage of United States total
1901 (estimate)	75,000		1919	4,784,899	1.0
1902 (estimate)	25,000		1920	4,925,635	.9
1903 (estimate)	190,000		1921	3,317,589	.8
1904 (estimate)	50,000		1922	5,671,572	1.3
1905 (estimate)	200,000		1923	5,893,637	1.4
1906	308,759	0.1	1924	5,895,731	1.2
1907	533,687	.1	1925	7,175,403	1.4
1908	561,735	.2	1926	7,703,730	1.3
1909	684,450	.2	1927	7,749,475	1.5
1910	953,605	.2	1928	7,073,149	1.4
1911	1,136,997	.3	1929	7,372,445	1.4
1912	1,406,462	.3	1930	5,929,378	1.3
1913	2,224,041	.4	1931	4,659,100	1.2
1914	2,653,315	.6	1932	4,002,219	1.3
1915	2,830,236	.6	1933	4,226,754	1.3
1916	3,756,927	.7			
1917	3,846,651	.7	Total	112,190,581	
1918	4,473,000	.8			

The coal is used for steam and domestic purposes, gas production, railroad fuel, brick and ceramic burning, and cement manufacture.

The commercial mines are fully equipped with electric power, and their methods and equipment are of the most modern labor-saving and safety-promoting kinds. The coal beds are nearly flat, and all the mines are drifts that enter the coal by tunnel. Main entries and side halls are driven back, and the coal is removed from these and connecting rooms. Broad pillars of coal left standing between the rooms support the roof while the mine is being extended to the property limits. When these limits are reached and the rooms fully mined out, the coal pillars are removed, working back from the ends of the halls, and the roof is allowed to cave.

The mining of the coal first involves the cutting out of a layer at the top or bottom of the bed. The cut is generally a few inches thick and several feet into the face and is made by electrically operated machines. A hole is then drilled into the main part of the bed, an explosive charge placed in the hole, and the bed broken down by firing the charge. Dirty coal and partings are removed by hand while the coal is being shoveled into mine cars. The loaded cars are then pulled in long trains by electric locomotives to the drift mouth and headhouse. At the tipple the coal is mechanically sorted by size and, if necessary, can be further picked over to remove dirty coal overlooked at the mine face. In general, however, the coal beds being mined in Pike County have very low ash content, so that laborious cleaning and picking of the coal is not essential. A few of the mines have satisfactorily filled orders requiring less than 2½ percent of ash in the coal as shipped.

The natural conditions are favorable to mine development in Pike County. The coal beds are nearly flat and practically free of water and gas. The writers have found no records of explosions due to natural causes.

The percentage of the coal recovered during mining in the county can hardly be estimated. All the large mines have excellently planned operations, which, if carried to completion, would result in a very high percentage of recovery—probably about 85 percent. Fluctuations in business conditions, however, interrupt well-planned mine operations. Enforced idleness for extended periods results in caving of the roofs, and at many places in some of those mines caving now prohibits further work. The percentage of recovery in such mines is accordingly very low.

Some criticism may be raised by failure of the mines to recover first the very high coal beds, which locally may be ruined by fracturing due to removal of lower beds. The opening of mines high above valley floors, however, entails an additional immediate expense, even though involving a saving of coal reserves, and until this procedure is adopted by the whole industry, a single field is unable to undertake it successfully.

COAL RESERVES

Pike County contains about 8,000,000,000 tons of coal, in beds 12 inches or more thick, minable by drift mines. Beds less than about 30 inches thick are not commercially mined in the county under present economic conditions, but beds of less thickness constitute reserves that can be mined when they are needed. The estimate of 8,000,000,000 tons assumes that there are 15 coal beds with a density of 1.3 that average 20 inches in thickness across 35 percent of each division. It probably errs in being too small rather than too large. However, the coal beds minable by drift methods in each division probably constitute less than half—perhaps a fourth or a fifth—of the total coal that may be expected down to the base of the Pennsylvanian series.

THE COAL BEDS, BY DIVISIONS

In order to facilitate the presentation and the use of the data contained in this report, Pike County has been divided into 46 parts. The divisions are very arbitrary in size and shape, having been selected only for convenience of description. The divisions are shown on plate 48, and each division number corresponds to the number of the plate illustrating the relations of coal openings in the division. Plates 1–46 show the altitude and correlation of coal openings and the thickness of the coal beds. Altitudes are shown by contours with 200-foot intervals. Coal openings are numbered, and symbols indicate openings where measured sections are recorded. The measured

sections are grouped by beds at the edges of the plates. Correlations between coal openings are indicated by connecting lines, the degree of certainty and uncertainty being shown by different kinds of lines. The principal streams of each division are indicated at the bottom of the plate, for general orientation.

The following descriptions emphasize the uncertainties, perhaps unduly so, but they are intended merely to supplement the plates. The plates themselves illustrate most of the obvious features and established facts but do not properly emphasize many uncertainties.

DIVISION 1

The Flatwoods coal bed is the highest bed found in division 1, but there is probably another valuable bed about 100 feet higher. This higher bed, if present, would underlie enough area to be suitable for mining, and it is reported to be 5 feet thick at the nearby locality 196, in division 3. The Flatwoods bed is more than 50 inches thick in most of the eastern part of the division, but it apparently thins westward. However, more prospecting at the head of Long and Swinge Camp Branches is needed to prove this. The analysis of a sample of the Flatwoods coal bed, taken from locality 54, is given on page 89.

The Taylor coal bed is about 100 feet below the Flatwoods bed in division 1, but very little information concerning it is available. Caved prospect openings found at localities 53 and 61 are probably on the bed. At nearby locality 97, in division 2, this coal bed is more than 40 inches thick.

One or more thin coal beds about 100 feet below the Taylor are represented at localities 29, 52, and 59. At locality 59 a coal bed 12 inches thick is exposed.

About 200 feet below the Taylor there is a zone about 75 feet thick containing three coal beds, the middle one of which is probably the Bevins coal bed. At the localities where only one of the beds is opened it is uncertain which is represented. For this reason the indicated correlation of the Bevins coal bed in division 1 must be considered a general correlation for the zone rather than for the beds within the zone.

The Williamson coal bed, about 120 feet below the Bevins, has been opened at several localities in division 1. The bed is generally more than 3 feet thick but contains thin shale partings near the top.

Probably the coal beds are nearly flat in most of the division, but in the northwestern part there seems to be a fairly steep northwest dip. Additional prospecting to provide more accurate correlations at the head of Lick, Long, and Swinge Camp Branches is needed to prove the inferred dip.

DIVISION 2

The Flatwoods coal bed is the highest bed mapped in division 2, but another coal bed about 100 feet higher was found at localities 133 and 177. These localities show several thick partings in the coal, but there may be a thick bench of clean coal about 20 feet lower. This is suggested by the section at the nearby locality 337, in division 4, which is also thought to be 100 feet above the Flatwoods coal bed.

The Flatwoods coal bed has been mined at Borderland and one of the Fall Branch mines and prospected at several localities in the north half of division 2. The indicated correlation (pl. 2) there is probably correct. There are few openings on the bed in the south half of the division, however, and the indicated

correlation of the few openings is uncertain. The bed commonly consists of two thick benches of coal separated by a few inches of shale.

The Taylor coal bed, about 125 feet below the Flatwoods bed in division 2, has also been opened at several localities in the north half of the division. The correlations there are probably correct, but in the south half of the division, where openings are few, the correlation is uncertain. This coal bed has only very thin shale partings and is about 42 inches thick at most of the localities.

The Bevins coal bed should be present about 120 feet below the Taylor. At localities 174 and 180 coal beds were found at this position and may represent the Bevins bed. In other parts of Pike County, notably southwest of division 2, the Bevins is an excellent bed of coal, and it may be valuable in this division.

On plate 2 locality 115 is indicated about 65 feet higher than the Williamson coal bed, but this is very uncertain.

The Williamson coal bed has been opened at many localities. It is being commercially mined at Borderland and has been mined at one of the Fall Branch mines in division 2. The correlation of openings shown on the plate is probably correct. The bed is generally more than 3 feet thick but contains some shale partings near the top. Samples of the Williamson coal bed from the mine at Borderland were collected and analyzed, and the results are given on page 86.

In division 2 there are several openings of a coal bed about 95 feet below the Williamson. This bed may be the Upper Elkhorn No. 2, or it may be about 40 feet higher and therefore be correlative with the Upper Elkhorn No. 3. The bed could be measured at only three localities, and at each there is some shale in the coal.

A coal bed, probably the Alma, was found at several localities about 75 feet below the bed just described and about 120 feet above the Pond Creek coal bed. This coal bed is thick but contains several shale partings at localities 166 and 167, where it could be measured.

The Pond Creek coal bed, about 300 feet below the Williamson bed, has been opened at several localities on Turkey Creek. The northwest dip carries the Pond Creek bed under Tug Fork near the mouth of Bobs Branch. The coal bed therefore underlies practically all of the division. However, because the bed is known to thin westward in the central and southern parts of Pike County, a core-drill survey should precede attempts to mine this coal bed extensively in division 2.

The coal beds dip about 300 feet from the southeast to the northwest edge of the division.

DIVISION 3

The Williamson coal bed is the highest bed mapped in division 3, but there are several higher beds. Localities 186 and 196 are on the highest bed and may represent the bed 100 feet above the Flatwoods coal bed. Localities 184 and 185 may represent the Flatwoods coal bed; localities 194, 203, and 224 the Taylor coal bed; and locality 202 the Bevins coal bed. The few sections measured on these beds indicate that each is a valuable coal bed, locally at least. However, too little is known of them to be sure of the correlations.

There are numerous openings on the Williamson coal bed in the valley of Long Fork. Localities 223 and 232, on Coburn Branch of Big Creek, may also be on this bed. The Williamson bed is more than 3 feet thick but contains shale partings near the top at each of the five localities where the bed was measured.

A coal bed about 90 feet below the Williamson bed has been opened at a few localities. The bed is probably correlative with the upper Elkhorn no. 3. It is 2½ feet or more in thickness at the four localities where measurements could be made (pl. 3). A sample collected from locality 222 was analyzed (p. 83).

The Upper Elkhorn No. 2 bed is about 140 feet below the Williamson coal bed in division 3. It is 3 to 4 feet thick but contains shale partings at the nine localities where measurements could be made.

A coal bed 70 feet below the Upper Elkhorn No. 2 has been prospected at several localities along Big Creek and is probably the Alma coal bed. It is 2½ feet thick at the only locality where a measurement could be made. A sample of the bed collected from the nearby locality 1219, in division 15, was analyzed (p. 76).

The coal beds in division 3 dip about 450 feet from the southeast to the northwest edge of the division.

DIVISION 4

The Williamson coal bed is the highest bed mapped in division 4, but there are several higher beds. Localities 335 and 337 are on the highest bed, which may be the bed 100 feet above the Flatwoods coal bed. The bed is in two thick benches, but at locality 337 the upper bench has several shale partings. Localities 303 and 336 may represent the Flatwoods coal bed. A coal sample collected at locality 303 was analyzed (p. 89). No openings were found on the Taylor, which is a fairly thick coal bed in division 2. It should be present about 300 feet above the Williamson coal bed and about 100 feet below localities 303 and 336 if they represent the Flatwoods coal bed. The Bevins coal bed may be represented at locality 300, and there is a bed, reported to be 3 feet thick, 60 feet above it at that locality.

The Williamson coal bed has been opened at numerous places and is being mined at the Pond Creek Collieries. The bed is more than 3½ feet thick but contains some partings at most of the localities where measurements could be obtained. The bed was sampled at the Pond Creek Collieries, and the results are given on page 89.

Exposures along the highway on Coburn Branch indicate that the Upper Elkhorn No. 2 bed is thin or absent in the southern part of division 4. However, there is considerable uncertainty regarding the correlation of the coal beds within the 200-foot zone separating the Williamson and Alma coal beds. Three or more coal beds are present near the middle of this zone and each, locally at least, is thick. Considerably more prespecting is necessary to correlate these beds properly. The correlation line on plate 4 indicating a bed as Upper Elkhorn No. 3 therefore should be regarded as very uncertain.

The Alma coal bed, about 110 feet above the Pond Creek bed, has been opened at several localities along Pond Creek and Road Fork. The bed was not found in the north half of division 4, but locality 124, across Turkey Creek in division 2, may represent the Alma.

There are at least two coal beds in the 110-foot interval between the Alma and Pond Creek coal beds in division 4. These beds are generally thin, and no attempt was made to correlate them.

The Pond Creek coal bed is thick and extensive in this division. The Pond Creek Collieries are now mining it in the north half of the division, and several mines have worked the bed in the southeastern part. This bed is generally about 3½ feet or more thick, but the top 6 inches is commonly laminated with thin shale partings. Samples of the bed collected at the Pond Creek Collieries were analyzed (p. 63).

At several localities a coal bed is exposed about 50 feet below the Pond Creek bed. The bed is locally called the Pond Creek leader. It does not exceed 2 feet in thickness at the three localities where measurements could be made.

A coal bed about 380 feet below the Pond Creek bed was reported from wells 8 and 9. This deep bed is at the position of the Millard coal bed. Coal beds were reported about 1,000 feet below the Pond Creek bed in well 7 and about 1,250 feet below the Pond Creek in well 6. These two coal beds are below drainage level everywhere in Pike County except possibly along Pine Mountain.

There is nearly 300 feet of structural relief in division 4. The coal beds in general dip northwest, but this dip is interrupted by a fold in the divide between Pond Creek and Road Fork and a smaller fold in the divide between Julius Branch and Turkey Creek.

DIVISION 5

A high coal bed that may be thick over a considerable area in division 5 occurs at locality 1025, in the adjoining part of division 13, where it is 11 feet thick with a 12-inch parting near the middle.

The coal bed correlated as the Williamson on plate 5 is stratigraphically about 330 feet above the Pond Creek bed. This interval is greater than in division 4, and the bed may therefore be above the Williamson coal bed. The bed is several feet thick in division 5 but contains some partings.

There are at least two coal beds between the Williamson and the Upper Elkhorn No. 2 (?) coal beds, but no measurements could be made on them.

The coal bed designated "Upper Elkhorn No. 2 (?)" on plate 5 may be about 40 feet above the Upper Elkhorn No. 2. It contains partings at the two localities where measurements could be made; but it is reported to be 4 feet thick at locality 603, in the adjoining part of division 7. A sample collected at locality 340 was analyzed (p. 77).

A coal bed between the Upper Elkhorn No. 2 (?) and the Alma may be the true Upper Elkhorn No. 2. It is reported to be only 1½ feet thick at locality 602.

There have been several openings on the Alma coal bed, but measurements were made at only four localities. Two of the openings show only 2 feet of coal with a parting, but openings in adjoining divisions indicate that the bed is commonly about 3 feet thick in this part of the county. A sample collected at locality 600, in an adjoining part of division 7, was analyzed (p. 75).

One or more coal beds between the Alma and Pond Creek beds have been opened at several localities. The maximum thickness reported for these beds is 22 inches.

The Pond Creek coal bed has been extensively mined. It is generally 4½ to 5 feet thick but is laminated with thin shale partings near the top. Samples of this bed collected from the Fordson mine (locality 402) and the Hardly-Able mine (locality 400) have been analyzed (p. 64).

The beds dip about 300 feet from the southeast to the northwest edge of division 5.

DIVISION 6

The Williamson coal bed is the highest bed mapped in division 6, but there are at least five beds above it that contain valuable coal. Measurements on these high beds were obtained at localities 438, 442, 494, and 500. Their correlation is not known, but each bed underlies a considerable area in this division.

In the western part of division 6 the Williamson coal bed is 280 feet above the Pond Creek bed. Toward the east, however, the interval apparently thickens, because the bed identified as Williamson at the mines in the eastern part of the division is 330 feet above the Pond Creek bed. There are not enough openings on the bed to be entirely confident of this change, however. No measurements were made on the bed, but it is reported to be 4 feet thick at locality 498.

About 75 feet below the Williamson bed there is a coal bed, possibly the upper Elkhorn no. 3, on which several openings have been made. At locality 430B the bed is 6 feet thick but contains several fairly thick shale partings. At locality 529 the bed is 4 feet thick and has no important partings. The caved prospect opening at locality 497 is believed to be on this bed, but the coal is reported to be only 18 inches thick.

The Upper Elkhorn No. 2 coal bed is about 120 feet below the Williamson bed. The coal bed at locality 460 is correlated with the Upper Elkhorn No. 2 (pl. 6) but may represent a higher bed. The attitude of the beds on Coom Branch is not clear, and the coal bed at locality 431 may be erroneously correlated with the Upper Elkhorn No. 2.

A coal bed about 30 feet below the Upper Elkhorn No. 2 has been prospected at a few localities, but its thickness is not known.

The Alma coal bed has been opened at a considerable number of places and has been extensively mined in the eastern part of the division. It is generally about 3 feet thick and practically free of partings. A sample of the coal was collected at locality 587, in the adjoining part of division 7, and samples were collected at the Allburn mines, in the eastern part of this division. The analyses are given on page 74.

A bed about midway between the Alma and Pond Creek beds, locally called the Pond Creek rider, has been opened at three localities. It is reported to be 14 inches thick at locality 520.

The Pond Creek coal bed has been extensively worked by several mines in division 6. The bed is generally about 5 feet thick but contains partings near the top. Coal samples collected at several localities in the mines in this division were analyzed (p. 65).

A coal bed 60 feet below the Pond Creek bed is locally known as the Pond Creek leader. This bed has been opened at locality 441 but is reported to be only 18 inches thick.

The beds in division 6 dip about 350 feet from the southeast to the northwest edge of the division.

DIVISION 7

The Williamson coal bed is the highest bed mapped in division 7, but at least three higher beds were found. Only two measurements could be made on the high beds (pl. 7), and their correlation is not known. A coal sample collected at locality 591, which may represent the Taylor coal bed, was analyzed (p. 89).

The Williamson coal bed is shown on plate 48, but only seven openings were found on it, and all except one (locality 596) were caved. The indicated correlation of the bed is therefore doubtful. At locality 596 the bed is 4 feet thick and has no important partings.

Five coal beds were found in the Upper Elkhorn zone in division 7.

A coal bed 50 feet below the Williamson, possibly the Upper Elkhorn No. 3 bed, has been opened at a few localities. At locality 568 the bed is 2½ feet thick, with a shale parting near the middle. The bed is reported to be 2½ feet thick at locality 584, but only 1½ feet at locality 583 and 10 inches at locality 610. A sample of the bed collected at locality 568 was analyzed (p. 84).

There are two openings on a coal bed 80 feet below the Williamson, but both are caved in. At locality 609 the bed is reported to be 2 feet 4 inches thick.

The Upper Elkhorn No. 2 is probably the coal bed 120 feet below the Williamson in division 7. It has been prospected at several localities, but only one measurement could be made, at locality 605, where the bed is 3 feet thick, with a 1-inch shale parting near the top. A sample of the Upper Elkhorn No. 2 coal was collected at locality 340, in the adjoining part of division 5, and the analysis is given on page 77.

A coal bed 40 feet above the Alma has been opened at a few localities. One measurement, at locality 597, shows over 2½ feet of clean coal. The bed is reported to be 4 feet and 1½ feet thick at localities 589 and 602, respectively.

The Alma coal bed has been opened at a considerable number of places, and several measurements (pl. 7) show 3 feet or more of clean coal. At locality 564, however, the bed contains two shale partings. Samples of the Alma coal bed collected at localities 587 and 600 were analyzed (p. 75).

A coal bed about 30 feet below the Alma has been opened at several localities along the Right Fork of Blackberry Creek. No measurements could be made on the bed, but there is a reported thickness of 1½ feet at locality 565.

The Pond Creek coal bed has been opened at several places along Blackberry Creek, but the bed is below drainage level at most other places in this division. The bed is generally 4 to 5 feet thick. Coal samples of the Pond Creek bed were collected at localities 548 and 563 and analyzed (p. 66).

A coal bed 25 feet below the Pond Creek bed has been opened at locality 539 but is reported to be only 1 foot thick.

An anticlinal nose extends into the south half of division 7, but in the north half of the division the beds dip northwest fairly uniformly at about 100 feet to the mile.

DIVISION 8

In division 8 two coal openings were found on beds higher than the Williamson but their correlation is not known. Both openings are caved. Locality 627 is on a bed about 200 feet above the Williamson. Coal beds higher than this in division 8 probably would not cover sufficient area to be mined profitably except in conjunction with mines on a lower bed.

There are three caved openings in the Williamson coal bed in division 8. The thickness of the bed is not known, and its correlation is uncertain.

The Upper Elkhorn No. 3 (?) coal bed is represented at the six localities shown on plate 8. The bed is reported to be 4 feet thick at locality 641 and 3 feet thick at locality 663, but a measurement at locality 622 shows 10 inches of shale in the coal bed. The correlation is uncertain. The bed has been commercially mined in the northern part of the division.

Four openings on a coal bed about 170 feet above the Pond Creek bed and 120 feet below the Williamson bed probably represent the Upper Elkhorn No. 2. The bed consists of 32 inches of clean coal at locality 621.

The Alma coal bed has been opened at numerous places and commercially mined in the northern part of the division. Measurements at five localities show the bed to be locally more than 3½ feet thick, including some thin shale partings (pl. 8). Coal samples collected from the Alma coal bed at locality 680 and in the New Alma Coal Co.'s mines were analyzed (p. 75).

There are four openings on one or more coal beds between the Pond Creek and Alma beds, but 1½ feet is the maximum thickness reported, and no attempt was made to correlate the beds between the openings.

The Pond Creek coal bed has been opened at numerous localities. The bed is generally 5 feet or more thick but commonly has shale partings near the top in the central and southern parts of the division and contains many shale partings in the northern part. Coal samples collected at localities 633 and 667 were analyzed (p. 66).

A coal bed 170 feet below the Pond Creek is represented in the caved opening at locality 665. This is probably the Bingham coal bed.

A coal bed, probably the Millard, about 350 feet below the Pond Creek bed, has been opened at several localities along Peter Creek. The bed is 3½ feet thick at locality 709, in the adjoining part of division 9, but is reported to be only 1½ to 2 feet thick at most of the localities in division 8.

The beds in division 8 dip about 300 feet from the southeast to the northwest edge of the division.

DIVISION 9

A thick coal bed opened at locality 745, about 80 feet above the Williamson, is the highest bed found in division 9. The bed probably underlies a considerable area in the west half of the division but would be found only in small isolated knobs in the east half.

The Williamson coal bed has been opened at several localities and has been commercially mined in the west part of the division. It is 4 to 5½ feet thick at the two localities where measurements could be made. The Williamson bed is 275 to 300 feet above the Pond Creek.

At a few localities coal beds were found between the Williamson and Alma, but none seem to be correlative with the upper Elkhorn no. 2 except possibly the upper bed at locality 743.

The coal bed correlated with the Alma on plate 9 may be a bed slightly higher than the Alma, for it is locally 140 feet above the Pond Creek bed. The bed is clean and 3½ to 4 feet thick at two localities, but at locality 692 it contains several shale partings near the middle. Samples of the bed collected at the mines at Vulcan and Freeburn were analyzed (p. 75).

The Pond Creek coal bed, also locally known as the Warfield or Freeburn, has been opened at many places and commercially mined in the western part of the division. The character of the bed is variable, as indicated by several measurements shown on plate 9. Samples of the bed collected at the mines at Majestic and Freeburn were analyzed (p. 66).

The caved coal opening at locality 732 is probably on the Bingham coal bed.

A coal bed about 350 feet below the Pond Creek bed is probably the Millard. It has been opened at numerous places. Three measurements on the bed indicate variable character and thickness. There are thin coal beds in the 50-foot zone overlying the Millard, and their correlation is not certain. A sample of the Millard bed was collected at locality 709, and the analysis is given on page 60.

The Auxier coal bed may be represented at three caved coal openings (localities 800, 731, 738). The bed is reported to be only 1½ feet thick at locality 800.

A coal bed 90 feet below the Auxier has been opened at several localities along Knox Creek. Several measurements on the bed are given on plate 9. A coal sample collected at locality 778, in the adjoining part of division 10, was analyzed (p. 58).

The coal beds in division 9 dip 400 feet from the southeast to the northwest edge of the division.

DIVISION 10

In the western part of division 10 there are several openings on coal beds above the Alma (pl. 10). These beds underlie a considerable area in the westernmost divide of this division, but toward the east they occur only in isolated knobs. Most of the beds are thin and contain shale partings, but at locality 828 there is 4½ feet of coal with only a thin shale parting.

The Alma coal bed is 3 feet or more thick at the three localities where measurements could be made. The bed underlies a considerable area in the part of the division west of Knox Creek.

A coal bed between the Alma and Pond Creek was found at several localities, but it is only about 18 inches thick.

The Pond Creek bed has been opened at several localities. The bed is more than 5 feet thick but generally contains shale partings. A coal sample collected at locality 718, in the adjoining part of division 9, was analyzed (p. 67).

Correlation of coal beds below the Pond Creek bed is very uncertain. Localities 797 and 803 are apparently only about 125 feet below the Pond Creek and, therefore, too high to be Bingham. Localities 813 and 833 may represent the Bingham, but their stratigraphic position is not known very closely. Localities 782 to 787 are on a coal bed that probably is above the Millard, but the stratigraphic position is not closely known. The bed is reported to be 2½ feet thick.

The coal bed designated "Millard" is probably correctly so designated in the western part of the division, where it is 360 feet below the Pond Creek bed.

However, in the central and eastern parts of the division the stratigraphic positions of the coal beds have not been fully determined, and the correlations are uncertain.

The identification of the beds designated "Auxier" and "Elswick" is very uncertain, and even the correlation between openings, except where shown by solid lines is doubtful. A coal sample collected at locality 778, interpreted as 90 feet below the Auxier, has been analyzed (p. 58).

The beds in division 10 dip about 300 feet to the northwest across the division.

DIVISION 11

The Pond Creek coal bed is the highest bed mapped in division 11, but there are several higher beds that underlie a considerable area. Openings on these high beds, however, are not closely spaced, and the correlations are uncertain.

The upper openings at localities 897 and 916 represent the highest coal bed known in the division. This bed may be the Taylor. The two measured sections indicate 3 feet or more of coal, although there is a considerable shale parting at one of the localities (pl. 11).

A thin bed, with shale partings, 50 feet below the Taylor (?) is represented at the lower openings at localities 897 and 916.

A coal bed about 140 feet below the Taylor (?) is 2 feet thick at locality 891, but at locality 896, apparently on the same bed, only 6 inches of coal is reported.

A coal bed 200 feet below the Taylor (?) and 120 feet above the Williamson bed may be the Bevins. It has been opened at localities 856, 890, and 905, and in the upper opening at locality 915. The three measured sections indicate that the bed contains many shale partings.

A coal bed 70 feet above the Williamson (?) has been opened at localities 855, 884, 889, and 895 and in the lower opening at locality 915. It is thin and contains shale partings at each locality where measurements could be made.

The Williamson (?) coal bed has been opened at localities 854, 879, 883, and 904, but the bed is thin and contains shale partings at each of these localities.

There are at least four coal beds between the Williamson and the Pond Creek beds. These beds have been opened at several widely separated localities, and the correlations are uncertain. A bed 50 to 70 feet below the Williamson, possibly equivalent to the Upper Elkhorn No. 3, has been opened at localities 853, 882, 888, 894, 904 (middle opening), 914 (upper opening), and possibly 878. The bed is thin and contains several partings. There are at least two coal beds near the middle of the zone between the Williamson and Pond Creek beds, and these may represent the Alma and Upper Elkhorn No. 2 beds. Localities 877, 903 (upper opening), 914 (lower opening), and 920 are on these beds, which are 2 to 3 feet thick where they could be measured.

A coal bed 65 to 90 feet above the Pond Creek bed is reported to be from 6 to 18 inches thick.

The Pond Creek coal bed is the best-known bed in division 11. It is generally 5 feet or more thick but commonly contains some shale partings. Samples were collected on the Pond Creek at localities 927 and 865, in this division; at locality 2482, in the adjoining part of division 29; and at locality 953, in the adjoining part of division 12. These were analyzed, and the results are given on page 67.

The Bingham coal bed, 190 feet below the Pond Creek, has been opened at several places.

A coal bed 90 feet below the Bingham has been opened at several localities. It is 26 inches thick at locality 850.

The Millard coal bed has been opened at several places and is reported to be 4 feet thick at locality 842. Several measurements on the bed (pl. 11) show thicknesses ranging from 18 to 44 inches. Samples collected at locality 907 and at locality 709, in an adjoining part of division 9, were analyzed (p. 60).

Several coal beds below the Millard underlie practically all of division 11. A measurement at locality 841, in the adjoining part of division 10, and measurements by Hinds [25] at localities 867 and 790, along Pawpaw and Knox Creeks, in Virginia, indicate that some of these beds are 2½ to 3½ feet thick.

In division 11 the beds dip about 400 feet from the State line to the northwest edge of the division.

DIVISION 12

A coal bed about 600 feet above the Pond Creek, probably the Taylor, is the highest coal bed mapped in this division, but two openings were found on higher coal beds. Locality 1023 is on a coal bed 700 feet above the Pond Creek and may represent the Flatwoods beds. The coal is 7 feet thick, but the upper 2½ feet contains numerous shale partings. Locality 1015 is probably on a higher coal bed. The opening was caved, and no measurement could be made.

The Taylor coal bed has been opened at localities 937, 974, 1002, and 1013 (upper bed). The bed could be measured only at locality 937, where it contains considerable shale.

There are at least three coal beds between the Taylor and the Williamson, but their correlation and extent are not known. Measurements on the beds were made at three localities (pl. 12) and a sample was collected for analysis (p. 87) from one of the beds at locality 1113, in the adjoining part of division 13.

The Williamson coal bed is one of several coal beds about 300 feet above the Pond Creek bed in division 12. Where these beds could be measured they are either thin or contain many partings. The correlation line of the Williamson coal bed on plate 12 and the outcrop line shown on plate 48 represent a zone of several coal beds and not any one bed within the zone.

The coal bed correlated as Upper Elkhorn No. 2 in division 12 may be below the true Upper Elkhorn No. 2. There are at least two coal beds in the zone between the Upper Elkhorn No. 2 and the Williamson, but no measurements could be made on them.

The Upper Elkhorn No. 2 coal bed is 4 feet or more thick but contains considerable shale at the three localities where it could be measured.

The Alma coal bed, 110 feet above the Pond Creek, has been opened and could be measured at numerous places (pl. 12). The bed commonly is clean coal about 3 feet thick, although at locality 948 it is less than 2 feet. The Alma coal was sampled at locality 998 and the analysis is given on page 76.

At least two coal beds between the Pond Creek and Alma are represented at the three localities shown on plates 12 and 48. The number of these beds and their corrrelations are not known.

The Pond Creek coal bed has been opened at many places in division 12. The bed is generally 4 feet or more thick, but commonly the upper few inches is shaly. Samples of the Pond Creek coal were collected at localities 931, 953, and 960 and analyzed (p. 67).

No openings were found on the Bingham coal bed in division 12, but at locality 918, in the adjoining part of division 11, the bed is 25½ inches thick (pl. 11).

The Millard coal bed comes to the surface only in the easternmost part of division 12. At locality 614 it is 21 inches thick, but the top 8 inches is shale.

The beds in division 12 dip about 250 feet from the southeast to the northwest edge of the division.

DIVISION 13

Numerous openings have been made on high coal beds in division 13, but they are so scattered that the beds cannot be accurately correlated (pl. 13). Locality 1078 is on the highest bed, and a measurement there shows 5 feet of clean coal.

[25] Hinds, Henry, The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, pp. 206, 222, 1918.

Localities 1058, 1095, 1099, and 1110 are at about the same stratigraphic position and may be on a single bed of coal. Measurements at 1095 and 1099, however, show that the bed consists of 1½ feet of coal above and below 1 foot of shale (pl. 13). The coal bed is about 700 feet above the Pond Creek bed and may be the Flatwoods coal bed.

There are at least three coal beds in the interval 75 to 100 feet below the Flatwoods bed, and one of these, probably the middle, represents the Taylor coal bed. The correlation line marked "Taylor (?) coal bed" on plate 13 and the line showing the approximate position of the bed on plate 48 should be considered general lines showing the position of the zone of three coal beds and not referring to any one of them. Each of the beds is commonly about 2 feet thick, with some shale partings, but the coal sections vary considerably between openings. A sample collected from the upper bed at locality 1113 was analyzed (p. 87).

At least two coal beds about 400 feet above the Pond Creek are represented at localities 1039, 1045, 1069, 1070, 1097, 1182, 2323, and 2328. The correlations between these openings are not known.

A coal bed 45 feet above the Upper Elkhorn No. 2 may be the Upper Elkhorn No. 3. It is reported to be 2½ feet thick at locality 1043, but only 1½ feet thick at locality 1065 and only 1 foot at locality 1076.

The coal bed designated "Upper Elkhorn No. 2" is 30 feet higher than the bed designated "No. 2" in division 28. In this division the bed is about 175 feet above the Pond Creek bed and has been opened at several localities although measured at only two, 1065 and 1076. At locality 1065 the bed is 2½ feet thick, with a thin shale parting; at locality 1076 the bed is in two thin benches of coal separated by 2½ feet of shale.

A coal bed between the Alma and the Upper Elkhorn No. 2 beds has been opened at several localities. The bed is commonly 2 feet or more thick but at two localities contains shale partings.

The Alma coal bed, about 110 feet above the Pond Creek bed, has been opened at many places. The bed ranges from 2 to 3 feet in thickness and is generally free of partings.

There are at least two coal beds between the Pond Creek and the Alma beds, and although the beds may be locally thick enough to mine, they are generally too thin or have too many partings to be valuable.

The Pond Creek bed is generally 4 feet or more in thickness but commonly contains shale partings in the upper part. There is, however, considerable clean coal in the bed at each of the four localities where measurements could be obtained. The bed is being mined in the northern part of the division.

DIVISION 14

A very high coal bed, reported to be 6 feet thick, has been opened at locality 1126B. This coal bed is about 1,100 feet higher than the Pond Creek bed and therefore occurs only in the small areas of the highest knobs.

Two coal beds about 600 feet above the Pond Creek bed are represented at localities 1128, 1131, 1182, and 1184. The lower of these two beds is probably the Taylor. The beds are reported to be 3½ feet thick at localities 1182 and 1184, and there is more than 4 feet of coal at locality 1131. The Taylor (?) coal bed has been mapped in division 14, but the position of the line is controlled only at the two localities where the bed was opened and at the openings on other beds 500 feet or more below the Taylor (?).

Localities 1125 and 1126A are openings on a coal bed about 500 feet above the Pond Creek bed, at a stratigraphic position between the Taylor (?) and

Bevins coal beds. The coal is in two benches, each 1 to 1½ feet thick, separated by 1 foot of shale.

Locality 1146 may represent the Williamson bed, and locality 1139 may represent the Upper Elkhorn No. 2 bed. No other openings were found at the position of these two coal beds, both of which are excellent in nearby portions of the county.

The coal bed correlated as Alma on plate 14 and the line representing that bed on plate 48 may be above the true Alma. The coal bed is about 140 feet above the Pond Creek in most of the division, whereas the Alma generally is about 110 feet above the Pond Creek. The Alma coal bed is clean and 3 feet thick at localities 1129 and 1130 but contains about 11 inches of shale at localities 1133 and 1158. A sample of the Alma (?) coal bed was collected for analysis (p. 76) at locality 1130.

There are at least two coal beds between the Alma (?) and the Pond Creek beds. The upper bed is more than 2 feet thick at locality 1157 and is reported to be 3 feet thick at locality 1181. The lower bed is 18 inches or less in thickness at three localities (pl. 14).

The Pond Creek bed has been abundantly prospected and has been mined in the northern part of the division. The bed is generally 5 feet or more in thickness but at many places contains considerable shale in thin partings. Part of the westward thinning of the Pond Creek coal bed (p. 19) occurs in the western part of division 14. At locality 1160, about 2½ miles above the mouth of Meathouse Fork the bed is about 5 feet thick, and at locality 1169, at the mouth of Meathouse Fork, it is about 3 feet thick. Samples of the Pond Creek coal collected at the Octavia J. mine (locality 1135) and locality 1169, in this division, and at locality 2193, in the adjoining part of division 26, were analyzed (p. 68).

One or more coal beds occur 30 to 50 feet below the Pond Creek bed. Locally these beds are 2 feet thick but contain some shale partings.

The Bingham coal bed comes to the surface only along Johns Creek. The openings found on this bed were caved in, and no measurements could be made. The reported thickness of the bed ranges from 1 to 3 feet.

A northward plunging anticlinal nose crosses the middle of division 14. The beds rise gently from Johns Creek and Pond Creek to the axis in the divide between these streams.

DIVISION 15

Locality 1235 reveals the only very high coal bed found in division 15. The bed is 4 feet thick, with some shale partings near the top. Its stratigraphic position is not closely known, although the bed is probably not lower than the Flatwoods coal bed.

There are probably several thick coal beds, which were not observed in the 450-foot interval between the Williamson and the bed represented at locality 1235. The Bevins and Taylor coal beds and possibly the Flatwoods beds may be found in this zone. Each of these is an excellent bed of coal in nearby parts of the county.

The position of the Williamson coal bed has been mapped approximately (pl. 48) and the probable position of the bed has been indicated on plate 15, but only one opening (locality 1228) is known on the bed. At locality 1228 the bed is 6 feet thick, including a 1-foot shale parting 1 foot below the top of the bed. The bed underlies a considerable area in division 15. It is thick in adjoining divisions and at the one opening found in this division.

Localities 1227 and 1234 are openings on a coal bed between the Williamson and Upper Elkhorn No. 2. At locality 1227 the bed is 4 feet thick and may be the Upper Elkhorn No. 3 bed, but at localities 234 and 235, in the adjoining part of divisions 3 and 4, the bed is thin.

The Upper Elkhorn No. 2 coal bed has been opened at several localities and is generally 3 feet or more thick, although commonly with some shale partings.

One or more coal beds between the Upper Elkhorn No. 2 and the Alma are represented at several openings. No thickness over 20 inches was reported. At locality 1158 there are three thin benches of coal separated by shale partings.

The Alma coal bed has been opened at several localities, but the bed shows considerable range in thickness and character. It is generally less than 2½ feet thick except where there are thick shale partings, but at locality 237, in the adjoining part of division 4, the bed is 4 feet thick. A sample collected at locality 1219 was analyzed (p. 76).

One or more coal beds occur between the Alma and the Pond Creek beds, but they are generally thin.

The Pond Creek Coal bed has been opened and is being mined at numerous places in the southern and eastern parts of the division where the bed is above drainage level. The thickness ranges from 3 to 6 feet, but there is generally some shale in thin partings near the top. Samples of the Pond Creek coal collected at the Tierney mines (locality 1198) were analyzed (p. 68).

At least three coal beds occur in the 100-foot zone beneath the Pond Creek bed in division 15, but they are generally only about 1 foot thick.

Several coal beds that do not rise above drainage level in this division are reported in wells. A coal bed about 180 feet below the Pond Creek, probably the Bigham bed, is reported in wells 23 and 24. Wells 25, 21, and 22 report coal at 250, 400, and 1,200 feet respectively below the Pond Creek bed.

An anticlinal nose plunges northward along the divide west of Mullen Fork. From this divide the beds dip gently northeastward into Pond Creek and dip more than 1° NW. to the northwest edge of the division.

DIVISION 16

Several very high coal beds have been opened in division 16, and some of these beds that are thick apparently underlie a considerable area. The openings are not closely spaced, however, and the extent of these beds in this division and into other divisions is uncertain.

Locality 1277 is on the highest coal bed found in the division. The bed is about 900 feet above the Pond Creek bed and about 200 feet above the Flatwoods bed. The coal bed is in several benches, mostly thin except the lowest bench, which is 33 inches thick. Several fairly large areas of this coal bed may be expected in the highest divides of the division.

The Flatwoods coal bed is probably one of the several coal beds about 700 feet above the Pond Creek. On the divide at the head of Bent Branch, at localities 1237 and 1267, there are three thin beds at the stratigraphic position of the Flatwoods, but at locality 1275B, farther down Bent Branch, and at locality 1235, in the adjoining part of division 15, a coal bed at about the same position is respectively 6 and 4 feet thick, including some thin shale partings. The correlation between these openings is not known. The lines representing the bed on plates 16 and 48 are approximate.

The Taylor coal bed may be represented by the thin bed at locality 1284.

There are at least three coal beds in the 100-foot interval above the Bevins bed. Two of the beds, about 100 and 60 feet above the Bevins, are each about 3 feet thick, including some shale partings.

The Bevins coal bed is typically developed at locality 1270, near the store of J. Mont Bevins, on the Williamson-Pikeville highway. At localities 1239, 1270, and 1272 there is the characteristic ferruginous clay parting (p. 22) near the base. However, at other localities in the eastern part of the division the coal bed correlated with the Bevins bed does not have the characteristic parting. A sample of the Bevins bed collected at locality 1270 was analyzed (p. 87).

There are several coal beds between the Bevins and Williamson, but all are thin or contain many shale partings where they could be measured.

The Williamson coal bed has been opened at several localities. The bed generally is 3 feet or more thick, though commonly with shale partings near the top. Some partings of cannel coal occur in this coal bed.

A coal bed in the lower part of the zone between the Williamson and Upper Elkhorn No. 2 beds probably represents the Upper Elkhorn No. 3. Measurements on the bed at six openings indicate considerable range in thickness and character (pl. 16).

The Upper Elkhorn No. 2 coal bed has been opened at numerous localities. This bed commonly contains fairly thick shale partings, which divide it into benches that range from a few inches to about 2 feet in thickness.

A coal bed between the Upper Elkhorn No. 2 and Alma beds is 2 feet thick at locality 1280.

The Alma coal bed is very similar to the Upper Elkhorn No. 2 and of about the same thickness in division 16.

The Pond Creek coal bed comes to the surface along Johns Creek. Most of the westward thinning of this bed (p. 19) occurs in this division. At the southeast corner of the division the bed is about 4½ feet thick, including some thin shale partings near the top, but westward along Johns Creek it thins to 2½ feet at locality 1296 and is only 1 foot thick at locality 1907, in the adjoining part of division 24.

There is a fairly uniform north-northwest dip of about 75 feet to the mile in division 16.

DIVISION 17

The Flatwoods is the highest coal bed mapped in division 17, but several higher coal beds have been opened at widely separated localities.

Localities 1341 and 1344 are caved openings on a bed about 350 feet above the Flatwoods. At locality 1341 the bed is reported to be 6 feet thick, but at locality 1344 only 1 foot.

A coal bed about 275 feet above the Flatwoods bed has been opened at localities 1327, 1340, and 1343. At locality 1327 the bed is more than 4 feet thick, including some thin shale partings. At locality 1343 this bed is in two benches, each about 4½ feet thick including shale partings.

A coal bed 200 feet above the Flatwoods bed has been opened at localities 1355 and 1375. The bed is 4 feet thick, in part cannel, at locality 1375.

One or more coal beds 100 to 150 feet above the Flatwoods are represented at localities 1342, 1367, 1374, and 1377. There is 4 feet of clean coal at locality 1342, but at the other localities thick shale partings occur in the coal.

A coal bed about 50 feet above the Flatwoods bed is represented at localities 1339 and 1396. At 1339 it is in two thin benches of coal separated by 3 feet of shale. Only 1 foot of coal was reported at locality 1396.

The Flatwoods coal bed has been opened at numerous places and underlies a considerable area in division 16. Several measurements of the bed show 3 to 4½ feet of fairly clean coal.

Cannel coal, 2 feet thick, was reported at the caved opening at locality 1362. This bed is probably between the Flatwoods and Taylor coal beds.

The Taylor coal bed may be represented at the caved opening at locality 1419, where the coal is reported to be 2 feet thick.

The Bevins coal bed is one of several beds in a zone about 130 feet thick. There are not enough openings to correlate the beds properly within this zone, although an attempt has been made to do this (pl. 17). The correlation line, however, should be regarded as approximate and as representing correlation of the zone rather than of any individual bed within the zone. Numerous measured

sections of these beds are shown on plate 17. A sample of the Bevins bed, collected at locality 1361, was analyzed (p. 88).

The Williamson coal bed has been opened at a few localities along the northeast edge of the division, but each of the openings was caved, and no measurements could be made. The Williamson bed is above drainage level along Johns Creek, also, but no openings on it were found there.

The Upper Elkhorn No. 2 and Alma coal beds are above drainage level only along Johns Creek. At least three and possibly four coal beds are present in the zone of the Upper Elkhorn No. 2 and Alma, but there are not enough openings to correlate the individual beds properly. Each of the beds ranges from 2½ to about 4 feet in thickness, including shale partings.

The beds dip about 350 feet from the southeast to the northwest in division 17.

DIVISION 18

At least one coal bed about 150 feet above the Flatwoods coal bed is represented at localities 1367, 1426, and 1485. At localities 1426 and 1485 the bed is 6 feet thick, including a shale parting. This bed underlies a considerable area in the eastern part of division 18 but farther west occurs only in the highest knobs.

The Flatwoods coal bed is at least 3 feet thick at localities 1425, 1428, and 1429 and underlies a considerable area in most of the divides of division 18.

A coal bed at locality 1427 is reported to be 4 feet thick and may be the Taylor bed.

There are at least two coal beds in the 200-foot zone overlying the Bevins zone. The lower of these, 60 to 75 feet above the Bevins zone is 4 feet or more in thickness at several localities.

The Bevins coal bed is probably near the middle of a 75-foot zone containing at least three coal beds. The line on plate 18 representing the Bevins and the line on plate 48 showing the approximate position of the outcrop should be regarded as general lines for the whole zone and not referring to any one bed in the zone. These coal beds commonly contain shale partings, and the coal is in benches that range from a few inches to about 3 feet in thickness at the localities where measurements could be made (pl. 18).

The Williamson coal bed contains numerous shale partings, although its over-all thickness is commonly 4 feet or more.

The Upper Elkhorn No. 2 coal bed also contains many partings but its over-all thickness is 5 to 7 feet at the localities where measurements could be made.

Coal beds 150, 250, 300, and 1,200 feet below the Williamson have been reported from wells 28 and 29. The uppermost of these beds is probably between the Alma and Upper Elkhorn No. 2 coal beds. The bed 250 feet below the Williamson is probably in the zone between the Alma and Pond Creek beds. The bed 300 feet below the Williamson is probably the Pond Creek. The bed 1,200 feet below the Williamson lies about 200 feet below the Elswick.

DIVISION 19

Several high openings in the northern part of division 19 may be on the Flatwoods coal bed. Correlation between these openings is uncertain, but they apparently represent two thick coal beds only 10 to 15 feet apart. This interpretation, however, needs to be checked by additional prospecting. The Flatwoods bed (?) underlies a considerable area and if composed of a pair of thick beds, as suggested, would be very valuable. A coal sample collected at locality 1527 was analyzed (p. 89).

A coal bed between the Flatwoods (?) and Bevins coal beds has been opened at locality 1535.

The Bevins coal bed has been prospected at several widely separated localities in this division. The openings commonly expose the clay parting characteristic

of the Bevins bed, but the stratigraphic distance above the zone of upper Elkhorn beds is about 75 feet greater than in other parts of Pike County. The presence of a coal bed at the position indicated on plates 19 and 48 is definite, but the identification of that bed as Bevins is less certain. There are at least two coal beds in the zone of the Bevins bed in division 19. The coal occurs commonly in benches as much as 18 inches thick separated by equally thick shale partings.

There are very few openings on the Williamson (?) coal bed. The bed is not over 2 feet thick at any of the localities in this division where the thickness could be measured.

The correlation of the Upper Elkhorn coal zone with beds in other parts of Pike County is probably correctly shown on plate 47, and the individual beds of the zone are probably correlated with fair accuracy on plate 19. However, the correlation of the individual beds with beds of the zone in other parts of Pike County is very uncertain. Misidentification of the top bed of the zone may contribute to the excessive interval shown between this zone and the Bevins bed. Numerous measurements of these coal beds are shown on plate 19. Samples of the Upper Elkhorn No. 3 bed collected in the Pike-Floyd mine were analyzed (p. 84).

DIVISION 20

The Bevins coal bed is the highest bed found in division 20, but the Flatwoods bed, about 300 feet above the Bevins, is probably present and may be thick enough and underlie sufficient area for commercial mining.

The Bevins bed has been opened at several localities and is about 4 feet thick including the characteristic clay parting (p. 22).

The zone of Upper Elkhorn coal beds contains at least three coal beds. Correlation of the zone with beds in other parts of Pike County is probably shown correctly on plate 47, and the individual beds of the zone are probably correlated with fair accuracy on plate 20, but the correlation of the individual beds with beds of the zone in other parts of Pike County is very uncertain. Numerous measurements of the Upper Elkhorn beds are shown on plate 20. A sample of the Upper Elkhorn No. 2 coal collected at locality 1559 was analyzed (p. 78).

DIVISION 21

At least two fairly high coal beds were found in division 21. The upper of these is about 140 feet above the Bevins, and its reported thickness ranges from 2 to 4½ feet. No measurements could be made on the bed.

The Bevins coal bed contains the characteristic clay parting (p. 22) at several localities and is commonly 4 feet or more in thickness, including partings.

The Williamson coal bed was not found in this division.

The 150-foot zone of the Upper Elkhorn beds includes at least five coal beds. The correlation of the zone on plate 47 is probably correct, and the correlation of individual beds of the zone within this division shown on plate 21, is probably fairly accurate, but correlation of the individual beds with Upper Elkhorn beds in other divisions is very uncertain. Several measurements made on the Upper Elkhorn coal beds show considerable range in thickness and character (pl. 21). A sample of the Upper Elkhorn No. 1 coal collected at locality 1604 was analyzed (p. 76).

The Pond Creek (Lower Elkhorn) coal bed is probably represented by one of the several coal beds about 100 feet below the Upper Elkhorn coal zone. A sample of one of these beds collected at locality 1603 was analyzed (p. 69).

The beds in division 21 dip northwest fairly regularly at about 50 feet to the mile.

DIVISION 22

A coal bed about 200 feet above the zone of the Upper Elkhorn beds was found at three localities in division 22. Each of the openings was caved in, but at locality 1688 the bed is reported to be 1½ feet thick.

The Upper Elkhorn zone is about 120 feet thick and includes at least four coal beds. The correlation of the zone as Upper Elkhorn is probably correct, and the correlation of beds in the zone in division 22 as shown on plate 22 is probably fairly accurate, but the correlation of the individual beds with those in other divisions (pl. 47) is uncertain. Each of the coal beds commonly includes some partings, but generally thick benches of clean coal occur above or below the partings. A sample of the Upper Elkhorn No. 3 coal collected at locality 1661 and a sample of the Upper Elkhorn No. 2 coal collected at locality 1683 were analyzed (pp. 84, 78).

In Burning Forks openings were found on two coal beds at the approximate position of the Lower Elkhorn. Only two beds were found in division 22, but farther down Raccoon Creek several beds are opened. Which of these beds represents the Lower Elkhorn is not known (p. 19).

The Bingham coal bed, about 300 feet below the Upper Elkhorn zone, was found at several localities in the southern part of division 22. Measurements were made at five places, and a sample of the coal collected at locality 1733 was analyzed (p. 62).

The beds in division 22 dip about 50 feet to the mile to the northwest.

DIVISION 23

A coal bed about 450 feet above the Upper Elkhorn zone was found at several localities. It is designated "Flatwoods (?) coal bed" on plates 23 and 48, but it may be below the Flatwoods and possibly correlative with the Taylor. It is a very thick coal at each of the five localities where it could be measured. Although some partings occur in the bed, there are thick benches of clean coal at each of the localities.

A caved opening at locality 1744 is on a bed reported to be 4 feet thick. The position of the opening indicated on plate 23 is below the Flatwoods (?) coal bed. This may be due to error in determining the altitude of the opening, or there may be another thick coal bed about 370 feet above the Upper Elkhorn zone.

The Williamson bed, about 80 feet above the Upper Elkhorn zone, was found at a few localities. A measurement at locality 1767 shows two benches of coal 12 and 18 inches thick, separated by a 15-inch parting. Presumably the reported thickness of 1½ feet at the other localities represents only one of the benches.

The Upper Elkhorn zone is about 100 feet thick and contains at least four coal beds. The two principal beds in the zone, no. 2 and no. 3, are probably correlated with fair accuracy in this division, but whether the beds are equivalent to the nos. 2 and 3 beds in other divisions is very uncertain (pl. 47). Both beds are thick in division 23, but their character is variable, and shale partings are common. A sample of the no. 3 coal collected at locality 1885 was analyzed (p. 84).

The Pond Creek (Lower Elkhorn) coal bed may be represented by some of the thin beds found about 100 feet below the Upper Elkhorn coal zone.

The Bingham coal bed was found at several localities in the southern part of division 23. Measurements at six openings indicate that the bed commonly contains shale partings, although it is generally more than 3 feet thick. A sample of the Bingham coal collected at locality 1834 was analyzed (p. 62).

The Millard coal bed is about 150 feet below the Bingham and is above drainage level only in the southern part of the division. The bed is 2 to 3 feet thick but commonly has some shale partings near the top (pl. 23).

A very thin coal bed 150 feet below the Millard is exposed in the road cut near The Forks, at the south edge of the division. This bed is possibly the Auxier.

The beds dip about 300 feet from the south to the north edge of division 23. The northwest dip carries the Millard under Levisa Fork near the southwest edge of the division.

DIVISION 24

The highest coal bed found in division 24 is represented at locality 1918 and possibly also at 1959. The bed is about 800 feet above the Pond-Creek (Lower Elkhorn).

Another coal bed, probably a little lower in the section, is represented at locality 1963.

One of the coal beds about 450 feet above the Pond Creek (Lower Elkhorn) is probably the Bevins bed. Several openings were found on these beds, but all are caved in. The character of the bed is not known, but the thickness is reported to reach 4 feet 2 inches (locality 1926). Probably the Bevins bed is represented at one of the several openings on Grassy Creek, but the correlations have not been properly determined.

A coal bed 300 feet above the Pond Creek (Lower Elkhorn) is probably the Williamson bed. The bed is reported to be 1 to 1½ feet thick at several localities.

The Upper Elkhorn zone is about 100 feet thick and contains at least four coal beds. The correlation of these beds across the division as shown on plate 24 is probably fairly accurate, but the correlation with Upper Elkhorn beds in other divisions is very uncertain. Both the character and the thickness of each of the three principal beds in the zone are variable. The other generally thin beds in the zone also thicken and become similar in their character to the principal beds. A sample of the no. 1 coal collected at locality 1909 was analyzed (p. 76).

The Pond Creek (Lower Elkhorn) coal bed is several feet thick, including shale partings, in the eastern part of division 24. Toward the west, however, the bed thins or is replaced by several thin coal beds. This change may be due to one of two causes: (1) The coal bed thins westward and is represented by a single thin bed on Raccoon Creek; or (2) the shale partings thicken westward, and the coal bed is represented by the zone of several thin beds on Raccoon Creek.

A low anticlinal nose plunges gently northwestward across division 24, and the beds dip down the tributaries of Johns and Raccoon Creeks.

DIVISION 25

One or possibly two coal beds about 600 feet above the Lower Elkhorn are represented by openings at localities 2046 and 2111. One or both openings may represent the Taylor coal bed. At locality 2046 the bed consists of a 3-foot bench of coal overlain by 3 feet of shaly coal and shale.

A coal bed 400 feet above the Lower Elkhorn is represented at localities 2116, 2121, and possibly 2101. This may be the Bevins coal bed. It is reported to be 4 feet thick at locality 2116.

A coal bed about 300 feet above the Lower Elkhorn may represent the Williamson coal bed. At two localities this bed consists of a 2-foot bench of coal with shaly coal and shale above and below the bench.

Locality 2020 is probably on another coal bed, perhaps the Upper Elkhorn no. 3, 250 feet above the Lower Elkhorn. The bed consists of a 20-inch bench of cannel coal with shaly coal and shale above and below. A sample of the cannel coal was analyzed (p. 86).

The zone of Upper Elkhorn beds is about 150 feet thick and includes at least three coal beds. The correlation of these beds with Upper Elkhorn beds in

other divisions is very uncertain. The no. 2 bed is probably correlated with fair accuracy on plate 25, but correlation of the other beds in the zone is less certain. The top bed, interpreted as the no. 3, is 2 feet thick, including shale partings, at locality 2085. The bed is reported to be 2 feet thick at locality 2071. A coal bed between the no. 2 and no. 3 is reported to be 4 feet thick at locality 2072 and measures 2½ feet, including a shale parting, at locality 2084. The no. 2 bed is of variable character in division 25, but generally there is a thick bench of coal in the bed. A sample of the no. 2 bed collected at locality 1846 was analyzed (p. 78).

There are few openings on the Lower Elkhorn coal bed, but apparently the bed thins from about 3 feet in the eastern part of the division to about 1 foot in the western part.

The Bingham coal bed, about 180 feet below the Lower Elkhorn, is the best-known coal bed in division 25. It is variable in character and thickness, though generally about 3 feet thick, including some shale partings. Numerous measurements of the bed are shown on plate 25.

There are a few openings on coal beds below the Bingham in division 25, but these openings are widely separated and cannot be accurately correlated.

The irregular fold shown by the structure contours in the eastern part of this division may not be correct. The fact that all altitudes on Hurricane Creek are low may be due to inaccurate determination of the base altitude on that creek.

DIVISION 26

Locality 2191, in division 26, and locality 2338, in the adjoining part of division 28, are probably on the Taylor coal bed. The coal is clean and 3 feet thick at locality 2191 but contains partings at locality 2338.

A coal bed 200 feet below the Taylor coal bed, probably the Bevins bed, is represented at locality 2339, in the adjoining part of division 28. The coal is 2½ feet thick, with a thin shale parting near the middle.

There are several openings on what is probably the Williamson coal bed about 300 feet above the Lower Elkhorn. The bed is 32 inches thick at locality 2304.

Practically no information is available on the Upper Elkhorn coal beds in division 26. The Upper Elkhorn zone probably contains several coal beds here, as it does in divisions to the west, but considerably more prospecting is necessary before these beds can be accurately correlated in this division. Measurements at six openings (pl. 26) indicate that at least one of these beds is 3 feet or more thick, including some shale partings.

The Pond Creek (Lower Elkhorn) coal bed has been opened at numerous places and can be correlated with reasonable certainty. Although the bed commonly contains shale partings, there are thick benches of clean coal at every opening where measurements could be made. A sample of the Lower Elkhorn coal collected at locality 2193 was analyzed (p. 69).

The Bingham coal bed, 200 feet below the Lower Elkhorn, is not as thick as the Lower Elkhorn but contains fairly thick benches of clean coal at most of the localities where measurements could be made (pl. 26). Samples of the Bingham coal collected at localities 2177 and 2204 were analyzed (p. 62).

The Millard coal bed is about 170 feet below the Bingham. The coal is 2 feet thick at locality 2165 but is reported to be only 1 foot thick at the caved opening at locality 2172. A sample of the Millard coal collected at locality 2165 was analyzed (p. 60).

The beds are so nearly flat in most of division 26 that the gently irregular dips shown by the structure contours (pl. 48) may not be correct. They may be due to inaccurate determination of the altitude.

DIVISION 27

No very high coal beds were found in division 27, but in the adjoining part of division 28 the Taylor and Bevins coal beds, 600 and 400 feet respectively above the Lower Elkhorn, were found. These beds probably extend into division 27, and the Bevins bed would underlie a considerable area in the northeastern part of the division.

A coal bed 300 feet above the Lower Elkhorn, probably the Williamson bed, is represented at locality 2304. The coal there is 32 inches thick.

There is practically no information on the Upper Elkhorn coal beds in division 27. The zone probably contains several coal beds here, as it does in the divisions to the west, but considerably more prospecting is necessary before these beds can be accurately traced across this division. Measurements at three openings and reports of thicknesses at several others (pl. 27) indicate that at least two of the beds are 3 feet or more thick.

The Pond Creek (Lower Elkhorn) coal bed has been opened at a few localities. The bed is thick, and although it commonly contains some shale partings there is generally a thick bench of clean coal in the bed.

The Bingham coal bed, 180 feet below the Pond Creek (Lower Elkhorn) is the best known coal bed in division 27. It has been prospected at many places, and the measurements show that benches of clean coal in the Bingham are about as thick as the benches of clean coal in the Lower Elkhorn, although the over-all thickness of the Bingham is generally less than that of the Lower Elkhorn.

The Millard coal bed, about 170 feet above the Bingham, is reported to be only 18 inches thick at several localities, but at localities 2248 and 2346, where measurements could be made, the bed is 2 and 3½ feet thick, respectively, including some shale partings.

There are at least two coal beds in the zone 120 to 180 feet below the Millard, and the lower one is probably the Auxier bed. These beds are reported to range from a few inches to 1½ feet in thickness.

The beds are so nearly flat in most of division 27 that the gently irregular dips shown by the structure contours (pl. 48) may not be correct. They may be due to inaccurate determination of the altitudes.

DIVISION 28

Two coal beds at the approximate position of the Taylor are the highest coal beds found in division 28 (pl. 28). The correlation of these beds in this division and with those in other divisions is very uncertain. The beds in the Taylor coal zone underlie a considerable area and contain fairly thick benches of clean coal separated by shale partings at each of the localities where the beds could be measured.

At least three coal beds occur between the Taylor and Bevins coal zones, but their correlation is very uncertain. Each of the beds contains shale partings, and only locally do they contain thick benches of clean coal.

Several coal beds about 400 feet above the Pond Creek (Lower Elkhorn) have been correlated as the Bevins coal zone. The beds contain numerous shale partings and only moderately thick benches of clean coal.

There are several coal beds in a 50-foot zone about 300 feet above the Pond Creek (Lower Elkhorn) bed. One of these beds is probably the Williamson, but there is little or no basis for its determination in this division. The beds in the zone contain many shale partings and only locally thick benches of clean coal.

The correlation of individual coal beds in the upper Elkhorn zone in division 28 is very uncertain. The coal bed mapped as the no. 2 bed locally contains fairly thick benches of clean coal, but this bed is 30 feet lower than the bed mapped as no. 2 in division 13. The no. 1 bed at localities 2325 and 1108 con-

tains 2 feet of clean coal, and there are very thin lenses of coal in the shale above it.

The Pond Creek (Lower Elkhorn) is the best-known coal bed in division 28 and probably is correctly correlated within the division and with beds in adjoining divisions. It commonly contains a thick bench of clean coal at the base and partings of shaly coal and shale at the top (pl. 28). Samples of the coal collected at localities 927 and 2342 were analyzed (p. 69).

The Bingham coal bed is probably correctly identified in division 28. The bed is commonly about 3 to 4 feet thick including some shale partings. A sample of the coal collected at locality 2344 was analyzed (p. 62).

A coal bed between the Bingham and the Millard is reported to be 1 to 1½ feet thick at several prospect openings, but where it could be measured at four localities it is about 3 feet thick, including some shale partings.

The Millard coal bed, about 200 feet below the Bingham, was measured at five localities. It is generally about 3 feet thick, including thin partings. A sample of the Millard coal collected at locality 2346 was analyzed (p. 60).

The beds in division 28 dip about 350 feet from the southeast to the northwest edge of the division.

DIVISION 29

The Williamson coal bed may be represented at locality 2407, but no measurement of the coal could be made there. The bed probably underlies a considerable area in the northeastern part of division 29 but only small areas of the highest knobs in the southern and western parts.

Locality 2408 is on one of the Upper Elkhorn coal beds, probably no. 2. No measurement could be made at the opening. The bed underlies a considerable area in the central and northeastern parts of the division. If this opening represents the no. 2 bed, the no. 3 bed may be present about 60 feet higher and the no. 1 bed about 50 feet lower than locality 2408.

The Pond Creek (Lower Elkhorn) coal bed was found at several places in the division and probably has been correlated correctly. The bed is 3 to 6 feet thick, including shale partings. A sample of the coal collected at locality 2482 was analyzed (p. 69).

The Bingham coal bed, 180 feet below the Lower Elkhorn, is the best-known coal bed in this division. It is generally at least 4 feet thick and at localities 2484 and 2485 is 6½ feet. Samples of the coal collected at localities 2443, 2485, and 2493 were analyzed (p. 62).

A coal bed about 80 feet below the Bingham has been opened at several places. Two measurements on the bed show thicknesses of 3½ and 5½ feet, including partings.

The Millard coal bed, 180 feet below the Bingham, has been opened at a few localities. Two measurements on the bed show thicknesses of 1½ and 3 feet of clean coal. A sample of the Millard coal collected at locality 2479 was analyzed (p. 61).

The Auxier coal bed, 180 feet below the Millard, was found at a few localities along Levisa Fork. Three measurements of the bed show a 2-foot bench of clean coal with other thin benches of coal separated by partings.

A coal bed 90 feet below the Auxier was found along Levisa Fork. Hinds [26] reports two measurements on this coal bed, called the Splash Dam coal bed in his report, at localities 2421 and 2422, in nearby parts of Virginia. These measurements show a 3½-foot bench of clean coal above thin benches of coal separated by partings.

[26] Hinds, Henry, The geology and coal resources of Buchanan County, Va.: Virginia Geol. Survey Bull. 18, p. 105, 1918.

The beds dip about 300 feet from the State line to the northwest edge of division 29. The difficulties of determining altitudes by hand level in the rough country southeast of Feds Creek casts some doubt on the irregular structure indicated there.

DIVISION 30

Two coal beds at locality 2589, 400 feet above the Lower Elkhorn, are the highest beds found in division 30. One of them is probably the Bevins coal bed. They occur only in the highest knobs, although there is a fairly large area of the coal in the divides west of Lick Creek. At locality 2589 the beds consist of two 2-foot benches of clean coal, with thick shale partings between the benches. There is 10 inches of cannel coal at the top of the upper bed.

Probably two coal beds are represented by the openings, not correlated, between the Bevins (?) and Upper Elkhorn beds. The beds underlie several areas of moderate size in the divides of this division.

The Upper Elkhorn coal beds are represented at a few localities in the division. At least one thick bed, probably no. 2, about 200 feet above the Lower Elkhorn, was found in the zone. Sections of the bed were measured at locality 2494A and the upper opening at locality 2587. A second bed in the Upper Elkhorn zone, about 40 feet below no. 2 (?), is reported to be 15 inches thick at the lower opening of locality 2587.

The Lower Elkhorn coal bed is probably correctly identified and correlated in division 30. The bed is generally more than 4 feet and in places more than 5 feet thick, including partings. Samples of the coal collected at localities 2507 and 2547 were analyzed (p. 70).

The Bingham coal bed, about 200 feet below the Lower Elkhorn, is the best-known coal bed in division 30. It is generally more than 3½ feet thick and is commonly free of partings. A sample of this coal collected at locality 2546 was analyzed (p. 63).

One or more coal beds between the Bingham and Millard were found at a few localities. The reported thicknesses range from 14 to 28 inches, and a measured section at locality 2828 shows a thickness of 28 inches.

The Millard coal bed, 180 feet below the Bingham, was found at several localities. Two measured sections and some reported thicknesses show that the bed is 2 to 2½ feet thick, including partings.

Probably there are two coal beds in the zone 120 to 180 feet below the Millard, but the correlation of the beds is uncertain. The upper one has been mapped as Auxier in division 30 (pl. 48), but this bed may be about 50 feet above the true Auxier. The coal bed was measured at four localities (pl. 30), where it is 2½ feet thick, including about 2 feet of clean coal. A sample of the coal collected at locality 2558 was analyzed (p. 59).

The beds in division 30 dip about 450 feet from the southeast to the northwest edge of the division.

DIVISION 31

A coal bed, probably the Williamson, 300 feet above the Lower Elkhorn, is the highest coal bed found in division 31. The bed underlies a considerable area in the central and western parts of the division and is reported to be 4 feet thick at locality 2628.

The relations of the Upper Elkhorn coal beds in division 31 are not clear. At least two and perhaps three coal beds are represented at the several openings found in the Upper Elkhorn zone. The highest bed is 180 to 225 feet above the Lower Elkhorn and is shown on plate 31 as no. 2 bed, though it may be no. 3. The minimum interval (180 feet) between the bed and the Lower Elkhorn is smaller than the usual interval between no. 3 and the Lower Elkhorn. On the other hand, the maximum interval (225 feet) is greater than the usual interval from

no. 2 to the Lower Elkhorn. The average of the intervals is about right for no. 2. The bed is cannel coal in the westernmost divide of division 31, where it is being mined by the Purity Cannel Coal Co. A sample of the cannel coal collected at the mine was analyzed (p. 78). The no. 2 bed in the southeastern part of the division is bituminous coal and is several feet thick at the localities where it could be measured.

The Lower Elkhorn is the best-known coal bed in division 31 and probably is correlated correctly. It commonly consists of two benches of coal, each about 3 feet thick, separated by a few inches of shale. Samples of the Lower Elkhorn coal collected at localities 2596 and 2651 were analyzed (p. 70).

The Bingham coal bed, 180 feet below the Lower Elkhorn, has been opened at numerous places and probably is correctly correlated. The bed ranges from 3 to 5 feet in thickness at the localities where measurements could be made.

The Millard coal bed, about 360 feet below the Lower Elkhorn, is probably correlated correctly. Five measured sections of the bed and several reported thicknesses indicate that it is 2 to 5 feet thick, including partings.

A thin coal bed 120 feet below the Millard has been opened at a few localities. This bed probably corresponds to the bed 120 feet below the Millard in divisions 27 and 30, about 60 feet above the Auxier. The Auxier may be represented by the coal bed at localities 2590, 2658, and 2671. It is reported to be 5 feet thick at locality 2671.

The beds dip about 250 feet from the southeast to the northwest edge of division 31.

DIVISION 32

One of the Upper Elkhorn beds, probably no. 2, 180 to 200 feet above the Lower Elkhorn, is the highest coal bed found in division 32. The bed is commonly more than 6 feet thick and underlies a considerable area in this division.

The Lower Elkhorn is the best-known coal bed in division 32 and probably is correctly correlated. The coal commonly consists of a 3½- to 4-foot bench of clean coal, with thin benches of coal and partings above or below it. Samples of the Lower Elkhorn coal collected at localities 2699, 2722, and 2800 were analyzed (p. 70).

The Bingham coal bed, about 180 feet below the Lower Elkhorn, has been opened at a few localities. It is about 2½ feet thick at the localities where its thickness could be measured.

At least two and possibly three coal beds occur in the zone 120 to 210 feet below the Bingham. The correlation of these beds is very uncertain, but the bed 180 feet below the Bingham is shown as the Millard (pl. 32). This bed is about 2½ feet thick at five localities where it could be measured. A coal bed 60 feet above the Millard is reported to be 4 feet thick at locality 2794, and a bed believed to be about 70 feet below the Millard is reported to be 4 feet thick at locality 2769.

The Auxier coal bed, 360 feet below the Bingham, has been opened at several localities. Four measurements of the Auxier show thicknesses of 1½ to 4½ feet.

A coal bed about 60 feet below the Auxier is reported to be 1½ and 2 feet thick at localities 2772 and 2779, respectively, and at locality 2762 it is 4 feet thick but contains numerous partings.

The beds dip about 250 feet from the southeast to the northwest edge of division 32.

DIVISION 33

A coal bed 180 feet above the Lower Elkhorn, probably the Upper Elkhorn No. 2, is the highest coal bed found in division 33. It underlies a considerable area in the northern and northeastern part of the division but occurs only in small

tracts on the highest knobs in the southwestern part. The thickness of the bed ranges from 2½ to 6 feet.

The Lower Elkhorn coal bed is high but underlies a considerable area. The bed is in two thick benches of clean coal separated by 2 feet of shale at locality 2917. At locality 2494B apparently only one of the benches is exposed.

The Bingham coal bed, 180 feet below the Lower Elkhorn, is fairly thick. Five measurements on the bed (pl. 33) show a range in thickness from 2½ to 3½ feet, including thin partings. A sample of the Bingham coal collected at the mine of the Barrowman Coal Corporation (locality 2891A) was analyzed (p. 63).

There are probably two coal beds between the Bingham and the Millard represented at the three localities shown on plate 33. At locality 2828 one of the beds is 2 feet thick.

The Millard coal bed, 180 feet below the Bingham, is probably correlated correctly in the northeastern part of division 33, but there is considerable uncertainty regarding the correlation of coal openings at about the position of the Millard in the central and southwest parts of the division. Several measurements on the bed show numerous partings in the coal.

The Auxier is the best-known coal bed in division 33. It has been opened at many places and is being mined in the southern part. Numerous measurements on the bed show a bench of clean coal about 2½ feet thick, above a shale parting, and a thin bench of coal. Samples of the Auxier coal collected at localities 2815, 2840, 2889, and 2912 were analyzed (p. 59).

A coal bed between the Auxier and the Elswick, probably equivalent to the Splash Dam coal bed of Virginia (p. 17), has been opened at many places in the southeastern part of division 33. The coal is about 4 feet thick, including a shale parting near the middle. Locality 2814, in the northern part of the division, may be on another bed above the Splash Dam (?). Samples of the Splash Dam (?) coal collected at the mine of the Barrowman Coal Corporation and at locality 2901 were analyzed (p. 58). The analysis of the sample from locality 2901 is so different from the other analyses of samples of this coal bed that doubt is cast on the correlation indicated on plate 33.

The Elswick coal bed, 180 feet below the Auxier, has been opened at a few localities in the southern part of division 33. Three measurements on this coal bed show a thickness of 2 to 3 feet, including shale partings. A sample of the Elswick coal collected at locality 2866 was analyzed (p. 57).

Two caved openings (localities 2883 and 2899) are probably on a coal bed about 75 feet below the Elswick, possibly the Kennedy coal bed of Virginia.

DIVISION 34

A caved opening at locality 3012, on a coal bed about 400 feet above the lower Elkhorn, is the highest coal bed found in division 34 and may be the Bevins bed. This coal is reported to be 3 feet thick and would underlie a considerable area in the west-central part of the division.

Two coal beds about 300 feet above the Lower Elkhorn may represent the Upper Elkhorn No. 3 or the Williamson coal bed. The reported thicknesses on these beds range from 2 to 5 feet. They underlie a considerable area in the west-central part of the division.

A coal bed generally about 180 feet above the Lower Elkhorn is probably the Upper Elkhorn No. 2. The coal occurs in thick benches separated by fairly thick shale partings.

The Lower Elkhorn is the best-known coal bed in division 34. It has been opened at many localities and is being mined in the northern part of the division. Numerous measurements show 2 to 3 feet of clean coal overlain by coal and shaly coal. Samples of the Lower Elkhorn coal collected at localities 2934 and 2978 were analyzed (p. 71).

In division 34 the Bingham coal bed was found only along Russell Fork. The bed is known to thin toward the southwest, and the absence of openings in the southwestern part of division 34 suggests that much of the thinning occurs in this division. A single measurement of the coal bed on Russell Fork shows a 3-foot bench of clean coal overlain by shaly coal and shale. The bed is reported to be 4 and 3 feet thick at localities 2982 and 3000, respectively.

A coal bed between the Bingham and Millard was found at locality 2936, but its thickness and exact stratigraphic position are not known.

A few widely separated openings on a coal bed about 400 feet below the lower Elkhorn may represent the Millard coal bed, but the correlation is uncertain. The bed is 1½ to 3 feet thick, including shale partings.

The Auxier coal bed is one of the best-known coal beds in this division. It has been opened at many places and is being mined in the northern part of the division. The bed commonly contains a fairly thick bench of clean coal, with thin coal and shale lenses above and below. A sample of the Auxier coal collected at the Federal mine no. 2 of the Elswick Coal Co. (locality 2957) was analyzed (p. 59).

A coal bed about 90 feet below the Auxier has been opened at several localities. The coal is reported to be 3 feet thick at localities 2939 and 2941. At locality 2942 a measurement shows 4 feet of coal, with a thin shale parting.

The Elswick coal bed is above drainage level only in the northern part of the division. Four measurements on the bed show a range in thickness from 2½ to 4 feet. A sample of the Elswick coal collected at the Federal mine no. 1 of the Elswick Coal Co. (locality 2956) was analyzed (p. 57).

DIVISION 35

Although the boundaries of division 35 have been extended southeastward to the State line, no attempt was made to map the coal beds southeast of Elkhorn Creek.

A coal bed at locality 3128, 400 feet above the Lower Elkhorn, may be the Bevins coal bed. The bed underlies a considerable area in the central and southern parts of the division but was found only at this locality, where it is nearly 3 feet thick and contains no partings.

One of the three coal beds in the 50-foot zone about 300 feet above the Lower Elkhorn probably represents the Williamson coal bed. The beds underlie a considerable area in the central and southern parts of division 35. Three measurements on the beds show thicknesses ranging from about 3 to 5 feet, with one thin parting.

The Upper Elkhorn No. 3 is probably represented at the caved openings (localities 3087 and 3124) about 50 feet above the no. 2 bed. The coal is reported to be only 1½ feet thick at locality 3124.

The Upper Elkhorn No. 2, 170 to 200 feet above the Lower Elkhorn, has been opened at many places and is being mined. The bed is fairly clean and thick in most of the division (pl. 35). A sample of the coal collected at the Coaldale no. 4 mine of the Edgewater Coal Co. was analyzed (p. 79).

The Lower Elkhorn coal bed generally contains a 3- to 3½-foot bench of clean coal overlain by 1 foot of laminated coal. Samples of the coal collected at locality 3030 and the Coaldale no. 1 and no. 3 mines of the Edgewater Coal Co. were analyzed (p. 72).

The Bingham coal bed, about 180 feet below the Lower Elkhorn, was found at three localities in the north half of the division. At locality 3048 the bed is reported to be 3 feet thick, and at locality 3075 it consists of two 20-inch benches of coal separated by 14 inches of shale.

The Millard coal bed, about 370 feet below the Lower Elkhorn, has been opened at several widely separated localities. Several measurements on the coal show partings, but at localities 3056 and 3074 there is 2½ feet of clean coal.

At least two coal beds were found below the Millard, but their stratigraphic position was not accurately determined. These coal beds range from 500 to 700 feet below the Lower Elkhorn.

In the part of division 35 north of Elkhorn Creek there is only about 150 feet of structural relief, and the gentle irregularities shown by the structure contours may be due to errors in determining altitudes. The beds dip gently west and northwest (pl. 48), but local irregular dips of the individual coal beds probably affect mining operations more than the regional dip.

DIVISION 36

The boundaries of division 36 have been extended southeastward to the State line, but no attempt was made to map the coal beds southeast of Elkhorn Creek.

The Flatwoods coal bed, about 750 feet above the Lower Elkhorn, is the highest bed found. The bed underlies a considerable area in the west-central part of the division. It is about 16 feet thick but contains many partings at the three localities where measurements were available.

At least four coal beds were found in the interval between the Flatwoods and Upper Elkhorn No. 2, but there are not enough data to correlate these beds properly. One of the beds, about 400 feet above the lower Elkhorn may be the Bevins. It is about 3 feet thick at localities 3244 and 3249.

The Upper Elkhorn No. 2 bed, 179 to 200 feet above the lower Elkhorn, is well known in division 36. It is generally 4 feet or more thick. Three samples of this bed collected at the Greenough no. 2 mine, the Peabody Coal Co. no. 28 mine, and the Henry Clay no. 2 mine of the Edgewater Coal Co. were analyzed (p. 79).

The Lower Elkhorn coal bed is extensively mined in division 36. This coal bed is about 4½ feet thick at most of the localities where it could be measured (pl. 36). Samples of the coal collected at locality 3144 and the Henry Clay no. 1 mine of the Edgewater Coal Co. were analyzed (p. 72).

Locality 3237 is a caved opening on a coal bed reported to be 1½ feet thick 360 feet below the Lower Elkhorn. It is probably the Millard coal bed.

Locality 3160 is a caved opening on a coal bed reported to be 2 feet thick about 270 feet below the Lower Elkhorn. It is probably about 90 feet above the Millard.

A synclinal axis plunging gently morthward trends northeastward across the central part of division 36, and a parallel anticlinal axis crosses the northwestern part of the division. However, the structural relief in the division is less than 150 feet.

DIVISION 37

Only three openings were found on coal beds higher than the Upper Elkhorn No. 2 in division 37. Locality 3277 is on a bed reported to be 7 feet thick about 700 feet above the Lower Elkhorn. It may be the Flatwoods bed. There is a fairly large area of this coal in the high divide in the southwest corner of the division. Locality 3360 is about 120 feet above the Upper Elkhorn No. 2 bed and may represent the Williamson coal bed. Locality 3352 is 80 feet above the no. 2 bed and may represent either the Williamson or the no. 3. A fairly thick coal bed about 400 feet above the Lower Elkhorn has been found in adjoining divisions, and this bed would underlie a considerable area in the western part of division 37.

The Upper Elkhorn No. 2 coal bed has been abundantly prospected and mined. The coal is clean and commonly 3½ to 4 feet thick. Samples of this bed collected at localities 3276 and 3299 were analyzed (p. 80).

The Lower Elkhorn coal bed also has been abundantly prospected and mined in this division. It commonly consists of a 3½-foot bench of clean coal, with

other thin benches of coal and shale partings above and below the main bench. Samples of the coal collected at localities 3273 and 3283 were analyzed (p. 73).

The Bingham coal bed, 180 feet below the Lower Elkhorn, is reported to be 2 feet thick at three caved openings, but at locality 3271 is reported to be 2½ feet thick and at locality 3324 is 32 inches thick.

The Millard coal bed, about 380 feet below the Lower Elkhorn, is 2½ to 3 feet thick at several localities in division 37. Thin coal beds very near the Millard, however, confuse the correlations of this part of the stratigraphic section.

An anticlinal nose plunging gently northward extends into the southern part of division 37.

DIVISION 38

Coal beds of the Upper Elkhorn zone are the highest beds found in division 38. The no. 3 bed was found at several localities in the northwestern part of the division. This bed commonly consists of two benches of clean coal separated by 1 foot of shale. The bed has been mined by the Shelby Coal Mining Co. (locality 3494) in the northern part of the division. A sample of the bed collected at locality 3388 was analyzed (p. 85).

The no. 2 bed has been extensively prospected and mined. This bed commonly consists of a 4½-foot bench of clean coal, with shale and shaly coal above the bench. The bed has been mined in division 38 by the Shelby Coal Mining Co. (locality 3493) and the Corrigan-McKinney Steel Co. (localities 3375 and 3400). A coal bed about 50 feet below the no. 2 was found in the northwestern part of the division and is probably the no. 1 (Alma) coal bed. Locality 3487, the mine of the Funk Coal Co., is probably on this bed, but the correlation is not certain.

In the southeastern part of division 38 the Lower Elkhorn is an easily recognized and well-known coal bed. The bed there is generally several feet thick, including a thick bench of clean coal (pl. 38). It has been mined by the Corrigan-McKinney Steel Co. at localities 3374 and 3401. However, the lower Elkhorn apparently thins considerably in the northwestern part of division 38, and other thin coal beds occur at about its position. The relations there are confused, and the indicated correlation (pl. 38) of the several thin beds is very uncertain.

The Bingham coal bed, about 180 feet below the Lower Elkhorn, was found at few localities. At locality 3396 this bed is reported to be 3 feet thick, but at localities 3384 and 3471 it is reported to be less than 2 feet thick, and at locality 3495 it contains many partings (pl. 38).

A coal bed between the Bingham and Millard was found at localities 3445 and 3482. It is reported to be only 8 inches thick at locality 3482, however.

The Millard coal bed, 360 feet below the Lower Elkhorn, was found at many places. This bed has been mined by the Winston Elkhorn Coal Co. (locality 3422). Several measurements on the bed show its variable character and thickness (pl. 38). Samples of the Millard coal collected at localities 3420, 3427, and 3479 were analyzed (p. 61).

A thin and very shaly coal bed about 220 feet below the Millard was found at locality 3408. It may represent the Auxier, although the interval to the Millard is larger than usual.

The beds dip about 350 feet from the southeast to the northwest edge of division 38.

DIVISION 39

A coal bed at locality 3592, about 700 feet above the Lower Elkhorn, is the highest bed found in division 39. Its thickness and correlation are not known, but it may be the Flatwoods and correlative with the bed at locality 3277, in division 37, where the coal is reported to be 7 feet thick. The bed underlies a considerable area in the southeastern and central parts of division 39.

A coal bed about 375 feet above the Lower Elkhorn was found at four localities. Its correlation is not known. The bed is reported to be 3½ feet thick at locality 3591.

The Upper Elkhorn No. 3 was found at several localities. The bed commonly consists of a 3- to 4-foot bench of clean coal, with thinner benches of coal separated by shale partings.

The no. 2 bed is the best-known coal bed in division 39 and has been mined in the northwestern part of the division. It is commonly found in two thick benches separated by a 1½-foot shale parting (pl. 39). Samples of this coal collected at localities 3568, 3599, 3618, 3621, and 3630 were analyzed (p. 80).

The correlation of the bed at localities 3534 and 3505 as upper Elkhorn no. 1 is uncertain.

A coal bed between the Upper Elkhorn beds and the Lower Elkhorn is reported to be 2 feet thick at locality 3578, and 2 feet of clean coal is exposed at locality 3504.

The Lower Elkhorn coal bed as mapped (pl. 48) includes two coal beds about 30 feet apart. The extent of these beds is not known, and their thickness and character are variable (pl. 39). Samples of the coal collected at localities 3617 and 3628 were analyzed (p. 73).

The Bingham coal bed, about 180 feet below the Lower Elkhorn, was found only at a few widely separated localities, but the correlation of the bed is probably correct. The bed is generally thin, with shale partings.

There are at least three coal beds, generally thin, with shale partings, in the zone 100 to 150 feet below the Bingham.

DIVISION 40

The Flatwoods coal bed, about 700 feet above the Lower Elkhorn, is the highest bed found in division 40. It is represented at locality 3711, but probably only part of the bed is exposed there (pl. 40). The Flatwoods underlies a considerable area at the southeast corner of division 40 and also smaller areas in the highest knobs of the division.

One of two coal beds about 400 feet above the Lower Elkhorn may be the Bevins. These beds, however, contain many shale partings.

A coal bed about 300 feet above the Lower Elkhorn at locality 3709 may represent the Williamson bed. The coal is 2 feet thick.

The Upper Elkhorn No. 3 may be represented at locality 3733 or 3727. At locality 3727 there is 2 feet of clean coal, overlain by 1 foot of shaly coal.

The Upper Elkhorn No. 2 is the best-known coal bed in division 40. It has been extensively prospected and is being mined in the northwestern part of the division. The bed is generally about 5 feet thick, including a thick bench of clean coal (pl. 40). Samples of this bed collected at localities 3658 and 3677 and the Utilities Elkhorn no. 6 mine, at Virgie (locality 3705), were analyzed (p. 81).

A coal bed 30 feet below the Upper Elkhorn No. 2 is reported to be 2 feet thick. at localities 3726 and 3747. This may be the Upper Elkhorn No. 1 bed.

Another coal bed between the Elkhorn No. 2 and the Lower Elkhorn is represented at locality 3707, where there is 2 feet of clean coal, overlain by 1 foot of shaly coal.

The Lower Elkhorn coal bed includes two coal beds about 30 feet apart. The upper bed apparently contains abundant partings, whereas the lower bed generally has about 3 feet of clean coal with shaly coal above. These beds, however, cannot everywhere be distinguished, nor can it be determined which is the true Lower Elkhorn. Accordingly, the outcrop line on plate 48 and the correlation line on plate 40 should be regarded as representing both beds. A sample of the Lower Elkhorn coal collected at locality 3660 was analyzed (p. 73).

A coal bed about 200 feet below the Lower Elkhorn in division 40 is presumably the Bingham coal bed. It was found at only two localities, however, and at one of these (locality 3696) it is only 31 inches thick, including a 7-inch shale parting.

A very thin coal bed was found at localities 3729 and 3731 about 330 feet below the Lower Elkhorn. The bed is possibly the Millard. Localities 3699 and 3706 are about 360 feet below the Lower Elkhorn and may also be on the Millard, but the coal there is reported to be 2½ and 3 feet thick, respectively.

DIVISION 41

Two coal beds about 1,250 feet above the Lower Elkhorn were found at localities 3860 and 3861. The lower of these beds is reported to be 5 feet thick. They underlie a considerable area through the Flatwoods region.

The Flatwoods coal bed, about 700 feet above the Lower Elkhorn was found at localities 3754 and 3758. At 3758 the bed includes some cannel coal. At 3754 the coal is very thick but includes some partings. A sample of the Flatwoods coal collected at locality 3754 was analyzed (p. 90).

A coal bed 600 feet above the Lower Elkhorn was found at two localities. At locality 3826 it consists of a 3-foot bench of clean coal and an 8-inch coal bed 3½ feet above the bench. This may be the Taylor bed.

A coal bed about 450 feet above the Lower Elkhorn is reported to be 4 feet thick at locality 3819.

A coal bed about 350 feet above the Lower Elkhorn is 2½ feet thick, including a shale parting, at locality 3797 and is reported to be 2 feet thick at locality 3840 and 3 feet thick at locality 3753.

The Upper Elkhorn No. 3 is probably represented at localities 3813 and 3818. At 3813 the coal is in two 2-foot benches separated by 4 inches of shale.

The Upper Elkhorn No. 2 coal bed has been extensively prospected in division 41. The bed is generally 4 feet or more thick, including a thick bench of clean coal (pl. 41). A sample of this bed collected at locality 3825 was analyzed (p. 82).

There are at least four and perhaps locally as many as six coal beds in the 80-foot zone at the approximate position of the Lower Elkhorn. The thickest coal bed has been assumed to be the Lower Elkhorn, and an attempt has been made to separate it from the other coal beds nearby. These beds range from a few inches to several feet in thickness. Samples of the beds collected at localities 3759, 3768, and 3847 were analyzed (p. 74).

Localities 3788 and 3791 are caved openings on a coal reported to be less than 2 feet thick. Their position is probably between the Bingham and the Millard.

DIVISION 42

Most of the information on the coal beds in division 42 is based on a thorough prospect survey by the Consolidation Coal Co., at Jenkins, Ky.

Both the Upper Elkhorn coal beds are thick, and many measurements on them are shown on plate 42. A sample of the no. 2 bed, collected at the Wright Elkhorn mine (locality 3885) was analyzed (p. 82).

The Lower Elkhorn coal bed is one of a series of beds occurring about 180 feet below no. 2. There are at least four of these beds in division 42, and their thickness ranges from a few inches to 4 feet (reported thickness at locality 3893).

A coal bed about 350 feet below no. 2 bed is probably the Bingham. At locality 3884 it is about 1½ feet thick.

A thin coal bed at locality 3883 is probably between the Bingham and the Millard coal beds.

A coal bed at locality 3952, about 540 feet below no. 2 bed, is probably the Millard. The coal here is 2½ feet thick and composed partly of cannel. A sample of the coal was analyzed (p. 61).

DIVISION 43

Most of the information on the coal beds in division 43 is based on a thorough prospect survey by the Consolidation Coal Co., at Jenkins, Ky.

The Upper Elkhorn No. 2 and No. 3 beds are both thick, and many measurements on them are shown on plate 43.

A coal bed at locality 4020, about 180 feet below no. 2 bed, is probably the Lower Elkhorn. It is 2½ feet thick, including thin shale partings.

DIVISION 44

Several coal beds above the Upper Elkhorn zone were found in division 44 but the openings on these high beds are so few and so widely separated that their correlation is very uncertain.

A coal bed at locality 4088, about 650 feet above the Upper Elkhorn No. 2, is the highest bed found. The bed contains numerous partings.

A coal bed at locality 4090 is 3 feet thick, including partings. Localities 4191 and 4158 may also be on this bed. The coal is reported to be 6 feet thick at locality 4158. This bed may be the Flatwoods.

A coal bed at locality 4092 is about 3 feet thick, including a shale parting, and may be represented at localities 4157, 4167, 4190, and 4198. At locality 4190 the bed is 7 feet thick, including two thin shale partings. The lower 3 feet of the bed at this locality is cannel coal.

A coal bed 275 feet above the Upper Elkhorn No. 2 is reported to be 3 feet thick at locality 4093.

A coal bed 200 feet above the Upper Elkhorn No. 2 is reported to be 7 feet thick at localities 4152 and 4154. At locality 4094 only 1½ feet was found, but this thickness may include only part of the bed.

A coal bed about 120 feet above the Upper Elkhorn No. 2 was found at a few localities and may be the Williamson bed. It is several feet thick but includes some partings.

The Upper Elkhorn No. 3 has been extensively prospected in division 44 and probably has been correlated correctly. This bed generally consists of two fairly thick benches of clean coal, separated by a few inches of shale. Samples of this bed collected at localities 4114, 4118, and 4170 were analyzed (p. 85).

The Upper Elkhorn No. 2 has also been extensively prospected. It generally consists of a single bench of clean coal, with shaly coal and shale above. Samples of the coal collected at localities 4113 and 4164 were analyzed (p. 82).

A coal bed 30 to 50 feet below the no. 2 may be the Upper Elkhorn No. 1 coal bed. Several measurements on this bed are shown on plate 44.

Localities 4172, 4174, and 4178 are probably on a coal bed between the Upper Elkhorn No. 1 and the Lower Elkhorn. The bed is reported to be 3 feet thick at locality 4178, but at locality 4172 there is a thick shale parting in the bed.

The Lower Elkhorn is probably represented at localities 4115 and 4177, but the thickness of the bed is not known.

The Bingham coal bed, 360 feet below no. 2, is represented at locality 4126, where it consists of several thin coal benches separated by shale partings.

A coal bed at localities 4110 and 4111, about 460 feet below the Upper Elkhorn No. 2, is probably between the Bingham and the Millard. The coal is nearly 3 feet thick and contains 1 foot of cannel coal at the top.

DIVISION 45

A coal bed at localities 4202 and 4214, about 500 feet above the Upper Elkhorn No. 2, may be the Flatwoods. The bed underlies a considerable area in the high divide at the county line, at the west edge of division 45, and extends eastward in the divide between Robinson and Island Creeks. It is thick at both localities and includes some cannel coal at locality 4202.

A coal bed 200 feet above the Upper Elkhorn No. 2 was found at one caved opening (locality 4203). No other beds above the Upper Elkhorn zone were found in division 45, but other high coal beds can be expected, for they are present in adjoining divisions (pl. 47).

The Upper Elkhorn coal beds have been extensively prospected in division 45, and the no. 2 and no. 3 beds have been mined in the eastern part of the division. Each of these beds is thick. (See pl. 45.) The identification of the no. 1 coal bed is uncertain, and it may have been confused with a bed in the no. 2 zone.

The Lower Elkhorn is probably one of the several thin coal beds about 180 feet below the Upper Elkhorn No. 2. Correlation of these thin beds was not attempted.

A 2-foot coal bed at a few localities about 360 feet below the Upper Elkhorn No. 2 is probably the Bingham.

A 2-foot coal bed found at a few localities about 460 feet below the no. 2 is probably a bed between the Bingham and the Millard.

Locality 4252A is shown at an altitude of 1,220 feet and the nearby locality 4,256 at 1,310 feet. The correlation is believed to be correct but the implied steep dip is doubted. The altitude of locality 4256 and other openings in Ford Branch may be shown incorrectly.

DIVISION 46

A caved opening on a very high coal bed was found at locality 4282, but the thickness of the bed is not known. The altitude of the opening corresponds to that of locality 4214, in the adjoining part of division 45, which suggests that locality 4282 represents the Flatwoods.

A thick coal bed 300 feet above the Upper Elkhorn zone may be the Bevins bed, although it seems to be above the usual position of the Bevins. The bed underlies a considerable area in isolated divides of division 46. It is 4 feet thick, including some thin shale partings, at the Utilities Elkhorn no. 5 mine (locality 4339).

The Upper Elkhorn coal beds have been extensively prospected in division 46 and mined in the northern and eastern parts of the division. Locally there are four of these beds in a zone only 90 feet thick. The individual beds were not satisfactorily correlated. An attempt to correlate the beds is shown by the lines on plate 46, but the suggested correlations are exceedingly uncertain except where shown by solid lines.

The Lower Elkhorn coal bed is represented by one of the several thin coal beds about 150 feet below the upper Elkhorn zone.

A very thin coal bed about 300 feet below the Upper Elkhorn zone, found at locality 4292, may be the Bingham.

Several openings on one or more beds about 400 feet below the Upper Elkhorn zone are probably on coal beds lying between the Bingham and the Millard.

Analyses of coal from Pike County, Ky.

[All analyses made by U. S. Bureau of Mines. Measured sections of the coal beds at localities sampled are given on plates 1–46]

Elswick coal bed

[Samples collected by U. S. Geological Survey, 1934]

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis[1]	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 33, locality 2866, east side of Russell Fork ½ mile above mouth of Beaver Creek.	B–463	1.7	1	0.6	29.1	56.2	14.1	1.4	------	------	------	------	7,267	13,080	2,900
			2	2.3	28.6	55.2	13.9	1.4	------	------	------	------	7,144	12,860	
			3	------	29.2	56.6	14.2	1.4	------	------	------	------	7,311	13,160	
			4	------	34.1	65.9	------	1.7	------	------	------	------	8,522	15,340	
Division 34, locality 2956, Elswick Coal Co., Federal mine no. 1; room 5, entry 24 off 8 left. Partings and dirty coal excluded.	B–922	1.1	1	.7	30.7	61.5	7.1	1.9	------	------	------	------	7,922	14.260	2,490
			2	1.7	30.4	60.9	7.0	1.8	------	------	------	------	7,839	14,110	
			3	------	30.9	62.0	7.1	1.9	------	------	------	------	7,972	14,350	
			4	------	33.3	66.7	------	2.0	------	------	------	------	8,589	15,460	
Same, 100 feet up left airway of main entry; 1,800 feet from John Moores Branch and 3,600 feet from Russell Fork. Sample includes 1 inch of dirty coal; other partings excluded.	B–921	1.6	1	.7	29.4	59.8	10.1	2.8	------	------	------	------	7,650	13,770	2,330
			2	2.2	28.9	59.0	9.9	2.8	------	------	------	------	7,533	13,560	
			3	------	29.5	60.4	10.1	2.8	------	------	------	------	7,700	13,860	
			4	------	32.9	67.1	------	3.1	------	------	------	------	8,567	15,420	
Same, in main air course at 4 left entry about 900 feet from entrance. Partings and dirty coal excluded.	B–920	1.3	1	1.0	30.8	58.3	9.9	3.4	------	------	------	------	7,550	13,590	2,280
			2	2.3	30.4	57.5	9.8	3.4	------	------	------	------	7,450	13,410	
			3	------	31.1	58.9	10.0	3.4	------	------	------	------	7,622	13,720	
			4	------	34.6	65.4	------	3.8	------	------	------	------	8,472	15,250	
Same, composite of samples B–920, B–921, B–922	B–923	1.3	1	.8	30.1	60.1	9.0	2.7	4.9	77.7	1.4	4.3	7,717	13,890	
			2	2.1	29.7	59.3	8.9	2.6	5.0	76.7	1.4	5.4	7,611	13,700	
			3	------	30.3	60.6	9.1	2.7	4.9	78.4	1.4	3.5	7,778	14,000	
			4	------	33.3	66.7	------	3.0	5.4	86.1	1.5	4.0	8,550	15,390	

[1] Air-dried; 2, as received; 3, moisture-free; 4, moisture- and ash-free.

Analyses of coal from Pike County, Ky.—Continued

Bed 90 feet above Elswick coal bed

[Samples collected by U. S. Geological Survey, 1934]

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 10, locality 778, 0.1 mile above mouth of Lower Elk Creek of Knox Creek. All partings excluded from the sample.	B–429	1.3	1	1.2	31.8	59.8	7.2	0.7	------	------	------	------	7,828	14,090	2,900
			2	2.3	31.3	59.1	7.1	.7	------	------	------	------	7,728	13,910	
			3	------	32.1	60.7	7.2	.7	------	------	------	------	7,922	14,260	
			4	------	34.6	65.4	------	.8	------	------	------	------	8,539	15,370	
Division 33, locality 2887, Barrowman Coal Corporation, Praise, Ky., 500 feet southeast of main entry, room 4. All partings and 6 inches of cannel coal excluded.	B–914	1.5	1	.7	30.9	60.2	8.2	.7	------	------	------	------	7,833	14,100	2,910
			2	2.2	30.5	59.2	8.1	.7	------	------	------	------	7,717	13,890	
			3	------	31.1	60.6	8.3	.7	------	------	------	------	7,833	14,190	
			4	------	33.9	66.1	------	.7	------	------	------	------	8,594	15,470	
Same, room 6, 500 feet from main entry to southeast. All partings and 6 inches of cannel coal excluded.	B–913	2.3	1	.8	29.9	57.6	11.7	.8	------	------	------	------	7,500	13,500	2,910
			2	3.1	29.2	56.2	11.5	.8	------	------	------	------	7,328	13,190	
			3	------	30.1	58.1	11.8	.8	------	------	------	------	7,556	13,600	
			4	------	34.2	65.8	------	.9	------	------	------	------	8,572	15,430	
Same, room 1, 100 feet east of main entry. All partings and 5 inches of cannel coal excluded.	B–912	1.6	1	.8	30.7	59.1	9.4	.7	------	------	------	------	7,694	13,850	2,900
			2	2.3	30.2	58.3	9.2	.7	------	------	------	------	7,572	13,630	
			3	------	31.0	59.6	9.4	.7	------	------	------	------	7,756	13,960	
			4	------	34.2	65.8	------	.8	------	------	------	------	8,567	15,420	
Same, composite of samples B–912, B–913, B–914	B–915	1.8	1	.7	30.7	58.8	9.8	.7	5.1	77.8	1.6	5.0	7,667	13,800	
			2	2.5	30.2	57.7	9.6	.7	5.2	76.4	1.6	6.5	7,533	13,560	
			3	------	30.9	59.2	9.9	.7	5.1	78.4	1.6	4.3	7,722	13,900	
			4	------	34.3	65.7	------	.8	5.6	86.9	1.8	4.9	8,567	15,420	
Division 33, locality 2901, up first hollow to east off of first hollow above mouth of Hunts Branch, which empties into Grassy Creek of Russell Fork. All partings excluded.	B–986	2.6	1	.9	30.5	65.9	2.7	.5	------	------	------	------	8,239	14,830	2,470
			2	3.5	29.7	64.2	2.6	.5	------	------	------	------	8,028	14,450	
			3	------	30.8	66.5	2.7	.5	------	------	------	------	8,317	14,970	
			4	------	31.6	68.4	------	.6	------	------	------	------	8,550	15,390	

Auxier coal bed

[Samples collected by U. S. Geological Survey, 1934]

Division 30, locality 2558, east side of Lick Creek of Levisa Fork, 0.7 mile above mouth of Elswick Fork. All partings and dirty coal excluded.	B-466	2.1	1	0.6	32.5	60.6	6.3	1.6					7,961	14,330	2,280
			2	2.7	31.8	59.3	6.2	1.6					7,800	14,040	
			3		32.6	61.1	6.3	1.6					8,011	14,420	
			4		34.9	65.1		1.7					8,550	15,390	
Division 33, location 2815, east side of Card Creek, ¾ mile below mouth of Indian Grove Fork.	B-468	1.8	1	.8	31.1	61.5	6.6	2.4					7,922	14,260	2,230
			2	2.5	30.5	60.5	6.5	2.3					7,783	14,010	
			3		31.3	62.1	6.6	2.4					7,983	14,370	
			4		33.5	66.5		2.6					8,550	15,390	
Division 33, location 2840, ¼ mile up right fork of Beaver Creek of Russel Fork. On northwest side of fork.	B-465	1.7	1	.6	31.7	61.0	6.7	1.3					7,994	14,390	2,50
			2	2.3	31.1	60.0	6.6	1.3					7,856	14,140	
			3		31.9	61.4	6.7	1.3					8,039	14,470	
			4		34.2	65.8		1.4					8,622	15,520	
Division 33, location 2889, Barrowman Coal Corporation, Praise, Ky. Main working face 100 yards from entrance. All partings and shaly coal excluded.	B-918	1.9	1	.7	30.0	58.2	11.1	3.1					7,522	13,540	2,210
			2	2.6	29.4	57.1	10.9	3.1					7,378	13,280	
			3		30.2	58.6	11.2	3.2					7,578	13,640	
			4		33.9	66.1		3.5					8,528	15,350	
Same, main working face 75 yards from entrance. All partings and shaly coal excluded.	B-917	1.6	1	.7	30.7	59.8	8.8	2.3					7,756	13,960	2,340
			2	2.3	30.2	58.9	8.6	2.3					7,633	13,740	
			3		30.9	60.3	8.8	2.3					7,806	14,050	
			4		33.8	66.2		2.6					8,561	15,410	
Same, main working face 200 yards from entrance. All partings and shaly coal excluded.	B-916	1.1	1	.7	31.0	59.9	8.4	2.1					7,783	14,010	2,460
			2	1.8	30.7	59.2	8.3	2.0					7,700	13,860	
			3		31.2	60.4	8.4	2.1					7,839	14,110	
			4		34.1	65.9		2.3					8,561	15,410	
Same, composite of samples B-916, B-917, B-918	B-919	1.6	1	.8	30.6	59.1	9.5	2.5	4.9	77.3	1.5	4.3	7,689	13,840	
			2	2.3	30.1	58.3	9.3	2.5	4.9	76.1	1.4	5.8	7,572	13,630	
			3		30.8	59.6	9.6	2.5	4.8	77.9	1.5	3.7	7,750	13,950	
			4		34.1	65.9		2.8	5.3	86.1	1.6	4.2	8,567	15,420	
Division 33, location 2912, east side of first west fork of Abes Fork of Grassy Creek. All partings and shaly coal excluded.	B-467	3.4	1	2.0	29.9	64.5	3.6	.8					7,828	14,090	2,460
			2	5.3	28.9	62.3	3.5	.8					7,561	13,610	
			3		30.5	65.8	3.7	.8					7,989	14,380	
			4		31.7	68.3		.8					8,294	14,930	
Division 34, location 2957, Elswick Coal Co., Federal mine no. 2, 340 feet up second left entry, which is 640 feet from entrance to mine. All partings and 2 inches of coal were excluded.	B-926	1.1	1	.8	33.3	61.7	4.2	1.0					8,161	14,690	2,800
			2	1.9	33.0	60.9	4.2	1.0					8,072	14,530	
			3		33.6	62.1	4.3	1.0					8,228	14,810	
			4		35.1	64.9		1.1					8,594	15,470	
Same, in main entry 200 feet from main entrance. All partings were excluded.	B-925	.9	1	.8	31.3	62.6	5.3	1.0					8,061	14,510	2,790
			2	1.7	31.0	62.1	5.2	1.0					7,989	14,380	
			3		31.6	63.1	5.3	1.0					8,128	14,630	
			4		33.3	66.7		1.0					8,583	15,450	

645944—36——5

Analyses of coal from Pike County, Ky.—Continued

Auxier coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Same, in main entry 900 feet from main entrance. 4½ inches of shaly coal was excluded.	B-924	0.9	1	0.8	31.8	61.0	6.4	1.5	------	------	------	------	7,972	14,350	2,490
			2	1.7	31.5	60.5	6.3	1.5	------	------	------	------	7,900	14,220	
			3	------	32.1	61.4	6.5	1.5	------	------	------	------	8,039	14,470	
			4	------	34.3	65.7	------	1.6	------	------	------	------	8,593	15,470	
Same, composite of samples B-924, B-925, B-926	B-927	1.0	1	.8	32.2	61.7	5.3	1.2	5.2	81.6	1.7	5.0	8,061	14,510	
			2	1.8	31.9	61.0	5.3	1.1	5.2	80.8	1.7	5.9	7,983	14,370	
			3	------	32.5	62.1	5.4	1.2	5.1	82.3	1.7	4.3	8,128	14,630	
			4	------	34.3	65.7	------	1.2	5.4	86.9	1.8	4.7	8,589	15,460	

Millard coal bed

[Samples collected by U. S. Geological Survey, 1934, except 3662, collected in 1906]

Division 9, locality 709, east side of Peter Creek, ¼ mile north of Phelps. Entire coal bed sampled.	B-424	1.2	1	1.4	31.7	59.7	7.2	0.6	------	------	------	------	7,772	13,990	2,930
			2	2.6	31.3	59.0	7.1	.6	------	------	------	------	7,678	13,820	
			3	------	32.2	60.5	7.3	.6	------	------	------	------	7,883	14,190	
			4	------	34.7	65.3	------	.6	------	------	------	------	8,506	15,310	
Division 11, locality 907, south side of Beech Creek of left fork of Peter Creek, ¼ mile above mouth. Entire bed sampled.	B-415	.8	1	.9	32.1	60.6	6.4	.6	------	------	------	------	7,978	14,360	2,919
			2	1.7	31.8	60.1	6.4	.6	------	------	------	------	7,911	14,240	
			3	------	32.3	61.2	6.5	.6	------	------	------	------	8,044	14,480	
			4	------	34.6	65.4	------	.7	------	------	------	------	8,606	15,490	
Division 26, locality 2165, left fork of Grapevine Creek, 1 mile above mouth on east side of creek. Entire bed sampled.	B-492	1.9	1	1.2	31.6	58.9	8.3	.6	------	------	------	------	7,644	13,760	2,910
			2	3.1	31.0	57.8	8.1	.6	------	------	------	------	7,500	13,500	
			3	------	32.0	59.6	8.4	.6	------	------	------	------	7,739	13,930	
			4	------	34.9	65.1	------	.7	------	------	------	------	8,450	15,210	
Division 28, locality 2346, east side of Hunts Branch of Levisa Fork, ½ mile above mouth.	B-414	1.1	1	1.0	33.0	58.5	7.5	.9	------	------	------	------	7,844	14,120	2,800
			2	2.0	32.6	58.0	7.4	.9	------	------	------	------	7,756	13,960	
			3	------	33.3	59.1	7.6	.9	------	------	------	------	7,917	14,250	
			4	------	36.0	64.0	------	1.0	------	------	------	------	8,567	15,420	

Division 29, locality 2479, east side of Feds Creek, ½ mile above mouth of Right Fork. Entire bed sampled.	B-416	1.1	1	.9	31.3	57.4	10.4	1.3					7,578	13,640	2,540
			2	1.9	31.0	56.8	10.3	1.2					7,494	13,490	
			3		31.6	57.9	10.5	1.3					7,639	13,750	
			4		35.3	64.7		1.4					8,539	15,370	
Division 31, locality 2641B, ½ mile above mouth of first hollow on the north side of Russell Fork, below mouth of Harless Creek.	3662	1.4	1												
			2	3.0	32.2	56.6	8.2	1.1							
			3		33.2	58.4	8.4	1.1							
			4												
Division 35, locality 3069, west side of Dry Fork of Marrowbone Creek, 1 mile above mouth of Dry Fork. Sample includes 2¾ inches of shale.	B-397	2.4	1	1.4	32.6	56.9	9.1	1.3					7,572	13,630	2,540
			2	3.7	31.8	55.6	8.9	1.3					7,394	13,310	
			3		33.0	57.8	9.2	1.3					7,678	13,820	
			4		36.4	63.6		1.5					8,461	15,230	
Division 37, locality 3293, north side of Rockhouse Creek of Marrowbone Creek, ½ mile above mouth of Bad Fork. All partings excluded.	B-394	1.8	1	1.3	34.6	52.4	11.7	1.6					7,378	13,280	2,360
			2	3.0	34.0	51.5	11.5	1.6					7,244	13,040	
			3		35.0	53.1	11.9	1.6					7,467	13,440	
			4		39.8	60.2		1.9					8,478	15,260	
Division 38, locality 3420, north side of Winston Branch of Russell Fork and 9/10 mile above the mouth. Sample includes 5/8 inch clay partings. Other parting and shaly coal excluded.	B-491	1.4	1	1.2	33.8	48.4	16.6	6.3					6,822	12,280	2,110
			2	2.6	33.3	47.7	16.4	6.2					6,728	12,110	
			3		34.2	49.0	16.8	6.4					6,906	12,430	
			4		41.1	58.9		7.7					8,306	14,950	
Same, locality 3427, east side of Hopkins Branch of Russell Fork, 1 mile above mouth. Sample includes 3 inches of cannel coal and 1 inch of shaly coal; all other partings excluded.	B-490	1.3	1	1.4	36.5	53.2	8.9	1.5					7,594	13,670	2,340
			2	2.7	36.0	52.6	8.7	1.5					7,494	13,490	
			3		37.0	54.0	9.0	1.5					7,706	13,870	
			4		40.6	59.4		1.7					8,461	15,230	
Same, locality 3479, west side of Greasy Creek of Levisa Fork, 0.7 mile above the mouth. All partings excluded.	B-489	1.3	1	1.5	35.5	57.9	5.1	1.1					7,878	14,180	2,490
			2	2.8	35.0	57.2	5.0	1.1					7,778	14,000	
			3		36.0	58.8	5.2	1.1					8,000	14,400	
			4		38.0	62.0		1.2					8,433	15,180	
Division 42, locality 3952, west side of Shelby Creek ½ mile below the mouth of Elswick Branch. Includes 4 or 5 1/8-inch shale partings.	B-460	1.9	1	1.3	34.4	58.1	6.2	2.2					7,778	14,000	2,150
			2	3.2	33.7	57.1	6.0	2.1					7,628	13,730	
			3		34.8	59.0	6.2	2.2					7,878	14,180	
			4		37.2	62.8		2.4					8,406	15,130	
Division 44, locality 4110, west side of Shelby Creek, ½ mile below Virgie. Sample includes 1 foot of cannel coal.	B-457	.9	1	1.1	33.2	52.3	13.4	.8					7,161	12,890	2,040
			2	2.0	32.9	51.8	13.3	.8					7,094	12,770	
			3		33.5	52.9	13.6	.8					7,239	13,030	
			4		38.8	61.2		1.0					8,378	15,080	

Analyses of coal from Pike County, Ky.—Continued

Bingham coal bed

[Samples collected by U. S. Geological Survey, 1934]

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 22, locality 1733, 0.1 mile above the mouth on the east side of Road Fork of Upper Chloe Creek of Levisa Fork. All partings excluded.	B–471	2.7	1	1.4	31.9	52.8	13.9	1.4	------	------	------	------	6,989	12,580	2,720
			2	4.1	31.1	51.3	13.5	1.4	------	------	------	------	6,794	12,230	
			3	------	32.4	53.5	14.1	1.5	------	------	------	------	7,083	12,750	
			4	------	37.7	62.3	------	1.7	------	------	------	------	8,250	14,850	
Division 23, locality 1834, west side of Lower Pompey Creek, 0.5 mile below mouth of Wolfpen Fork. All partings and 2 inches of coal excluded.	B–472	1.4	1	1.1	33.3	56.9	8.7	1.0	------	------	------	------	7,589	13,660	2,800
			2	2.5	32.8	56.1	8.6	1.0	------	------	------	------	7,483	13,470	
			3	------	33.7	57.5	8.8	1.0	------	------	------	------	7,672	13,810	
			4	------	36.9	63.1	------	1.1	------	------	------	------	8,411	15,140	
Division 26, locality 2177, east side at mouth of Trace Fork of Grapevine Creek. Entire bed sampled.	B–474	2.3	1	1.3	30.6	58.6	9.5	.9	------	------	------	------	7,411	13,340	2,860
			2	3.5	29.9	57.3	9.3	.9	------	------	------	------	7,244	13,040	
			3	------	31.0	59.4	9.6	.9	------	------	------	------	7,506	13,510	
			4	------	34.3	65.7	------	1.0	------	------	------	------	8,306	14,950	
Same, locality 2204, west side of Elkhorn Creek of Johns Creek, 0.6 mile above mouth. Sample includes 3 inches of cannel coal and 3 inches of laminated coal; ½-inch shale parting excluded.	B–408	.9	1	1.3	36.1	53.4	9.2	1.5	------	------	------	------	7,544	13,580	2,500
			2	2.1	35.8	53.0	9.1	1.5	------	------	------	------	7,483	13,470	
			3	------	36.5	54.2	9.3	1.5	------	------	------	------	7,644	13,760	
			4	------	40.3	59.7	------	1.7	------	------	------	------	8,428	15,170	
Division 28, locality 2344, east side of Hunts Branch of Levisa Fork, 0.5 mile below gap. Sample includes 1-inch coal-iron band; other partings excluded.	B–409	1.2	1	1.1	32.2	55.8	10.9	1.1	------	------	------	------	7,483	13,470	2,810
			2	2.3	31.8	55.2	10.7	1.1	------	------	------	------	7,394	13,310	
			3	------	32.5	56.5	11.0	1.2	------	------	------	------	7,561	13,610	
			4	------	36.6	63.4	------	1.3	------	------	------	------	8,494	15,290	
Division 29, locality 2443, east side 0.2 mile from mouth of right fork of Laurel Fork of Feds Creek. Entire bed sampled.	B–413	2.3	1	2.2	28.8	61.0	8.0	.7	------	------	------	------	7,439	13,390	2,540
			2	4.4	28.1	59.7	7.8	.7	------	------	------	------	7,272	13,090	
			3	------	29.4	62.5	8.1	.7	------	------	------	------	7,606	13,690	
			4	------	32.0	68.0	------	.8	------	------	------	------	8,278	14,900	
Same, locality 2485, west side of Dicks Fork of Feds Creek, 0.5 mile above mouth. Sample includes entire bed.	B–411	2.1	1	2.3	30.4	60.7	6.6	.8	------	------	------	------	7,572	13,630	2,390
			2	4.4	29.8	59.3	6.5	.8	------	------	------	------	7,411	13,340	
			3	------	31.1	62.1	6.8	.8	------	------	------	------	7,744	13,940	
			4	------	33.4	66.6	------	.9	------	------	------	------	8,311	14,960	

Same, locality 2493, north side 0.5 mile above mouth of Motley Fork of Feds Creek. Sample includes entire bed.	B-412	1.8	1	1.8	28.6	62.4	7.2	.7					7,589	13,660	2,890
			2	3.6	28.1	61.2	7.1	.7					7,450	13,410	
			3		29.1	63.5	7.4	.8					7,728	13,910	
			4		31.4	68.6		.8					8,344	15,020	
Division 30, locality 2546, head of hollow on east side of Lick Creek of Levisa Fork, 1.1 miles above mouth of Lick Creek. 3 inches of shaly coal and 2 inches of marcasite excluded.	B-470	.7	1	.8	32.2	59.1	7.9	2.1					7,817	14,070	2,520
			2	1.4	31.9	58.9	7.8	2.1					7,761	13,970	
			3		32.4	59.7	7.9	2.1					7,872	14,170	
			4		35.2	64.8		2.3					8,550	15,390	
Division 33, locality 2891A, Barrowman Coal Corporation, Praise, Ky. Main working face 100 feet from entrance.	B-960	.6	1	.6	34.6	57.2	7.6	1.9					7,894	14,210	2,390
			2	1.1	34.4	56.9	7.6	1.9					7,850	14,130	
			3		34.8	57.5	7.7	2.0					7,939	14,290	
			4		37.7	62.3		2.1					8,600	15,480	
Division 39, locality 3614, east side of Shelby Creek, 0.3 mile below mouth of Caney Creek. 5-inch iron pyrite excluded.	B-456	1.9	1	1.0	36.3	52.8	9.9	3.7					7,483	13,470	2,160
			2	2.8	35.6	51.9	9.7	3.6					7,344	13,220	
			3		36.6	53.4	10.0	3.7					7,556	13,600	
			4		40.7	59.3		4.1					8,400	15,120	
Division 45, locality 4250, north side 1 mile above the mouth of Sukey Creek of Shelby Creek. All partings excluded.	B-450	2.3	1	1.3	36.7	53.0	9.0	1.9					7,528	13,550	2,280
			2	3.5	35.8	51.9	8.8	1.9					7,361	13,250	
			3		37.1	53.8	9.1	1.9					7,628	13,730	
			4		40.9	59.1		2.1					8,389	15,100	

Pond Creek (Lower Elkhorn) coal bed

[Samples collected by U. S. Geological Survey, 1934, except as indicated in footnotes]

Division 4, locality 316, Pond Creek Collieries Co., Norfolk & Western Fuel, Goody, Ky.; no. 2 butt off no. 1 flat. 3 inches of shaly coal excluded.	B-938	1.7	1	1.6	34.4	59.7	4.3	0.6					7,894	14,210	2,860
			2	3.3	33.8	58.7	4.2	.5					7,756	13,960	
			3		35.0	60.7	4.3	.5					8,022	14,4.0	
			4		36.6	63.4		.5					8,389	15,100	
Same, room A, fifth right. 5½ inches of shaly coal excluded..	B-937	1.8	1	1.6	34.7	59.5	4.2	.5					7,878	14,180	2,810
			2	3.3	34.1	58.4	4.2	.5					7,739	13,930	
			3		35.3	60.4	4.3	.5					8,011	14,420	
			4		36.8	63.2		.5					8,372	15,070	
Same, new main south heading. 6½ inches of shaly coal excluded.	B-936	1.6	1	1.6	34.7	59.2	4.5	.6					7,867	14,160	2,810
			2	3.2	34.2	58.2	4.4	.5					7,739	13,930	
			3		35.3	60.1	4.6	.6					7,994	14,390	
			4		37.0	63.0		.6					8,378	15,080	

Analyses of coal from Pike County, Ky.—Continued

Pond Creek (Lower Elkhorn) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Same, composite of samples B-936, B-937, B-938	B-939	1.7	1	1.6	34.8	59.3	4.3	0.5	5.4	80.0	1.4	8.4	7,867	14,160	
			2	3.2	34.2	58.4	4.2	.5	5.5	78.7	1.4	9.7	7,733	13,920	
			3	-------	35.3	60.3	4.4	.5	5.3	81.3	1.4	7.1	7,989	14,380	
			4	-------	37.0	63.0	------	.5	5.5	85.0	1.5	7.5	8,356	15,040	
Division 5, locality 400, Hardly Able Coal Co., Huddy, Ky., no. 1 main heading, room 4. 11 inches of laminated coal excluded.	B-970	1.3	1	1.1	34.4	59.0	5.5	.6	------	------	------	------	7,856	14,140	2,940
			2	2.4	33.9	58.3	5.4	.6	------	------	------	------	7,756	13,960	
			3	-------	34.7	59.7	5.6	.6	------	------	------	------	7,944	14,300	
			4	-------	36.8	63.2	------	.6	------	------	------	------	8,411	15,140	
Division 5, locality 402, Fordson Coal Co., mine 3, Stone, Ky.; fourth left flat, air course.	[3] A74297	------	1	-------	------	------	------	------	------	------	------	------	------	------	2,710
			2	3.6	31.5	60.5	4.4	.5	------	------	------	------	7,717	13,890	
			3	-------	32.7	62.7	4.6	.5	------	------	------	------	8,011	14,420	
			4	-------	34.3	65.7	------	.5	------	------	------	------	8,394	15,110	
Same, third left flat	[3] A74296	------	1	-------	------	------	------	------	------	------	------	------	------	------	2,840
			2	3.1	32.9	59.1	4.9	.6	------	------	------	------	7,756	13,960	
			3	-------	33.9	61.0	5.1	.6	------	------	------	------	8,006	14,410	
			4	-------	35.8	64.2	------	------	------	------	------	------	8,428	15,170	
Same, first left flat	[3] A74295	------	1	-------	------	------	------	------	------	------	------	------	------	------	2,550
			2	4.5	32.3	58.0	5.2	.6	------	------	------	------	7,594	13,670	
			3	-------	33.8	60.8	5.4	.6	------	------	------	------	7,950	14,310	
			4	-------	35.8	64.2	------	.6	------	------	------	------	8,411	15,140	
Same, room no. 8, 6 butt right off first left flat	[3] A74294	------	1	-------	------	------	------	------	------	------	------	------	------	------	2,490
			2	5.1	31.1	58.9	4.9	.5	------	------	------	------	7,567	13,620	
			3	-------	32.8	62.1	5.1	.5	------	------	------	------	7,972	14,350	
			4	-------	34.6	65.4	------	.5	------	------	------	------	8,406	15,130	
Same, composite of samples A74294, A74295, A74296, A74297	[3] A74298	------	1	-------	------	------	------	------	------	------	------	------	------	------	
			2	4.0	32.0	59.2	4.8	.5	5.1	76.8	1.4	11.4	7,672	13,810	
			3	-------	33.4	61.4	5.0	.5	4.9	80.0	1.5	8.1	7,994	14,390	
			4	-------	35.1	64.9	------	.5	5.2	84.2	1.6	8.5	8,417	15,150	
Same, main entry near 5 right flat, 4,600 feet S. 50° E. of mine mouth.	[3] 74419	------	1	-------	------	------	------	------	------	------	------	------	------	------	
			2	2.97	33.41	58.9	4.7	.5	------	------	------	------	------	14,051	
			3	-------	34.43	60.7	4.9	.5	------	------	------	------	------	14,481	
			4	-------	36.2	63.8	------	.6	------	------	------	------	------	15,225	

Same, 5 right butt entry off 4 right flat entry, 4,800 feet S. 30° E. of mine mouth.	[3] 74418	------	1	------	------	------	------	------	------	------	------	------	
			2	3.2	33.3	59.2	4.4	.5	------	------	------	------	14,095	
			3	------	34.4	61.1	4.5	.6	------	------	------	------	14,558	
			4	------	36.0	64.0	------	.6	------	------	------	------	15,246	
Same, composite of samples 74418, 74419	[3] 74436	------	1	------	------	------	------	------	------	------	------	------	
			2	1.6	34.0	59.8	4.6	.8	5.1	80.5	1.4	7.7	------	14,250
			3	------	34.6	60.7	4.7	.8	5.0	81.9	1.4	6.3	------	14,486
			4	------	36.3	63.7	------	.8	5.2	85.9	1.5	6.6	------	15,197
Division 5, locality 409, Marietta Coal Co., last break through between no. 4 right entry and air course.	[4] 84209	------	1	1.0	34.6	59.3	5.1	.6	5.3	80.4	1.6	7.1	7,939	14,090
			2	2.5	34.1	58.3	5.1	.6	5.2	79.3	1.5	8.2	7,823	14,290
			3	------	34.9	59.9	5.2	.6	5.1	81.2	1.6	6.3	8,019	14,440
			4	------	36.8	63.2	------	.7	5.4	85.7	1.7	6.5	8,457	15,230
Division 6, locality 448, Burnwell Coal Co., mine no. 2, room 9, fourth left entry off main entry.	[5] 17459	------	1	1.9	33.5	59.5	5.2	.6	5.3	79.5	1.4	8.0	------	------	2,940
			2	3.2	33.0	58.7	5.1	.6	5.3	78.5	1.4	9.1	7,711	13,880	
			3	------	34.1	60.6	5.3	.6	5.1	81.1	1.5	6.4	7,967	14,340	
			4	------	36.0	64.0	------	.7	5.4	85.5	1.5	6.9	8,406	15,130	
Division 6, locality 464, north side of Lower Stringtown Branch, 0.3 mile from Tug River.	B-388	2.3	1	1.6	33.5	60.5	4.4	.5	------	------	------	------	7,806	14,230	2,770
			2	3.9	32.7	59.1	4.3	.5	------	------	------	------	7,717	13,890	
			3	------	34.1	61.5	4.4	.5	------	------	------	------	8,028	14,450	
			4	------	35.6	64.4	------	.6	------	------	------	------	8,406	15,130	
Division 6, locality 488, Leckie Collieries Co., Leckie No. 1. Everything excluded except 1¼ feet of shaly coal, ninth right heading.	B-954	1.7	1	1.2	27.4	47.0	24.4	.4	------	------	------	------	6,128	11,030	2,930
			2	3.0	26.9	46.1	24.0	.4	------	------	------	------	6,022	10,840	
			3	------	27.7	47.6	24.7	.4	------	------	------	------	6,206	11,170	
			4	------	36.8	63.2	------	.5	------	------	------	------	8,244	14,840	
Same, first left off second right off seventh left off main. All partings excluded.	B-953	2.4	1	1.4	34.0	61.7	2.9	.7	------	------	------	------	8,033	14,460	2,760
			2	3.7	33.1	60.3	2.9	.6	------	------	------	------	7,844	14,120	
			3	------	34.4	62.6	3.0	.7	------	------	------	------	8,144	14,660	
			4	------	35.5	64.5	------	.7	------	------	------	------	8,394	15,110	
Same, first right air course off third left off seventh left off main. 2½ feat of shaly coal excluded.	B-952	2.1	1	1.4	34.5	62.0	2.1	.6	------	------	------	------	8,117	14,610	2,460
			2	3.5	33.8	60.7	2.0	.5	------	------	------	------	7,944	14,300	
			3	------	35.0	62.9	2.1	.6	------	------	------	------	8,233	14,820	
			4	------	35.8	64.2	------	.6	------	------	------	------	8,406	15,130	
Same, ninth right heading. 1¼ feet of shaly coal excluded	B-951	1.8	1	1.2	35.5	59.3	4.0	.6	------	------	------	------	7,928	14,270	2,520
			2	3.0	34.8	58.2	4.0	.6	------	------	------	------	7,783	14,010	
			3	------	35.9	60.0	4.1	.6	------	------	------	------	8,028	14,450	
			4	------	37.4	62.6	------	.7	------	------	------	------	8,367	15,060	
Same, composite of samples B-951, B-952, B-953	B-955	2.1	1	1.4	34.7	60.9	3.0	.5	5.5	81.8	1.4	7.8	8,028	14,450	
			2	3.4	34.0	59.7	2.9	.5	5.6	80.1	1.4	9.5	7,861	14,150	
			3	------	35.2	61.7	3.1	.5	5.4	82.9	1.4	6.7	8,139	14,650	
			4	------	36.3	63.7	------	.5	5.6	85.5	1.5	6.9	8,394	15,110	

[3] Sample collected by U. S. Bureau of Mines, 1931.
[4] Sample collected by U. S. Bureau of Mines, 1922.
[5] Sample collected by U. S. Geological Survey, 1920.
[6] Sample collected by U. S. Bureau of Mines, 1918.

Analyses of coal from Pike County, Ky.—Continued

Pond Creek (Lower Elkhorn) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 6, locality 516, north side of Blackberry Fork of Pond Creek, 0.2 mile above mouth of Mudlick Branch. 1¼ feet of shaly coal excluded.	B–385	3.3	1	1.5	31.8	62.0	4.7	0.5	------	------	------	------	7,839	14,110	2,820
			2	4.7	30.7	60.1	4.5	.5	------	------	------	------	7,578	13,640	
			3	------	32.3	62.9	4.8	.5	------	------	------	------	7,956	14,320	
			4	------	33.9	66.1	------	.5	------	------	------	------	8,356	15,040	
Division 7, locality 548, north side of south fork of Rockhouse Branch of Blackberry Creek, 0.2 mile above forks. 8 inches of shaly coal excluded.	B–428	.9	1	1.7	31.3	60.9	6.1	.5	------	------	------	------	7,783	14,010	2,920
			2	2.6	31.0	60.4	6.0	.5	------	------	------	------	7,717	13,890	
			3	------	31.8	62.0	6.2	.5	------	------	------	------	7,917	14,250	
			4	------	33.9	66.1	------	.6	------	------	------	------	8,439	15,190	
Division 7, locality 563, south side of Dial Branch of Blackberry Creek, 0.3 mile above left fork. 11 inches of shaly coal excluded.	B–391	2.4	1	1.4	32.5	60.9	5.2	.5	------	------	------	------	7,839	14,110	2,210
			2	3.8	31.7	59.9	5.0	.5	------	------	------	------	7,650	13,770	
			3	------	33.0	61.8	5.2	.5	------	------	------	------	7,950	14,310	
			4	------	34.8	65.2	------	.6	------	------	------	------	8,389	15,100	
Division 8, locality 633, north side of Poundmill Run of Tug River, 0.7 mile above mouth. 1 foot of coal and all partings excluded.	B–427	2.2	1	1.7	31.7	60.3	6.3	.6	------	------	------	------	7,778	14,000	2,920
			2	3.9	31.0	58.9	6.2	.6	------	------	------	------	7,606	13,690	
			3	------	32.3	61.3	6.4	.6	------	------	------	------	7,917	14,250	
			4	------	34.5	65.5	------	.7	------	------	------	------	8,456	15,220	
Division 8, locality 667, west side 0.5 mile above mouth of Slate Branch of Blackberry Creek. 1¼ feet of shaly coal excluded.	B–392	1.3	1	1.1	33.4	60.2	5.3	.6	------	------	------	------	8,006	14,410	2,941
			2	2.4	33.0	59.4	5.2	.6	------	------	------	------	7,900	14,220	
			3	------	33.8	60.9	5.3	.6	------	------	------	------	8,089	14,560	
			4	------	35.7	64.3	------	.6	------	------	------	------	8,544	15,380	
Division 9, locality 693, Emperor Coal Co., Emperor mine no. 4, room 1, fourth butt off fifth butt off ninth right off main. 8½ inches of shale and shaly coal excluded.	B–878	1.4	1	1.1	33.7	61.5	3.7	.6	------	------	------	------	8,100	14,580	2,870
			2	2.4	33.2	60.8	3.6	.6	------	------	------	------	7,989	14,380	
			3	------	34.0	62.3	3.7	.6	------	------	------	------	8,183	14,730	
			4	------	35.3	64.7	------	.6	------	------	------	------	8,506	15,310	
Same, room no. 1 off parallel entry off main. 10½ inches of shaly coal excluded; sample includes ½ inch of carbonaceous shale.	B–877	2.0	1	1.1	32.8	61.5	4.6	.9	------	------	------	------	8,044	14,480	2,700
			2	3.0	32.1	60.4	4.5	.8	------	------	------	------	7,883	14,190	
			3	------	33.1	62.3	4.6	.9	------	------	------	------	8,128	14,630	
			4	------	34.7	65.3	------	.9	------	------	------	------	8,522	15,340	
Same, chain pillar on 6 north at mouth of room 5. All partings excluded.	B–876	1.2	1	1.1	33.2	61.1	4.6	.6	------	------	------	------	8,050	14,490	2,860
			2	2.2	32.8	60.5	4.5	.5	------	------	------	------	7,956	14,320	
			3	------	33.5	61.9	4.6	.6	------	------	------	------	8,139	14,650	
			4	------	35.2	64.8	------	.6	------	------	------	------	8,533	15,360	

Same, composite of samples B-876, B-877, B-878	B-879	1.5	1	1.1	33.4	61.2	4.3	.6	5.2	81.7	1.5	6.7	8,050	14,490	
			2	2.6	32.9	60.3	4.2	.6	5.3	80.5	1.5	7.9	7,928	14,270	
			3		33.7	62.0	4.3	.6	5.1	82.6	1.5	5.9	8,133	14,640	
			4		35.3	64.7		.6	5.4	86.3	1.6	6.1	8,506	15,310	
Division 9, locality 718, north side of Turkey Creek, ½ mile above mouth of Malachi Branch. All partings excluded.	B-425	5.7	1	1.6	32.4	60.7	5.3	.7					7,928	14,270	2,930
			2	7.2	30.5	57.3	5.0	.6					7,478	13,460	
			3		32.9	61.8	5.3	.7					8,061	14,510	
			4		34.8	65.2		.7					8,511	15,320	
Division 9, locality 742, Majestic Collieries Co.; no. 1 main entry left air course, 500 feet from mouth, 9½ inches shaly coal excluded.	B-957	1.4	1	1.0	33.2	61.0	4.8	.5					8,033	14,460	2,930
			2	2.4	32.7	60.2	4.7	.5					7,922	14,260	
			3		33.5	61.7	4.8	.5					8,111	14,600	
			4		35.2	64.8		.6					8,522	15,340	
Same, room 2 off fifth left entry. All partings excluded	B-958	1.6	1	1.0	33.0	62.2	3.8	.5					8,089	14,560	2,860
			2	2.6	32.5	61.2	3.7	.5					7,961	14,330	
			3		33.3	62.9	3.8	.5					8,172	14,710	
			4		34.6	65.4		.5					8,489	15,280	
Same, room 1 off fourth left off main. All partings excluded	B-956	1.8	1	.9	33.2	61.0	4.9	.5					8,006	14,410	2,930
			2	2.7	32.6	59.9	4.8	.5					7,867	14,160	
			3		33.5	61.6	4.9	.5					8,083	14,550	
			4		35.2	64.8		.6					8,500	15,300	
Same, composite of samples B-956, B-957, B-958	B-959	1.6	1	1.0	33.2	61.3	4.5	.5	5.2	81.3	1.5	7.0	8,028	14,450	
			2	2.6	32.7	60.3	4.4	.5	5.3	80.0	1.4	8.4	7,900	14,220	
			3		33.6	61.9	4.5	.5	5.2	82.2	1.5	6.1	8,106	14,590	
			4		35.1	64.9		.6	5.4	86.0	1.5	6.5	8,489	15,280	
Same, no. 1 main entry left air course, 500 feet from mouth. This sample includes only 9½ inches of shaly coal; everything else excluded.	B-464	1.4	1	.9	27.9	52.1	19.1	.5					6,700	12,060	2,900
			2	2.3	27.5	51.3	18.9	.5					6,606	11,890	
			3		28.2	52.5	19.3	.5					6,767	12,180	
			4		34.9	65.1		.6					8,383	15,090	
Division 11, locality 865, east side 0.1 mile below gap of Rockhouse Fork of Pawpaw Creek. All partings excluded.	B-419	1.8	1	1.3	31.3	60.2	7.2	.5					7,800	14,040	2,860
			2	3.0	30.8	59.2	7.0	.5					7,661	13,790	
			3		31.7	61.0	7.3	.5					7,900	14,220	
			4		34.2	65.8		.5					8,517	15,330	
Division 11, locality 927, east side 0.2 mile above mouth of King Camp Branch on Staggerweed Branch of Smith Fork of Right Fork of Peter Creek. 7 inches of laminated coal excluded.	B-418	2.4	1	1.4	31.0	62.2	5.4	.8					7,861	14,150	2,750
			2	3.7	30.2	60.8	5.3	.8					7,678	13,820	
			3		31.4	63.1	5.5	.8					7,972	14,350	
			4		33.2	66.8		.9					8,439	15,190	
Division 12, locality 931, north side of Road Fork of Peter Creek 1.3 miles west of Coleman. 7 inches of laminated coal excluded.	B-417	1.5	1	1.2	31.8	59.1	7.9	.7					7,722	13,900	2,850
			2	2.7	31.3	58.3	7.7	.7					7,606	13,690	
			3		32.2	59.9	7.9	.7					7,817	14,070	
			4		34.9	65.1		.7					8,494	15,290	

Analyses of coal from Pike County, Ky.—Continued

Pond Creek (Lower Elkhorn) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 12, locality 953, 1.2 miles southwest of Phelps, northwest side of Right Fork of Peter Creek. 9 inches of shaly coal excluded.	B–426	2.7	1	3.1	28.4	64.4	4.1	0.5	------	------	------	------	7,556	13,600	
			2	5.7	27.6	62.7	4.0	.4	------	------	------	------	7,356	13,240	
			3	--------	29.3	66.5	4.2	.5	------	------	------	------	7,794	14,030	
			4	--------	30.6	69.4	------	.5	------	------	------	------	8,139	14,650	
Division 12, locality 960, east side 0.8 mile above mouth of Oldhouse Branch of Blackberry Creek. 1 foot 5 inches of laminated coal exluded.	B–389	1.6	1	1.1	32.9	61.0	5.0	.6	------	------	------	------	8,011	14,420	2,940
			2	2.7	32.4	60.0	4.9	.5	------	------	------	------	7,889	14,200	
			3	--------	33.2	61.8	5.0	.6	------	------	------	------	8,106	14,590	
			4	--------	35.0	65.0	------	.6	------	------	------	------	8,533	15,360	
Division 14, locality 1135, Octavia J. Mining Co., fourth left heading off no. 1 butt. 6 inches of coal and 11 inches of laminated coal excluded.	B–890	2.0	1	1.3	35.2	59.1	4.4	.5	------	------	------	------	7,933	14,280	2,910
			2	3.3	34.5	57.9	4.3	.5	------	------	------	------	7,772	13,990	
			3	--------	35.7	59.8	4.5	.5	------	------	------	------	8,033	14,460	
			4	--------	37.4	62.6	------	.5	------	------	------	------	8,411	15,140	
Same, second right heading off 29. 1 foot 4 inches of laminated coal excluded.	B–889	1.6	1	1.3	34.2	60.1	4.4	.5	------	------	------	------	7,933	14,280	2,760
			2	2.9	33.6	59.2	4.3	.5	------	------	------	------	7,806	14,050	
			3	--------	34.6	60.9	4.5	.5	------	------	------	------	8,039	14,470	
			4	--------	36.3	63.7	------	.5	------	------	------	------	8,411	15,140	
Same, room 41 off second left main. 10 inches of coal and 11 inches of laminated coal excluded.	B–888	1.5	1	1.3	34.3	58.9	5.5	.4	------	------	------	------	7,800	14,040	2,390
			2	2.7	33.8	58.1	5.4	.4	------	------	------	------	7,689	13,840	
			3	--------	34.8	59.6	5.6	.4	------	------	------	------	7,906	14,230	
			4	--------	36.8	63.2	------	.5	------	------	------	------	8,372	15,070	
Same, composite of samples B–888, B–889, B–890	B–891	1.7	1	1.3	34.6	59.3	4.8	.5	5.3	80.3	1.5	7.6	7,878	14,180	
			2	3.0	34.0	58.3	4.7	.4	5.4	78.9	1.5	9.1	7,744	13,940	
			3	--------	35.0	60.1	4.9	.5	5.2	81.3	1.6	6.5	7,983	14,370	
			4	--------	36.8	63.2	------	.5	5.5	85.5	1.6	6.9	8,394	15,110	
Division 14, locality 1169, southeast side of Johns Creek at mouth of Meathouse Fork. Entire bed sampled, including 1 inch of shale in 4⅛-inch partings.	B–512	2.4	1	1.9	34.3	56.7	7.1	.8	------	------	------	------	7,561	13,610	2,910
			2	4.3	33.4	55.4	6.9	.8	------	------	------	------	7,378	13,280	
			3	--------	34.9	57.8	7.3	.8	------	------	------	------	7,706	13,870	
			4	--------	37.7	62.3	------	.8	------	------	------	------	8,311	14,960	
Division 15, locality 1198, Tierney Mining Co., first left no. 1 main. 10 inches of laminated coal and 3 inches of coal excluded.	B–973	1.5	1	1.2	34.2	58.9	5.7	.5	------	------	------	------	7,861	14,150	2,490
			2	2.6	33.7	58.1	5.6	.5	------	------	------	------	7,750	13,950	
			3	--------	34.6	59.6	5.8	.5	------	------	------	------	7,956	14,320	
			4	--------	36.7	63.3	------	.5	------	------	------	------	8,444	15,200	

Same, room 2, butt 2 off 6 left no. 3 main. 9 inches of coal and 11 inches of laminated coal excluded.	B-972	1.4	1	1.2	34.0	60.7	4.1	.5					8,000	14,440	2,910
			2	2.6	33.5	59.8	4.1	.5					7,889	14,200	
			3		34.4	61.4	4.2	.5					8,094	14,570	
			4		35.9	64.1		.5					8,450	15,210	
Same, no. 1 main heading. 2 inches of coal and 10 inches of laminated coal excluded.	B-971	2.0	1	1.3	34.5	59.9	4.3	.5					7,900	14,220	2,910
			2	3.2	33.8	58.7	4.3	.5					7,744	13,940	
			3		35.0	60.6	4.4	.5					8,006	14,410	
			4		36.6	63.4		.6					8,372	15,070	
Same, composite of samples B-971, B-972, B-973	B-1015	1.6	1	1.2	34.3	59.8	4.7	.5	5.2	80.2	1.5	7.9	7,933	14,280	
			2	2.8	33.8	58.8	4.6	.5	5.3	78.9	1.4	9.3	7,806	14,050	
			3		34.8	60.5	4.7	.5	5.2	81.2	1.5	6.9	8,028	14,450	
			4		36.5	63.5		.5	5.4	85.2	1.5	7.4	8,428	15,170	
Division 21, locality 1603, west side of Burning Fork of Raccoon Creek, 0.5 mile above Zebulon. Entire bed sampled.	B-398	3.0	1	2.1	36.5	56.1	5.3	.7					7,700	13,860	2,890
			2	5.0	35.4	54.4	5.2	.7					7,472	13,450	
			3		37.3	57.3	5.4	.7					7,861	14,150	
			4		39.4	60.6		.7					8,317	14,970	
Division 24, locality 1960, north side of Grassy Branch of Raccoon Creek. 0.5 mile above mouth of Romey Fork. 4 inches of shaly coal excluded.	B-513	2.3	1	2.1	34.3	57.1	6.5	.7					7,583	13,650	2,910
			2	4.4	33.5	55.8	6.3	.7					7,406	13,330	
			3		35.1	58.3	6.6	.7					7,744	13,940	
			4		37.6	62.4		.8					8,294	14,930	
Division 26, locality 2159, west side of left Fork of Grapevine, 0.5 mile below gap into Elkhorn of Johns Creek. All partings excluded.	B-495	1.7	1	1.3	30.2	51.2	17.3	.9					6,767	12,180	2,910
			2	2.9	29.7	50.4	17.0	.9					6,656	11,980	
			3		30.6	51.9	17.5	.9					6,856	12,340	
			4		37.1	62.9		1.1					8,311	14,960	
Division 26, locality 2193, southwest side of Johns Creek at mouth of Long Fork. All partings excluded.	B-494	4.4	1	3.0	29.3	57.1	10.6	.6					7,000	12,600	2,810
			2	7.2	28.0	54.6	10.2	.5					6,689	12,040	
			3		30.1	58.9	11.0	.6					7,211	12,980	
			4		33.9	66.1		.6					8,100	14,580	
Division 28, locality 2342, east side of Hunts Branch of Levisa Fork, 0.2 mile south of gap to Grapevine. All partings excluded.	B-493	3.7	1	2.2	29.4	60.1	8.3	.5					7,394	13,310	2,870
			2	5.8	28.3	57.9	8.0	.5					7,122	12,820	
			3		30.0	61.5	8.5	.5					7,561	13,610	
			4		32.8	67.2		.6					8,261	14,870	
Division 29, locality 2482, west side of head of Dicks Fork of Feds Creek. Everything excluded except 6 inches of laminated coal.	B-420	2.2	1	1.7	23.3	44.7	30.3	.3					5,633	10,140	2,860
			2	3.9	22.8	43.7	29.6	.3					5,511	9,920	
			3		23.7	45.5	30.8	.3					5,733	10,320	
			4		34.3	65.7		.5					8,283	14,910	
Same, 6 inches of laminated coal excluded	B-421	2.8	1	1.5	30.8	60.8	6.9	1.4					7,783	14,090	2,390
			2	4.3	30.0	59.0	6.7	1.4					7,567	13,620	
			3		31.3	61.7	7.0	1.5					7,900	14,220	
			4		33.6	66.4		1.6					8,494	15,290	

Analyses of coal from Pike County, Ky.—Continued

Pond Creek (Lower Elkhorn) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 30, locality 2494B, north side of head of Indian Grave Fork of Card Creek. Entire bed sampled.	B–473	4.8	1	3.0	30.8	62.2	4.0	0.7	------	------	------	------	7,411	13,340	2,370
			2	7.7	29.3	59.2	3.8	.6	------	------	------	------	7,061	12,710	
			3	------	31.7	64.2	4.1	.7	------	------	------	------	7,644	13,760	
			4	------	33.1	66.9	------	.7	------	------	------	------	7,972	14,350	
Division 30, locality 2507, north side near head of Road Fork of Card Creek. All partings excluded.	B–488	2.9	1	3.2	28.1	61.1	7.6	.7	------	------	------	------	7,250	13,050	2,610
			2	6.0	27.3	59.4	7.3	.6	------	------	------	------	7,039	12,670	
			3	------	29.0	63.2	7.8	.7	------	------	------	------	7,489	13,480	
			4	------	31.5	68.5	------	.7	------	------	------	------	8,122	14,620	
Division 30, locality 2547, head of hollow on east side of Lick Creek of Levisa Fork, 1.2 miles above mouth. All partings excluded.	B–479	1.6	1	1.1	32.8	62.2	3.9	.5	------	------	------	------	8,061	14,510	2,820
			2	2.6	32.3	61.3	3.8	.5	------	------	------	------	7,939	14,290	
			3	------	33.1	62.9	4.0	.5	------	------	------	------	8,150	14,670	
			4	------	34.5	65.5	------	.5	------	------	------	------	8,483	15,270	
Division 31, locality 2596, west side of Left Fork of Simms Creek 0.7 mile above mouth. All partings excluded.	B–483	1.2	1	1.3	32.4	61.1	5.2	.6	------	------	------	------	7,956	14,320	2,820
			2	2.5	32.0	60.4	5.1	.6	------	------	------	------	7,856	14,140	
			3	------	32.8	62.0	5.2	.6	------	------	------	------	8,056	14,507	
			4	------	34.6	65.4	------	.6	------	------	------	------	8,506	15,310	
Division 31, locality 2651, north side of head of right fork of Harless Creek of Russell Fork. All partings excluded.	B–477	1.6	1	1.2	34.0	62.5	2.3	.5	------	------	------	------	8,167	14,700	2,590
			2	2.8	33.4	61.6	2.2	.5	------	------	------	------	8,033	14,460	
			3	------	34.4	63.3	2.3	.5	------	------	------	------	8,261	14,870	
			4	------	35.2	64.8	------	.5	------	------	------	------	8,456	15,220	
Division 32, locality 2690, 1 mile up right fork of Road Creek on north side.	3663	3.2	1	------	------	------	------	------	------	------	------	------	------	------	
			2	4.7	31.6	61.6	2.1	.7	------	------	------	------	------	------	
			3	------	33.2	64.6	2.2	.8	------	------	------	------	------	------	
			4	------	------	------	------	------	------	------	------	------	------	------	
Division 32, locality 2699, at head of second hollow on west side of Ferrells Creek. All partings and dirty coal excluded.	B–478	1.5	1	1.2	33.6	63.6	1.6	.5	------	------	------	------	8,261	14,870	2,310
			2	2.6	33.1	62.7	1.6	.5	------	------	------	------	8,144	14,660	
			3	------	34.0	64.3	1.7	.5	------	------	------	------	8,361	15,050	
			4	------	34.6	65.4	------	.5	------	------	------	------	8,506	15,310	

Division 32, locality 2722, near head of right fork of Abners Fork. All partings excluded.	B-484	.9	1	1.1	32.1	63.5	3.3	.6					8,161	14,690	2,880
			2	2.0	31.8	63.0	3.2	.6					8,089	14,560	
			3		32.5	64.2	3.3	.6					8,256	14,860	
			4		33.6	66.4		.6					8,533	15,360	
Division 32, locality 2800, near head and on west side of Left Fork of Beaver Creek. 9 inches of dirty coal excluded.	B-485	1.2	1	1.4	33.3	63.4	1.9	.5					8,233	14,820	2,260
			2	2.5	32.8	62.9	1.8	.5					8,133	14,640	
			3		33.7	64.4	1.9	.5					8,350	15,030	
			4		34.4	65.6		.6					8,511	15,320	
Division 34, locality 2934, northeast side near head of Kettlecamp Branch of Elkhorn Creek. 1 foot 2 inches of laminated coal and all partings excluded.	B-486	3.2	1	2.5	29.8	63.6	4.1	.5					7,711	13,880	2,210
			2	5.6	28.8	61.7	3.9	.5					7,461	13,430	
			3		30.5	65.3	4.2	.5					7,906	14,230	
			4		31.9	68.1		.5					8,250	14,850	
Division 34, locality 2978, Paragon Elkhorn Collieries, 100 feet in second butt off old main, left off new main. Includes ¾ inch of gray shale; all other partings excluded.	B-946	1.0	1	1.2	32.0	61.9	4.9	.6					7,972	14,350	2,810
			2	2.1	31.7	61.4	4.8	.6					7,889	14,200	
			3		32.4	62.7	4.9	.6					8,061	14,510	
			4		34.0	66.0		.6					8,478	15,260	
Same, 500 feet in from main entrance and off wall of siding to main entry, 20 feet from main entry. All partings excluded.	B-945	1.7	1	1.2	31.8	63.6	3.4	.6					8,078	14,540	2,750
			2	2.8	31.3	62.6	3.3	.6					7,944	14,300	
			3		32.2	64.4	3.4	.6					8,172	14,710	
			4		33.3	66.7		.6					8,467	15,240	
Same, mouth of fourteenth room, sixth left heading off new main. All partings excluded.	B-944	1.1	1	1.1	32.7	61.7	4.5	.6					7,994	14,390	2,760
			2	2.2	32.3	61.1	4.4	.6					7,906	14,230	
			3		33.0	62.5	4.5	.6					8,089	14,560	
			4		34.6	65.4		.6					8,472	15,250	
Same, composite of samples B-944, B-945, B-946	B-1013	1.3	1	1.2	32.3	62.2	4.3	.6	5.3	81.1	1.4	7.3	8,022	14,440	
			2	2.4	31.9	61.5	4.2	.6	5.3	80.1	1.4	8.4	7,917	14,250	
			3		32.7	63.0	4.3	.6	5.2	82.0	1.4	6.5	8,111	14,600	
			4		34.1	65.9		.6	5.4	85.8	1.5	6.7	8,478	15,260	
Division 34, locality 3008, 0.5 mile above mouth of Camp Creek on east side of Pond Creek of Russell Fork.	[6] 3661	3.4	1												
			2	5.3	27.7	59.8	7.2	.5							
			3		29.3	63.1	7.6	.5							
			4												
Division 35, locality 3030, head of north fork of large hollow to northwest, 0.6 mile up Pond Creek of Russell Fork. All partings excluded.	B-482	2.7	1	1.5	32.6	63.8	2.1	.9					8,139	14,650	2,210
			2	4.1	31.7	62.1	2.1	.8					7,922	14,260	
			3		33.1	64.7	2.2	.9					8,261	14,870	
			4		33.8	66.2		.9					8,444	15,200	
Division 35, locality 3050, head of Laurel Branch of Marrowbone Creek. All partings excluded.	B-480	2.3	1	1.2	32.8	62.7	3.3	1.0					8,117	14,610	2,330
			2	3.4	32.0	61.4	3.2	1.0					7,928	14,270	
			3		33.2	63.5	3.3	1.0					8,211	14,780	
			4		34.3	65.7		1.1					8,494	15,290	

[6] Sample collected by U. S. Geological Survey, 1906.

Analyses of coal from Pike County, Ky.—Continued

Pond Creek (Lower Elkhorn) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 35, locality 3105, Edgewater Coal Co., Coaldale no. 3, eighth right at first right of 8 main. 1 foot 5 inches of laminated coal excluded.	B–984	1.6	1	1.3	32.9	64.0	1.8	0.5	------	------	------	------	8,189	14,740	2,480
			2	3.0	32.4	62.8	1.8	.5	------	------	------	------	8,056	14,500	
			3	------	33.4	64.8	1.8	.5	------	------	------	------	8,300	14,940	
			4	------	34.0	66.0	------	.5	------	------	------	------	8,456	15,220	
Division 35, locality 3111, Edgewater Coal Co., Coaldale no. 1, on main at no. 10 left. Sample includes only 1 foot 3½ inches of laminated coal.	B–968	2.1	1	1.0	25.8	51.2	22.0	.4	------	------	------	------	6,367	11,460	2,700
			2	3.2	25.2	50.0	21.6	.4	------	------	------	------	6,228	11,210	
			3	------	26.0	51.7	22.3	.4	------	------	------	------	6,433	11,580	
			4	------	33.5	66.5	------	.6	------	------	------	------	8,272	14,890	
Same, on main at 10 left. Sample contains 2 feet 9 inches of coal and excludes 1 foot 3½ inches of laminated coal.	B–967	1.9	1	1.3	30.7	65.0	3.0	.5	------	------	------	------	8,061	14,510	2,490
			2	3.1	30.1	63.9	2.9	.5	------	------	------	------	7,911	14,240	
			3	------	31.1	65.9	3.0	.5	------	------	------	------	8,167	14,700	
			4	------	32.0	68.0	------	.5	------	------	------	------	8,417	15,150	
Division 35, locality 3130. head of hollow to east 1 mile up Jackson Branch of Elkhorn Creek of Levisa Fork. All partings excluded.	B–481	2.1	1	1.3	31.9	63.8	3.0	.5	------	------	------	------	8,089	14,560	2,550
			2	3.4	31.2	62.5	2.9	.5	------	------	------	------	7,911	14,240	
			3	------	32.3	64.7	3.0	.5	------	------	------	------	8,194	14,750	
			4	------	33.3	66.7	------	.5	------	------	------	------	8,450	15,210	
Division 36, locality 3144, Sycamore Creek, 50 feet northeast of road 0.9 mile above Left Fork. All partings excluded.	B–487	1.8	1	1.7	31.3	63.5	3.5	.6	------	------	------	------	7,978	14,360	2,490
			2	3.4	30.8	62.3	3.5	.6	------	------	------	------	7,833	14,100	
			3	------	31.9	64.5	3.6	.6	------	------	------	------	8,111	14,600	
			4	------	33.1	66.9	------	.6	------	------	------	------	8,417	15,150	
Division 36, locality 3184, Peabody Coal Co., Allegheny mine, 700 feet from entrance.	[6] 3706	1.7	1	------	------	------	------	------	------	------	------	------	------	------	
			2	3.4	31.8	60.7	4.1	.5	------	------	------	------	------	------	
			3	------	32.9	62.9	4.2	.6	------	------	------	------	------	------	
			4	------	------	------	------	------	------	------	------	------	------	------	
Same, 700 feet from entrance. Sample includes laminated coal only.	[6] 3702	1.8	1	------	------	------	------	------	------	------	------	------	------	------	
			2	3.2	25.8	48.6	22.4	.4	------	------	------	------	------	------	
			3	------	26.7	50.2	23.1	.4	------	------	------	------	------	------	
			4	------	34.7	65.3	------	------	------	------	------	------	------	------	
Same, no. 1 right heading	[6] 6928	2.6	1	------	------	------	------	------	------	------	------	------	------	------	
			2	3.7	30.0	59.5	6.8	.6	5.1	76.3	1.1	10.1	7,583	13,650	
			3	------	31.2	61.7	7.1	.6	4.8	79.3	1.1	7.1	7,878	14,180	
			4	------	33.6	66.4	------	.6	5.2	85.3	1.2	7.7	8,478	15,260	

Same, main heading; right parallel entry 4	[6] 6929	2.0	1											
			2	3.4	32.1	58.8	5.7	.5	5.2	77.0	1.8	10.3	7,739	13,930	
			3		33.2	60.9	5.9	.6	5.0	79.3	1.2	7.6	8,011	14,420	
			4		35.3	64.7		.6	5.3	84.8	1.3	8.0	8,517	15,330	
Division 36, locality 3235, Edgewater Coal Co., Henry Clay no. 1, seventh left off H left off twelfth left. All partings excluded.	B-902	2.6	1	1.4	33.1	63.8	1.7	.5					8,194	14,750	2,390
			2	4.0	32.2	62.1	1.7	.5					7,978	14,360	
			3		33.5	64.7	1.8	.5					8,306	14,950	
			4		34.1	65.9		.5					8,456	15,220	
Same, third main right crosscut. 1 foot 2 inches of laminated coal excluded.	B-901	2.9	1	1.4	33.3	62.8	2.5	.5					8,089	14,560	2,220
			2	4.3	32.3	61.0	2.4	.5					7,850	14,130	
			3		33.8	63.7	2.5	.5					8,200	14,760	
			4		34.7	65.3		.5					8,411	15,140	
Same, fifth left off 1 main. 1 foot 5 inches of laminated coal excluded.	B-900	2.3	1	1.4	33.1	63.8	1.7	.5					8,189	14,740	2,440
			2	3.7	32.3	62.4	1.6	.5					7,994	14,390	
			3		33.5	64.8	1.7	.5					8,306	14,950	
			4		34.1	65.9		.5					8,444	15,200	
Same, composite of samples B-900, B-901, B-902	B-903	2.6	1	1.4	33.2	63.4	2.0	.5	5.3	83.0	1.6	7.6	8,161	14,690	
			2	4.0	32.3	61.8	1.9	.5	5.5	80.8	1.5	9.8	7,944	14,300	
			3		33.7	64.3	2.0	.5	5.2	84.1	1.6	6.6	8,272	14,890	
			4		34.4	65.6		.6	5.3	85.9	1.6	6.6	8,444	15,200	
Division 37, locality 3273, south side 0.4 mile above mouth of left fork of Rockhouse Creek. 1 foot 1 inch of laminated coal excluded.	B-400	1.2	1	1.9	33.9	61.6	2.6	.6					8,061	14,510	2,530
			2	3.0	33.4	61.1	2.5	.6					7,967	14,340	
			3		34.5	62.9	2.6	.6					8,211	14,780	
			4		35.4	64.6		.7					8,433	15,180	
Division 37, locality 3283, at head of Rockhouse Creek. 1 foot 4 inches of laminated coal excluded.	B-393	1.9	1	1.8	34.1	61.5	2.6	1.3					8,072	14,530	2,440
			2	3.6	33.5	60.3	2.6	1.3					7,922	14,260	
			3		34.7	62.6	2.7	1.4					8,222	14,800	
			4		35.7	64.3		1.4					8,444	15,200	
Division 39, locality 3617, northwest side of Kinney Branch of Caney Creek 0.5 mile above mouth. 1 foot of dirty coal excluded.	B-432	2.3	1	2.1	32.5	58.4	7.0	.5					7,539	13,570	2,930
			2	4.3	31.7	57.1	6.9	.5					7,361	13,250	
			3		33.1	59.7	7.2	.5					7,694	13,850	
			4		35.7	64.3		.5					8,289	14,920	
Division 39, locality 3628, head of right fork of right fork of left fork of Caney Creek. All partings excluded.	B-433	.3	1	1.9	34.4	61.5	2.2	.5					8,061	14,510	2,510
			2	2.2	34.3	61.3	2.2	.5					8,033	14,460	
			3		35.1	62.6	2.3	.5					8,211	14,780	
			4		35.9	64.1		.5					8,400	15,120	
Division 40, locality 3660, 0.5 mile up Camp Fork of Caney Creek, up east side of hollow to south. All partings excluded.	B-434	1.5	1	1.7	35.6	59.4	3.3	.6					7,994	14,390	2,260
			2	3.2	35.1	58.5	3.2	.5					7,878	14,180	
			3		36.3	60.4	3.3	.6					8,133	14,640	
			4		37.5	62.5		.6					8,411	15,140	

[6] Sample collected by U. S. Geological Survey, 1906.

Analyses of coal from Pike County, Ky.—Continued

Pond Creek (Lower Elkhorn) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 41, locality 3759, Dorton Creek, 250 feet south of creek, 0.5 mile above mouth of Coal Branch. All partings and 9 inches of coal excluded.	[7] B-436	1.7	1	1.7	32.1	52.5	13.7	1.7	------	------	------	------	6,983	12,570	2,600
			2	3.3	31.6	51.6	13.5	1.6	------	------	------	------	6,861	12,350	
			3	--------	32.6	53.5	13.9	1.7	------	------	------	------	7,100	12,780	
			4	--------	37.9	62.1	------	2.0	------	------	------	------	8,250	14,850	
Division 41, locality 3768, south side and 0.5 mile up Flemming Branch of Shelby Creek. All partings and dirty coal excluded. Sample contains 5½ inches of cannel coal.	B-435	2.6	1	1.9	31.1	57.4	9.6	.7	------	------	------	------	7,372	13,270	2,930
			2	4.5	30.3	55.9	9.3	.7	------	------	------	------	7,178	12,920	
			3	--------	31.7	58.5	9.8	.7	------	------	------	------	7,517	13,530	
			4	--------	35.2	64.8	------	.8	------	------	------	------	8,328	14,990	
Division 41, locality 3847, on northwest side of Elkhorn Creek ¾ mile below mouth of Pigeon Branch. All partings excluded; also all dirty coal.	B-431	.8	1	1.6	34.0	54.8	9.6	1.2	------	------	------	------	7,417	13,350	2,810
			2	2.4	33.7	54.4	9.5	1.2	------	------	------	------	7,356	13,240	
			3	--------	34.5	55.8	9.7	1.3	------	------	------	------	7,539	13,570	
			4	--------	38.3	61.7	------	1.4	------	------	------	------	8,350	15,030	

Alma (Upper Elkhorn No. 1) coal bed

[Samples collected by U. S. Geological Survey, 1934, except 17460F, collected in 1913]

Division 6, locality 430A, Allburn Coal Corporation, Allburn no. 4, room 4. 1-inch sandstone parting excluded.	B-885	1.2	1	1.1	35.3	58.8	4.8	0.6	------	------	------	------	7,983	14,370	2,720
			2	2.3	34.9	58.1	4.7	.6	------	------	------	------	7,889	14,200	
			3	--------	35.7	59.5	4.8	.6	------	------	------	------	8,072	14,530	
			4	--------	37.5	62.5	------	.6	------	------	------	------	8,478	15,260	
Same, locality 426, third right off main room 1. Entire bed included in sample.	B-884	2.2	1	1.5	34.4	60.8	3.3	.5	------	------	------	------	7,950	14,310	2,800
			2	3.6	33.7	59.5	3.2	.5	------	------	------	------	7,778	14,000	
			3	--------	34.9	61.7	3.4	.5	------	------	------	------	8,072	14,530	
			4	--------	36.1	63.9	------	.5	------	------	------	------	8,350	15,030	
Same, locality 428, ninth left heading. Entire bed sampled	B-886	1.4	1	1.1	34.3	58.4	6.2	.8	------	------	------	------	7,817	14,070	2,560
			2	2.4	33.8	57.7	6.1	.8	------	------	------	------	7,711	13,880	
			3	--------	34.6	59.2	6.2	.8	------	------	------	------	7,900	14,220	
			4	--------	36.9	63.1	------	.9	------	------	------	------	8,422	15,160	
Same, composite of samples B-884, B-885, B-886	B-887	1.6	1	1.2	34.3	59.8	4.7	.7	5.2	80.5	1.5	7.4	7,922	14,260	
			2	2.8	33.7	58.9	4.6	.7	5.3	79.2	1.4	8.8	7,794	14,030	
			3	--------	34.7	60.6	4.7	.7	5.2	81.5	1.5	6.4	8,017	14,430	
			4	--------	36.4	63.6	------	.7	5.4	85.5	1.5	6.9	8,417	15,150	

Division 7, locality 587, south point of Turkey Foot. Sample includes entire bed.	B-383	1.0	1	1.2	37.8	58.3	2.7	.6					8,150	14,670	2,860
			2	2.2	37.4	57.7	2.7	.6					8,067	14,520	
			3		38.3	58.9	2.8	.6					8,250	14,850	
			4		39.4	60.6		.6					8,483	15,270	
Division 7, locality 600, east side of Mudlick Branch of Blackberry Fork of Pond Creek, 1 mile above mouth. Sample includes entire bed.	B-384	2.6	1	1.3	36.1	58.9	3.7	.6					8,039	14,470	2,860
			2	3.8	35.2	57.4	3.6	.6					7,833	14,100	
			3		36.6	59.7	3.7	.6					8,144	14,660	
			4		38.0	62.0		.6					8,456	15,220	
Division 8, locality 637A, Thacker Coal Co., Little Thacker mine, face of first right heading off main air course.	17460F	1.0	1	1.53	35.2	58.9	4.3	.6	5.2	80.7	1.5	7.8	7,993	14,387	
			2	2.50	34.8	58.4	4.2	.6	5.2	79.9	1.5	8.6	7,914	14,245	
			3		35.7	59.9	4.3	.6	5.1	81.9	1.5	6.5	8,117	14,611	
			4		37.4	62.6		.6	5.3	85.7	1.6	6.8	8,488	15,278	
Division 8, locality 640, New Alma Coal Corporation, New Alma no. 3, 4 left of main, room 3. Sample includes entire bed.	B-882	1.5	1	1.1	34.3	61.4	3.2	.5					8,106	14,590	2,770
			2	2.6	33.7	60.6	3.1	.5					7,983	14,370	
			3		34.6	62.2	3.2	.5					8,200	14,760	
			4		35.8	64.2		.6					8,472	15,250	
Same, north end of main entry. Sample includes entire bed.	B-881	1.8	1	1.1	34.2	61.4	3.3	.5					8,111	14,600	2,870
			2	2.8	33.6	60.3	3.3	.5					7,967	14,340	
			3		34.6	62.0	3.4	.5					8,200	14,760	
			4		35.8	64.2		.5					8,483	15,270	
Same, 3½ off first entry, room 16. Sample includes entire bed.	B-880	1.8	1	1.0	34.8	60.2	4.0	.6					8,072	14,530	2,930
			2	2.8	34.1	59.2	3.9	.6					7,922	14,260	
			3		35.1	60.9	4.0	.6					8,156	14,680	
			4		36.6	63.4		.6					8,494	15,290	
Same, composite of samples B-880, B-881, B-882	B-883	1.7	1	1.1	34.3	61.1	3.5	.5	5.4	82.6	1.5	6.5	8,117	14,610	
			2	2.7	33.7	60.2	3.4	.5	5.5	81.1	1.5	8.0	7,978	14,360	
			3		34.6	61.9	3.5	.5	5.3	83.4	1.5	5.8	8,206	14,770	
			4		35.9	64.1		.5	5.5	86.5	1.6	5.9	8,506	15,310	
Division 8, locality 680, on divide between Robinet Branch and Blue Spring Branch. 4 inches of roof coal and all partings excluded.	B-422	2.0	1	1.2	34.3	60.2	4.3	.5					8,061	14,510	2,930
			2	3.1	33.7	59.0	4.2	.5					7,906	14,230	
			3		34.8	60.9	4.3	.5					8,161	14,690	
			4		36.3	63.7		.6					8,528	15,350	
Division 9, locality 703, Emperor Coal Co., heading of 6 right off north main. 11 inches of dirty coa excluded.	B-874	1.4	1	1.0	34.8	61.1	3.1	.5					8,200	14,760	2,850
			2	2.4	34.3	60.3	3.0	.5					8,083	14,550	
			3		35.1	61.8	3.1	.5					8,283	14,910	
			4		36.3	63.7		.5					8,550	15,390	
Same, third right cross off main. 4 inches of dity coal excluded.	B-873	1.5	1	1.1	33.8	61.1	4.0	.6					8,144	14,660	2,810
			2	2.6	33.2	60.2	4.0	.6					8,022	14,440	
			3		34.1	61.8	4.1	.6					8,233	14,820	
			4		35.6	64.4		.6					8,583	15,450	

[7] Lower Elkhorn (?).

Analyses of coal from Pike County, Ky.—Continued

Alma (Upper Elkhorn No. 1) coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Same, fourth south off first right off main. 5 inches of dirty coal excluded.	B-872	1.2	1	1.1	34.5	61.0	3.4	0.6	.....	.....	.....	.....	8,183	14,730	2,800
			2	2.3	34.0	60.4	3.3	.6	.....	.....	.....	.....	8,083	14,550	
			3	.....	34.8	61.8	3.4	.6	.....	.....	.....	.....	8,267	14,880	
			4	.....	36.0	64.0	.....	.6	.....	.....	.....	.....	8,556	15,400	
Same, composite of samples B-872, B-873, B-874	B-875	1.4	1	1.0	34.9	60.6	3.5	.5	5.3	83.1	1.5	6.1	8,178	14,720	
			2	2.3	34.5	59.8	3.4	.5	5.4	82.0	1.5	7.2	8,061	14,510	
			3	.....	35.3	61.2	3.5	.5	5.2	83.9	1.5	5.4	8,256	14,860	
			4	.....	36.6	63.4	.....	.6	5.4	87.0	1.5	5.5	8,556	15,400	
Division 9, locality 754, Vulcan Collieries, room 4, no. 1 left. 11 inches of laminated coal excluded.	B-985	1.8	1	1.0	35.1	61.0	2.9	.5	.....	.....	.....	.....	8,222	14,800	2,790
			2	2.7	34.5	59.9	2.9	.5	.....	.....	.....	.....	8,078	14,540	
			3	.....	35.5	61.6	2.9	.5	.....	.....	.....	.....	8,300	14,940	
			4	.....	36.5	63.5	.....	.5	.....	.....	.....	.....	8,550	15,390	
Division 12, locality 998, east side 0.3 mile above mouth of left fork of Right Fork of Blackberry Creek. Entire bed sampled.	B-423	2.5	1	2.3	33.5	60.0	4.2	.6	.....	.....	.....	.....	7,822	14,080	2,710
			2	4.7	32.6	58.6	4.1	.6	.....	.....	.....	.....	7,628	13,730	
			3	.....	34.3	61.4	4.3	.6	.....	.....	.....	.....	8,000	14,400	
			4	.....	35.8	64.2	.....	.6	.....	.....	.....	.....	8,356	15,040	
Division 14, locality 1130, west side of Pinson Fork 2.5 miles above mouth.	B-387	1.8	18	1.1	34.9	61.0	3.0	.4	.....	.....	.....	.....	8,233	14,820	2,910
			2	2.9	34.3	59.9	2.9	.4	.....	.....	.....	.....	8,089	14,560	
			3	.....	35.3	61.7	3.0	.4	.....	.....	.....	.....	8,328	14,990	
			4	.....	36.4	63.6	.....	.5	.....	.....	.....	.....	8,583	15,450	
Division 15, locality 1219, south side of Big Creek, 200 feet below mouth of Meathouse Fork.	B-380	2.9	1	1.6	33.0	57.2	8.2	.8	.....	.....	.....	.....	7,522	13,540	2,920
			2	4.4	32.1	55.6	7.9	.8	.....	.....	.....	.....	7,306	13,150	
			3	.....	33.6	58.1	8.3	.8	.....	.....	.....	.....	7,644	13,760	
			4	.....	36.6	63.4	.....	.9	.....	.....	.....	.....	8,339	15,010	
Division 21, locality 1604, south side 0.3 mile above mouth of Knob Fork of Burning Fork of Raccoon Creek. ½-inch clay parting excluded.	B-500	1.8	1	1.9	35.4	52.0	10.7	1.4	.....	.....	.....	.....	7,183	12,930	2,810
			2	3.7	34.7	51.1	10.5	1.3	.....	.....	.....	.....	7,056	12,700	
			3	.....	36.1	53.0	10.9	1.4	.....	.....	.....	.....	7,328	13,190	
			4	.....	40.5	59.5	.....	1.6	.....	.....	.....	.....	8,228	14,810	
Division 24, locality 1909, east side of branch west of Lick Branch, 0.4 mile above mouth. Sample includes ¾ inch of dirt, all other partings excluded.	B-501	1.4	1	1.8	41.5	51.2	5.5	2.9	.....	.....	.....	.....	7,761	13,970	2,190
			2	3.2	40.9	50.5	5.4	2.9	.....	.....	.....	.....	7,656	13,780	
			3	.....	42.3	52.1	5.6	3.0	.....	.....	.....	.....	7,906	14,230	
			4	.....	44.8	55.2	.....	3.2	.....	.....	.....	.....	8,372	15,070	

Division 44, locality 4160, south side of Robinson Creek, 0.2 mile above school 12. All partings excluded.	B-453	2.4	1	1.4	36.2	57.8	4.6	.9					7,861	14,150	2,880
			2	3.7	35.4	56.4	4.5	.8					7,678	13,820	
			3		36.7	58.6	4.7	.9					7,972	14,350	
			4		38.5	61.5		.9					8,367	15,060	
Division 44, locality 4168, east side of drain from north, 0.5 mile above school 12 on north side of Robinson Creek. All partings and dirty coal excluded.	B-459	.8	1	1.4	37.2	55.4	6.0	.8					7,783	14,010	2,890
			2	2.2	36.9	55.0	5.9	.8					7,717	13,890	
			3		37.7	56.2	6.1	.9					7,889	14,200	
			4		40.1	59.9		.9					8,394	15,110	
Division 46, locality 4337, Utilities Elkhorn Coal Co. no. 1. All partings excluded. Room 3, left side of air course of 19 left main hallway.	B-894	3.2	1	1.9	37.2	57.6	3.3	.8					7,844	14,120	2,900
			2	5.0	36.0	55.8	3.2	.7					7,594	13,670	
			3		37.9	58.7	3.4	.8					7,994	14,390	
			4		39.3	60.7		.8					8,272	14,890	
Same, main hallway 800 feet from Gap Branch entry. Sample includes entire bed.	B-893	2.2	1	1.6	39.1	55.6	3.7	.7					7,883	14,190	2,840
			2	3.8	38.3	54.3	3.6	.6					7,706	13,870	
			3		39.8	56.5	3.7	.7					8,011	14,420	
			4		41.3	58.7		.7					8,322	14,980	
Same, no. 1 right of 4 butt of 5 right of main hallway, 3,500 feet from Boldman. All partings excluded.	B-892	3.1	1	1.9	35.7	58.5	3.9	1.1					7,756	13,960	2,500
			2	4.9	34.6	56.7	3.8	1.0					7,511	13,520	
			3		36.4	59.6	4.0	1.1					7,900	14,220	
			4		37.9	62.1		1.1					8,233	14,820	
Same, composite of samples B-892, B-893, B-894	B-895	2.9	1	1.8	37.4	57.2	3.6	.9	5.5	78.9	1.6	9.5	7,828	14,090	
			2	4.6	36.3	55.6	3.5	.9	5.6	76.7	1.6	11.7	7,606	13,690	
			3		38.0	58.3	3.7	.9	5.3	80.4	1.7	8.0	7,967	14,340	
			4		39.5	60.5		1.0	5.5	83.4	1.7	8.4	8,272	14,890	

Upper Elkhorn No. 2 coal bed

[Samples collected by U. S. Geological Survey, 1934]

Division 5, locality 340, west side of Mudlick Branch of Blackberry Fork at mouth of left fork. Sample includes 1½ inches of shale; other partings excluded.	B-381	3.8	1	2.6	31.9	60.3	5.2	0.7					7,489	13,480	2,590
			2	6.3	30.6	58.1	5.0	.7					7,200	12,960	
			3		32.7	62.0	5.3	.7					7,689	13,840	
			4		34.5	65.5		.7					8,117	14,610	
Division 16, locality 1307, east side of Road Fork of Big Creek 0.3 mile above mouth. All partings excluded.	B-399	2.1	1	2.1	35.2	58.2	4.5	.8					7,728	13,910	2,840
			2	4.2	34.5	56.9	4.4	.8					7,561	13,610	
			3		36.0	59.4	4.6	.8					7,889	14,200	
			4		37.7	62.3		.9					8,272	14,890	
Division 18, locality 1448, north side of Johns Creek across from mouth of Joes Creek. All partings excluded.	B-405	4.0	1	2.8	35.9	52.6	8.7	1.2					7,189	12,940	2,520
			2	6.7	34.4	50.6	8.3	1.2					6,900	12,420	
			3		36.9	54.2	8.9	1.3					7,394	13,310	
			4		40.5	59.5		1.4					8,117	14,610	

Analyses of coal from Pike County, Ky.—Continued

Upper Elkhorn No. 2 coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 20, locality 1559, west side of left fork of Stonecoal Creek near Miller Creek Gap. All partings excluded.	B–404	6.6	1	2.7	36.9	56.3	4.1	0.8	------	------	------	------	7,678	13,820	2,730
			2	9.1	34.4	52.7	3.8	.8	------	------	------	------	7,172	12,910	
			3	------	37.9	57.9	4.2	.8	------	------	------	------	7,889	14,200	
			4	------	39.5	60.5	------	.9	------	------	------	------	8,233	14,820	
Division 22, locality 1683, east side near head of Ferguson Fork. All partings excluded.	B–476	2.6	1	1.4	35.2	50.4	13.0	1.0	------	------	------	------	7,089	12,760	2,620
			2	3.9	34.3	49.2	12.6	1.0	------	------	------	------	6,900	12,420	
			3	------	35.7	51.2	13.1	1.0	------	------	------	------	7,183	12,930	
			4	------	41.1	58.9	------	1.2	------	------	------	------	8,272	14,890	
Division 22, locality 1739, east side of gap between Upper and Lower Chloe Creeks.	B–475	1.1	1	1.4	37.3	55.4	5.9	.9	------	------	------	------	7,761	13,970	2,910
			2	2.5	36.9	54.8	5.8	.9	------	------	------	------	7,672	13,810	
			3	------	37.8	56.2	6.0	.9	------	------	------	------	7,867	14,160	
			4	------	40.2	59.8	------	.9	------	------	------	------	8,367	15,060	
Division 23, locality 1846, west side of Lower Pompey Branch 0.6 mile below gap to Sloane Branch. All partings excluded.	B–410	2.6	1	3.5	33.0	58.8	4.7	.8	------	------	------	------	7,428	13,370	2,300
			2	6.0	32.2	57.2	4.6	.8	------	------	------	------	7,233	13,020	
			3	------	34.2	60.9	4.9	.8	------	------	------	------	7,694	13,850	
			4	------	36.0	64.0	------	.8	------	------	------	------	8,089	14,560	
Division 25, locality 2075, head of right fork of Upper Pompey Branch on west side. All partings excluded.	B–469	3.3	1	1.9	32.4	56.4	9.3	.8	------	------	------	------	7,294	13,130	2,700
			2	5.2	31.4	54.4	9.0	.7	------	------	------	------	7,056	12,700	
			3	------	33.1	57.4	9.5	.8	------	------	------	------	7,439	13,390	
			4	------	36.5	63.5	------	.9	------	------	------	------	8,211	14,780	
Division 31, locality 2619, Purity Cannel Coal Co., main room right 100 yards from entrance 2. 4 inches of block coal excluded.	B–942	.4	1	.5	43.5	50.4	5.6	.9	------	------	------	------	8,311	14,960	2,360
			2	.8	43.4	50.3	5.5	.9	------	------	------	------	8,283	14,910	
			3	------	43.7	50.7	5.6	.9	------	------	------	------	8,356	15,040	
			4	------	46.3	53.7	------	1.0	------	------	------	------	8,844	15,920	
Same, main room right 100 yards southeast from entrance 1. 5 inches of block coal excluded.	B–941	.4	1	.4	44.2	48.9	6.5	1.5	------	------	------	------	8,222	14,800	2,210
			2	.8	44.0	48.7	6.5	1.5	------	------	------	------	8,189	14,740	
			3	------	44.4	49.1	6.5	1.5	------	------	------	------	8,256	14,860	
			4	------	47.5	52.5	------	1.6	------	------	------	------	8,828	15,890	
Same, main room left 175 yards southwest of entrance 1....	B–940	.4	1	.5	44.4	49.2	5.9	1.4	------	------	------	------	8,272	14,890	2,240
			2	.9	44.2	49.0	5.9	1.4	------	------	------	------	8,244	14,840	
			3	------	44.6	49.5	5.9	1.4	------	------	------	------	8,317	14,970	
			4	------	47.4	52.6	------	1.5	------	------	------	------	8,839	15,910	

Same, composite of samples B-940, B-941, B-942	B-943	.4	1	.5	43.8	49.7	6.0	1.3	6.1	80.9	1.5	4.2	8,278	14,900	
			2	.8	43.7	49.5	6.0	1.3	6.2	80.7	1.5	4.3	8,250	14,850	
			3		44.0	50.0	6.0	1.3	6.1	81.3	1.5	3.8	8,317	14,970	
			4		46.8	53.2		1.3	6.5	86.5	1.6	4.1	8,850	15,930	
Division 35, locality 3106, Edgewater Coal Co., Coaldale no. 4. First south off main near first butt. Sample includes only laminated coal.	B-965	1.9	1	1.1	29.8	54.9	14.2	.6					7,083	12,750	2,910
			2	3.0	29.2	53.9	13.9	.6					6,950	12,510	
			3		30.1	55.5	14.4	.6					7,161	12,890	
			4		35.1	64.9		.7					8,361	15,050	
Same, first south off main near first butt entry. 1 foot of laminated coal excluded.	B-966	1.3	1	1.2	34.8	61.3	2.7	1.2					8,111	14,600	2,180
			2	2.4	34.4	60.5	2.7	1.2					8,006	14,410	
			3		35.2	62.1	2.7	1.2					8,206	14,770	
			4		36.2	63.8		1.2					8,439	15,190	
Division 36, locality 2177, Greenough Coal Co., Inc., Greenough no. 2, entry 20, right working face. 8 inches of laminated coal excluded.	B-963	2.5	1	1.1	32.1	64.7	2.1	.5					8,178	14,720	2,650
			2	3.5	31.3	63.1	2.1	.5					7,978	14,360	
			3		32.5	65.3	2.2	.5					8,267	14,880	
			4		33.2	66.8		.5					8,450	15,210	
Same, rib of entry, 17 right near working face. 7½ inches of laminated coal excluded.	B-962	1.8	1	1.0	33.4	62.7	2.9	.6					8,139	14,650	2,590
			2	2.7	32.8	61.7	2.8	.6					7,994	14,390	
			3		33.7	63.4	2.9	.6					8,217	14,790	
			4		34.7	65.3		.6					8,461	15,230	
Same, main entry heading. 9 inches of laminated coal excluded.	B-961	1.9	1	1.0	32.4	63.9	2.7	.8					8,156	14,680	2,390
			2	2.8	31.8	62.7	2.7	.8					8,006	14,410	
			3		32.7	64.5	2.8	.8					8,239	14,830	
			4		33.7	66.3		.8					8,472	15,250	
Same, composite of samples B-961, B-962, B-963	B-964	2.0	1	1.0	32.5	63.9	2.6	.6	5.2	82.7	1.4	7.5	8,161	14,690	
			2	3.0	31.8	62.7	2.5	.6	5.3	81.0	1.4	9.2	7,994	14,390	
			3		32.8	64.6	2.6	.6	5.2	83.5	1.4	6.7	8,244	14,840	
			4		33.7	66.3		.6	5.3	85.8	1.5	6.8	8,467	15,240	
Division 36, locality 3183, Peabody Coal Co., Peabody no. 28, 50 feet from drift mouth on main entry. 2 feet 1 inch of laminated coal excluded.	B-981	2.8	1	1.3	34.9	61.6	2.2	.5					8,122	14,620	2,580
			2	4.1	32.9	59.9	2.1	.5					7,889	14,200	
			3		35.3	62.5	2.2	.5					8,222	14,800	
			4		36.1	63.9		.5					8,411	15,140	
Division 36, locality 3236, Edgewater Coal Co., Henry Clay no. 2, first right off no. 3 main. 1 foot 2 inches of laminated coal excluded.	B-898	2.1	1	1.3	35.8	61.1	1.8	.5					8,178	14,720	2,430
			2	3.3	35.0	60.0	1.7	.5					8,006	14,410	
			3		36.2	62.0	1.8	.5					8,233	14,910	
			4		36.9	63.1		.5					8,433	15,180	
Same, first main entry. 18 inches of dirty coal excluded	B-897	1.8	1	1.4	34.9	62.1	1.6	.6					8,183	14,730	2,390
			2	3.2	34.3	60.9	1.6	.5					8,033	14,460	
			3		35.4	62.9	1.7	.6					8,300	14,940	
			4		36.0	64.0		.6					8,439	15,190	

Analyses of coal from Pike County, Ky.—Continued

Upper Elkhorn No. 2 coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Same, first butt off 13 left off 12 left: 7 inches of laminated coal and partings excluded.	B–896	1.7	1	1.3	35.8	61.1	1.8	0.6	------	------	------	------	8,239	14,830	2,370
			2	3.0	35.2	60.0	1.8	.6	------	------	------	------	8,100	14,580	
			3	--------	36.3	61.9	1.8	.6	------	------	------	------	8,350	15,030	
			4	--------	36.9	63.1	------	.6	------	------	------	------	8,500	15,300	
Same, composite of samples B–896, B–897, B–898	B–899	1.9	1	1.3	35.6	61.3	1.8	.6	5.5	83.0	1.5	7.6	8,206	14,770	
			2	3.1	34.9	60.3	1.7	.6	5.6	81.4	1.5	9.2	8,050	14,490	
			3	--------	36.1	62.1	1.8	.6	5.4	84.0	1.5	6.7	8,311	14,960	
			4	--------	36.7	63.3	------	.6	5.5	85.6	1.6	6.7	8,461	15,230	
Division 37, locality 3276, head of left fork of Rockhouse Creek. 8½ inches of laminated coal excluded.	B–401	2.3	1	1.7	35.8	60.9	1.6	.5	------	------	------	------	8,178	14,720	2,390
			2	3.9	35.0	59.5	1.6	.5	------	------	------	------	7,989	14,380	
			3	--------	36.4	61.9	1.7	.5	------	------	------	------	8,317	14,970	
			4	--------	37.0	63.0	------	.6	------	------	------	------	8,456	15,220	
Division 37, locality 3299, west side at head of Bad Fork of Rockhouse Creek. 10 inches of laminated coal excluded.	B–386	2.7	1	1.4	36.8	60.0	1.8	.9	------	------	------	------	8,206	14,770	2,450
			2	4.0	35.8	58.5	1.7	.8	------	------	------	------	7,989	14,380	
			3	--------	37.3	60.9	1.8	.9	------	------	------	------	8,322	14,980	
			4	--------	38.0	62.0	------	.9	------	------	------	------	8,472	15,250	
Division 39, locality 3568, south side 0.8 mile above mouth of Stagger Fork of Shelby Creek. All partings and dirty coal excluded.	B–439	2.6	1	1.5	35.1	59.1	6.3	.5	------	------	------	------	7,761	13,970	2,750
			2	4.0	32.2	57.7	6.1	.5	------	------	------	------	7,567	13,620	
			3	--------	33.6	60.0	6.4	.5	------	------	------	------	7,878	14,180	
			4	--------	35.8	64.2	------	.6	------	------	------	------	8,417	15,150	
Division 39, locality 3599, head of hollow on west side of Little Creek of Shelby Creek 0.3 mile above mouth of Deadening Fork. All partings and dirty coal excluded.	B–443	1.4	1	1.4	33.5	54.3	10.8	.7	------	------	------	------	7,356	13,240	2,730
			2	2.8	33.1	53.5	10.6	.6	------	------	------	------	7,256	13,060	
			3	--------	34.0	55.1	10.9	.7	------	------	------	------	7,461	13,430	
			4	--------	38.2	61.8	------	.7	------	------	------	------	8,378	15,080	
Division 39, locality 3603, west side of Little Creek of Shelby Creek 0.5 mile below mouth of Deadening Fork. All partings and dirty coal excluded.	B–446	2.1	1	1.7	35.3	56.6	6.4	.5	------	------	------	------	7,722	13,900	2,880
			2	3.7	34.6	55.4	6.3	.5	------	------	------	------	7,561	13,610	
			3	--------	35.9	57.6	6.5	.5	------	------	------	------	7,850	14,130	
			4	--------	38.4	61.6	------	.5	------	------	------	------	8,400	15,120	
Division 39, locality 3618, near head of hollow on southeast side of Kinney Branch of Caney Creek 0.5 mile above the mouth. All partings excluded.	B–441	1.8	1	1.5	34.6	57.8	6.1	.6	------	------	------	------	7,778	14,000	2,810
			2	3.3	33.9	56.8	6.0	.6	------	------	------	------	7,633	13,740	
			3	--------	35.1	58.7	6.2	.6	------	------	------	------	7,894	14,210	
			4	--------	37.4	62.6	------	.6	------	------	------	------	8,417	15,150	

Division 39, locality 3621, 0.3 mile up first hollow on north side of Left Fork of Caney Creek. All partings and dirty coal excluded.	B-440	2.4	1	2.0	34.8	60.4	2.8	.5					7,956	14,320		2,450
			2	4.3	34.0	58.9	2.8	.5					7,767	13,980		
			3		35.5	61.6	2.9	.5					8,117	14,610		
			4		36.5	63.5		.6					8,356	15,040		
Division 39, locality 3630, head of small hollow on west side of Pig Branch of Left Fork of Caney Creek. All partings excluded.	B-437	3.3	1	3.2	33.0	59.4	4.4	.5					7,517	13,530		2,470
			2	6.4	31.9	57.4	4.3	.5					7,267	13,080		
			3		34.1	61.4	4.5	.5					7,767	13,980		
			4		35.7	64.3		.5					8,139	14,650		
Division 40, locality 3658, Camp Fork of Caney Creek, on east side of south hollow 0.5 mile above mouth of Hopkins Fork. All partings and dirty coal excluded.	B-438	2.1	1	1.4	33.0	59.1	6.5	.7					7,772	13,990		2,820
			2	3.5	32.3	57.9	6.3	.6					7,611	13,700		
			3		33.5	59.9	6.6	.7					7,883	14,190		
			4		35.8	64.2		.7					8,439	15,190		
Division 40, locality 3677, head of right fork of hollow on west side of Caney Creek 0.3 mile above mouth of Camp Fork. All partings, dirty coal, and 7 inches of block coal excluded.	B-447	2.1	1	1.9	33.8	57.4	6.9	.6					7,550	13,590		2,910
			2	4.0	33.1	56.2	6.7	.6					7,389	13,300		
			3		34.5	58.5	7.0	.6					7,694	13,850		
			4		37.0	63.0		.7					8,272	14,890		
Division 40, locality 3705, Utilities Elkhorn Coal Co., Virgie or no. 6 mine, 25 feet in room 9, off entry 10 left. All partings excluded. This is sample of lower split.	B-950	1.3	1	1.5	35.0	58.9	4.6	.7					7,883	14,190		2,930
			2	2.8	34.6	58.0	4.6	.6					7,783	14,010		
			3		35.6	59.7	4.7	.7					8,006	14,410		
			4		37.3	62.7		.7					8,400	15,120		
Same, 25 feet in room 9, off entry 10 left. All partings excluded. This sample is of upper split.	B-949	1.6	1	1.4	32.5	59.1	7.0	.7					7,667	13,800		2,780
			2	3.0	32.0	58.1	6.9	.7					7,544	13,580		
			3		33.0	59.9	7.1	.7					7,778	14,000		
			4		35.5	64.5		.8					8,372	15,070		
Same, just adjacent to room 1 off first left off 13 right. All partings and dirty coal excluded except four 1/16-inch partings.	B-948	1.3	1	1.4	34.4	58.9	5.3	.6					7,839	14,110		2,870
			2	2.6	33.9	58.3	5.2	.6					7,739	13,930		
			3		34.8	59.8	5.4	.6					7,950	14,310		
			4		36.8	63.2		.7					8,400	15,120		
Same, 25 feet in 14 west off first butt. All partings and dirty coal excluded except 1/2 inch of shale.	B-947	2.2	1	1.3	33.8	60.0	4.9	.7					7,911	14,240		2,860
			2	3.5	33.0	58.7	4.8	.6					7,733	13,920		
			3		34.2	60.9	4.9	.7					8,011	14,420		
			4		36.0	64.0		.7					8,428	15,170		
Same, composite of samples B-947, B-948	B-1014	1.8	1	1.3	34.1	59.6	5.0	.6	5.2	79.8	1.4	8.0	7,878	14,180		
			2	3.0	33.5	58.6	4.9	.6	5.3	78.4	1.4	9.4	7,739	13,930		
			3		34.6	60.3	5.1	.6	5.1	80.8	1.4	7.0	7,978	14,360		
			4		36.4	63.6		.7	5.4	85.2	1.5	7.2	8,406	15,130		
Division 40, locality 3724, up east side of hollow draining north at Elswick. All partings excluded.	B-452	2.1	1	1.5	33.7	58.3	6.5	.6					7,694	13,850		2,890
			2	3.6	33.0	57.0	6.4	.6					7,539	13,570		
			3		34.3	59.1	6.6	.6					7,817	14,070		
			4		36.7	63.3		.6					8,372	15,070		

Analyses of coal from Pike County, Ky.—Continued

Upper Elkhorn No. 2 coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 40, locality 3748, west side at head of Trace Fork of Dorton Creek.	B–451	3.3	1	1.8	33.2	62.7	2.3	0.5	------	------	------	------	8,033	14,460	2,540
			2	5.0	32.2	60.6	2.2	.5	------	------	------	------	7,772	13,990	
			3	------	33.9	63.8	2.3	.5	------	------	------	------	8,183	14,730	
			4	------	34.7	65.3	------	.6	------	------	------	------	8,378	15,080	
Division 41, locality 3825, south side of Big Branch of Elkhorn Creek, 1 mile above mouth. 7 inches of laminated coal excluded.	B–430	3.3	1	3.2	33.3	60.4	3.1	.5	------	------	------	------	7,739	13,930	2,530
			2	6.4	32.2	58.4	3.0	.5	------	------	------	------	7,483	13,470	
			3	------	34.3	62.5	3.0	.5	------	------	------	------	7,994	14,390	
			4	------	35.5	64.5	------	.6	------	------	------	------	8,256	14,860	
Division 42, locality 3885, Wright Elkhorn Coal Co., 7 right off 8 left off main hallway, 4,800 feet from drift mouth. Sample includes ½ inch of dirt.	B–930	2.0	1	1.4	34.2	59.8	4.6	1.2	------	------	------	------	7,878	14,180	2,500
			2	3.3	33.6	58.6	4.5	1.1	------	------	------	------	7,728	13,910	
			3	------	34.7	60.6	4.7	1.2	------	------	------	------	7,989	14,380	
			4	------	36.4	63.6	------	1.2	------	------	------	------	8,383	15,090	
Same, no. 2 mine, 11 right off main hallway, 4,000 feet from drift mouth. Sample includes ½ inch of dirt.	B–929	1.7	1	1.4	33.0	59.5	6.1	.9	------	------	------	------	7,772	13,990	2,620
			2	3.1	32.4	58.5	6.0	.9	------	------	------	------	7,633	13,740	
			3	------	33.5	60.3	6.2	.9	------	------	------	------	7,883	14,190	
			4	------	35.7	64.3	------	1.0	------	------	------	------	8,400	15,120	
Same, 9 right off 8 left off main hallway, 5,400 feet from drift mouth. Sample includes ¾ inch of dirt.	B–928	1.7	1	1.4	34.0	59.9	4.7	1.2	------	------	------	------	7,911	14,240	2,490
			2	3.1	33.4	58.9	4.6	1.1	------	------	------	------	7,772	13,990	
			3	------	34.4	60.8	4.8	1.2	------	------	------	------	8,022	14,440	
			4	------	36.2	63.8	------	1.2	------	------	------	------	8,428	15,170	
Same, composite of samples B–928, B–930, B–929	B–931	1.8	1	1.4	33.8	59.7	5.1	1.1	5.2	79.7	1.4	7.5	7,856	14,140	
			2	3.2	33.1	58.7	5.0	1.1	5.4	78.2	1.4	8.9	7,711	13,880	
			3	------	34.3	60.5	5.2	1.1	5.2	80.8	1.5	6.2	7,967	14,340	
			4	------	36.1	63.9	------	1.1	5.4	85.3	1.5	6.7	8,406	15,130	
Division 44, locality 4113, Elkhorn Shelby Coal Co., room 2 off left main entry. All partings excluded.	B–982	1.6	1	1.3	35.3	59.8	3.6	.5	------	------	------	------	8,006	14,410	2,720
			2	2.9	34.7	58.9	3.5	.4	------	------	------	------	7,878	14,180	
			3	------	35.7	60.7	3.6	.5	------	------	------	------	8,111	14,600	
			4	------	37.1	62.9	------	.5	------	------	------	------	8,422	15,160	
Division 44, locality 4164, west side of left fork of head of Robinson Creek, 0.1 mile above mouth. All partings excluded.	B–442	1.8	1	1.4	35.5	56.4	6.7	1.7	------	------	------	------	7,700	13,860	2,340
			2	3.1	34.9	55.4	6.6	1.6	------	------	------	------	7,567	13,620	
			3	------	36.0	57.2	6.8	1.7	------	------	------	------	7,806	14,050	
			4	------	38.6	61.4	------	1.8	------	------	------	------	8,378	15,080	

Division 45, locality 4215, Right Fork of Straight Fork of Bear Fork of Robinson Creek; first hollow to east. All partings excluded.	B-402	3.5	1	3.0	33.4	59.2	4.4	.5					7,522	13,540	2,730
			2	6.3	32.2	57.2	4.3	.5					7,261	13,070	
			3		34.4	61.0	4.6	.5					7,750	13,950	
			4		36.0	64.0		.6					8,117	14,610	
Division 45, locality 4222, southwest side of Foundation Branch of Robinson Creek 0.7 mile above main forks of branch. All partings and 1 inch of coal excluded.	B-445	2.6	1	2.2	35.8	58.9	3.1	.6					7,839	14,110	2,450
			2	4.8	34.9	57.3	3.0	.5					7,633	13,740	
			3		36.6	60.3	3.1	.6					8,011	14,420	
			4		37.8	62.2		.6					8,272	14,890	
Division 45, locality 4225, west side of Foundation Branch of Robinson Creek at forks at head. All partings and 1 inch of coal excluded.	B-444	3.0	1	1.9	36.4	58.9	2.8	.6					7,906	14,230	2,620
			2	4.8	35.3	57.2	2.7	.6					7,667	13,800	
			3		37.1	60.1	2.8	.6					8,056	14,500	
			4		38.2	61.8		.6					8,294	14,930	
Division 45, locality 4229, east side 1 mile above main forks on Foundation Branch of Robinson Creek. All partings and 4 inches of laminated coal excluded.	B-448	4.1	1	2.2	35.4	59.5	2.9	.5					7,839	14,110	2,260
			2	6.2	33.9	57.1	2.8	.4					7,522	13,540	
			3		36.2	60.8	3.0	.5					8,017	14,430	
			4		37.3	62.7		.5					8,261	14,870	
Division 45, locality 4249, west side of Sukey Creek of Shelby Creek at gap. All partings and dirty coal excluded.	B-449	1.7	1	1.7	37.3	58.4	2.6	.5					8,022	14,440	2,540
			2	3.4	36.7	57.4	2.5	.5					7,889	14,200	
			3		38.0	59.4	2.6	.5					8,167	14,700	
			4		39.0	61.0		.5					8,389	15,100	
Division 46, locality 4337, Utilities Elkhorn Coal Co., Boldman, Ky., room 5 off first left off 5 right off main hallway, 4,000 feet from Boldman entry. All partings excluded.	B-975	2.2	1	2.3	35.7	59.1	2.9	.7					7,867	14,160	2,470
			2	4.4	34.9	57.9	2.8	.7					7,694	13,850	
			3		36.5	60.5	3.0	.7					8,050	14,490	
			4		37.7	62.3		.7					8,294	14,930	
Same, room 7 off first left off 5 right off main hallway. All partings excluded.	B-974	2.6	1	1.9	36.1	59.0	3.0	.7					7,861	14,150	2,470
			2	4.5	35.1	57.4	3.0	.7					7,656	13,780	
			3		36.8	60.1	3.1	.7					8,017	14,430	
			4		38.0	62.0		.7					8,272	14,890	
Same, composite of samples B-974, B-975	B-976	2.4	1	2.0	35.9	59.0	3.1	.7	5.4	78.8	1.6	10.4	7,861	14,150	
			2	4.3	35.0	57.7	3.0	.7	5.5	76.9	1.5	12.4	7,672	13,810	
			3		36.6	60.3	3.1	.7	5.3	80.4	1.6	8.9	8,022	14,440	
			4		37.8	62.2		.8	5.4	83.0	1.6	9.2	8,278	14,900	

Upper Elkhorn No. 3 coal bed

[Samples collected by U. S. Geological Survey, 1934]

Division 3, locality 222, first hollow from north above Canada P. O., west side of road 0.5 mile from Coburn Branch of Big Creek. Entire bed included.	B-379	4.6	1	1.9	34.3	49.1	14.7	3.8					6,828	12,290	2,180
			2	6.4	32.7	46.9	14.0	3.6					6,517	11,730	
			3		34.9	50.1	15.0	3.8					6,956	12,520	
			4		41.1	58.9		4.5					8,183	14,730	

Analyses of coal from Pike County, Ky.—Continued

Upper Elkhorn No. 3 coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 7, locality 568, south side of left fork at head of Dial Branch of Blackberry Creek. All partings excluded.	B-390	3.4	1	1.4	37.3	55.6	5.7	1.9	------	------	------	------	7,828	14,090	2,290
			2	4.8	36.0	53.7	5.5	1.8	------	------	------	------	7,561	13,610	
			3	------	37.8	56.5	5.7	1.9	------	------	------	------	7,939	14,290	
			4	------	40.1	59.9	------	2.0	------	------	------	------	8,422	15,160	
Division 19, locality 1501, Pike Floyd Coal Co., room 2 off 8 right, 3,000 feet from entry no. 4 mine. All partings excluded.	B-904	2.4	1	2.0	38.0	55.7	4.3	1.1	------	------	------	------	7,744	13,940	2,390
			2	4.3	37.1	54.4	4.2	1.1	------	------	------	------	7,561	13,610	
			3	------	38.7	56.9	4.4	1.1	------	------	------	------	7,900	14,220	
			4	------	40.5	59.5	------	1.2	------	------	------	------	8,267	14,880	
Same, locality 1507, 8 east off main hallway 1,700 feet from entry. Sample includes three ½-inch layers of dirty coal; all other partings excluded.	B-905	2.4	1	2.0	36.9	57.4	3.7	1.0	------	------	------	------	7,744	13,940	2,340
			2	4.3	36.0	56.1	3.6	1.0	------	------	------	------	7,561	13,610	
			3	------	37.6	58.7	3.7	1.0	------	------	------	------	7,900	14,220	
			4	------	39.1	60.9	------	1.1	------	------	------	------	8,206	14,770	
Same, locality 1514, 1 east off 1 north of no. 5 mine. All partings excluded.	B-906	2.4	1	1.9	38.0	56.0	4.1	1.1	------	------	------	------	7,750	13,950	2,340
			2	4.2	37.1	54.7	4.0	1.1	------	------	------	------	7,561	13,610	
			3	------	38.7	57.2	4.1	1.1	------	------	------	------	7,894	14,210	
			4	------	40.4	59.6	------	1.2	------	------	------	------	8,239	14,830	
Same, composite of samples B-904, B-905, B-906	B-907	2.4	1	2.0	37.6	56.4	4.0	1.1	5.4	78.3	1.6	9.6	7,756	13,960	
			2	4.3	36.7	55.1	3.9	1.1	5.5	76.5	1.6	11.4	7,567	13,620	
			3	------	38.4	57.5	4.1	1.1	5.3	79.9	1.6	8.0	7,911	14,240	
			4	------	40.0	60.0	------	1.2	5.5	83.3	1.7	8.3	8,250	14,850	
Division 22, locality 1661, west side of Burning Fork of Raccoon Creek, 1 mile above Burning Fork. Entire bed included.	B-511	2.6	1	3.0	34.4	59.2	3.4	.8	------	------	------	------	7,633	13,740	2,470
			2	5.5	33.5	57.7	3.3	.8	------	------	------	------	7,433	13,380	
			3	------	35.4	61.1	3.5	.8	------	------	------	------	7,867	14,160	
			4	------	36.7	63.3	------	.8	------	------	------	------	8,150	14,670	
Division 22, locality 1739, east side of gap between Upper and Lower Chloe Creeks. Entire bed sampled, including 1½ inches of dirty coal.	B-497	2.6	1	1.8	36.9	55.7	5.6	1.1	------	------	------	------	7,661	13,790	2,360
			2	4.3	35.9	54.4	5.4	1.1	------	------	------	------	7,467	13,440	
			3	------	37.6	56.7	5.7	1.1	------	------	------	------	7,806	14,050	
			4	------	39.8	60.2	------	1.2	------	------	------	------	8,276	14,890	
Division 23, locality 1885, west side of Raccoon Creek, 1 mile above Zebulon. Sample includes ¼ inch of dirt; all other partings excluded.	B-510	2.6	1	2.2	36.8	51.3	9.7	1.2	------	------	------	------	7,244	13,040	2,730
			2	4.7	35.9	49.9	9.5	1.2	------	------	------	------	7,050	12,690	
			3	------	37.6	52.5	9.9	1.2	------	------	------	------	7,406	13,330	
			4	------	41.8	58.2	------	1.4	------	------	------	------	8,217	14,790	

Division 38, locality 3388, east side of right fork of Wolfpen Branch of Marrowbone Creek 0.5 mile above mouth. All partings excluded.	B-498	1.5	1	2.0	37.3	56.8	3.9	1.6					7,867	14,160	2,220
			2	3.4	36.7	56.0	3.9	1.6					7,750	13,950	
			3		38.0	58.0	4.0	1.6					8,028	14,450	
			4		39.6	60.4		1.7					8,361	15,050	
Division 44, locality 4114, Elkhorn Shelby Coal Co., working face 60 feet in from entry. All partings and 5 inches of black coal excluded.	B-983	1.8	1	1.4	33.8	59.7	5.1	.7					7,806	14,050	2,930
			2	3.2	33.2	58.6	5.0	.6					7,667	13,800	
			3		34.3	60.5	5.2	.7					7,917	14,250	
			4		36.2	63.8		.7					8,356	15,040	
Division 44, locality 4118, northwest side at head of right fork of Peter Branch of Robinson Creek. All partings excluded.	B-455	2.2.	1	1.5	35.9	59.8	3.8	.8					7,933	14,280	2,640
			2	3.7	35.1	57.5	3.7	.8					7,756	13,960	
			3		36.4	59.8	3.8	.8					8,056	14,500	
			4		37.9	62.1		.9					8,372	15,070	
Division 44, locality 4170, east side of road over gap and ¼ mile above Main Creek at head of Robinson Creek. Sample includes entire bed.	B-454	1.7	1	1.5	38.0	57.9	2.6	.7					8,050	14,490	2,470
			2	3.2	37.3	56.9	2.6	.7					7,917	14,250	
			3		38.5	58.8	2.7	.7					8,172	14,710	
			4		39.6	60.4		.7					8,400	15,120	
Division 45, locality 4216, head of first hollow on east side of right fork of Straight Fork of Bear Fork. All partings excluded.	B-462	1.5	1	1.5	37.6	58.1	2.8	.8					8,033	14,460	2,670
			2	3.0	37.0	57.3	2.7	.8					7,911	14,240	
			3		38.1	59.1	2.8	.8					8,156	14,680	
			4		39.2	60.8		.8					8,389	15,100	
Division 45, locality 4228, east side of right fork of head of Foundation Branch of Robinson Creek.	B-458	1.9	1	1.6	39.2	55.8	3.4	1.3					7,922	14,260	2,390
			2	3.4	38.5	54.7	3.4	1.2					7,772	13,990	
			3		39.9	56.6	3.5	1.3					8,050	14,490	
			4		41.3	58.7		1.3					8,339	15,010	
Division 46, locality 4324, United Elkhorn Coal Co., Hatcher entry, 6,600 feet from drift mouth. All partings excluded.	B-910	2.1	1	1.7	37.5	55.8	5.0	1.2					7,756	13,960	2,490
			2	3.7	36.7	54.7	4.9	1.2					7,594	13,670	
			3		38.1	56.8	5.1	1.2					7,883	14,190	
			4		40.2	59.8		1.3					8,306	14,950	
Same, 24 left off main hallway, 5,000 feet from drift mouth. All partings excluded.	B-909	1.7	1	1.6	38.5	55.6	4.3	.9					7,822	14,080	2,730
			2	3.2	37.8	54.8	4.2	.9					7,689	13,840	
			3		39.1	56.6	4.3	.9					7,944	14,300	
			4		40.9	59.1		.9					8,306	14,950	
Same, first room off 17 left off main hallway, 4,000 feet from drift mouth. All partings excluded.	B-908	1.7	1	1.6	37.9	56.3	4.2	.8					7,811	14,060	2,730
			2	3.3	37.3	55.3	4.1	.8					7,678	13,820	
			3		38.5	57.2	4.3	.8					7,939	14,290	
			4		40.2	59.8		.9					8,289	14,920	
Same, composite of samples B-908, B-909, B-910	B-911	1.8	1	1.6	38.1	55.9	4.4	1.0	5.4	78.8	1.5	8.9	7,811	14,060	
			2	3.4	37.4	54.8	4.4	1.0	5.5	77.4	1.5	10.2	7,667	13,800	
			3		38.7	56.8	4.5	1.0	5.3	80.1	1.6	7.5	7,939	14,290	
			4		40.5	59.5		1.0	5.5	83.9	1.6	8.0	8,311	14,960	

Analyses of coal from Pike County, Ky.—Continued

Upper Elkhorn No. 3 coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 46, locality 4338, Utilities Elkhorn Coal Co., Boldman, Ky., 50 feet in 1 west, 50 feet in from Gap Branch entry. Sample includes 5 inches of dirty coal; all other partings excluded.	B–977	2.1	1	1.7	38.1	55.1	5.1	1.1	------	------	------	------	7,700	13,860	2,500
			2	3.8	37.3	53.9	5.0	1.0	------	------	------	------	7,539	13,570	
			3	--------	38.8	56.1	5.1	1.1	------	------	------	------	7,833	14,100	
			4	--------	40.9	59.1	------	1.1	------	------	------	------	8,256	14,860	

Bed 50 feet above Upper Elkhorn No. 3 coal bed

[Sample collected by U. S. Geological Survey, 1934]

Division 25, locality 2020, between main forks near head of Rattlesnake Hollow of Raccoon Creek. Entire bed sampled.	B–496	1.2	1	1.1	34.5	43.0	21.4	0.6	------	------	------	------	6,561	11,810	2470
			2	2.3	34.1	42.4	21.2	.6	------	------	------	------	6,483	11,670	
			3	--------	34.9	43.5	21.6	.6	------	------	------	------	6,633	11,940	
			4	--------	44.5	55.5	------	.8	------	------	------	------	8,467	15,240	

Williamson coal bed

[Samples collected by U. S. Geological Survey, 1934, except 74,420, collected in 1920]

Division 1, locality 8, south side 0.2 mile above mouth of Halfway Branch of Big Creek. All partings excluded.	B–395	1.7	1	2.0	41.0	52.5	4.5	1.3	------	------	------	------	7,794	14,030	2,730
			2	3.6	40.3	51.7	4.4	1.3	------	------	------	------	7,661	13,790	
			3	--------	41.8	53.6	4.6	1.4	------	------	------	------	7,950	14,310	
			4	--------	43.8	56.2	------	1.4	------	------	------	------	8,328	14,990	
Division 2, locality 171, Borderland Coal Corporation, mine 2, face of main entry 5,400 feet S. 80° W. of drift mouth.	74,420	------	1	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	
			2	3.04	38.42	51.57	6.97	2.71	------	------	------	------	--------	13,295	
			3	--------	39.62	53.19	7.19	2.79	------	------	------	------	--------	13,712	
			4	--------	42.69	57.31	------	3.01	------	------	------	------	--------	15,774	
Division 4, locality 317, Pond Creek Collieries Co., no. 1 heading. All partings excluded.	B–934	1.6	1	1.5	39.9	52.7	5.9	2.8	------	------	------	------	7,728	13,910	2,280
			2	3.0	39.2	52.0	5.8	2.7	------	------	------	------	7,600	13,680	
			3	--------	40.4	53.6	6.0	2.8	------	------	------	------	7,839	14,110	
			4	--------	43.0	57.0	------	3.0	------	------	------	------	8,339	15,010	

Same, no. 2 heading. All partings excluded	B-933	1.6	1	1.4	39.9	52.8	5.9	3.0					7,722	13,900	2,290
			2	2.9	39.3	52.0	5.8	2.9					7,606	13,690	
			3		40.5	53.5	6.0	3.0					7,833	14,100	
			4		43.0	57.0		3.2					8,333	15,000	
Same, no. 1, first left. All partings excluded	B-932	1.3	1	1.5	40.0	52.1	6.4	3.1					7,667	13,800	2,320
			2	2.7	39.4	51.6	6.3	3.1					7,572	13,630	
			3		40.5	53.0	6.5	3.2					7,783	14,010	
			4		43.4	56.6		3.4					8,322	14,980	
Same, composite of samples B-932, B-933, B-934	B-935	1.5	1	1.5	39.8	51.6	6.1	2.9	5.4	76.8	1.4	7.5	7,700	13,860	
			2	2.9	39.2	51.9	6.0	2.9	5.5	75.6	1.3	8.7	7,589	13,660	
			3		40.4	53.4	6.2	3.0	5.3	77.9	1.4	6.2	7,811	14,060	
			4		43.1	56.9		3.2	5.7	83.0	1.5	6.6	8,333	15,000	

Bed 70 feet above Williamson coal bed

[Sample collected by U. S. Geological Survey, 1913]

Division 8, locality 637B, Thacker Coal Co., Little Thacker mine, last right entry off no. 2 drift, 3,000 feet from mine mouth.	17461F	1.3	1	1.5	36.6	57.4	4.3	1.3	5.3	80.2	1.4	7.2	7,977	14,359	
			2	2.7	36.2	56.7	4.3	1.3	5.3	79.2	1.4	8.2	7,877	14,179	
			3		37.2	58.3	4.4	1.3	5.2	81.5	1.5	5.9	8,101	14,582	
			4		38.9	61.0		1.4	5.4	85.2	1.5	6.2	8,475	15,255	

Bevins coal bed

[Samples collected by U. S. Geol. Survey, 1934]

Division 13, locality 1113, north side of road near gap at head of Johns Creek. Sample of 3-inch carbonaceous clay parting; everything else excluded.	B-407	0.2	1	0.7	16.2	9.6	73.5	0.4					1,461	2,630	
			2	1.0	16.2	9.4	73.4	.4					1,456	2,620	
			3		16.3	9.6	74.1	.4					1,467	2,640	
			4		60.8	39.2									
Same, at working face 150 feet from entrance. Sample includes 4 feet 4 inches of coal at top; all partings and some thin layers of dirty coal are excluded.	B-406	2.2	1	1.3	35.2	58.2	5.3	.7					7,911	14,240	2,700
			2	3.5	34.4	56.9	5.2	.7					7,739	13,930	
			3		35.7	58.9	5.4	.7					8,017	14,430	
			4		37.7	62.3		.8					8,472	15,250	
Division 16, locality 1270, Bent Branch just above mouth of Open Fork opposite J. Mont Bevins' store. Sample of 3-inch carbonaceous clay parting; everything else excluded.	B-503	1.7	1	1.9	16.0	3.6	78.5								2,910
			2	3.5	15.7	3.6	77.2								
			3		16.3	3.7	80.0								
			4		81.5	18.5									
Same, at working face 75 feet from opening. All partings excluded.	B-502	6.7	1	4.2	33.6	54.3	7.9	.7					7,006	12,610	2,450
			2	10.7	31.3	50.6	7.4	.6					6,533	11,760	
			3		35.1	56.7	8.2	.7					7,311	13,160	
			4		38.2	61.8		.8					7,972	14,350	

Analyses of coal from Pike County, Ky.—Continued

Bevins coal bed—Continued

Location and description of sample	Laboratory no.	Air-drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 17, locality 1333, point between forks southeast of Varney. Sample of 3-inch carbonaceous clay parting; everything else excluded.	B–507	1.2	1	2.2	14.3	6.2	77.3	------	------	------	------	------	------	------	2,910
			2	3.4	14.2	6.1	76.3	------	------	------	------	------	------	------	
			3	------	14.7	6.3	79.0	------	------	------	------	------	------	------	
			4	------	69.7	30.3	------	------	------	------	------	------	------	------	
Same, at working face 50 feet from opening. All partings excluded except ½ inch of dirt.	B–506	2.3	1	2.2	37.3	55.2	5.3	0.9	------	------	------	------	7,594	13,670	2,870
			2	4.5	36.4	53.9	5.2	.8	------	------	------	------	7,417	13,350	
			3	------	38.1	56.5	5.4	.9	------	------	------	------	7,761	13,970	
			4	------	40.3	59.7	------	.9	------	------	------	------	8,206	14,770	
Division 17, locality 1361, east side of Left Fork of Brushy Fork 0.8 mile above mouth of Gin Fork. All partings excluded except ¼ inch of dirt.	B–504	2.4	1	2.2	35.4	49.7	12.7	3.1	------	------	------	------	6,900	12,420	2,230
			2	4.5	34.5	48.6	12.4	3.0	------	------	------	------	6,739	12,130	
			3	------	36.2	50.8	13.0	3.1	------	------	------	------	7,050	12,690	
			4	------	41.6	58.4	------	3.6	------	------	------	------	8,106	14,590	
Division 17, locality 1409, north side of Dry Branch near head. Sample of 2½-inch carbonaceous clay parting; everything else is excluded.	B–509	2.4	1	2.9	15.0	12.4	69.7	.1	------	------	------	------	1,233	2,220	2,910
			2	5.2	14.7	12.0	68.1	.1	------	------	------	------	1,206	2,170	
			3	------	15.5	12.7	71.8	.1	------	------	------	------	1,272	2,290	
			4	------	54.6	45.4	------	------	------	------	------	------	------	------	
Same, working face 5 feet from opening. All partings excluded.	B–508	5.7	1	7.2	28.8	45.0	19.0	.5	------	------	------	------	5,356	9,640	2,700
			2	12.5	27.2	42.4	17.9	.5	------	------	------	------	5,050	9,090	
			3	------	31.0	48.5	20.5	.5	------	------	------	------	5,772	10,390	
			4	------	39.0	61.0	------	.7	------	------	------	------	7,261	13,070	
Division 46, locality 4339, Utilities Elkhorn Coal Co., no. 5, Boldman, Ky.; room 2 off 1 east, 500 feet from entry. All partings and 4 inches of dirty coal excluded.	B–979	2.9	1	1.6	37.1	55.6	5.7	.9	------	------	------	------	7,628	13,730	2,640
			2	4.5	36.0	54.0	5.5	.8	------	------	------	------	7,406	13,330	
			3	------	37.7	56.6	5.7	.9	------	------	------	------	7,756	13,960	
			4	------	40.0	60.0	------	.9	------	------	------	------	8,228	14,810	
Same, room 3 off room 2 off 1 east, 500 feet from entry. All partings and 4 inches of dirty coal excluded.	B–978	2.5	1	1.8	37.5	54.9	5.8	.9	------	------	------	------	7,628	13,730	2,600
			2	4.3	36.5	53.6	5.6	.9	------	------	------	------	7,439	13,390	
			3	------	38.2	55.9	5.9	.9	------	------	------	------	7,772	13,990	
			4	------	40.5	59.5	------	1.0	------	------	------	------	8,256	14,860	
Sample, composite of samples B–978, B–979	B–980	2.7	1	1.8	37.5	55.0	5.7	.8	5.4	77.1	1.5	9.5	7,639	13,750	
			2	4.5	36.4	53.6	5.5	.8	5.6	75.0	1.5	11.6	7,433	13,380	
			3	------	38.2	56.0	5.8	.8	5.3	78.5	1.6	8.0	7,783	14,010	
			4	------	40.5	59.5	------	.9	5.7	83.3	1.7	8.4	8,261	14,870	

Taylor coal bed

[Samples collected by U. S. Geological Survey, 1934, except 74421, collected in 1920]

Division 2, locality 169–A, Borderland Coal Corporation, mine 2, room 3 off second left entry off fifth left entry, 4,350 feet southwest of mine mouth.	74421	------	1	-------	-------	-------	------	------	------	------	------	------	-------	-------	
			2	4.4	33.6	49.7	12.4	1.7	------	------	------	------	-------	12,342	
			3	-------	35.1	52.0	13.0	1.8	------	------	------	------	-------	12,909	
			4	-------	40.3	59.7	------	2.1	------	------	------	------	-------	14,828	
Division 7, locality 591, head of right fork of Turkey Foot on east side. All partings and 1 foot 6 inches of laminated coal excluded.	B–382	1.4	1	1.7	36.0	55.6	6.7	.7	------	------	------	------	7,661	13,790	2,919
			2	3.1	35.5	54.8	6.6	.7	------	------	------	------	7,556	13,600	
			3	-------	36.6	56.6	6.8	.7	------	------	------	------	7,789	14,020	
			4	-------	39.3	60 7	------	.8	------	------	------	------	8,361	15,050	
Division 26, locality 2191, head of left fork at head of Grapevine Creek.	B–499	1.4	1	1.6	34.5	59.5	4.4	.5	------	------	------	------	7,917	14,250	2,670
			2	3.0	34.0	58.7	4.3	.5	------	------	------	------	7,806	14,050	
			3	-------	35.1	60.7	4.4	.5	------	------	------	------	8,039	14,470	
			4	-------	36.7	63.3	------	.5	------	------	------	------	8,417	15,150	

Flatwoods coal bed

[Samples collected by U. S. Geological Survey, 1934, except 3829, collected in 1906]

Division 1, locality 54, west side of left fork of Millstone Branch of Bent Branch of Big Creek.	B–396	2.8	1	2.6	38.2	56.0	3.2	0.6	------	------	------	------	7,850	14,130	2,800
			2	5.4	37.1	54.4	3.1	.6	------	------	------	------	7,633	13,740	
			3	-------	39.2	57.5	3.3	.6	------	------	------	------	8,067	14,520	
			4	-------	40.6	59.4	------	.7	------	------	------	------	8,344	15,020	
Division 2, locality 169–B, Borderland Coal Corporation, mine 2, room 3 off third right entry, 3,000 feet southwest of drift mouth.	74422	------	1	-------	-------	-------	------	------	------	------	------	------	-------	-------	
			2	6.2	36.6	51.6	5.6	.9	------	------	------	------	-------	12,922	
			3	-------	39.0	55.0	6.0	.9	------	------	------	------	-------	13,775	
			4	-------	41.5	58.5	------	1.0	------	------	------	------	-------	14,648	
Division 4, locality 303, just under top of hill on west side of head of Road Fork of Pond Creek. One parting, 1 foot 6 inches of shale excluded.	B–378	1.6	1	2.0	37.1	58.4	2.5	.6	------	------	------	------	7,933	14.280	2,640
			2	3.5	36.5	57.5	2.5	.6	------	------	------	------	7,811	14,060	
			3	-------	37.8	59.6	2.6	.6	------	------	------	------	8,094	14,570	
			4	-------	38.8	61.2	------	.6	------	------	------	------	8,306	14,950	
Division 19, locality 1527, head of left fork of McCombs Branch of Johns Creek. All partings and all dirty coal excluded.	B–403	1.9	1	3.1	36.6	54.3	6.0	.7	------	------	------	------	7,417	13,350	2,890
			2	4.9	35.9	53.4	5.8	.6	------	------	------	------	7,278	13,100	
			3	-------	37.8	56.0	6.2	.7	------	------	------	------	7,656	13,780	
			4	-------	40.3	59.7	------	.7	------	------	------	------	8,161	14,690	
Division 36, locality 3189, Musgrove prospect, head of Marrowbone Creek.	3829	1.7	1	-------	-------	-------	------	------	------	------	------	------	-------	-------	
			2	3.5	33.7	54.5	8.3	------	------	------	------	------	-------	-------	
			3	-------	34.9	56.6	8.5	------	------	------	------	------	-------	-------	
			4	-------	-------	-------	------	------	------	------	------	------	-------	-------	

Analyses of coal from Pike County, Ky.—Continued

Flatwoods coal bed—Continued

Location and description of sample	Laboratory no.	Air drying loss	Form of analysis	Proximate				Ultimate					Calorific value		Softening temperature of the ash (°F.)
				Moisture	Volatile matter	Fixed carbon	Ash	Sulphur	Hydrogen	Carbon	Nitrogen	Oxygen	Calories	British thermal units	
Division 41, locality 3754, up center of main drain of Coal Branch of Dorton Creek. All partings excluded; 1 inch of cannel coal and 5 inches of shaly coal included.	B–461	2.2	1	1.4	35.1	55.7	7.8	0.8	------	------	------	------	7,522	13,540	2,870
			2	3.6	34.3	54.4	7.7	.8	------	------	------	------	7,356	13,240	
			3	--------	35.5	56.6	7.9	.9	------	------	------	------	7,628	13,730	
			4	--------	38.6	61.4	------	.9	------	------	------	------	8,289	14,920	
Bed 140 feet above Flatwoods coal bed															
[Sample collected by U. S. Geological Survey, 1934]															
Division 6, locality 494, Leckie Collieries Co., on main between first and second right. Entire bed sampled.	B–969	2.3	1	1.3	34.1	58.8	5.8	0.5	------	------	------	------	7,756	13,960	2,870
			2	3.6	33.3	57.5	5.6	.5	------	------	------	------	7,578	13,640	
			3	--------	34.5	59.7	5.8	.5	------	------	------	------	7,856	14,140	
			4	--------	36.7	63.3	------	.5	------	------	------	------	8,344	15,020	
Bed 310 feet above Flatwoods coal bed															
[Sample collected by U. S. Geological Survey, 1934]															
Division 17, locality 1343, Brushy Creek road near Bent Mountain Gap. All partings excluded but contains a great deal of dirty coal.	B–505	2.5	1	2.3	35.6	55.3	6.8	0.7	------	------	------	------	7,433	13,380	2,870
			2	4.8	34.7	53.9	6.6	.7	------	------	------	------	7,244	13,040	
			3	--------	36.5	56.6	6.9	.8	------	------	------	------	7,611	13,700	
			4	--------	39.2	60.8	------	.8	------	------	------	------	8,178	14,720	

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