

# Geology and Coal Resources of the Tiptop Quadrangle Kentucky

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## CONTRIBUTIONS TO ECONOMIC GEOLOGY

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### GEOLOGY AND COAL RESOURCES OF THE TIPTOP QUADRANGLE, KENTUCKY

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#### ABSTRACT

The Tiptop 7½-minute quadrangle in the eastern Kentucky coalfield, covers about 59 square miles in Breathitt, Magoffin, and Knott Counties. The bedrock cropping out at the surface and extending to a depth of about 200 feet below drainage, as described herein, is assigned to the Breathitt formation of Pennsylvania age. The Breathitt formation consists primarily of sandstone, siltstone, and shale, and of minor amounts of limestone, chert, underclay, and coal. Sandstone, the dominant rock type, occurs in beds ranging from less than 1 foot to more than 100 feet in thickness. Chert, the least common rock type, occurs locally as thin beds at a few stratigraphic positions. The most extensive beds are the coals and some of the marine shales and limestones.

The Big Caney syncline, which trends westward across the northern part of the Tiptop quadrangle, is the dominant structural feature. The strata dip gently toward the axis of this syncline, but the general dip is reversed along several small westward-trending anticlines, or steepened as, for example, along the Lambric fault. The Lambric fault extends westward from the north-central part of the quadrangle to the western edge, where its vertical displacement is a maximum of 160 feet. The fault is mapped here for the first time.

Reserves of coal were computed for nine coal beds: the Tom Cooper, Gun Creek, Fire Clay Rider, lower Haddix, upper Haddix, Prater, Oakley, Fugate, and Skyline. Of these, only the Skyline bed has been mined extensively. The coal is of high volatile A and B bituminous ranks. The estimated coal content of beds more than 14 inches thick is 535 million tons, of which about half is recoverable.

#### INTRODUCTION

The Tiptop quadrangle, in the eastern Kentucky coalfield, includes approximately 59 square miles in parts of Breathitt, Magoffin, and Knott Counties (fig. 51). The town of Tiptop, in the north-central part of the quadrangle, is about 13 miles south of Salyersville and 30 miles east of Jackson.

The principal road is State Route 542, which traverses the quadrangle in an east-west direction. Gravel or dirt roads along the larger streams serve the rest of the area. A spur line of the Chesapeake and Ohio Railroad, which serves the local coal industry, enters the

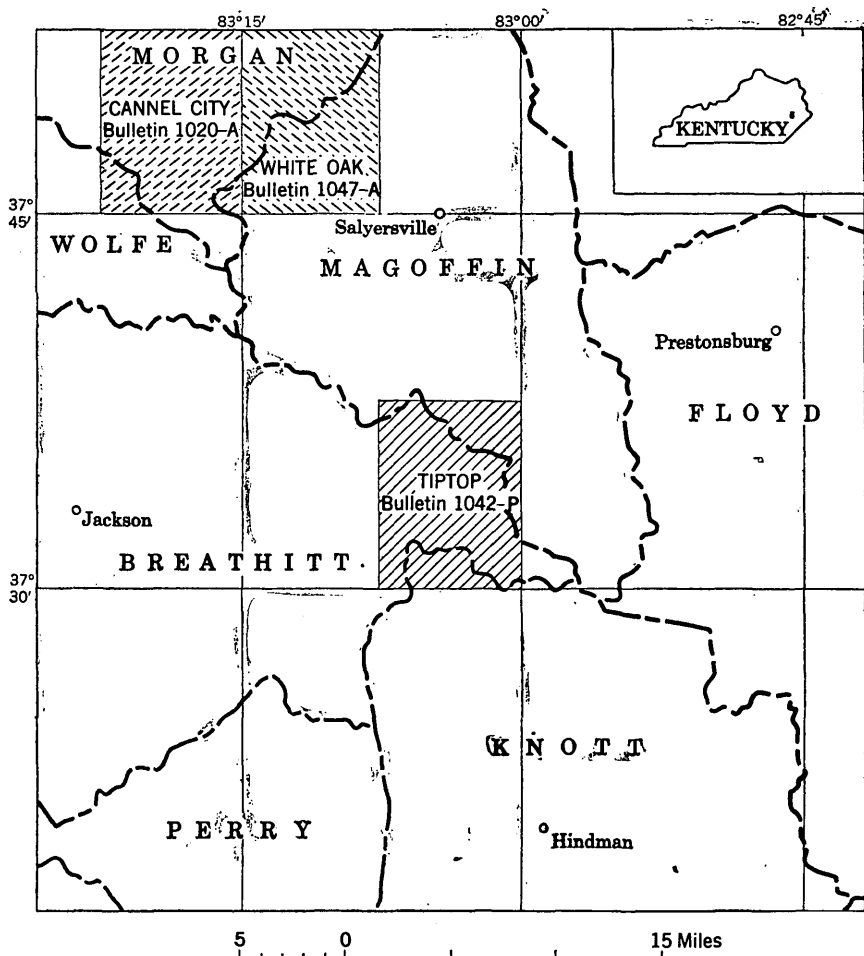


FIGURE 51. Index map showing location of Tiptop quadrangle and other quadrangles about which similar reports have been made.

quadrangle in the north-central part and extends south and east through Tiptop and Evanston to the southeastern corner.

Fieldwork consisted of measuring and describing several hundred coal and stratigraphic sections at mines, road cuts, railroad cuts, and natural outcrops. Most of the altitudes of coals and other key beds were determined by aneroid barometer traverses; a few were determined by hand leveling.

The Tiptop quadrangle lies near the western edge of the highly dissected Cumberland Plateau. The dendritic drainage and deep dissection have produced steep-sided valleys and generally narrow ridges. The larger streams are bordered by narrow flood plains, which are generally less than an eighth of a mile wide. Narrow benches have

been formed on the ridges by erosion of weak beds of shale and coal overlying resistant beds of sandstone.

Altitudes in the Tiptop quadrangle range from 825 feet at Spring Fork at the western border to more than 1,550 feet at many points on southern ridges. Local relief ranges from 400 to 600 feet.

The writer acknowledges the cooperation of the mine operators and many residents of Tiptop quadrangle during the field work done on this report.

## STRATIGRAPHY

### BREATHITT FORMATION

The bedrock of the Tiptop quadrangle is of Pennsylvanian age and is a part of the Breathitt formation which was named for its type exposures in Breathitt County. The formation was described by Campbell (1898, p. 3) as including all Carboniferous rocks above the Lee formation, and, although the upper boundary was not designated, it presumably includes the youngest Pennsylvanian rocks of the county. Wanless (1946, p. 10) considered the Breathitt formation approximately equivalent in age and stratigraphic position to the Briceville, Jellico, Scott, and Anderson formations in Tennessee, and to the upper Norton, Gladeville, Wise, and Harlan formations in Virginia.

The outcropping strata in the Tiptop quadrangle constitute approximately the upper 750 feet of the Breathitt formation. The stratigraphic relations and lateral variation of all except the uppermost strata are shown on plate 50.

Most of the available information concerns the outcropping strata, but the records of cores from several holes drilled in the central and southeastern parts of the quadrangle furnished a few data on 200 feet of strata below the level of the principal stream beds. These strata are also included in the Breathitt formation.

The Breathitt formation includes both continental and marine beds, consisting principally of sandstone, siltstone, and shale, and of minor amounts of limestone, chert, underclay, and coal. The sandstone consists primarily of subrounded, very fine to medium-grained quartz. It is micaceous and generally contains small amounts of carbonaceous material and dark minerals. The unweathered sandstone is commonly a light gray, but it generally weathers to various shades of reddish brown. The sandstone bodies may be thin lenses a few hundred feet across or thick beds covering many square miles. The bedding ranges from thin to massive, and crossbedding is common. Many of the sandstone beds have sharp, undulating contacts that represent disconformities which represent the removal of less than 10 to 30 feet of strata perhaps by ancient stream erosion.

The siltstone consists mainly of quartz and some clay, mica, and carbonaceous material. It is light to dark gray, and generally thin to medium bedded. Where directly beneath an underclay, it generally contains fossil root impressions and is poorly bedded. Much of the siltstone grades both laterally and vertically into sandstone or shale.

The shale is generally silty, and ranges from light gray to grayish black depending largely on the amount of carbonaceous material present. The shale commonly weathers to shades of olive gray, or it may be stained reddish brown by iron oxide. Thin ironstone layers and small ironstone concretions are present in some of the shale beds. A few shale beds contain marine fossils—some fossiliferous over large areas but others at scattered localities only.

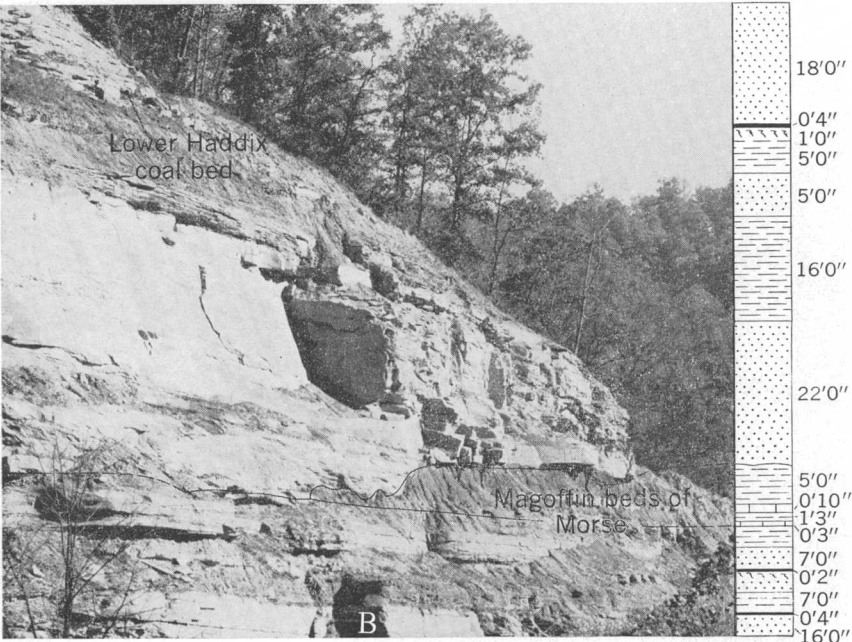
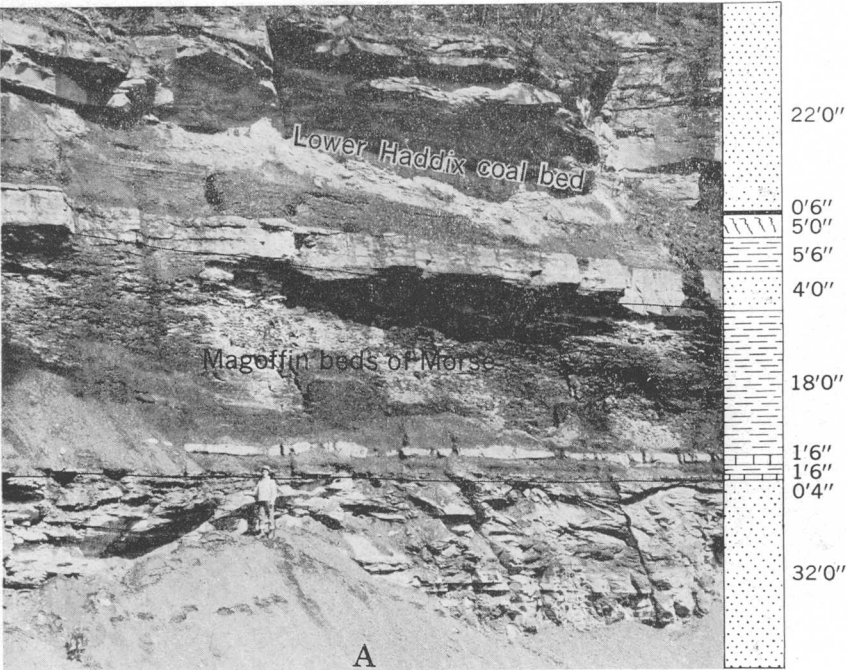
The limestone is argillaceous to silty, and medium gray to dark gray. It occurs as beds less than a foot thick, and as ellipsoidal concretions or lenses as much as 15 feet across and 2 feet thick. Marine fossils are generally present in the limestone where it is associated with fossiliferous shale.

Chert occurs in discontinuous layers at only a few stratigraphic positions in the Breathitt formation. It may be associated with beds containing fossils of marine invertebrates or of continental plants. Its color ranges from shades of brown and brownish gray to shades of bluish gray.

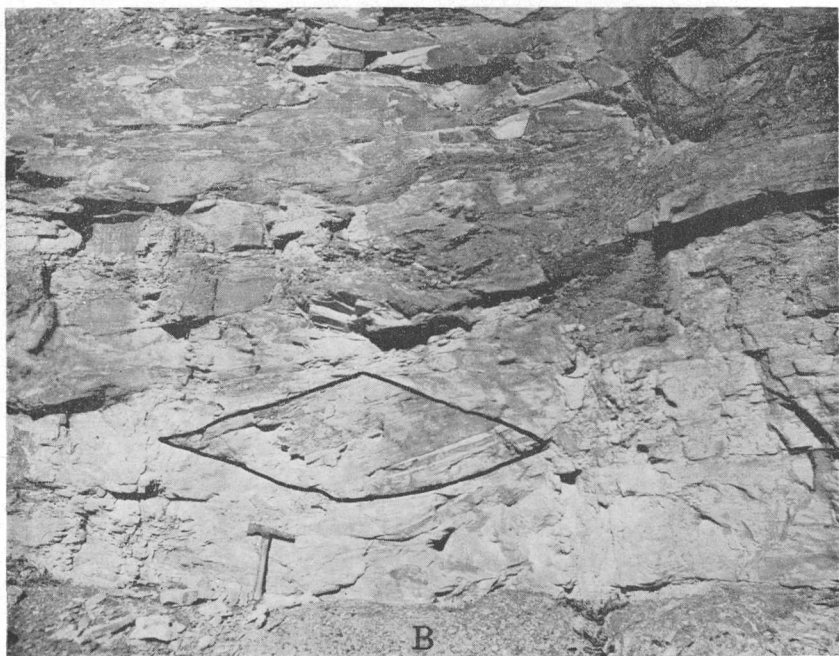
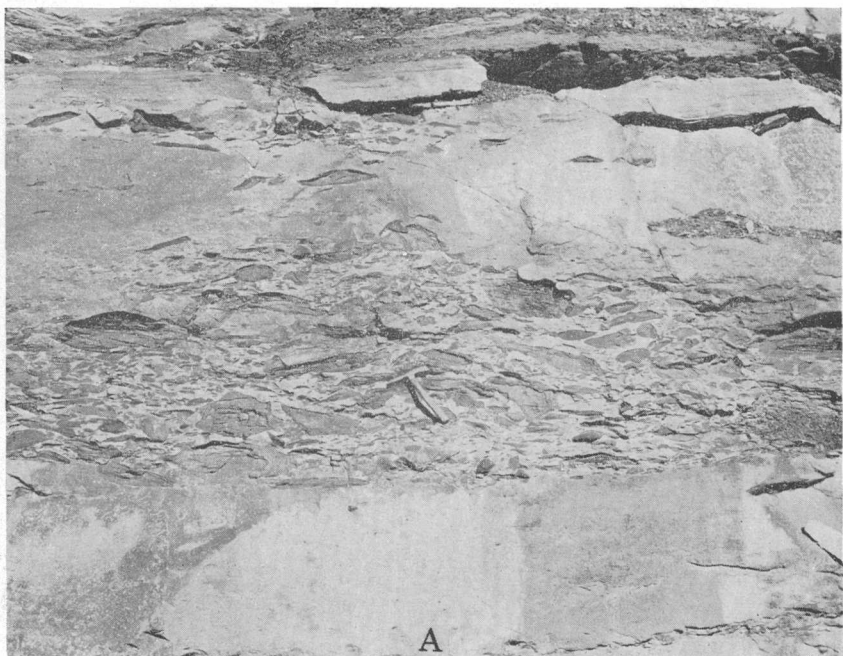
The underclay is generally silty, nonbedded, light gray to dark gray, and at most places underlies coal, exhibits traces of roots, and grades downward to shale or siltstone. Small ironstone concretions are common in some beds of underclay.

The coal is of high volatile A and B bituminous ranks, and heat values on the as-received basis range from 13,790 to 12,260 Btu. Ash and sulfur are present in moderate amounts. (See table 2.) The bituminous beds consist primarily of shiny vitrain bands in a ground-mass of attrital coal, but minor amounts of bone and fusain are commonly present. The bone is an impure coal consisting mainly of attrital coal and clay; the fusain is a soft carbonaceous material that resembles charcoal and commonly forms discontinuous stringers. A few beds contain benches of cannel coal which is distinguished by its conchoidal fracture, comparatively light weight, and the lack of vitrain bands.

The coal beds described in this report are, in ascending order, the Tom Cooper, Gun Creek, Whitesburg, Fire Clay and Fire Clay Rider, lower and upper Hamlin, lower and upper Haddix, Prater, Oakley, Fugate, Hindman, and lower and upper Skyline. The correlation of the bed names used in this report with those used in reports on adjoining areas is given in table 1.



Development of the Magoffin beds of Morse, and adjacent strata in a typical occurrence in (A) an abandoned quarry about 0.2 mile south of Evanston, and in an atypical situation (B) in a railroad cut on Spring Fork about 0.3 mile south of the mouth of Hawes Fork where a channel sandstone lies disconformably on the Magoffin or on lower strata in places where the Magoffin was removed by ancient stream erosion.



Exposure in a railroad cut at the mouth of Betts Mann Branch showing the channel sandstone that overlies the Magoffin beds of Morse containing (A) angular blocks of shale and ironstone nodules in a discontinuous zone and (B) a large angular block of silty shale.



The Tom Cooper coal, Gun Creek coal, Whitesburg coal, and the strata that separate them lie below the level of the principal stream beds. Data for their description were obtained from records of 15 core holes drilled to the Tom Cooper coal bed. The rocks exposed above the level of the principal stream beds extend from about 30 feet below the Fire Clay coal bed to about 100 feet above the Flint Ridge flint of Morse. The lowest beds are exposed on Spring Fork near Hughes Creek in the central part of the quadrangle and on Quicksand Creek at the mouth of Barnett Branch in the southwestern part of the quadrangle (pl. 51). The youngest strata crop out on the knobs at the head of Big Caney Creek in the northwest, in the southwestern corner, and at the head of Hawes Fork in the east-central part of the quadrangle. Plate 50 shows a composite stratigraphic section of outcropping rocks that extend upward from below the Fire Clay coal through the Flint Ridge flint of Morse, as measured in the Betts Mann Branch area in the north-central part of the quadrangle.

*Tom Cooper coal bed.*—The Tom Cooper coal, which was named by Browning and Russell (1919, p. 29), lies 200–300 feet below the level of the larger streams in Tiptop quadrangle. This bed, known to coal companies of the area as the Upper Elkhorn No. 3, is equivalent to the Little Caney coal bed of Englund (1955, p. 7). The Tom Cooper bed has an average thickness of about 36 inches in the southeastern part of the quadrangle and thins northwestward to 16 inches near the center of the quadrangle (pl. 54).

*Strata between the Tom Cooper and Gun Creek coal beds.*—The thickness of the rock sequence between the Tom Cooper and Gun Creek coal beds ranges from 95 feet in the southeast to less than 70 feet in the northwest. About 20 feet of dark shale overlies the Tom Cooper coal at most places. A coal bed only a few inches thick occurs 4 to 10 feet above the Tom Cooper at several places in the southeast. Overlying the shale in the southeastern part of the area is a bed of sandstone about 60 feet thick that grades laterally to dark siltstone and shale to the northwest. At some places the sandstone lies directly on the Tom Cooper coal, but between the sandstone and the Gun Creek coal are a few feet of siltstone, shale, and underclay.

*Gun Creek coal bed.*—The Gun Creek coal was named from exposures and small mines on Gun Creek, a few miles north of Tiptop quadrangle (Browning and Russell, 1919, p. 32). This bed is equivalent to the Cannel City coal of Englund (1955, p. 8), and to the Amburgy coal of Hodge (1915, p. 282). In the Tiptop quadrangle the coal lies 120–200 feet below the level of the larger streams. Core hole records show that in the southeast the Gun Creek coal is divided into three thin coal beds. These thin coal beds, and the shale and underclay that separate them, have a total thickness of about 20 feet. In the

**TABLE 1.**—*Correlation of names of coal-beds used in the present report with those used in reports on adjoining areas*

Browning and Russell, 1919 (Magoffin County)	Welch, present report (Tiptop quadrangle)	Williamson and Adkison, 1953 (Troublesome quadrangle)
-----	Flint Ridge flint of Morse-----	Flint Ridge flint of Morse.
-----	Upper Skyline-----?	Knob <sub>3</sub> .
Hindman-----?	{ Lower Skyline-----?	Knob <sub>2</sub> .
-----	-----?	Knob <sub>1</sub> .
Fugate-----?	Hindman-----?	Hindman.
Flag-----	Fugate-----	Flag—Hazard No. 7. <sup>1</sup>
Hazard-----	Oakley-----?	-----
Whittaker <sup>2</sup> -----?	Prater-----?	Hazard.
-----	Upper Haddix}-----?	Haddix.
Trace Fork-----	Lower Haddix}	-----
Fossil limestone-----	Magoffin beds of Morse-----	Magoffin beds of Morse.
Haddix-----	Upper Hamlin}-----?	Hamlin.
Hamlin-----	Lower Hamlin}	-----
Fire Clay Rider-----	Fire Clay Rider-----	Fire Clay Rider.
Fire Clay-----	Fire Clay-----	Fire Clay.
Whitesburg-----	Whitesburg-----	Whitesburg.
Gun Creek-----	Gun Creek-----	-----
Tom Cooper-----	Tom Cooper-----	-----

<sup>1</sup> The Flag coal of northern Troublesome quadrangle is equivalent to the Fugate coal of Tiptop quadrangle. The Hazard No. 7 coal was tentatively correlated with the Flag coal by Williamson and Adkison in the Troublesome quadrangle, but data obtained during this investigation indicate that the Hazard No. 7 is probably equivalent to the Oakley coal of the Tiptop quadrangle, a bed lying 15-40 feet below the Fugate coal.

<sup>2</sup> At several spots in the Tiptop quadrangle Browning and Russell assigned the name Young to a coal called Prater in this report; but data now indicate that this bed is equivalent to the Whittaker coal, which was named by Browning and Russell, in the area east of the Tiptop quadrangle.

central part of the quadrangle the Gun Creek is represented by a single coal bed about 3 feet thick that commonly has a thin shale parting near the middle. Information on this bed in the northern and western parts of the quadrangle was not available.

*Strata between the Gun Creek and Whitesburg coal beds.*—The strata between the Gun Creek and Whitesburg coals range in thickness from about 70 feet in the southeastern part of the area to about 100 feet in the central part. This sequence consists principally of a basal bed of sandstone, a shale bed, and an upper bed of sandstone. The basal sandstone is as much as 35 feet thick in the central part of the area and thin or absent in the southeastern part. This sandstone generally lies directly on the Gun Creek coal, but at several places a few feet of shale separates the sandstone and the coal. The shale above the basal sandstone ranges in thickness from 3 feet at one place in the central part of the area to about 40 feet in the southeastern part. This shale probably is equivalent to the Kendrick shale of Jillson (1919, p. 96-104). The upper bed of sandstone, which ranges in

thickness from 10 to 60 feet, grades upward to siltstone, shale, or underclay. At a few places as much as 20 feet of siltstone and shale is present between the sandstone and the Whitesburg coal.

*Whitesburg coal bed.*—The Whitesburg coal bed is equivalent to the lowest coal of the Fire Clay coal zone of Englund (1955, p. 9) in the Cannel City quadrangle and to the lower Whitesburg coal of Johnston (Johnston, Stafford, and Welch, 1955) in the Cornettsville quadrangle. This thin bed, which lies 20 to 100 feet below the level of the larger streams in Tiptop quadrangle, exhibits a consistent thickness of 5 to 13 inches in the central and southeastern parts of the quadrangle. Thin shale partings are present at a few places. Information was not available on this bed in the northern and western parts of the area.

*Strata between the Whitesburg and Fire Clay coal beds.*—The strata between the Whitesburg and Fire Clay coal beds are 42 to 64 feet thick, and consist of carbonaceous shale and siltstone, lens-shaped sandstone bodies, thin coal beds, and underclay. The thin coal beds are included in the Fire Clay coal zone of England (1955) in the Cannel City quadrangle, and are probably equivalent to the Little Fire Clay and upper Whitesburg coals of Johnston (Johnston, Stafford, and Welch, 1955) in the Cornettsville quadrangle. The strata between the Whitesburg and Fire Clay coal beds are below stream level in most of the area, but the upper beds crop out along Spring Fork near the mouth of Hughes Creek, at the mouth of Hawes Fork, and on Quicksand Creek at the mouth of Barnett Branch. From 5 to 10 feet of black shale, which may have a 3- to 5-inch coal near the top, directly overlies the Whitesburg coal bed at most places. Above the black shale is about 20 feet of gray shale and siltstone, and, in a few places, a few feet of sandstone. A thin coal overlies these beds and at several places is separated from another thin coal by about 5 feet of carbonaceous shale. The coal is commonly overlain by a bed of sandstone which has a maximum thickness of 30 feet in the southeast. At places where the sandstone is thin or absent, siltstone and shale (which commonly include one or two thin coal beds) are present instead. About 2 feet of underclay is present at the top of this sequence.

*Fire Clay coal bed.*—In most of eastern Kentucky the Fire Clay coal is a useful marker bed because it commonly has a distinctive flint clay parting. This parting is a hard brownish-gray clay with conchoidal fracture; it generally ranges from 2 to 5 inches in thickness but is locally absent. In the mapped area the coal bed averages about 12 inches in thickness; at a few localities it is absent. The Fire Clay coal, below drainage in most of the quadrangle, crops out along Spring Fork and Quicksand Creek. Particularly good exposures of the Fire Clay bed and its distinctive flint clay parting are on

Spring Fork at the mouth of Hawes Fork (loc. 1, pl. 51), at the mouth of Big Lovely Branch (loc. 3, pl. 51), and on Quicksand Creek at the mouth of Mill Branch (loc. 5, pl. 51).

*Strata between the Fire Clay and lower Hamlin coal beds.*—The strata between the Fire Clay and lower Hamlin coal beds are about 25 feet thick. A few feet of thin-bedded shale commonly lies directly over the Fire Clay coal. Large pelecypods were found in this shale at two localities on Spring Fork (locs. 3 and 4, pl. 51). The shale is commonly overlain by siltstone or very fine grained sandstone that grades upward to the underclay of the Fire Clay Rider coal.

The Fire Clay Rider coal bed, which lies 10 to 20 feet above the Fire Clay coal, is 10 to 40 inches in thickness; where it is more than 24 inches thick it commonly includes at least one shale parting. This bed is below stream level except where it crops out along Spring Fork between Big Lovely Branch and Evanston (locs. 6, 7, and 8, pl. 51), on Hawes Fork, on Quicksand Creek (loc. 9, pl. 51), and at the Decoy post office (loc. 10, pl. 51).

At most places the Fire Clay Rider coal is overlain by sandstone that grades upward to siltstone and shale. Where the sandstone is missing, shale or siltstone overlie the coal; at the mouth of Hawes Fork, the coal is overlain by shale that contains marine fossils in the lower 4 inches.

*Lower and upper Hamlin coal beds.*—Two coal beds in the Tiptop quadrangle which are at the approximate stratigraphic position of the Hamlin coal of Perry County, Ky. (Hodge, 1915, p. 8), are referred to in this report as the lower and upper Hamlin coal beds. Either of these coals may correlate with the Hamlin bed of Hodge, or both may be splits of that bed. The lower Hamlin coal bed, which lies about 25 feet above the Fire Clay coal bed, maintains a thickness of 7 to 14 inches throughout the quadrangle. The upper Hamlin lies from 12 to 25 feet above the lower Hamlin and consists of 8 to 24 inches of coal and thin shale partings. The strata between these two coals generally consist of a few feet of grayish-black, fissile shale that grades upward to siltstone or sandstone, and is overlain by 1 to 2 feet of underclay at the base of the upper Hamlin coal bed. The Hamlin coal beds are well exposed at many places in the road and railroad cuts along Spring Fork.

*Strata between the upper Hamlin coal bed and Magoffin beds of Morse.*—The strata between the upper Hamlin coal bed and the Magoffin beds of Morse have a thickness of 30 to 45 feet and generally consist of a few feet of carbonaceous shale at the base, a massive, ledge-forming sandstone, and a foot or less of underclay and coal stringers at the top. In the western part of the quadrangle the ledge-forming sandstone is absent in some places, and siltstone and silty shale that con-

tain one or two thin coal beds occupy its position (pl. 50). At several localities the sandstone directly underlies the Magoffin beds of Morse.

*Magoffin beds of Morse.*—The Magoffin beds were named by Morse (1931, p. 302) for exposures less than half a mile north of Tiptop quadrangle, on Sycamore Branch of Oakley Creek. The Magoffin beds lie from 70 to 100 feet above the Fire Clay coal and consist of 3 to 10 inches of dark-gray, fossiliferous limestone at the base; 1 to 5 feet of fossiliferous shale; 1 to 2 feet of dark-gray fossiliferous, concretionary limestone; and 12 to 30 feet of sparsely fossiliferous dark-gray shale (pl. 52). In the southeastern corner of the quadrangle the upper shale is very silty and commonly contains beds of calcareous siltstone and limestone concretions. At many places in the northern and western parts of the area all or part of the Magoffin beds is missing, apparently due to their removal by erosion before deposition of the overlying strata (pl. 50 and 52). The fossils of the Magoffin beds are mainly of fragments of crinoids and productid brachiopods, but other forms commonly present are *Composita*, *Chonetes*, *Spirifer*, and several genera of small gastropods and pelecypods. Crinoids are the most common fossil in the lower beds, and chonetids are the most abundant fossils in the upper shale.

The Magoffin beds of Morse are well exposed at several places in the Tiptop quadrangle. The best exposures are in the railroad cuts at the border in the southeastern corner; in an abandoned quarry about 0.2 mile south of Evanston (pl. 52); in a railroad cut on Spring Fork about 0.3 mile south of the mouth of Hawes Fork (pl. 52); in the bed of Millstone Branch north of the Decoy post office; and in a road cut on the quadrangle border about 0.8 mile north of Tiptop. The Magoffin beds are the best key beds for mapping purposes because of their distinctive lithologic character and the many exposures in the area.

*Strata between the Magoffin beds of Morse and lower Haddix coal bed.*—The strata between the Magoffin beds of Morse and the lower Haddix coal are 12 to 60 feet thick and consist of sandstone, siltstone, shale, and underclay. In most of the quadrangle the basal unit is a thin bed of sandstone or siltstone 1 to 4 feet thick, but in some areas a maximum of 45 feet of massive, fine-grained sandstone overlies the Magoffin beds. The massive sandstone fills an ancient stream channel that trends northeastward across the quadrangle. The stream that formed the channel completely removed the Magoffin beds at a few localities. (See pl. 52.) The massive sandstone crops out on Alum Cave and Barnett Branches of Quicksand Creek, Wolfpen Branch and Laurel Fork of Spring Fork, Coles Fork and Betts Mann Branch of Hawes Fork, and Big Half Mountain Creek. At many places along these streams this sandstone forms small cliffs along the streams and is

exposed in railroad cuts along Hawes Fork where it contains numerous angular blocks of silty shale and ironstone nodules in discontinuous zones (pl. 53). Probably these blocks of shale were eroded from a nearby stream bank and were buried in sand nearby because such large, angular blocks could not have been transported far without breaking into rounder and smaller fragments.

Above this basal sandstone bed lies 10 to 20 feet of carbonaceous shale that grades to underclay at the top and includes a thin bed of sandstone 5 feet or less in thickness. At many localities the upper beds of this unit commonly contain small ironstone nodules.

*Lower and upper Haddix coal beds.*—Two beds of coal occur in Tiptop quadrangle at the approximate stratigraphic position of the Haddix coal bed, named by Hodge (1908, p. 41–42) from exposures near the town of Haddix, to the southwest. These coals, called the lower Haddix and the upper Haddix in this report, may be splits of the Haddix bed of Hodge. One of these beds probably is equivalent to the Colvin coal bed of the White Oak quadrangle (Adkison, 1957, p. 11). The lower and upper Haddix beds generally are separated by 10 to 15 feet of shale, siltstone, sandstone, and underclay but at a few localities are separated by less than 3 feet of underclay, as at the mouth of Betts Mann Branch and on Kates Branch of Quicksand Creek (locs. 11 and 13, pl. 51). The lower Haddix coal ranges in thickness from 27 inches on Prater Branch of Spring Fork (loc. 21, pl. 51) to 4 inches just north of the Decoy post office. The upper Haddix coal ranges in thickness from 28 inches on Wolfpen Branch of Spring Fork (loc. 27, pl. 51) to 6 inches on Spring Fork near the mouth of Prater Branch (loc. 14, pl. 51). Both Haddix beds are missing in most of the northern half of the quadrangle and are discontinuous in the southern half. Their absence is attributed to erosion rather than nondeposition.

*Strata between the upper Haddix and Prater coal beds.*—The sequence of rocks between the upper Haddix and Prater coal beds includes sandstone, siltstone, underclay, coal, and shale from about 30 feet thick in the west-central part of the area to a maximum thickness of 70 feet in the southeast. A massive bed of fine- to medium-grained sandstone, at or near the base of the sequence, lies disconformably on the underlying strata and forms conspicuous cliffs in most of the area. At a few places this sandstone is separated from the upper Haddix coal by carbonaceous shale not more than 4 feet thick. In the northern part of the quadrangle, where the Haddix coal and associated strata are missing, the sandstone lies directly on a lower sandstone that extends down to the Magoffin beds of Morse; the two sandstones form a single unit about 70 feet thick between the Magoffin beds and the Prater coal. At a few localities a bed of coal is present just above the sandstone and from 8 to 30 feet below the Prater coal bed; it is com-

monly less than 14 inches thick, but on Betts Mann Branch of Hawes Fork just below the mouth of Boardinghouse Branch it is 28 inches thick, including a 4-inch shale parting. The carbonaceous shale and siltstone between this coal and the Prater bed grade to underclay in the upper 2 feet.

*Prater coal bed.*—A coal bed in the southeast that lies about 100 feet above the base of the Magoffin beds of Morse is known locally as the Prater bed. That name is adopted in this report. The Prater coal bed is exposed in a small abandoned mine on the south side of Prater Branch about 1.2 miles from its mouth (loc. 54, pl. 51). It is probably equivalent to the Hazard coal of Perry County (Hodge, 1908, p. 42, 43). In the Tiptop quadrangle it is from less than 12 inches to 56 inches thick and averages about 20 inches. This bed generally consists of solid coal with few or no partings of bone or shale, but in the northeast two splits of a bed at the approximate stratigraphic position of the Prater are separated by a few inches to 3 feet of shale and underclay (locs. 33, 34, and 42, pl. 51). Available information indicates that the Prater bed of the southeast is equivalent to the lower split, and that the coal known as the Prater bed in the northwest is equivalent to the upper split. If these correlations are correct, the bed called Prater in the northwest is slightly younger than the Prater coal of the southeast; but because these beds are at approximately the same stratigraphic position they are both considered part of the Prater coal bed in this report.

*Strata between the Prater and Oakley coal beds.*—The strata between the Prater and Oakley coal beds are 42 to 90 feet in thickness and include two thin coal beds and associated underclays in the lower part. Between the Prater bed and the first thin coal there is 10 to 20 feet of sandstone, siltstone, and shale. The sandstone is in lens-shaped bodies and grades laterally to siltstone and shale. The first thin coal has an average thickness of about 1 foot and commonly contains a shale parting near the middle. At a few localities in the northern and western parts of the quadrangle a flint clay parting, 2 to 4 inches thick, is associated with the coal. It resembles the flint clay parting of the Fire Clay coal bed, but lacks continuity of that parting and has a more mottled appearance. The coal containing the flint clay is well exposed in a railroad cut on Laurel Fork just north of Joe Push Branch in the north-central part of the area. It probably is equivalent to the Index coal bed near West Liberty, Ky. (Adkison, 1957, p. 12), which also contains a discontinuous flint-clay parting. In the Tiptop quadrangle this thin coal and the one next above are separated by 10 to 20 feet of strata that include shale and siltstone, a few feet of sandstone in some localities, and 1 to 2 feet of underclay at the top. The upper thin coal is less than 6 inches thick

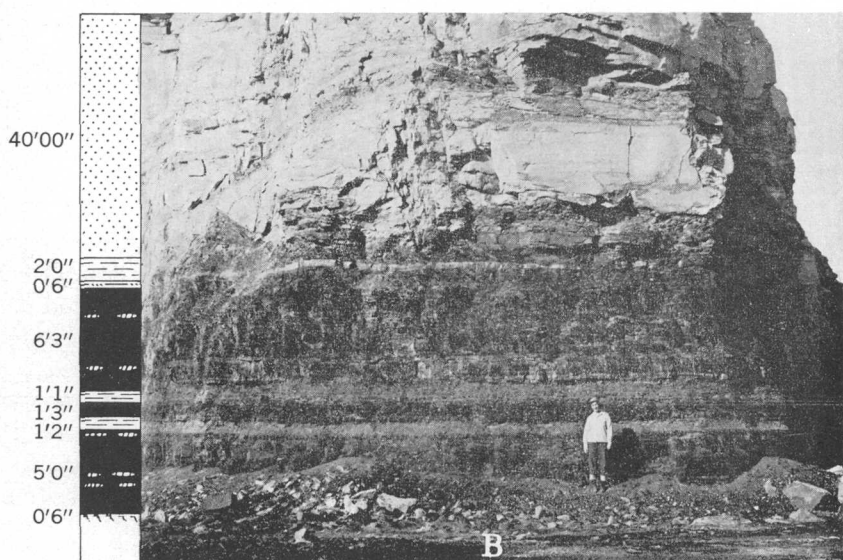
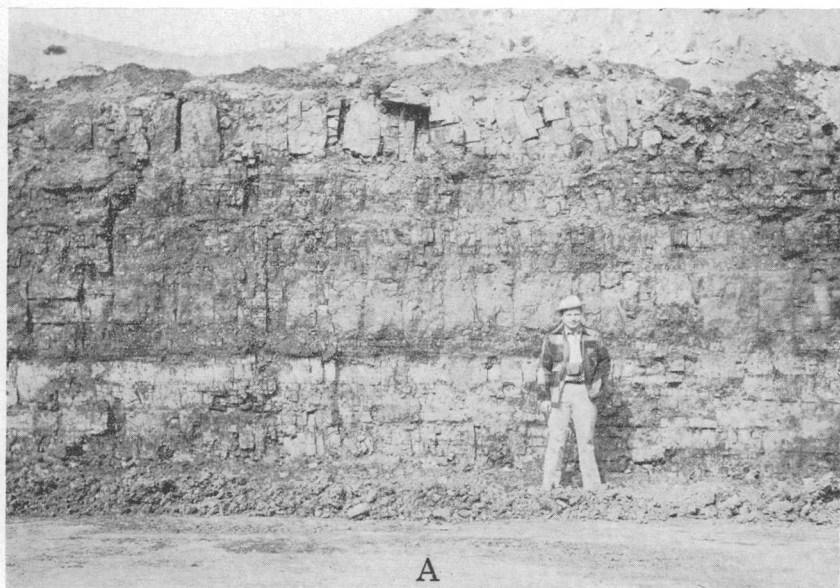
near Evanston but is 15 inches thick on the Right Fork of Buck Branch. It is overlain at most places by about 10 feet of silty shale and siltstone which commonly contain large disc-shaped concretions of silty limestone. Marine fossils were found in the basal few inches of this shale at a locality on Elvania Branch of Big Lovely Branch. In the northern and eastern parts of the quadrangle about 10 feet of siltstone or sandstone overlies the shale, but elsewhere a massive sandstone 35 to 55 feet thick lies disconformably on the shale or on the coal. This sandstone, which crops out locally in conspicuous cliffs (as in the west-central part of the quadrangle) is generally overlain by 1 to 2 feet of underclay. In some places however, as much as 10 feet of shale, underclay, and thin coal beds is present between it and the overlying Oakley bed.

*Oakley coal bed.*—The Oakley coal bed lies 130 feet above the base of the Magoffin beds of Morse in the north-central part of the area and 200 feet above the base near the southern border. Crandall (1910, p. 21) named the bed, which he described from several small mines on Oakley Creek just north of Tiptop quadrangle. This bed probably is equivalent to the Hazard No. 7 coal of Perry County, Ky. (Williamson and Adkison, 1953). It is well exposed at Tiptop a few feet above the railroad tracks (loc. 60, pl. 51). The coal has been mined for local use in the northern part of the quadrangle where the average thickness is about 3 feet. The Oakley coal bed splits into two separate coals along a line that approximates the Breathitt-Magoffin County line (pl. 54). The lower split extends only a short distance southwest of this line, but the upper split seems to be present throughout the rest of the quadrangle and has an average thickness of about 20 inches. It generally occurs a few feet above a massive, cliff-forming sandstone that is present only where the lower split of the Oakley coal is absent. This relation is shown in the stratigraphic diagram (pl. 50).

*Strata between the Oakley and Fugate coal beds.*—The strata between the Oakley and Fugate coal beds are 15 to 40 feet thick and consist predominantly of siltstone and shale. Thin beds of sandstone and underclay, and a bony coal bed also are generally present. At most places the thin coal lies 4 to 10 feet above the Oakley coal bed, but near the head of Laurel Fork of Spring Fork it is separated from the Oakley by only 8 inches of shale (loc. 76, pl. 51). At a few localities a massive sandstone bed occupies most of the interval between the Oakley and Fugate coals. About 2 feet of underclay is present at the top of this sequence.

*Fugate coal bed.*—The Fugate coal bed lies as much as 235 feet above the base of the Magoffin beds near the Decoy post office in the southern part of the quadrangle, and about 160 feet above the base of the





Exposure of the Skyline coal bed in (A) a strip pit of the Skyline mine on the ridge at the head of Robbins Branch of Hawes Fork where it is 13 feet thick and contains a few thin partings of bone coal and carbonaceous shale, and (B) in a strip pit of the Skyline mine on the ridge at the head of Burnt House Branch showing shale partings in the bed. The lower parting thickens to more than 20 feet 0.2 mile to the northwest.

Magoffin beds on Big Half Mountain Creek in the northern part. This bed was named by Hodge (1915, p. 5, 79) for exposures on Ball Fork of Troublesome Creek near the town of Hindman. It is equivalent to the Flag coal bed of the northern part of the Troublesome quadrangle (Williamson and Adkison, 1953). Throughout the northern part of the Troublesome quadrangle and the southern part of the Tiptop quadrangle local residents refer to this bed as the Slate seam. The Fugate bed consists of three layers of coal separated by shale partings of almost uniform thickness. At many places, especially in the southwest, thin shale partings also occur in the upper layer of coal. Along Quicksand Creek and near the Decoy post office the Fugate coal is about 6 feet thick, including partings, and is mined for local use. The bed thins to the north to about 3 feet in the northern part of the quadrangle. At a few localities part or all of the Fugate bed is missing and massive sandstone occupies its position as a result of erosion of the coal and subsequent deposition of the sandstone.

*Strata between the Fugate and Hindman coal beds.*—The strata between the Fugate and Hindman beds are about 90 feet thick. At most places a few feet of shale directly overlies the Fugate coal. The shale grades upward to siltstone or sandstone, which at many places in the northern and central parts of the quadrangle is overlain by underclay and a thin coal bed. This coal generally lies 15 to 25 feet above the Fugate coal, but at one locality on Laurel Fork of Spring Fork it is separated from the Fugate coal by only 2 feet of shale (loc. 93, pl. 51). Its thickness of 45 inches including thin partings, is much greater here than elsewhere in the quadrangle. This coal is generally overlain by massive sandstone, but as much as 13 feet of shale overlies the coal at a few places. Limestone concretions occur in the upper part of the shale in the railroad cuts at the head of Betts Mann Branch, and a few marine fossils are present in the basal part on Sandlick Branch of Laurel Fork. A massive sandstone disconformably overlies this shale or the coal below, and in a few places cuts out the Fugate coal also. The sandstone is about 50 feet thick at the railroad tunnel at the head of Betts Mann Branch, and probably is thicker in the central and southern parts of the quadrangle, where it is disconformably overlain by a lithologically similar sandstone. As exposed at the railroad tunnel, and probably at other places in the northern part of the quadrangle, the sandstone is overlain by a few feet of underclay and the Hindman coal.

*Hindman coal bed.*—A coal bed tentatively correlated with the Hindman coal bed of Hodge (1908, p. 43) was seen at only two localities in the Tiptop quadrangle—just above the railroad tunnel at the head of Betts Mann Branch and at a deeply weathered outcrop in the old

road at the head of Hard Fork. The correlation is based on the stratigraphic position of the bed, which is about the same as that of the Hindman coal near Hindman, Ky. In the central and southern parts of the quadrangle the stratigraphic position of this coal is occupied by massive sandstone, with a few stringers of coal. At the railroad tunnel the Hindman bed consists of three layers of coal separated by 2 feet of shale and 3 feet of shale and underclay (pl. 51). Scattered through the underclay are ironstone concretions, many of which have cavities containing crystals of quartz, pyrite, and sphalerite.

*Strata between the Hindman and Skyline coal beds.*—In most of the quadrangle this sandstone lies disconformably on the thick sandstone that occurs just below the horizon of the Hindman coal. These two sandstones form a 150- to 180-foot unit that crops out high on the hills at many places in the area. Above the railroad tunnel at the head of Betts Mann Branch the Hindman coal bed is directly overlain by 5 feet of carbonaceous shale and siltstone that contain *Lingula*. At this locality the shale and siltstone are disconformably overlain by 90-feet of massive sandstone. The sequence between the top of the sandstone and the Skyline coal bed is 32 feet thick near Tiptop and as much as 85 feet thick in the southeast, and includes shale, siltstone, sandstone, underclay, and coal. There are from 2 to 6 coal beds, each generally less than 2 feet thick. In the area just beyond the southeastern corner of the Tiptop quadrangle the two lowest of the coals form a single bed about 6 feet thick. In the area just beyond the southwestern corner of the quadrangle a coal bed about 5 feet thick lies at about the same stratigraphic position. This coal correlates with the Knob<sub>1</sub> coal in the northern part of the Troublesome quadrangle (Williamson and Adkison, 1953).

*Skyline coal bed.*—The Skyline coal crops out high on the ridges in Tiptop quadrangle, underlying only the main ridges in the northern part of the area and only the high knobs of the ridges in most of the southern part. It lies from 280 feet above the Fugate coal bed in the southeast to 220 feet above at Tiptop. The Skyline coal bed is here named for the Skyline mine of the United Electric Coal Company, located on the ridge just north of Spring Fork in the central part of the quadrangle. Here the coal is 13 to 18 feet thick, including thin partings of shale and bone coal (pl. 55), but thins toward the southeast to about 5 feet south of Prater Branch (pl. 54). North and west of the Skyline mine this bed is split into two main coal beds separated by 10 to 80 feet of shale, siltstone, and sandstone. The splits of coal are referred to as the lower Skyline and upper Skyline coal beds in this report. They are probably equivalent to the Knob<sub>2</sub> and Knob<sub>3</sub> coals of the northern part of the Troublesome quadrangle (Williamson and Adkison, 1953).

The lower Skyline bed has been mined for many years near Tiptop by the Buchanan Coal Company. In the highwalls of some of the strip pits near Tiptop, two coal beds are exposed above the lower Skyline bed—the upper Skyline bed near the top of the highwalls, and a thinner coal bed approximately midway between the lower and upper Skyline beds. Well-preserved plant fossils are abundant in the shale overlying the lower Skyline bed in the strip pits near Tiptop.

A coal bed about 15 feet thick including thin partings is exposed at a small abandoned mine at the head of Jim Ritchie Branch near the southwestern corner of the quadrangle (loc. 106, pl. 51). Although isolated from other exposures of the Skyline bed, it is assumed to be equivalent to that bed because of its great thickness and its stratigraphic position.

*Strata between the Skyline coal bed and Flint Ridge flint of Morse.*—The thickness of the strata between the Skyline coal bed and the Flint Ridge flint of Morse is about 85 feet in the southwestern corner of the quadrangle and about 80 feet on Hogtown Knob just west of Tiptop. The lower beds are exposed at several places in the highwalls of the strip pits of the Skyline mine and the Tiptop mine. At most places massive sandstone lies disconformably on the Skyline coal or upper Skyline coal, but at a few exposures in the Skyline mine a few feet of carbonaceous shale and a thin coal lie between the sandstone and Skyline bed. The upper strata are poorly exposed throughout the quadrangle but badly weathered sandstone, carbonaceous shale, and bony coal are present in some poor exposures near Hogtown Knob.

*Flint Ridge flint of Morse.*—The Flint Ridge flint, named by Morse (1931, p. 296, 305) for exposures on Flint Ridge in the northern part of the Troublesome quadrangle, crops out high on the ridges in the southwestern and northwestern ridges of the Tiptop quadrangle. It is 345 feet above the Fugate coal bed, and consists of a maximum of 4 feet of light to dark bluish-gray medium-bedded chert. On Flint Ridge southwest of the Tiptop quadrangle the chert is associated with fossiliferous limestone, but in the Tiptop quadrangle the chert is not associated with limestone. At several places in the north-central and northwestern parts of the area a bed of shale with abundant ironstone nodules occurs at the approximate stratigraphic position of the Flint Ridge flint. The exact relations of these beds were not determined.

*Strata above Flint Ridge flint of Morse.*—The strata above the Flint Ridge flint remain on only a few of the higher hills in the area. In exposures on Hogtown Knob and on a high knob at the head of Hawes Fork, about 100 feet of strata are present above the horizon of the Flint Ridge flint. These beds are composed mainly of massive, medium- to coarse-grained sandstone, but include some carbonaceous

shale in the lower part. Scattered quartz pebbles were found in the sandstone that caps Hogtown Knob (pl. 51).

### STRUCTURE

The dominant structural feature of the Tiptop quadrangle is a large syncline named the Big Caney syncline in this report because its axis nearly parallels Big Caney Creek in the northwestern part of the area. The syncline trends westward and plunges gently in that direction. The strata dip gently toward the axis of the Big Caney syncline except for local modifications such as abrupt changes in dip along the Lambric fault and in the vicinity of several small anticlinal folds. These structural features are shown on plate 2 by structure contour lines drawn on the base of the Magoffin beds of Morse.

The Lambric fault extends westward from Betts Mann Branch of Hawes Fork, where the displacement of strata is 20 feet or less, across Coles Fork, Laurel Fork, and Hade Fork to the western border of the quadrangle where the displacement is about 160 feet. Although the plane of the fault is not well exposed, outcrops of bedrock near the fault indicate that it dips steeply to the south, and that the displacement is normal to the strike of the fault with the upthrown block on the north side of the fault line upthrown relative to the block on the south side. The strata of the south block have a noticeable dip to the north which increases as the fault is approached. Dips of  $5^{\circ}$  to  $10^{\circ}$  are common near the fault, but strata on the north or upthrown side of the faultline dip northward at less than  $1^{\circ}$ .

Minor structural features in the Tiptop quadrangle are small anticlines, synclines, domes, and structural noses. Two of the more prominent anticlines have axes that lie about half a mile and 2 miles south of and parallel to the Lambric fault. The fold nearer the fault is a narrow westward-plunging anticline that terminates in a small structural nose in the east-central part of the quadrangle; the one farther from the fault is a broader anticline, also with a westward plunge, which extends westward from a small dome near the mouth of Hughes Creek of Spring Fork. Other structural features are a southward-plunging nose between Oakley and Big Half Mountain Creeks at the northern border of the area; a westward-plunging nose at the head of Little Fork of Spring Fork; a westward-plunging anticline on Spring Fork just south of Prater Branch; and a structural "high" on Lynn Log Branch in the southeastern corner of the area.

### COAL RESERVES

Original reserves of coal were computed for the Tom Cooper, Gun Creek, Fire Clay Rider, lower Haddix, upper Haddix, Prater, Oakley, Fugate, and Skyline coal beds; reserves were not computed for the other coal beds of the area either because the thickness of the beds

was generally less than 14 inches or because data on the beds were inadequate for the computation of reserves.

Coal reserves are reported in three main categories and three sub-groups. "Measured reserves" includes coal within a quarter of a mile of observation points that are not more than half a mile apart. "Indicated reserves" includes coal within half a mile of the area of measured reserves, or within three-fourths of a mile of observation points spaced more than half a mile apart. "Inferred reserves" includes coal within  $1\frac{1}{4}$  miles of the area of indicated reserves. The reserves were further divided on the basis of thickness of the coal bed, excluding partings; 14-28 inches, 28-42 inches, and more than 42 inches. The coal was assumed to weigh 1,800 tons per acre-foot. All coal beds have less than 1,000 feet of cover.

In the calculation of reserves all figures have been carried to the nearest 1,000 tons in order to provide a place to record the calculated total of reserves in small areas. In general, however, the local variations in thickness of a coal bed, and other related factors, do not permit the determination of reserves to this order of arithmetic accuracy. For this reason, the larger figures and totals, and particularly the figures for indicated and inferred reserves should be considered as expressing only to the nearest million tons the relative quantities of coal available in the respective categories.

*Tom Cooper coal bed.*—The Tom Cooper coal bed is composed of very bright coal with abundant vitrain bands, a few fusain stringers, and thin bone coal or shale partings at a few localities. The Tom Cooper bed has an average thickness of about 36 inches in the southeast but thins to the north and west to 16 inches or less (pl 54).

This bed is mined on Spring Fork just beyond the southeastern corner of the quadrangle by Pond Creek Pocahontas Coal Company, but at the time this report was written mining had not been extended into the Tiptop quadrangle. An analysis of a channel sample from the Pond Creek Pocahontas mine indicates that the coal is low in ash and high in Btu (table 2). The estimated original reserves of the Tom Cooper coal bed in the Tiptop quadrangle is 62,304,000 tons, of which 19,954,000 tons is in the 28- to 42-inch category, and 5,104,000 tons in the more-than-42-inch category (table 3).

*Gun Creek coal bed.* Limited data were available on the Gun Creek coal bed in the southeastern and central parts of the quadrangle. In the southeast this bed is represented by two or three thin coals, but in the central part it is a single bed and has an average thickness of about 32 inches. A thin shale parting is present near the middle of the bed at several localities.

The estimated original reserves of the Gun Creek coal bed is 93,992,000 tons, of which 50,617,000 tons is in the 28- to 42-inch

TABLE 2.—*Analyses of coals of Tiptop quadrangle*

[Analyses by U. S. Bur. Mines]

Coal bed	Loca- tion on plate 51	Bur. Mines labor- atory No.	Rank <sup>1</sup>	Form of analysis <sup>2</sup>	Proximate analysis				Ultimate analysis				Heating value (Btu)	Free swelling index	Ash softening temper- ature ° F.	
					Mois- ture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydro- gen	Carbon	Nitro- gen				Oxygen
Skyline.....	104	D-93338	HVBB..	{ A B	5.2	36.4	52.2	6.2	0.8	5.4	72.8	1.5	13.3	12,860	2	2,910+
Upper Skyline.....	105	D-93336	HVBB..		4.1	41.0	59.0	9.6	.8	5.4	82.1	1.7	10.0	14,510	1½	2,910+
Lower Skyline.....	105	D-93337	HVBB..	{ A B	5.3	37.1	58.5	3.3	.9	5.5	70.3	1.4	12.7	12,430	3	2,910+
Lower Skyline.....	109	D-93339	HVBB..		5.7	40.6	59.4	4.0	.8	5.5	81.5	1.5	10.4	14,410	3	2,910+
Lower Skyline.....	101	D-93340	HVBB..	{ A B	5.4	40.1	49.2	5.3	1.3	5.4	73.4	1.4	12.9	13,090	4	2,590
Fugate.....	56	D-93344	HVAB..		4.9	44.9	55.1	7.9	1.5	5.7	82.2	1.6	9.0	14,740	2½	2,910+
Oakley.....	66	D-93342	HVBB..	{ A B	4.8	41.5	58.5	10.9	.7	5.4	82.4	1.7	12.7	14,650	1	2,910+
Oakley.....		4.2	35.0		49.3	2.4	.8	5.4	69.4	1.4	12.5	14,540	1.7	9.8	12,260	4
Tom Cooper.....		D-93335	HVAB..	{ A B	4.2	36.9	56.5	2.4	.9	5.7	77.6	1.6	11.8	13,790		
					39.5	60.5			.9	5.6	83.0	1.7	8.8	14,770		

<sup>1</sup> HVAB, high volatile A bituminous, HVBB, high volatile B bituminous.<sup>2</sup> A, as received, B, moisture and ash free.<sup>3</sup> Initial deformation temperature.

TABLE 3.—*Estimated original coal reserves of the Tiptop quadrangle*  
[In thousands of short tons]

Bed	Measured reserves in beds—				Indicated reserves in beds—				Inferred reserves in beds—				Total reserves in beds—			
	14-28 in. thick	28-42 in. thick	>42 in. thick	Total	14-28 in. thick	28-42 in. thick	>42 in. thick	Total	14-28 in. thick	28-42 in. thick	>42 in. thick	Total	14-28 in. thick	28-42 in. thick	>42 in. thick	Total
Skyline <sup>1</sup> .....	68	1,500	21,493	23,061	236	2,440	5,689	8,365	117	2,208	731	3,056	421	6,148	27,913	34,482
Fugate.....	1,696	6,811	1,872	10,379	22,322	33,219	20,825	76,366	11,252	2,960	4,487	18,699	35,270	42,990	27,184	105,444
Oakley.....	2,156	11,392	1,030	14,578	26,055	24,294	707	51,056	19,292	1,694	-----	20,986	47,503	37,380	1,737	86,620
Prater.....	6,703	5,072	622	12,397	42,471	6,763	370	49,604	19,519	-----	-----	19,519	68,693	11,835	1,992	81,520
Upper Haddix.....	407	201	-----	608	15,535	-----	-----	15,535	-----	-----	-----	-----	15,942	201	-----	16,143
Lower Haddix.....	1,437	-----	-----	1,437	11,301	-----	-----	11,301	-----	-----	-----	-----	12,738	-----	-----	12,738
Fire Clay Rider.....	-----	-----	-----	-----	23,475	5,468	-----	28,943	18,741	1,583	-----	20,324	42,216	7,051	-----	49,267
Gun Creek.....	-----	-----	-----	-----	12,417	9,829	-----	22,246	30,958	40,788	-----	71,746	43,375	50,617	-----	93,992
Tom Cooper.....	-----	2,722	608	3,330	18,946	12,494	4,496	35,936	18,300	4,738	-----	23,038	37,246	19,954	5,104	62,304
Total.....	12,467	27,698	25,625	65,790	172,758	94,507	32,087	299,352	118,179	53,971	5,218	177,368	303,404	176,176	62,930	542,510

<sup>1</sup> Mined and lost in mining as of Jan. 1, 1951: 182,000 tons from measured coal 28-42 in. thick and 6,935,000 tons from measured coal more than 42 in. thick. Remaining reserves of the Skyline bed as of Jan. 1, 1951 are 27,365,000 tons for all thickness groups; thus, the total remaining reserves for all beds equal 535,393,000 tons.



category (table 3). Because data on this bed were sparse, all of the reserves fall into the indicated and inferred categories.

*Fire Clay and Fire Clay Rider coal beds.*—Reserves of the Fire Clay coal bed were not computed because the bed is thin in the Tiptop quadrangle; only at one locality was it found to contain more than 14 inches of coal (sec. 3, fig. 52). A large amount of Fire Clay coal may underlie the northern part of the quadrangle, but the bed is below stream level and the thickness is unknown. The area just north of the Tiptop quadrangle contains a moderately thick bed of Fire Clay coal, which may extend southward into the quadrangle. Sections of the Fire Clay bed are shown in figure 52.

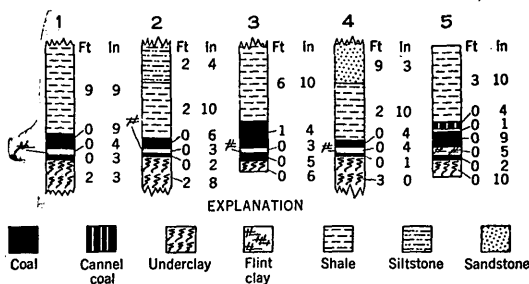


FIGURE 52. Sections of Fire Clay coal bed.

The Fire Clay Rider coal bed is composed of bright coal and contains shale and underclay partings at many localities. The partings are generally present where the bed is more than 24 inches thick (secs. 6 and 7, fig. 53), and absent where it is less (secs. 8 and 9, fig. 53). This bed has a maximum thickness of 32 inches, excluding a 7-inch underclay parting, west of Evanston near the mouth of Oliver Branch (sec. 6, fig. 53), and core-holes reveal about the same thickness on Robbins Branch of Hawes Fork and on Prater Branch of Spring Fork. The bed thins to less than 14 inches away from these points.

The estimated original reserves of the Fire Clay Rider coal total 49,267,000 tons, of which 42,216,000 tons is in the 14- to 28-inch

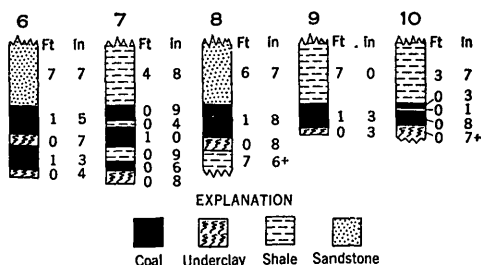


FIGURE 53. Sections of Fire Clay Rider coal bed.

category (table 3). As the data on this bed were sparse, all of the reserves are in the indicated and inferred categories.

*Lower and upper Haddix coal beds.*—The lower Haddix bed is composed of bright, blocky coal, and at many localities contains shale partings (secs. 12, 15, 16, 17, and 22, fig. 54). The coal is more than 14 inches thick south of Evanston along Spring Fork, Prater Branch, and Lynn Log Branch, and on Hawes Fork near Poplar Branch. The

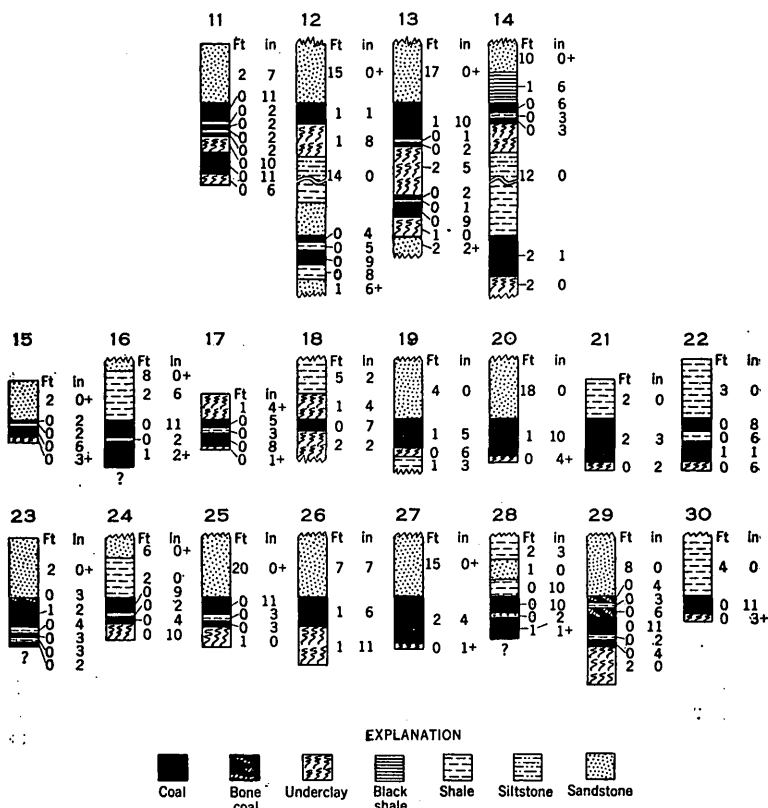


FIGURE 54. Sections of Haddix coal beds.

bed has a maximum thickness of 27 inches on Prater Branch (sec. 21 fig. 54).

The upper Haddix bed is also composed mainly of bright coal, and at many localities contains shale partings that are generally in the lower part of the bed (secs. 11, 14, 23, 24, and 25, fig. 54). It also contains bone coal at a few localities (secs. 23 and 29, fig. 54). This bed is more than 14 inches thick in an area that extends southward from Laurel Fork and Wolfpen Branch of Spring Fork along the western border of the quadrangle to the southern border, and eastward along

Middle Fork to Big Branch. It has a maximum thickness of 28 inches near the mouth of Wolfpen Branch (sec. 27, fig. 54).

The estimated original reserves of the lower Haddix coal total 12,738,000 tons, all of which is in the 14- to 28-inch category (table 3). The estimated original reserves of the upper Haddix coal total 16,143,000 tons, of which 15,942,000 tons is in the 14- to 28-inch category and the rest in the 28- to 42-inch category (table 3).

*Prater coal bed.*—The Prater bed consists primarily of bright coal and contains bone coal partings at a few localities. Shale partings are present in some areas, particularly in the northeastern and central parts of the quadrangle, including sections measured on Bullmire Branch (sec. 34, fig. 55), on Equal Branch of Big Half Mountain Creek (sec. 33, fig. 55), and on Poplar and Betts Mann Branches of Hawes Fork (secs. 42 and 43, fig. 55). The larger areas in which the Prater bed is more than 28 inches thick are in the ridges on both sides of Prater Branch of Spring Fork, and along the eastern border of the

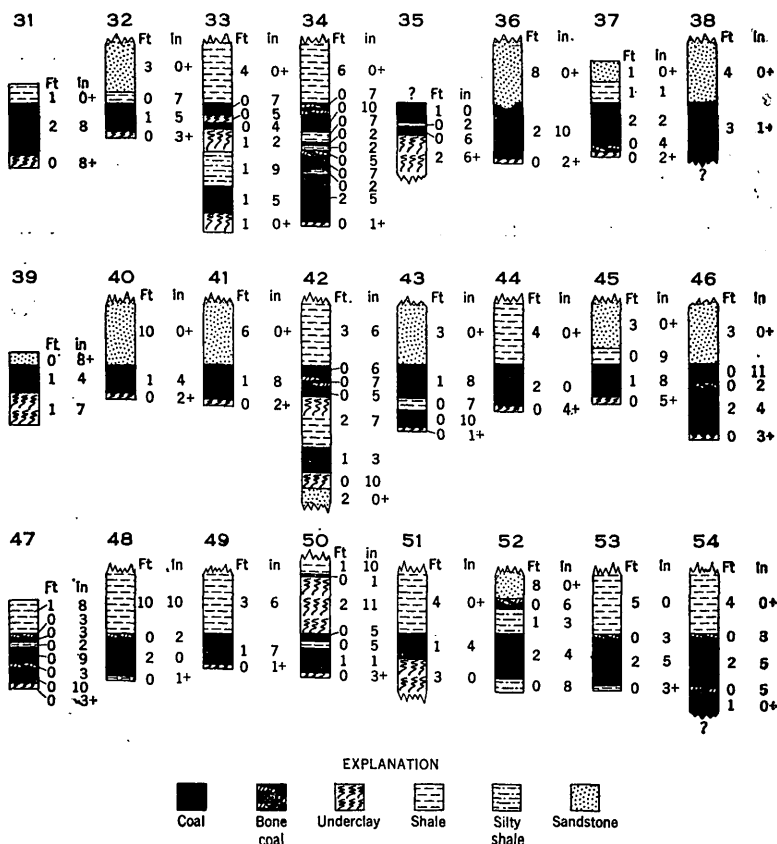


FIGURE 55. Sections of the Prater coal bed.

quadrangle from Right Fork of Trace Fork to Buck Branch (pl. 54). Smaller areas are near the head of Hughes Creek of Spring Fork, near Bullmire Branch, on Betts Mann Branch of Hawes Fork, and in the extreme northwestern corner of the quadrangle. Cores from holes near Prater Branch show a maximum thicknesses of about 56 inches of coal in this bed.

The Prater coal has been mined for local use, but the amount mined is believed to be small and is disregarded in this report. The estimated original reserves for the bed total 81,520,000 tons of which 68,693,000 tons is in the 14- to 28-inch category, 11,835,000 tons in the 28- to 42-inch category, and the rest in the more-than-42-inch category (table 3).

*Oakley coal bed.*—The Oakley coal bed consists of moderately bright, blocky coal, and at many places includes partings of shale or bone coal, and a few inches of cannel coal. Shale partings are generally restricted to a narrow belt just northwest of a line along which the Oakley coal splits into two beds (pl. 54). Bone coal partings are generally thin, but in the northeastern corner of the quadrangle (secs. 68 and 69, fig. 56) and near Laurel Fork of Spring Fork (secs. 75 and 76, fig. 56) bone coal makes up a large part of the bed. In most of the northern part of the quadrangle, 2 to 6 inches of impure cannel coal is present at the top of the bed, and at a locality on Poplar Branch of Hawes Fork the lower 16 inches of the bed is cannel coal (sec. 73, fig. 56). The Oakley coal is more than 28 inches thick in a large area in the northern part of the quadrangle, including the head of Big Half Mountain Creek southward to Hawes Fork, and westward from Big Half Mountain Creek to the northwestern corner, including Laurel Fork of Oakley Creek and part of Big Caney Creek (pl. 54). It is also more than 28 inches thick on the eastern border of the quadrangle near the heads of Little Fork and Prater Branch of Spring Fork, and at a locality in the southwest on Sugar Camp Branch of Quicksand Creek (sec. 77, fig. 56). The Oakley coal exceeds 42 inches in thickness at a few places; it has a maximum thickness of 66 inches, excluding partings, at a locality on Equal Branch of Big Half Mountain Creek (sec. 64, fig. 56).

The Oakley coal has been mined for local use at many places in the northern part of the quadrangle, but the amount mined has been small and is disregarded in this part. Analyses of samples taken from small mines on Hard Fork (sec. 56, fig. 56) and on Came Branch of Big Half Mountain Creek (sec. 66, fig. 56) showed 7.9 and 10.9 percent ash, respectively (table 2). The estimated original reserves in the Oakley bed total 86,620,000 tons of which 47,503,000 tons is in the 14- to 28-inch category, 37,380,000 tons in the 28- to 42-inch category, and the remaining 1,737,000 tons in the 42+-inch category (table 3). These



16 inches on Wireman Fork of Big Caney Creek (sec. 79, fig. 57), and is locally absent at some places in the northern and central parts of the area where its position is occupied by sandstone. A thin coal bed, which at most places lies about 20 feet above the Fugate bed, is separated from the Fugate bed by only 2 feet of shale at a locality on Laurel Fork of Spring Fork (sec. 93, fig. 57). This overlying coal bed is believed to be at this stratigraphic position only locally, and its reserves, therefore, were not included with those of the fugate coal or computed separately where it is thin and widely separated from the Fugate.

The Fugate coal has been mined for local use at several places along Quicksand Creek and in the vicinity of the Decoy post office, but the amount mined has been small and is disregarded in this report. An analysis of a coal sample from a small mine near the mouth of Cabin Log Branch of Middle Fork (sec. 101, fig. 57) indicated 5.3 percent ash (table 2). The estimated original reserves of the Fugate coal bed

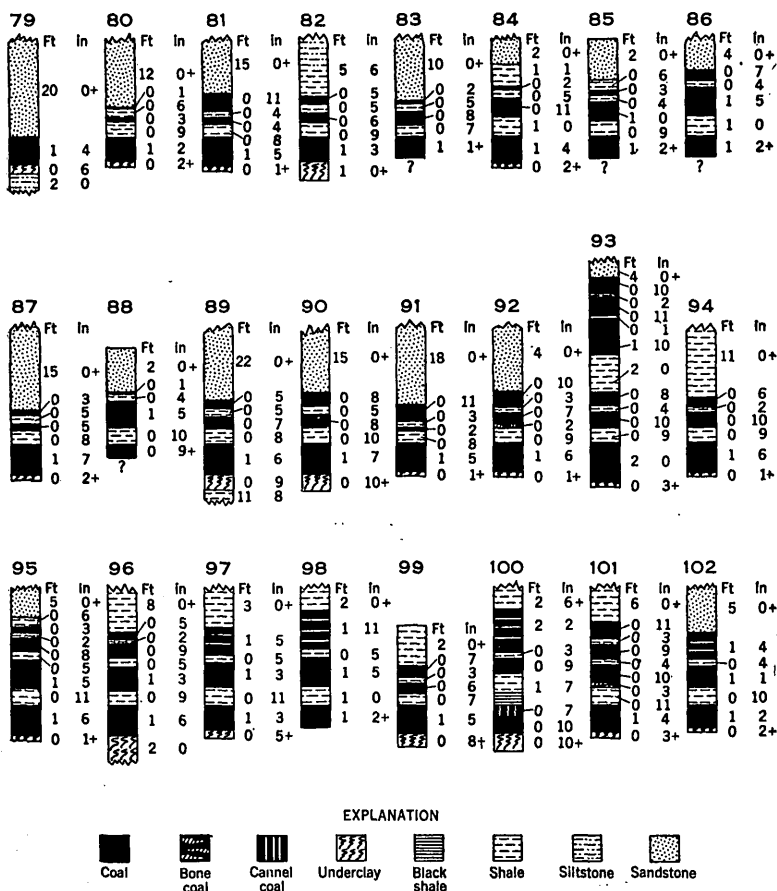


FIGURE 57.—Sections of the Fugate coal bed.

total 105,444,000 tons of which 35,270,000 tons is in the 14- to 28-inch category, 42,990,000 tons in the 28- to 42-inch category, and 27,184,000 tons in the 42+-inch category (table 3).

*Skyline coal bed.*—The Skyline coal bed underlies only the main ridges in the northern part of the area and only the high knobs of the ridges in most of the southern part. Although this bed underlies relatively small areas, it contributes appreciably to the reserves of the quadrangle because of its great thickness. The Skyline bed is composed mainly of bright coal, with a moderate abundance of vitrain bands, and several partings of bone coal and shale (secs. 103–106, fig. 58). At the Skyline mine on the ridge between Spring Fork and Hawes Fork it has a thickness of 120 to 167 inches, excluding partings, and thins to the southeast beyond Prater Branch to about 54 inches (pl. 54). To the north and west the Skyline coal splits into two beds here called the lower and upper Skyline beds. In the southwestern corner of the area the splits apparently again join to form a single bed; this is suggested by the great thickness, about 15 feet, of a coal bed measured at a small abandoned mine at the head of Jim Ritchie Branch of Quicksand Creek (sec. 106, fig. 58).

The lower Skyline bed is composed mainly of bright coal that generally contains from 1 to 3 bone partings near the middle of the bed (fig. 58). Near Tiptop a few inches of bone coal also is generally present at the top of the bed (secs. 109, 111, and 112, fig. 58). Shale partings are less common. Core holes reveal that the thickness of the lower Skyline bed, excluding partings, to range from 99 inches near Road Fork of Big Half Mountain Creek to 20 inches near the head of Poplar Branch of Hawes Fork. Its thickness exceeds 42 inches in most of the ridges east of Coles Fork of Hawes Fork and north of Hawes Fork to the northern border, and in the knobs along the ridge east of Big Lovely Branch of Spring Fork (pl. 54).

The upper Skyline bed is composed of moderately bright to moderately dull coal, and generally contains partings of bone coal and shale. Core hole records indicate that this bed has its greatest thickness of 77 inches in the high knobs near the mouth of Big Lovely Branch and is generally less than 28 inches in the ridge north of Hawes Fork. Near Tiptop the bed has an average thickness of about 4 feet and can be seen in the highwalls of the strip pits.

The Skyline coal bed is now being stripped at the Skyline mine by the United Electric Coal Company; and the lower Skyline bed is being stripped near Tiptop by the Buchanan Coal Company. Mined areas as of January 1, 1951 are shown on plate 54. Analyses of samples taken from these mines are given in table 2. Samples of the Skyline coal (sec. 104, fig. 58) and of the upper and lower Skyline coals (sec. 105, fig. 58) from the Skyline mine indicated 6.2, 9.6, and 3.3 percent ash, respectively. A sample of the lower Sky-

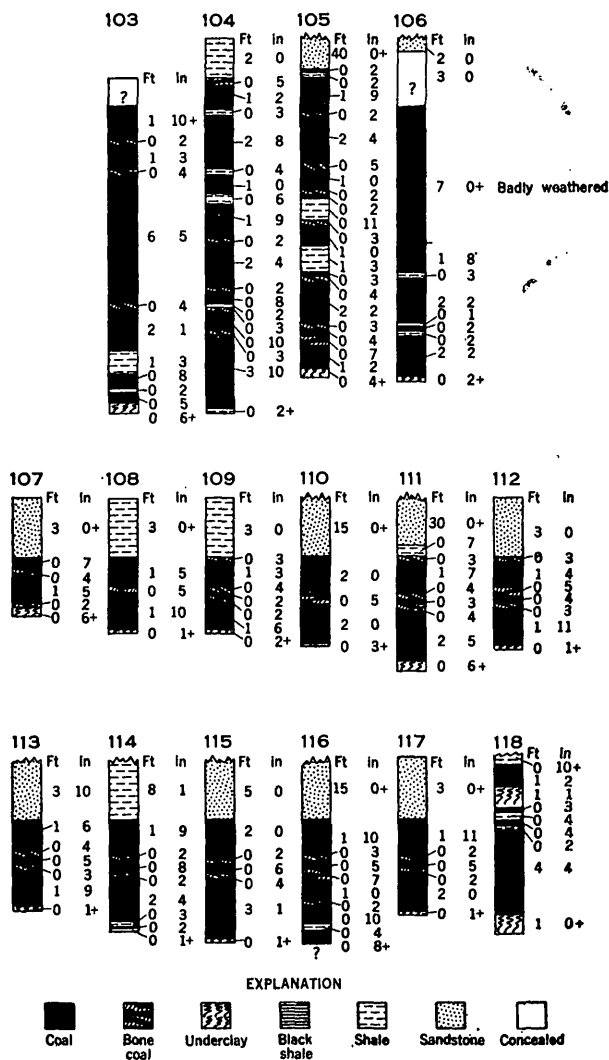


FIGURE 58. Sections of Skyline coal bed.

line coal from the Tiptop mine (sec. 109, fig. 58) indicated 4.0 percent ash. Estimated original reserves of the Skyline coal bed and the lower Skyline coal total 34,482,000 tons of which 27,913,000 tons is in the 42<sup>+</sup>-inch category (table 3). Of this total, an estimated 6,935,000 tons of coal in the 42<sup>+</sup>-inch category has been mined or lost in mining (table 3). Reserves of the upper Skyline bed were not computed because data were sparse and the bed underlies only the highest knobs in much of the area. The only part of the quadrangle in which it underlies extensive areas and is of adequate thickness is near Tiptop, but there the bed contains much dull coal and bone.



The nine beds in the Tiptop quadrangle for which reserves were calculated contain original reserves totaling about 542 million tons. (See table 3.) Most mining in the quadrangle has been concentrated in the Skyline bed, though some coal for local use has been taken from the other beds. As of January 1, 1951, the coal mined and lost in mining from the Skyline bed totaled about 7 million tons. The remaining reserves in the quadrangle as of January 1, 1951, thus total about 535 million tons, and the recoverable reserves, assuming 50 percent recoverability in mining, total about 268 million tons.

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