

# CASTLEMAN BASIN, GARRETT COUNTY, MD.

- I. Investigation of Field and Estimated Reserves of Coal, by  
Albert L. Toenges, Lloyd Williams, and Louis A. Turnbull
  - II. Petrography of Coal, by B. C. Parks and H. J. O'Donnell
  - III. Analyses of Drill-Core Samples, by Roy F. Abernethy and  
William H. Ode
  - IV. Stratigraphy of Castleman Coal Basin, by Karl M. Waage
- Appendix. Drill Logs and Chemical Analyses of Cores



## *Preface*

There has been a steady decline in the annual production of coal from mines in Maryland since 1926, except for brief periods of abnormal demand. The decline was caused principally by depletion of the upper coal beds, Pittsburgh (Big Vein) and Sewickley (Tyson) in the Georges Creek Basin and the Upper Freeport (Split Six) in the Upper Potomac Basin. These beds are nearing exhaustion; and, unless production can be increased from lower, thinner coal beds or from other coal fields in Maryland, particularly the Castleman coal field, the annual output of the State is certain to decline further, with accompanying economic losses. The development of mines in the beds of low-volatile coking coals (some of which are metallurgical grade) in the Castleman Basin depends upon knowledge of the reserves, the chemical properties of the coals, and the physical characteristics of the surrounding strata. The purpose of this investigation was to determine these factors. In order that the findings of the work may be a permanent record, the results of the investigation are given in this bulletin.

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### UNITED STATES DEPARTMENT OF THE INTERIOR

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# CASTLEMAN BASIN, GARRETT COUNTY, MD.

## Coal Beds in Central Part; Reserves; Petrographic and Chemical Characteristics of Coals; Stratigraphy of Area<sup>1</sup>

By

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William H. Ode,<sup>8</sup> and Karl Waage<sup>9</sup>

### Summary and Conclusions

(1) The Castleman Basin was investigated by diamond drilling, engineering examination, and geologic study. Agreements permitting investigation of about 14,700 acres of land were entered into with 79 landowners. Eleven beds of coal between the horizons of the Harlem and Mercer beds were penetrated in drilling. These beds from top downward are: Harlem, Upper Bakerstown, Lower Bakerstown, Brush Creek, Upper Freeport Rider, Upper Freeport, Upper Kittanning, Middle Kittanning, Lower Kittanning, Mount Savage, and Mercer.

The total estimated reserves of coal (measured, indicated, and inferred), 14 inches or more thick, in six beds follow:

Coal bed:	<i>Estimated reserves, tons</i>
Harlem.....	23, 430, 000
Lower Bakerstown.....	44, 688, 000
Brush Creek.....	23, 694, 000
Upper Freeport.....	57, 731, 000
Upper Kittanning.....	40, 450, 000
Middle Kittanning.....	42, 276, 000
Total.....	232, 269, 000

Reserves in the Upper Bakerstown, Upper Freeport Rider, Lower Kittanning, Mount Savage, and Mercer beds were not estimated

because these beds are not continuous in thickness and extent or they contain excessively thick partings.

About the minimum thickness of coal mined mechanically (hand-loaded conveyors) in the Northern Appalachian region is 28 inches. Four of the beds in the Castleman Basin contain areas of coal over 28 inches thick. The most important of these beds is the Upper Freeport, which contains an estimated reserve of over 37 million tons of coal over 28 inches thick.

The Castleman Basin coals have not been extensively developed. Most of the mines recover 35 to 50 percent of the coal under present mining practices. The development of modern mechanized mines in any of these beds should improve recovery.

(2) The coals of the Castleman Basin are too friable for recovery of solid cores in the diamond-drill test holes. Therefore, cores were unsuitable for systematic thin-section study. Petrographic examination of the fragmentary cores revealed all of the coal to be bright-banded bituminous. Thin layers of alternating brilliantly black and dull grayish lustered coal components are responsible for this banded appearance. Component layers were seldom thicker than  $\frac{1}{10}$  inch, and much of the lamination was so fine the coal surface appeared striated and silky-lustered. Fusain and banded impurities were inconspicuous and too thin to be observed without some magnification.

A detailed microscopic study of the cores from five coal beds encountered in hole 29-CB revealed that ash could be materially reduced by crushing coal to minus 8-mesh and separating it in heavy liquid of 1.55 specific gravity. The

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float fractions were found to consist predominantly of low-ash coal components, principally anthraxylon. Mineralized fusain, bony coal, shale, and mineral matter concentrated in the sink.

(3) The coals are low- and medium-volatile bituminous and generally are strongly coking. This should not be construed to mean that all coals included in this report are suitable for the manufacture of metallurgical coke according to present-day standards. The percentages of bed moisture reported are not true values because of the method of sampling. The dry, ash-free, volatile matter averages 24 percent for the various beds. The weighted average ash on the moisture-free basis ranges from 9.9 percent for the Upper Freeport to 22.7 percent for the Upper Bakerstown bed. Sulfur average of coal beds on the same basis ranges from 1.5 to 4.3 percent. The softening temperatures of the ash for individual samples vary from 2,000° to 2,900° F.

(4) The Castleman Basin is part of a syn-

cline, the axis of which is inclined and trends in a northeast direction from Garrett County, Md., into Pennsylvania. The structure is defined by prominent ridges formed from dipping sandstone beds of the Pottsville formation. The sequence of sedimentary deposition in the area was determined from study of Bureau of Mines drill holes correlated with geologic mapping and from the data in earlier geological investigations. The stratigraphic section ranges from the contact of the Mississippian Mauch Chunk shale formation with the basal sandstone member of the Pottsville up through the Allegheny and Conemaugh formations to the Barton coal. About 1,000 feet of alternating beds of sandstone, siltstone, shale, clay, coal, and limestones are represented in the stratigraphic column. Sandstones and lenticular beds of coal characterize the Pottsville and lower part of the Allegheny formations. In the upper part of the Allegheny and Conemaugh formations, shale beds predominate, and the coal beds are much more persistent in lateral extent.

## INTRODUCTION

The principal source of coal produced in Maryland in the past has been the thick coal beds (Big Vein and Tyson) in the Georges Creek field. The coal beds in the Castleman Basin in Garrett County are thinner than the Big Vein and Tyson beds, which are not present in this field. No doubt, this is the reason that the Castleman Basin coals have not been developed more extensively. The Big Vein and Tyson beds in the Georges Creek field are approaching exhaustion, and the Castleman Basin coals may become more important in future as a source of coal production in Maryland.

The total recorded production of coal from the Castleman Basin from 1917 to 1948 was 1,060,000 tons.<sup>10</sup> However, coal was produced before 1917, and it is estimated that the total production of the field to date has been about 1,360,000 tons.

The coals are low- and medium-volatile coking coals. Some areas in the Upper Freeport bed may be low enough in ash and sulfur to be of metallurgical grade. All of the coals will qualify for domestic and industrial use in nearby cities where smokeless coal is in demand.

Results of tests to determine washability

<sup>10</sup> Maryland Bureau of Mines, Annual Reports, 1917-48.

characteristics of Maryland coals have been published.<sup>11</sup>

Little was known of the continuity and thickness of the coal beds in the Castleman Basin, and the objective of this investigation was to obtain data that might be useful in future development of mines in the area. This report gives estimates of reserves of coal in the central part of the Castleman Basin, describes their physical and chemical characteristics, and contains other information obtained during an investigation of the field.

The name "Castleman" Basin is used in this report to describe the area because earlier geological reports use this name. The name of the river that flows through the center of the basin is spelled "Casselman"; and, because of general usage, this spelling of the name of the river is followed in this report.

Geologists of the Federal Geological Survey and Maryland Geological Survey cooperated with Bureau of Mines engineers in correlating the coal beds penetrated in drilling; and the names used for individual beds follow Pennsylvania terminology, which is standard for the northern Appalachian field.

<sup>11</sup> Crentz, W. L., and Fraser, Thomas, Preparation Characteristics of Maryland Coals: Bureau of Mines Tech. Paper 701, 1947, 65 pp.

## ACKNOWLEDGMENTS

The field survey and investigation were under the direction of Albert L. Toenges, Louis A. Turnbull, and Lloyd Williams. Most of the "Agreements for Investigation of Coal Deposits" between the Bureau of Mines and landowners in the area were negotiated by Joseph Gillespie, former mining engineer, Bureau of Mines. The preparation of thin sections and petrographic analyses of coal samples were supervised by Bryan C. Parks, coal technologist, assisted by H. L. Smith and H. J. O'Donnell, coal petrographers. Coal analyses were made under the direction of H. M. Cooper and R. F. Abernethy, chemists, Coal Analysis Section. Agglutinating determinations were supervised by W. A. Selvig, supervising chemist, Coal Constitution and Miscellaneous Analysis Section, assisted by W. H. Ode. Illustrations were prepared by the

Graphic Section at Pittsburgh, Pa., under the supervision of Louis F. Perry, supervising engineer. Geological field work was conducted by Karl Waage, Federal Geological Survey, and Thomas W. Amsden, Maryland Geological Survey.

The cooperation and assistance of Joseph T. Singewald, Jr., director of the Maryland Department of Geology, Mines, and Water Resources; and of Frank T. Powers, director, and John J. Rutledge, consulting mining engineer, Maryland Bureau of Mines, are appreciated. Thanks are extended to Joseph F. Fahey and William Winterberg of Grantsville, Md., and to many others in the district for their cooperation and the many courtesies throughout the investigation.

# PART I.—INVESTIGATION OF FIELD AND ESTIMATED RESERVES OF COAL

By

Albert L. Toenges, Lloyd Williams and Louis A. Turnbull

A reconnaissance of the area was made in the spring of 1946. Limits of the area to be investigated were established, and terms for "Agreement for Investigation of Coal Deposits" to be entered into between the Bureau of Mines and the landowners in the area were decided upon. This agreement provides for payment to the Government of a royalty of 5 mills per ton of coal mined in consideration of diamond drilling performed by the Bureau of Mines. A copy of the form of agreement is contained in the appendix. Seventy-nine agreements were entered into, covering about 14,700 acres of land.

Operating and abandoned mines were examined, and all maps and other available information were obtained while drilling was in progress. Cores from 40 diamond-drill holes determined physical conditions and thicknesses of beds. The locations of these holes are shown in figure 1.

## DESCRIPTION OF AREA INVESTIGATED

The area investigated comprises that part of the Castleman Basin between Negro and Meadow Mountains from Bittinger on the south, north to a line 1 mile north of Grantsville, Md.

The topography of the area is rolling and elevations range from 2,100 feet at "Little Crossing" (U. S. Highway 40 and Casselman River) to 3,000 feet on Negro and Meadow Mountains. Figures 2 and 3 are typical views in the field.

The Castleman River Railroad (rolling stock owned by the Baltimore & Ohio Railroad) traverses the Casselman River Valley from the Louis mine south of Jennings, to Worth, Pa., where it connects with the Baltimore & Ohio Railroad. Some of the mines are near enough to the railroad so that the coal is loaded directly into railroad cars at the tipples. Other mines use trucks to transport coal to tipples at the railroad.

A 132,000-volt transmission line, owned by Potomac Edison Power & Light Co., traverses the field from east to west. U. S. Highway 40 crosses the basin through Grantsville, Md. A paved highway extends from Grantsville to

Bittinger, and many all-weather roads traverse the field in every direction. Some parts of the area can be reached only by side roads and trails that are accessible by automobile only in good weather.

The mean annual rainfall at Grantsville from 1894 to 1920 was 42.28 inches.<sup>12</sup> The mean annual temperature at Grantsville for the same period was 47.5° F.<sup>13</sup>

## DIAMOND DRILLING

Diamond drilling was contracted by the Bureau of Mines to the Joy Manufacturing Co., Sullivan Division, Michigan City, Ind. The following unit contract prices are given as a guide for estimating the cost of diamond drilling to secure cores of 2½-inch (NX) minimum diameter in this general locality and under similar conditions.

1. Drilling and setting standpipe through overburden to accommodate continued drilling, as ordered by resident Government engineer:	
A. 0 to 50 feet.....	<i>Per foot</i> \$2. 20
B. Beyond depth of 50 feet.....	2. 20
2. Prices to be paid for drilling from bottom of standpipe to bottom of hole, except for reaming and casing:	
Drilling with diamond bit to secure core of 2½-inch minimum diameter; 7,500 feet of drilling guaranteed.....	2. 20
3. Additional diamond-drill core boring as may be ordered by resident Government engineer over the minimum guaranteed for items 1 and 2, inclusive, shall be performed at a reduction in price of.....	. 05
4. Reaming hole and installing casing.....	. 75
5. For cementing, waiting for cement to set, and drilling out cement.....	2. 00
	<i>Per hr.</i>
6. Surveying.....	\$3. 00
	<i>Per hole</i>
7. Plugging holes with cement from bottom of hole to 50 feet above minable coal beds.....	\$10. 00

The contract required that the contractor provide water for drilling at his own expense. The Bureau of Mines agreed to build and maintain access roads or trails to drill sites.

<sup>12</sup> U. S. Weather Bureau, Summaries of Climatological Data by Sections: Bull. W., vol. 3, 1926.  
<sup>13</sup> See footnote 12.





FIGURE 2.—VIEW OF JENNINGS, MD., LOOKING NORTH.



FIGURE 3.—LOUIS MINE, ALLEGHENY COAL CORP., NEAR JENNINGS (MORGART MINE).







FIGURE 4.—DIAMOND DRILL AT HOLE 38-CB.

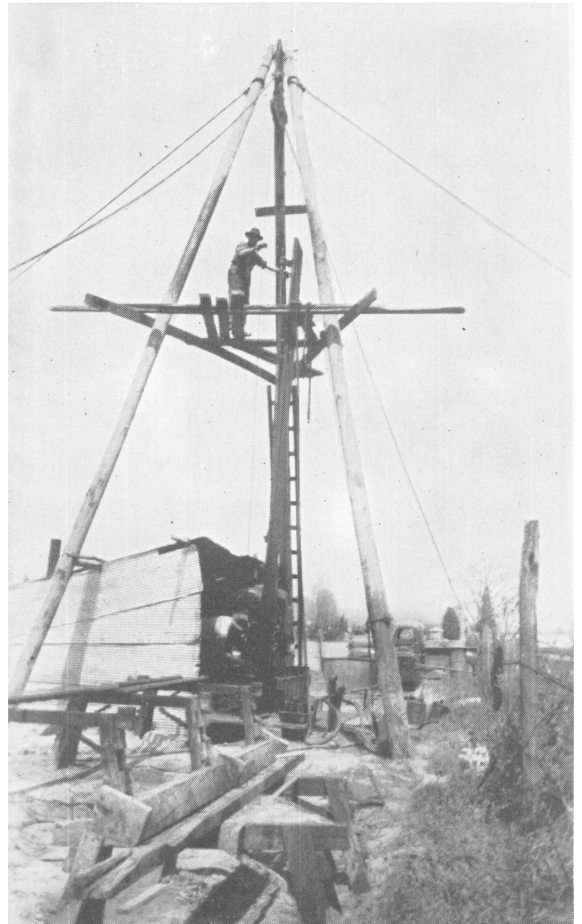


FIGURE 5.—DIAMOND DRILL AT HOLE 39-CB.

Cores of coal beds penetrated were wrapped in paper, packed in wooden cases, and shipped to the Central Experiment Station, Bureau of Mines, Pittsburgh, Pa., for petrographic and chemical analyses.

Diamond drilling was begun May 26, 1947. Two drills operated 1 shift a day, 6 days a week, until drilling was completed, May 6, 1949, except for a period from October 29, 1947, to February 3, 1948, when one drill operated 2 shifts a day and the other drill, 1 shift a day. Progress of drilling at the project follows:

Holes drilled.....	40
Feet drilled.....	25,561
Drill shifts (number of drilling shifts).....	940
Shifts reaming and casing, and other drilling delays.....	60
Shifts moving, setting up, repairs, plugging holes, and other delays.....	186
Shifts lost due to personal business, illness, inclement weather, night shift doubling with day shifts, holidays, etc.....	118
Average feet per drill per shift, excluding all delays.....	27.2
Average feet per drill per shift, including drilling delays.....	25.6
Average feet per drill per working shift, including moving, repairs, and other delays.....	21.6
Average feet per drill per shift based on a 6-day week, including all delays, illness, inclement weather, holidays, drillers off duty, etc.....	19.6

Forty diamond-drill holes were drilled at locations shown in figure 1. Each hole is designated by a serial number followed by two letters. The serial number designates the order of drilling, and the letters "CB" show that the hole was drilled at the Castleman Basin project. Typical drill set-ups are shown in figures 4 and 5.

Detailed logs of the drill holes and analyses of coal cores are given in the appendix.

Maryland is not subdivided into townships, ranges, and sections. Descriptions of hole locations, referring to latitude 39°40' and longitude 79°10', follow:

Hole:	Location	
	Latitude 39°40'	Longitude 79°10'
1-CB.....	12,050 ft. S.	10,000 ft. W.
2-CB.....	1,120 ft. N.	3,200 ft. E.
3-CB.....	17,330 ft. S.	10,000 ft. W.
4-CB.....	1,500 ft. S.	3,200 ft. E.
5-CB.....	12,650 ft. S.	4,700 ft. W.
6-CB.....	1,500 ft. S.	8,480 ft. E.
7-CB.....	17,330 ft. S.	4,700 ft. W.
8-CB.....	1,500 ft. S.	2,080 ft. W.
9-CB.....	1,500 ft. S.	5,850 ft. E.
10-CB.....	1,140 ft. N.	5,830 ft. E.
11-CB.....	22,700 ft. S.	10,000 ft. W.
12-CB.....	1,200 ft. N.	8,500 ft. E.
13-CB.....	9,200 ft. N.	2,050 ft. W.
14-CB.....	3,800 ft. N.	2,150 ft. W.
15-CB.....	1,150 ft. N.	2,080 ft. W.
16-CB.....	2,200 ft. S.	7,550 ft. W.
17-CB.....	9,000 ft. N.	3,200 ft. E.
18-CB.....	14,700 ft. S.	4,800 ft. W.
19-CB.....	3,800 ft. N.	3,200 ft. E.
20-CB.....	12,200 ft. S.	580 ft. E.
21-CB.....	6,750 ft. S.	550 ft. E.
22-CB.....	3,800 ft. N.	550 ft. E.

Hole—Con.	Location	
	Latitude 39°40'	Longitude 79°10'
23-CB.....	6,700 ft. S.	5,950 ft. E.
24-CB.....	6,400 ft. N.	500 ft. E.
25-CB.....	6,800 ft. S.	5,130 ft. W.
26-CB.....	6,570 ft. N.	1,900 ft. W.
27-CB.....	1,170 ft. N.	870 ft. E.
28-CB.....	17,400 ft. S.	20,900 ft. W.
29-CB.....	1,500 ft. S.	500 ft. E.
30-CB.....	9,400 ft. S.	17,850 ft. W.
31-CB.....	3,550 ft. N.	5,800 ft. E.
32-CB.....	9,200 ft. N.	16,400 ft. E.
33-CB.....	1,370 ft. N.	4,700 ft. W.
34-CB.....	6,650 ft. N.	3,100 ft. E.
35-CB.....	4,180 ft. S.	500 ft. E.
36-CB.....	1,480 ft. S.	4,600 ft. W.
37-CB.....	6,380 ft. N.	5,900 ft. E.
38-CB.....	3,780 ft. N.	11,140 ft. E.
39-CB.....	9,440 ft. N.	600 ft. E.
40-CB.....	9,500 ft. N.	9,200 ft. E.

**METHOD OF ESTABLISHING DRILL-HOLE LOCATIONS**

The drill locations were established at corners of a ½-mile grid pattern. Hole 2-CB in the north part of the area and hole 5-CB in the south part of the area were drilled to the Mauch Chunk red shales (top of the Mississippian) to obtain geological information and to check the thickness of the coal beds in the Pottsville formation. The Mercer coal bed in the Pottsville is the lowest bed that has been correlated. Eight other holes were drilled to the Mercer horizon at grid points 1 to 2 miles apart to ascertain the lowest minable coal bed in different parts of the area. Thirty holes were drilled to penetrate the lowest bed that might be minable in the immediate area which usually is at the horizon of the Kittanning coals.

**COAL BEDS AND OTHER STRATA PENETRATED IN DRILLING**

The strata in the Castleman Basin lie in a spoon-shaped syncline pitching gently to north-east. The general pitch of the syncline is ½° to 1° N. 30° E. The coal-bearing strata in the east limb outcrop along the west slope of Meadow Mountain, and the strata dip toward the northwest from a general strike of S. 40° W. The strata in the west limb outcrop along the east slope of Negro Mountain and dip toward the southeast from a general strike of N. 20° E. Dips range from nothing in the center of the syncline to a maximum of 15° near the outcrops. A section across the basin from northwest to southeast, together with graphic logs of strata penetrated in representative diamond-drill holes, is shown in figure 6. A longitudinal section near the axis of the basin is shown in figure 1. Information concerning direction and percentage of dip at any location can be obtained from coal contour lines shown

on maps of individual coal beds. (See figs. 7 to 12.)

The coal beds in the upper part of the section have been eroded by the Casselman River, and these beds are exposed near the center of the syncline. The highest of these beds have also been cut by tributaries of the Casselman River; consequently, islands of coal remain under the hilltops. The pitch of the syncline is greater than the gradient of the river, and the coal beds discussed in this report lie under the Casselman River north of U. S. Highway 40.

Eleven beds of coal between the horizons of the Harlem and Mercer beds were penetrated in drilling. An example of the stratigraphy of these coal beds and other strata from the top of the section downward follows:

<i>Formation</i>	<i>Coal beds and other strata</i>
Lower Cone- maugh.	Ames shale (marine fossils). <b>Harlem coal.</b> Also known locally as the "fossil coal." Only a few prospects are opened in this bed. Pittsburgh redbed. <b>Upper Bakerstown coal.</b> Also known locally as the "Slate seam," which is a good description of the bed. It has been opened by only a few small mines. <b>Lower Bakerstown coal.</b> Also known locally as the "Honeycomb." It has been mined and prospected in many places. Myersdale redbed. Shale (marine fossils). <b>Brush Creek coal.</b> Only a few prospects in this bed. Mahoning redbed. <b>Upper Freeport Rider coal.</b> Thin and irregular.
-----	-----
Allegheny (220 to 300 feet).	<b>Upper Freeport coal.</b> Locally called the "Beachy" or "Grantsville" bed. It has been mined most extensively west of Grantsville under or near the Joel Beachy farm. Bolivar clay. Sometimes a flint clay with good refractory qualities. <b>Upper Kittanning coal.</b> Opened by only a few small mines. <b>Middle Kittanning coal group.</b> Extensively stripped on Meadow Mountain. Middle Kittanning clay (often missing). Small clay strip mines on Meadow Mountain. Used as a binder in refractory bricks. Has some refractory qualities. <b>Lower Kittanning coal group.</b> No known openings. <b>Mount Savage coal group.</b> Also known in Pennsylvania as "Clarion" and "Brookville." Name derived from Mount Savage clay. Stripped with clay on Negro Mountain. Mount Savage refractory clay or flint clay (often missing) stripped on Negro Mountain, used for manufacturing refractory bricks.
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<i>Formation</i>	<i>Coal beds and other strata</i>
Pottsville (160 to 190 feet).	Homewood sandstone. <b>Mercer coal</b> (often missing). Connoquenessing sandstone.
-----	-----
Mississippian.	Mauch Chunk shale.
-----	-----

The intervals between the coal beds in the Lower Conemaugh are fairly constant, but vary considerably between the beds in the Allegheny and Pottsville formations. A table showing intervals between coal beds follows:

Interval		Feet		
From—	To—	Mini- mum	Maxi- mum	Aver- age
Harlem.....	Upper Bakerstown....	74	87	82
Upper Bakerstown....	Lower Bakerstown....	33	43	38
Lower Bakerstown....	Brush Creek.....	107	145	128
Brush Creek.....	Upper Freeport.....	105	136	118
Upper Freeport.....	Upper Kittanning....	61	103	75
Upper Kittanning....	Middle Kittanning horizon.	Extremely variable		

The preceding tabulations contain the key data used for correlation of the coal beds.

In the area southeast of Grantsville, the coarse sandstone immediately above the Upper Kittanning coal bed, contains water at enough pressure to produce artesian flow in wells drilled to this depth along the river and in the hollows. The same condition occurs in the sandstone below the Middle Kittanning coal horizon in the area south and east of Jennings. The water appears to break into the sandstone above the Middle Kittanning in the immediate vicinity of Jennings, so that artesian water might be encountered in wells drilled to the top of the Middle Kittanning.

#### INTERPRETATION OF DRILLING RESULTS AND ESTIMATED RESERVES OF COAL

Estimates of reserves of coal remaining in the Harlem, Upper Bakerstown, Brush Creek, Upper Freeport, Upper Kittanning, and Middle Kittanning beds have been made. The terms "measured," "indicated," and "inferred" reserves are used. These definitions of classification have been agreed upon by the Bureau of Mines and the Geological Survey, and the definition of each classification is given below so that the meaning of the estimates may be readily understood.

*Measured coal.*—Measured coal is that for which tonnage is computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced, and the thickness and extent of the coal are so well-defined

that the computed tonnage is judged to be accurate within 20 percent or less of the true tonnage. The limits of accuracy of the estimate should be stated. Although the spacing of the points of observation necessary to demonstrate continuity of coal will vary in different regions, according to the habit of the coal beds, the points of observation, are, in general, of the order of  $\frac{1}{2}$  mile apart. The outer limit of a block of measured coal, therefore, is of the order of  $\frac{1}{4}$  mile from the last point of positive information (that is, roughly half the distance between points of observation).

Where no data are available other than measurements along the outcrop, but where the continuity of the outcrop is measured in miles and suggests the presence of coal great distances in from the outcrop, a smooth line drawn roughly  $\frac{1}{2}$  mile in from the outcrop is used to mark the limit under cover of a block of coal that can also be classed as measured.

*Indicated coal.*—Indicated coal is that for which tonnage is computed partly from specific measurements and partly from projection of visible data for a reasonable distance on geologic evidence. In general, the points of observation are of the order of 1 mile apart, but may be as much as  $1\frac{1}{2}$  miles for beds of known geologic continuity. For example, if drilling on  $\frac{1}{2}$ -mile centers has proved up a block of measured coal of fairly uniform thickness and extent, the area of measured coal is, according to the judgment of the estimator, larger than the actual area of drilling by as much as  $\frac{1}{4}$  mile on all sides. If, from geologic evidence, the bed is believed to have greater continuity, the area of measured coal is surrounded by a belt of indicated coal, which, according to the judgment of the appraiser, may be as much as  $1\frac{1}{2}$  miles wide.

Where no data are available other than measurements along the outcrops but where the continuity of the outcrop is measured in miles and suggests the presence of coal great distances in from the outcrop, two lines drawn roughly parallel to the outcrop, one  $\frac{1}{2}$  mile in from the outcrop and one 2 miles in from the outcrop, define a block of coal that may be classed as indicated.

*Inferred coal.*—Inferred coal is that for which quantitative estimates are based largely on broad knowledge of the geologic character of the bed, or region, and for which there are few, if any, measurements. The estimates are based on an assumed continuity, for which there is geologic evidence. In general, inferred coal lies outside the limits defined for measured and indicated coal. Where there are only outcrop data on which to base estimates, inferred

coal is that lying more than 2 miles in from the outcrop.

Estimates of reserves are based upon the results obtained in diamond drilling, examinations of operating mines, information obtained from maps of abandoned mines and from other sources, and a thorough engineering and geologic study of the field.

Estimated reserves for each bed are tabulated as to thickness under the headings: 14 to 28 inches, 28 to 42 inches, and over 42 inches thick. This report does not propose to state what thickness of coal can or cannot be mined economically. Estimates of reserves under these thickness categories, together with other information, are presented to give any interested person as much knowledge as possible relative to physical conditions in each coal bed. A minimum of 14-inch coal is used in estimating total reserves because this minimum thickness has been established and used for years in publications of the Federal Geological Survey giving estimates of coal reserves. The 28-inch division is used as this is the generally accepted minimum thickness that can be economically mined mechanically with hand-loaded conveyors. Mining in beds over 42 inches thick usually is done mechanically with mobile loading machines or continuous mining devices.

This report contains a map for each of the six coal beds for which reserve estimates have been made. These maps show the areas of estimated reserves, sections of coal beds, and coal contour lines. Additional diamond drilling probably would increase the total reserves, particularly in the area north of U. S. Highway 40.

Mining has not been extensive in this field. The percentage of recovery in past mining has not been more than 35 to 50 percent. Some mechanical mining has been attempted on a very small scale, and the development of modern, mechanized mines should improve the percentage of recovery.

A description of each coal bed, together with the estimated reserves of coal, follows:

#### HARLEM BED (SEE FIG. 7)

The Harlem bed underlies the fossil-bearing Ames shale and is one of the most persistent beds in the Castleman Basin. It is easily identified and therefore is of assistance in correlating the coal beds and other strata in the field. However, the bed is thin and has not been mined to any extent, except for several small prospect openings. The bed ranges from 17 to 20 inches in thickness in the entire area. The calculated weighted average thickness is 18 inches.

TABLE 1.—*Estimated coal reserves, Harlem bed*

	Acres	Thousands of tons,
		14-28 in.
Measured.....	4,276	11,355
Indicated.....	2,251	5,796
Inferred.....	2,538	6,279
Total.....	9,065	23,430

## UPPER BAKERSTOWN BED

The Upper Bakerstown bed is not persistent and varies considerably in thickness. Analyses of the coal show a high ash content, even with partings removed. The ash content ranged from 19.0 to 25.3 percent in the seven coal cores that were analyzed. No commercial mines were in operation at the time of this investigation. No estimates of coal reserves were made due to the irregularity of the bed.

## LOWER BAKERSTOWN BED (SEE FIG. 8)

This bed is one of the most extensively mined in the drilled area, and it is estimated that the coal underlying 330 acres has been mined. The Maryland Bureau of Mines reports 192,360 tons produced during 1917 to 1948. This is probably less than half of the tonnage actually mined. The coal often outcrops a few feet above the Casselman River and is easily accessible to the Castleman River Railroad. Much of the coal can be mined with natural drainage. The bed is regular in thickness and free from partings. The calculated weighted average thickness of coal between 14 and 28 inches is 24 inches; and of coal over 28 inches, 29 inches. The largest commercial mine that operated in 1948 was the Louis mine of the Allegheny Coal Corp. The mine is south of Jennings and produced 16,647 tons of coal during 1948.<sup>14</sup> The bed at this mine is 30 to 32 inches thick, but the top 4 to 6 inches is usually bony.

TABLE 2.—*Estimated coal reserves, Lower Bakerstown bed*

	Acres	Thousands of tons		
		14-28 in.	28-42 in.	Total
Measured.....	7,736	22,883	5,311	28,194
Indicated.....	3,332	10,908	798	11,706
Inferred.....	1,330	4,788	-----	4,788
Total.....	12,398	38,579	6,109	44,688

<sup>14</sup> Maryland Bureau of Mines, Annual Reports, 1917-48.

## BRUSH CREEK BED (SEE FIG. 9)

The Brush Creek coal is fairly persistent, especially in the northwest part of the drilled area where it attains a thickness of 24 inches. The bed is over 20 inches thick in five holes in this area. The calculated weighted average thickness of all coal over 14 inches is 17 inches. The low fusion of the ash should help qualify the coal for use in domestic stokers. There are a few prospect openings along the outcrop but no commercial mines.

TABLE 3.—*Estimated coal reserves, Brush Creek bed*

	Acres	Thousands of tons,
		14-28 in.
Measured.....	5,466	13,884
Indicated.....	2,462	5,921
Inferred.....	1,691	3,889
Total.....	9,619	23,694

## UPPER FREEPORT RIDER BED

This is a thin, irregular bed often found above the Upper Freeport bed. The interval ranges from nothing to 30 feet. It has no commercial value under present conditions.

## UPPER FREEPORT BED (SEE FIG. 10)

Most of the commercial mines in the Upper Freeport bed were opened west of Grantsville. Several of them were operating in 1948. The J. A. Beachy mine produced 4,536 tons<sup>15</sup> in that year; and the Earl Stanton mine, operated by John Keister, produced 5,147 tons.<sup>16</sup> During 1917 to 1948, 718,247 tons of coal were reported<sup>17</sup> to have been produced from the Upper Freeport bed, and it is estimated that 350 acres have been mined in the limits of the drilled area.

The calculated weighted average thickness is 41 inches of clean coal, partings excluded, where the bed thickness exceeds 42 inches; 33 inches in the 28- to 42-inch category; and 22 inches in the 14- to 28-inch category. Analyses of the coal cores indicate that metallurgical coal could be produced by mining in selected areas. The remaining areas would be suitable for smokeless fuel. The softening temperature of the ash is relatively high and averages 2,600° F.

<sup>15</sup> Maryland Bureau of Mines, Work cited, footnote 9.<sup>16</sup> See footnote 15.<sup>17</sup> See footnote 15.



TABLE 4.—Estimated coal reserves, Upper Freeport bed

	Acres	Thousands of tons			
		14-28 in.	28-42 in.	Over 42 in.	Total
Measured.....	8,106	9,348	16,008	12,645	38,001
Indicated.....	2,985	6,812	2,890	1,980	11,682
Inferred.....	2,015	4,056	2,012	1,980	8,048
Total.....	13,106	20,216	20,910	16,605	57,731

The best-quality coal is found in areas where the bed is thickest. This is shown by calculated weighted average composite analyses of coal cores, as-received basis, in the following table.

TABLE 5.—Weighted average analyses, Upper Freeport coal cores

	14-28 in.	28-42 in.	Over 42 in.
Ash.....	12.1	10.0	8.5
Sulfur.....	2.3	1.7	1.3
Volatile matter.....	20.3	19.6	19.3

UPPER KITTANNING BED (SEE FIG. 11)

This coal bed has been opened in only a few isolated places. The outcrop is difficult to trace and "want" areas are common. The calculated average thickness of the 14- to 28-inch coal is 21 inches, and the 28- to 42-inch coal, 33 inches.

TABLE 6.—Estimated coal reserves, Upper Kittanning bed

	Acres	Thousands of tons		
		14-28 in.	28-42 in.	Total
Measured.....	4,218	6,903	10,328	17,231
Indicated.....	5,435	12,714	4,350	17,064
Inferred.....	1,701	5,255	900	6,155
Total.....	11,354	24,872	15,578	40,450

MIDDLE KITTANNING BED (SEE FIG. 12)

The Middle Kittanning is not a continuous coal bed in the Castleman Basin. It occurs at a stratigraphic horizon where lenses of coal or carbonaceous material usually are found in one or more splits. The thickness and extent of these lenses are irregular. Some of the lenses of coal that outcrop along Meadow Mountain were thick enough to strip or mine. During the period between 1937 and 1948, 36 acres were

stripped or mined by underground methods, and 110,000 tons<sup>18</sup> of coal were produced. Other than these operations, the bed has been opened at only a few places.

Three of the splits were correlated and reserve estimates are based on these three splits which are numbered from the top downward.

TABLE 7.—Estimated coal reserves, Middle Kittanning bed

	Acres	Thousands of tons			
		14-28 in.	28-42 in.	Over 42 in.	Total
No. 1 split:					
Measured.....	978	2,352		960	3,312
Indicated.....	1,141	956		4,584	5,540
Inferred.....					
Total.....	2,119	3,308		5,544	8,852
No. 2 split:					
Measured.....	1,382	2,886	1,633		4,519
Indicated.....	1,512	3,074	1,258		4,332
Inferred.....	1,376	2,223	1,805		4,028
Total.....	4,270	8,183	4,696		12,879
No. 3 split:					
Measured.....	1,018	2,175	1,372		3,547
Indicated.....	2,678	4,754	4,586		9,340
Inferred.....	2,194	3,702	3,956		7,658
Total.....	5,890	10,631	9,914		20,545
Total Middle Kittanning:					
Measured.....	3,378	7,413	3,005	960	11,378
Indicated.....	5,331	8,784	5,844	4,584	19,212
Inferred.....	3,570	5,925	5,761		11,686
Total.....	12,279	22,122	14,610	5,544	42,276

LOWER KITTANNING BED

This is a coal horizon similar to the Middle Kittanning, and no coal of present value was found during the investigation. Only a few prospects have been opened in this bed.

MOUNT SAVAGE BED

Two beds of coal at this horizon are known as the Clarion and Brookville beds in Pennsylvania. A clay strip mine on Negro Mountain produced 39,754 tons<sup>19</sup> of Mount Savage coal which occurred in the overburden. None of the diamond-drill holes penetrated thick enough coal to justify reserve estimates. Correlation of the beds was difficult because the coal or underlying Mount Savage refractory clay or both were not penetrated in the drill holes.

MERCER BED

Diamond drilling indicates that a small area of this coal occurs east of Jennings. The extent and continuity of the bed are too indefinite to estimate reserves. No mining is known to have been done in this bed.

<sup>18</sup> Maryland Bureau of Mines, Work cited in footnote 10.  
<sup>19</sup> Maryland Bureau of Mines, Work cited in footnote 10.

## RECAPITULATION OF RESERVES

Table 8 is a recapitulation of total reserves of coal in the beds for which reserve estimates have been made. The reserves shown are the estimated total reserves in the beds in each thickness category. Quantities of coal that might be recovered in mining have not been estimated. Recovery in this field under present mining practices probably is 35 to 50 percent. The development of modern mechanized mines in any of these beds should improve recovery.

TABLE 8.—*Recapitulation of total estimated coal reserves, all beds*

Bed	Thousands of tons			
	14-28 in.	28-42 in.	Over 42 in.	Total
<b>Harlem:</b>				
Measured .....	11,355	-----	-----	11,355
Indicated .....	5,796	-----	-----	5,796
Inferred .....	6,279	-----	-----	6,279
Total .....	23,430	-----	-----	23,430
<b>Lower Bakerstown:</b>				
Measured .....	22,883	5,311	-----	28,194
Indicated .....	10,908	798	-----	11,706
Inferred .....	4,788	-----	-----	4,788
Total .....	38,579	6,109	-----	44,688

TABLE 8.—*Recapitulation of total estimated coal reserves, all beds—Continued*

Bed	Thousands of tons			
	14-28 in.	28-42 in.	Over 42 in.	Total
<b>Brush Creek:</b>				
Measured .....	13,884	-----	-----	13,884
Indicated .....	5,921	-----	-----	5,921
Inferred .....	3,889	-----	-----	3,889
Total .....	23,694	-----	-----	23,694
<b>Upper Freeport:</b>				
Measured .....	9,348	16,008	12,645	38,001
Indicated .....	6,812	2,890	1,900	11,682
Inferred .....	4,056	2,012	1,980	8,048
Total .....	20,216	20,910	16,605	57,731
<b>Upper Kittanning:</b>				
Measured .....	6,903	10,328	-----	17,231
Indicated .....	12,714	4,350	-----	17,064
Inferred .....	5,255	900	-----	6,155
Total .....	24,872	15,578	-----	40,450
<b>Middle Kittanning:</b>				
Measured .....	7,413	3,005	960	11,378
Indicated .....	8,784	5,844	4,584	19,212
Inferred .....	5,925	5,761	-----	11,686
Total .....	22,122	14,610	5,544	42,276
<b>Total, all beds:</b>				
Measured .....	71,786	34,652	13,605	120,043
Indicated .....	50,935	13,882	6,564	71,381
Inferred .....	30,192	8,673	1,980	40,845
Total .....	152,913	57,207	22,149	232,269

## PART II.—PETROGRAPHY OF COAL

By

B. C. Parks and H. J. O'Donnell

Petrographic studies of cores from 40 test holes drilled in the Castleman Basin coal field resulted in considerable information useful in evaluating the coal beds underlying the basin. All cores with 12 or more inches of coal were examined. The solid portions were split lengthwise to expose unscored surfaces for detailed study. Each core was carefully measured, the coal was classified, bands and lenses of impurities were noted, and all such information was plotted on ruled log strips. Noncoal material thicker than  $\frac{3}{8}$  inch was cut from the core and the coal properly sampled for chemical analysis and agglutinating-value tests, the results of which are shown in the appendix.

The very friable nature of Castleman Basin coals made recovery of completely solid cores exceedingly difficult. Usually they consisted of some broken coal with short sections of solid core. However, despite friableness, in most instances, the coal recovered was completely representative of the entire bed thickness, even when much of the core was broken. The broken condition of the coal in the majority of cores made systematic thin-section preparation and microscopic study impractical. Cores subjected to detailed petrographic examination are listed in descending order of stratigraphic occurrence of coal beds in table 9.

TABLE 9.—Cores from the Castleman Basin field representing 12 inches or more of bed thickness, and amount of coal samples from cores for analyses and tests

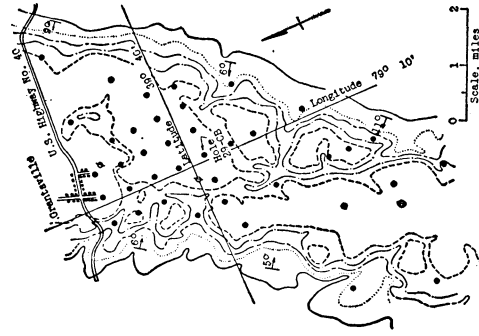
Coal beds from which cores representing 12 inches or more of coal were examined in detail	Number of cores examined	Total thickness of coal cores recovered from beds, including banded impurities more than $\frac{3}{8}$ inch thick		Total thickness of coal sampled from cores for analysis, excluding banded impurities	
		Feet	Inches	Feet	Inches
Barton.....	3	4	2	3	8
Federal Hill.....	1	1	7	1	3
Harlem.....	17	26	4	24	2
Upper Bakerstown.....	7	14	0	11	7
Lower Bakerstown.....	34	63	1	62	8
Brush Creek.....	28	39	0	37	11
Upper Freeport Rider.....	5	6	3	5	2
Upper Freeport.....	29	75	5	71	3
Upper Kittanning.....	27	59	1	56	1
Middle Kittanning.....	26	40	10	38	5
Lower Kittanning.....	13	20	1	17	11
Mercer.....	4	8	7	6	5
Total, all cores.....	194	358	5	336	6

### MEGASCOPIC CHARACTERISTICS OF CASTLEMAN BASIN COALS

The coals examined were all bright, banded-type bituminous. Alternating fine layers of brilliantly black and dull-lustered coal were responsible for banded appearance. Individual layers were seldom greater than  $\frac{1}{10}$  inch in thickness, and some banding was so fine as to

make the coal surface appear striated and silky-lustered. Fusain was not conspicuously present, and usually this ingredient was too finely banded to be observed without some magnification.

High degree of surface luster was characteristic of the Castleman Basin coals. This visual characteristic varied considerably with different coal components from brilliant anthraxylon to



Sketch map of Castleman Basin coal field as outlined in location of hole 29 CB and other test holes.

**LEGEND**  
 Outcrop trace of Upper Maitaming coal bed.  
 Outcrop trace of Brush Creek coal bed.  
 Outcrop trace of Lower Maitaming coal bed.  
 Outcrop trace of lower Bone coal bed.  
 Strike and dip of coal beds.  
 Location of test holes.

**Explanation of petrographic terms**

**Float coal ingredients**  
 Anthraxylon - The bright lustered coal, homogeneous in appearance, and containing from about 1.5 to 5 percent ash.  
 Bright attrital - The bright lustered coal fragments consisting of irregularly mixed fine layers of anthraxylon and attritus. Ash content ranges from about 5 to 10 percent.  
 Dull attrital - The dull lustered coal somewhat homogeneous in appearance, and containing from about 15 to 20 percent ash.  
 Fusain - Very soft, black, fibrous coal ingredient containing from about 5 to 20 percent ash.  
**Sink product ingredients**  
 Mineral substances freed as described in the text and identified as carbonate, sulphate, kaolinite, quartz, etc.  
 Similar in general appearance to the bright lustered coal, but containing from about 20 to over 50 percent ash.  
 Consists predominantly of organic matter containing sufficient mineral matter to account for very high ash content, from about 40 to over 50 percent.  
 Predominately mineral matter (clay and silt) but containing varying amount of organic matter.  
 Heavy appearing, crystalline substance of iron.

Coal Beds Corred	Depth	Description of Cores	Analyses of Coal, as received basis Laboratory No. D-35249	Petrographic analyses of coal from core samples after crushing to pass 8-mesh and making float-sink separations at 1.55 specific gravity.
21-1/2" bright coal (included in sample)	773-8"		Moisture 22.3 Volatile matter 49.3 Fixed carbon 27.9 Ash 13.5 Sulfur 13,200.3 D.T.U.	Amount 22.3 percent Ash content 2.6 percent Amount 49.3 percent Ash content 6.1 percent Amount 27.9 percent Ash content 18.4 percent Amount 13.5 percent Ash content 31.2 percent Amount 1.0 percent
20-1/2" bright coal (included in sample)	801 6-1/2"		Moisture 17.4 Volatile matter 65.5 Fixed carbon 16.8 Ash 17.3 Sulfur 13,460 D.T.U.	Amount 17.4 percent Ash content 2.9 percent Amount 65.5 percent Ash content 6.3 percent Amount 16.8 percent Ash content 17.3 percent Amount 17.3 percent Ash content 12.1 percent
1" bone coal (rejected)	621 2-1/2"		Moisture 92.4 Volatile matter 7.5 Fixed carbon 0 Ash 0 Sulfur 0 D.T.U.	Amount 92.4 percent Ash content 7.5 percent
3" bright coal (sampled)	538-1"		Moisture 20.7 Volatile matter 32.2 Fixed carbon 42.9 Ash 18.2 Sulfur 13,549.4 D.T.U.	Amount 20.7 percent Ash content 32.2 percent Amount 42.9 percent Ash content 4.9 percent
12" bright coal (included in sample)	648-9"		Moisture 21.9 Volatile matter 64.8 Fixed carbon 11.9 Ash 0 Sulfur 0 D.T.U.	Amount 21.9 percent Ash content 1.9 percent Amount 64.8 percent Ash content 9.0 percent
1" bone coal (rejected from sample)	668-9"		Moisture 97.3 Volatile matter 0.7 Fixed carbon 0 Ash 0 Sulfur 0 D.T.U.	Amount 97.3 percent Ash content 0.7 percent
25-1/2" bright coal (included in sample)	688 3-1/2"		Moisture 1.4 Volatile matter 30.6 Fixed carbon 68.2 Ash 14,110.2 Sulfur 13,400.3 D.T.U.	Amount 1.4 percent Ash content 1.9 percent Amount 30.6 percent Ash content 31.7 percent Amount 68.2 percent Ash content 30.6 percent
1" shale parting (rejected)	728-9"		Moisture 82.7 Volatile matter 0 Fixed carbon 0 Ash 0 Sulfur 0 D.T.U.	Amount 82.7 percent Ash content 0.0 percent
2-1/2" bone coal (rejected from sample)	728-9"		Moisture 82.7 Volatile matter 0 Fixed carbon 0 Ash 0 Sulfur 0 D.T.U.	Amount 82.7 percent Ash content 0.0 percent
25" bright coal (included in sample)	728-1/2"		Moisture 82.7 Volatile matter 0 Fixed carbon 0 Ash 0 Sulfur 0 D.T.U.	Amount 82.7 percent Ash content 0.0 percent

FIGURE 13.—COLUMN DIAGRAM OF COAL CORES FROM TEST HOLE 29-CB, CASTLEMAN BASIN, MD., WITH DATA FROM CHEMICAL AND PETROGRAPHIC ANALYSES.

the considerably duller attrital coal and soft fusain. Nevertheless, over-all brightness was relatively high, indicating advanced bituminous rank similar to low- and medium-volatile bituminous coals.

The friableness of the Castleman Basin coals was evident by the ease with which small lumps could be pulverized by finger pressure. Amenable to breakage is another physical characteristic of medium- and low-volatile bituminous coal. Ease of breakage in such coals does not result from inherent structural weakness of the coal substance. It is mainly due to tension fractures that develop in the coal beds as a result of stresses in the earth's crust. These tension fractures cut the beds at steep angles to the bedding planes, and two parallel sets inclined to each other occur in the coal beds. The fractures are sometimes filled with thin sheets of mineral matter. However, many fractures are incipient and not visibly detectable, but close examination of small lumps and coal particles reveals that vertical breakage occurs most often along tension fractures.

Abundance of visible mineral matter was not characteristic of these coals. Mineral deposits in the jointing fractures consisted mostly of thin sheets of kaolinite and calcite. Some of the beds contained thin layers and lenses of pyritic mineral matter and pyritized fusain.

#### PETROGRAPHY OF CASTLEMAN BASIN COALS FROM ANALYSIS OF BROKEN COAL

Systematic study of broken coal particles with a stereoscopic microscope can be used to determine quantitative proportion of physically and chemically different coal components and the nature and quantity of ash-forming mineral matter associated with coal. Adaptation of the method of analysis of ore samples by particle identification and count, commonly used in ore preparation to determine mineral composition, was followed. Work of this kind done with coal and the results obtained have been discussed in a number of publications.<sup>20</sup>

Since a petrographic survey of Castleman Basin coals by microscopic analysis of thin coal sections was not feasible, microscopic study by particle count method of selected cores believed to be representative of the five most important beds in the field was undertaken. Basically,

the technique requires careful sampling, close sizing with sieves, gravity separation of coal and noncoal material, and manual separation and counting of discrete components in the sample. The following account describes the laboratory procedure followed in the investigation, and it discusses significant results.

#### PREPARATION OF SAMPLES

Cores selected for study came from test hole 29-CB, and the location of this hole in relation to other drilling tests in the Castleman Basin field is shown on the sketch map, figure 13. Cores were from the Harlem, Lower Bakertown, Brush Creek, Upper Freeport, and Upper Kittanning beds. Except for a solid core from the Brush Creek bed, 10 to 85 percent of the cores consisted of broken coal.

Coal in each core was carefully crushed with a mortar and pestle in the first stage of preparing the sample. Frequent screening through an 8-mesh sieve during breakage helped to prevent excessive pulverization. After the coal had been crushed to pass an 8-mesh sieve, the undersize product was riffled through a standard Jones type riffle to obtain a 250-gram sample. This portion was mechanically screened with a Ro-tap mechanical shaker through Tyler standard sieves from 8- to 200-mesh. Additional 270- and 325-mesh sieves were also used, depending upon the amount of extreme fines.

Each sieve product was immersed separately in a mixed solution of carbon tetrachloride and benzene adjusted to a specific gravity of 1.55. This value was arbitrarily selected as suitable for separating coal from noncoal material to agree with usual laboratory and coal preparation practice. Size-frequency distribution of the float-and-sink products, determined from screen weights, is shown by cumulative curves in figure 14. It is of interest to note that the pattern of curves is the same for both the float and the sink of all five coals.

Sieve products of both the float and the sink were examined with a stereoscopic microscope at relatively low magnifications, the particles being illuminated with intense light. Using physical criteria such as luster, texture, fracture, shape, and hardness, determined from preliminary microscopic examination, the coal particles were classified into four categories: Anthraxylon, bright attrital coal, dull attrital coal, and fusain. Anthraxylon, bright attrital coal, and fusain were readily identified in particle form and recognized to be the same coal components as were classified in thin sections. Both anthraxylon and fusain, although quite different in composition and physical characteristics, are derived from wood tissues of plants, and both are homogeneous in appearance. Bright attrital

<sup>20</sup> Lessing, R., The Behaviour of the Constituents of Banded Bituminous Coal on Coking. Studies in the Composition of Coal: Trans. Chem. Soc., vol. 117, part 1, 1920, pp. 247-265.

Lessing, R., The Rational Preparation of Coal: Fuel in Science and Practice, vol. 26, No. 3, 1947, pp. 57-73.

McCabe, L. C., Mitchell, D. R., and Cady, G. H., Banded Ingredients of Illinois Coals and Their Heating Values as Related to Washability Characteristics: Illinois State Geol. Survey Report of Investigations 34, 1934, 44 pp.

Parke, B. C., Petrographic Analysis of Coal by the Particle Count Method: Econ. Geol., vol. 44, No. 5, 1949, pp. 376-424.

coal consists of fine shreds of anthraxylon inter-banded with equally fine layers of attrital plant remains, such as spores, humic matter, cuticles, and resinous particles. Dull attrital coal contains predominantly attrital plant remains, with considerable amounts of opaque matter. Particles of dull attrital coal examined in thin sections prove identical in physical composition with semisplint and splint coal. Differentiation of semisplint and splint coal is made on the basis of the amount of opaque matter microscopically determined in thin sections.<sup>21</sup> Since no distinction between semisplint and splint coal was practical by external particle examination, the term "dull attrital coal" was used as a

category to include both types. Difference in the physical appearance of the four constituents of the float coal, as seen with the stereoscopic microscope at 5-power magnification, is shown in the photograph of 8- by 10-mesh particles (fig. 15).

Particles of coal components from each category were isolated from the 8- by 10- and 10- by 14-mesh fractions, and ash determinations were made with samples thus obtained. These determinations revealed marked differences in the amount of ash from four ingredients, as shown in table 10.

<sup>21</sup> Parks, B. C., and O'Donnell, H. J.: Determination of Petrographic Components of Coal by Examination of Thin Sections: Am. Inst. Min. and Met. Eng. Tech. Pub. 2492, 1948, 17 pp.

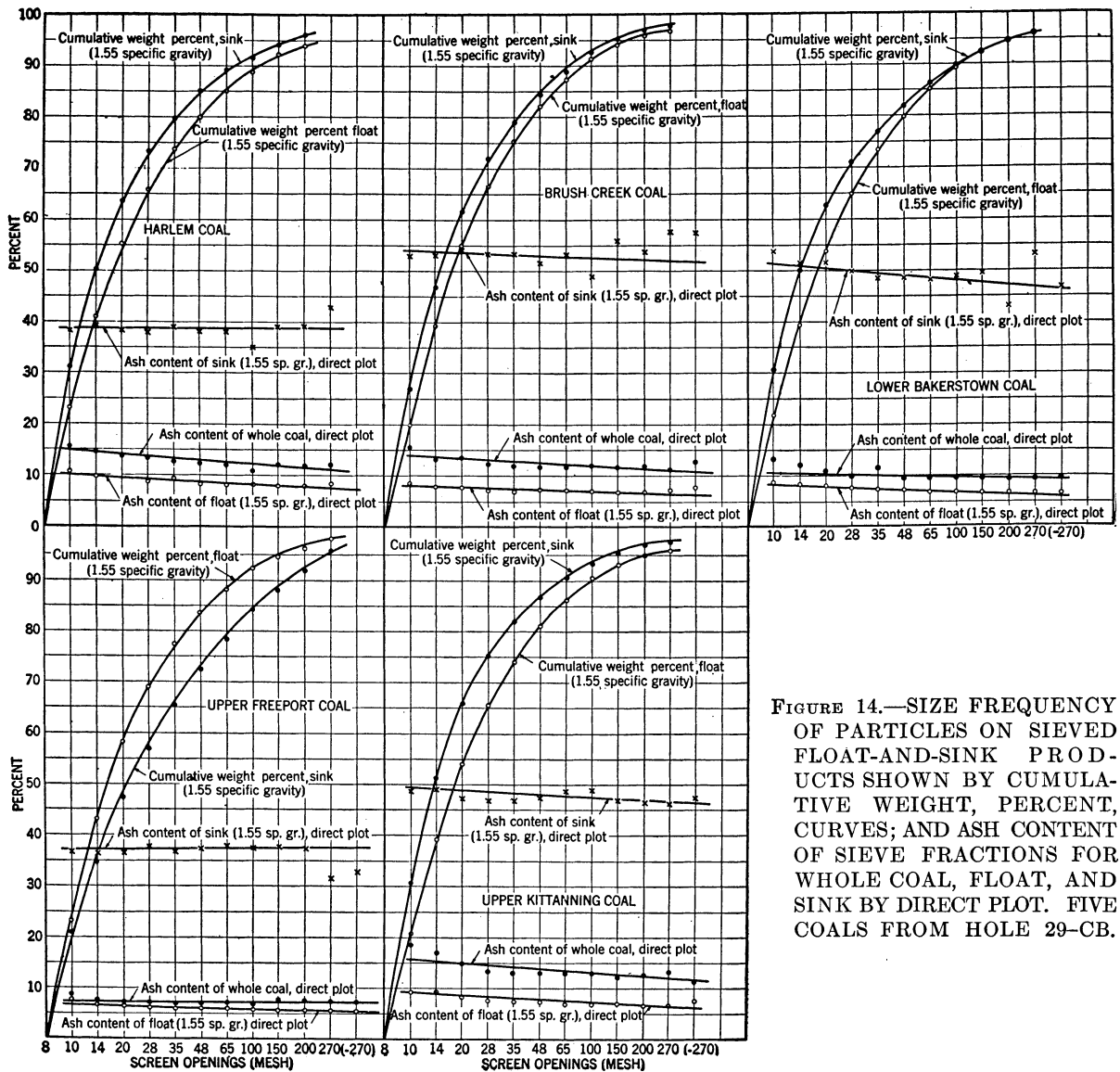


FIGURE 14.—SIZE FREQUENCY OF PARTICLES ON SIEVED FLOAT-AND-SINK PRODUCTS SHOWN BY CUMULATIVE WEIGHT, PERCENT, CURVES; AND ASH CONTENT OF SIEVE FRACTIONS FOR WHOLE COAL, FLOAT, AND SINK BY DIRECT PLOT. FIVE COALS FROM HOLE 29-CB.

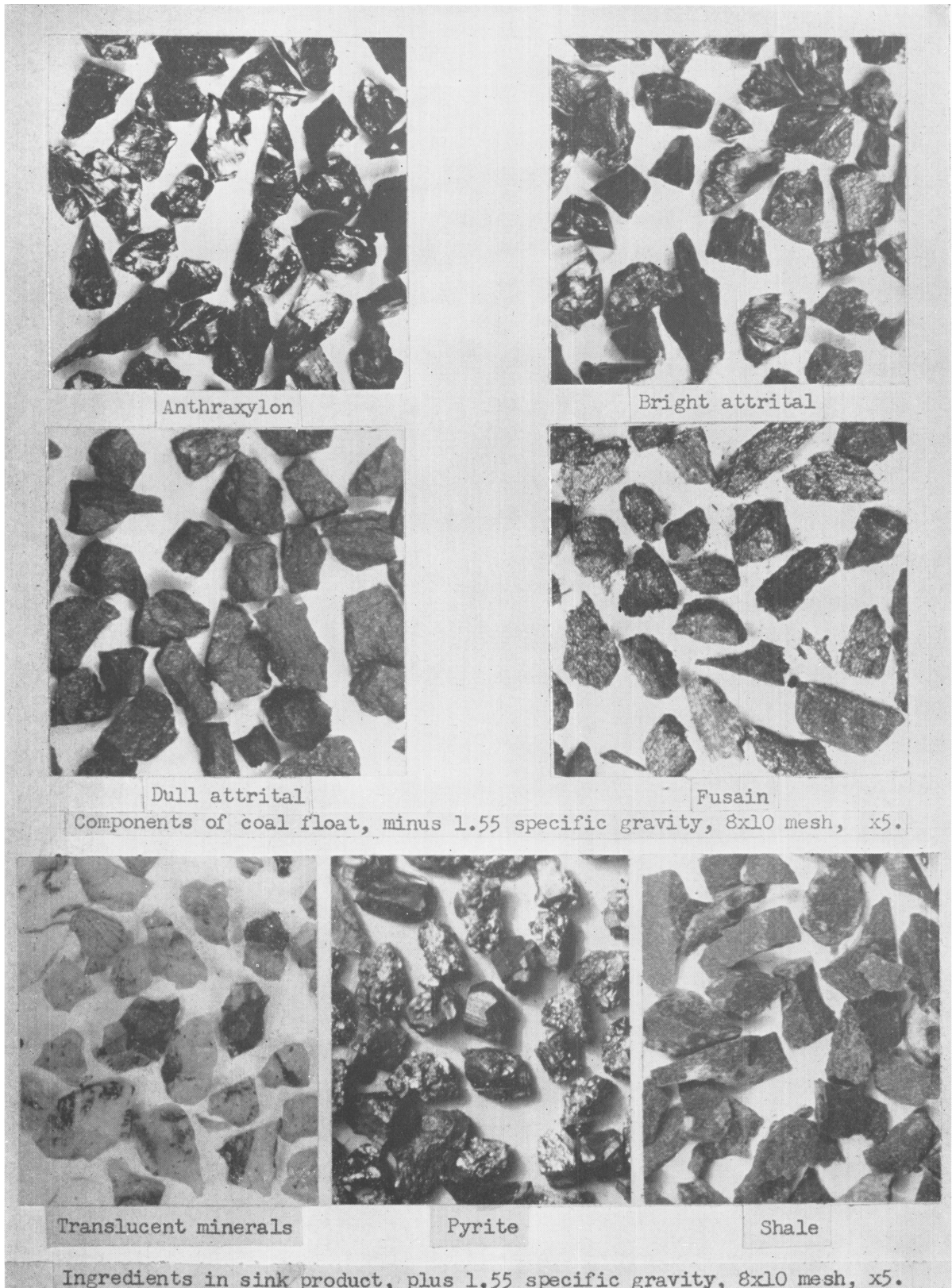


FIGURE 15.—SIZED PARTICLES OF COAL COMPONENTS AND MINERAL MATTER FROM LOWER BAKERSTOWN CORE, TEST HOLE 29-CB.





TABLE 10.—Ash content of the components of float coal, percent

Coal	Anthraxylon	Bright attrital	Dull attrital	Fusain
Harlem.....	2.6	6.1	18.4	10.6
Lower Bakerstown.....	2.9	6.3	17.3	12.1
Brush Creek.....	3.0	8.0	18.6	16.2
Upper Freeport.....	1.9	6.0	15.8	15.5
Upper Kittanning.....	2.9	8.4	18.0	5.6

Close agreement in ash of the same coal components in the various coals indicated good consistency in classification by particle identification and count. Size-frequency distribution of components in sieved coal is shown by direct plot curves in figure 16. Graphs show orderly decreases and increases correlating with decrease in size of sieve openings.

Sieve fractions of the sink product were also

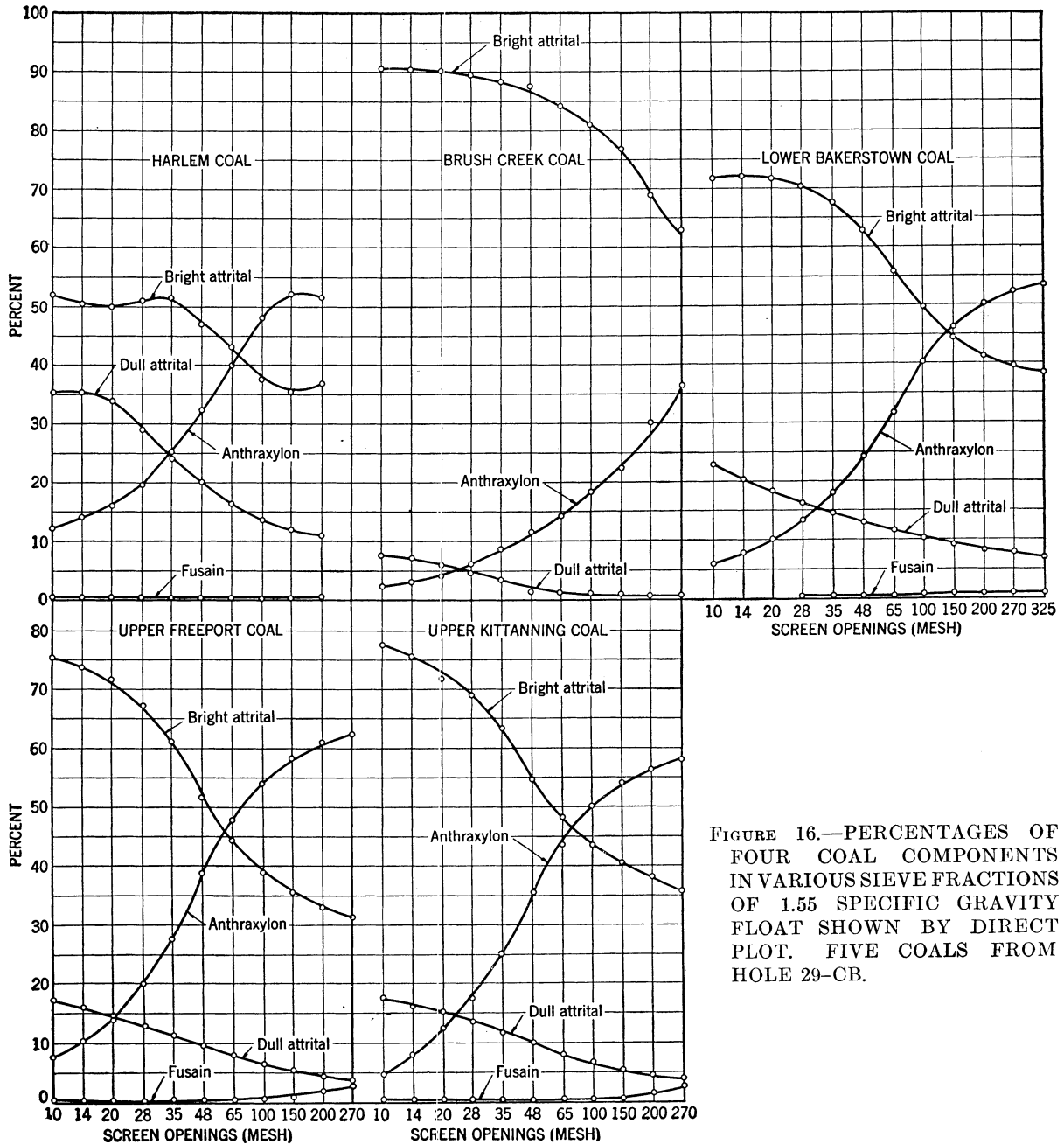


FIGURE 16.—PERCENTAGES OF FOUR COAL COMPONENTS IN VARIOUS SIEVE FRACTIONS OF 1.55 SPECIFIC GRAVITY FLOAT SHOWN BY DIRECT PLOT. FIVE COALS FROM HOLE 29-CB.

examined in the same manner as described above. The ingredients in the sink were classified into the following categories: Translucent mineral matter, mineralized fusain, bone coal and carbonaceous shale, and pyrite. Translucent mineral matter consisted chiefly of particles of kaolinite (clay mineral) and calcite (calcium carbonate). These minerals were derived mainly from mineralized fracture zones. Bone-coal and carbonaceous shale particles exhibited superficial resemblance to dull attrital coal, but ashing tests proved that they contained considerable more ash-forming mineral matter than commercial coal. Mineralized fusain consisted of fusain with pore spaces heavily impregnated with mineral matter. Pyrite consisted of individual crystals and crystal clusters of brassy iron sulfide mineral. This mineral was freed from lenses and thin layers in the coal. Ingredients found in the sink product are shown in the photograph of float-and-sink particles (fig. 15).

All screen fractions of sink were subjected to ash determinations. Direct plots of ash values determined for screen fractions of the five coal samples are shown by straight-line plots in figure 14. The graphs show about the same percentage of ash in each screen fraction, but the weighed amount varied with different coals.

Direct plots of ash in screen fractions of float coal and the whole coal (before gravity separation) are shown in figure 14. These plots show general uniformity of ash percentage for different screen fractions but slightly decreasing ash content with decrease in size of sieve openings.

## RESULTS OF ANALYSES

Data from petrographic analyses of five cores from test hole 29-CB are tabulated in figure 13. A more complete account of the petrographic composition revealed by the investigation is given in the following paragraphs.

### HARLEM COAL

The floated product of minus 1.55 specific gravity obtained from Harlem coal crushed to minus 8-mesh size amounted to 85 percent of the sample. Ash of float coal was determined to be 9.3 percent. Microscopic analysis revealed that 72 percent of the float coal consisted of anthraxylon and bright attrital coal, together having a combined ash content of 5 percent. The remaining constituents of the float consisted of 28 percent dull attrital coal, with an ash content of 18.4 percent and 0.5 percent fusain with 10.6 percent ash. The combined ash content of the dull coal and fusain was 18.2 percent.

Sink product of the Harlem coal consisted predominantly (95 percent) of bony coal and shale particles with combined ash of over 34 percent. About 4 percent mineralized fusain, having 30.6 percent ash, was present in the sink. The remainder of the ash-forming material consisted of particles of calcite and kaolinite, totaling 1 percent of sink.

Gravity separation of the Harlem coal at 1.55 specific gravity into coal and noncoal fractions resulted in lowering the ash of the coal from 13.6 (whole-coal basis) to 9.3 percent in the float product. The float coal could have been further benefited with respect to ash reduction by removal of dull attrital coal and fusain components at some lower specific gravity not experimentally determined. Ash improvement from 9.3 to 5 percent would have come about with 28 percent loss of coal.

### LOWER BAKERSTOWN COAL

Of the sample from this coal, 92.4 percent floated at 1.55 specific gravity, and the ash of the float fraction was 7.5 percent. Anthraxylon and bright attrital coal with combined ash of 5.6 percent made up 83 percent of the float. Combined ash of dull attrital coal and fusain was 17.2 percent, and these two components comprised 17 percent of the float.

In the sink product of the Lower Bakerstown coal, bony coal and shale particles were the chief ingredients, amounting to 92 percent of the sink and having an ash content of 42 percent. A hard variety of mineralized fusain with 52 percent ash made up 4 percent of the sink. An equal amount of pyrite was also present.

Gravity separation at 1.55 specific gravity of Lower Bakerstown coal into coal and noncoal fractions resulted in lowering the ash from 11.5 percent, whole-coal basis, to 7.5 percent ash in the float product. With loss of 17 percent coal, ash of float could have been reduced further to 5.6 percent by gravity separation of dull attrital and fusain components.

### BRUSH CREEK COAL

This coal, crushed to pass 8-mesh and immersed in gravity separation solution of 1.55 specific gravity, gave 88.1 percent float coal with an ash content of 7.6 percent. Microscopic analysis of the float coal showed that it contained anthraxylon and bright attrital coal components, totaling 95 percent, with a combined ash content of 7.6 percent. The sink product represented 11.9 percent of the sample and contained 53.4 percent ash. Composition of the sink was revealed by microscopic analysis to consist of 70 percent bony coal and shale particles having an ash content of 43 percent; 10 percent fusain with

ash content of 32 percent; and 20 percent translucent mineral matter.

Separation of the Brush Creek coal at 1.55 specific gravity effected a reduction of ash in the whole-coal sample from 12.2 percent to 7.6. Removal of dull attrital coal and fusain, which together constituted only 5 percent of the float, would not have lowered the ash materially. The sink product from the sample contained an unusually large amount of translucent mineral matter. It was noted, when the core sample was examined before crushing, that thin mineral facings on fracture surfaces were characteristic of this coal. Most of this mineral substance was freed in crushing and thrown down in the sink product.

UPPER FREEPORT COAL

The core from this coal bed contained the least amount of noncoal material of the five beds studied. More than 97 percent of the minus 8-mesh crushed coal floated on a 1.55-specific-gravity solution. The ash of the float coal was 6.7 percent. Anthraxylon and bright attrital components, with combined ash of 5 percent, made up 86 percent of the float coal. The dull attrital and fusain components, combined with 15.7 percent ash, composed the remaining 14 percent.

Mineralized fusain with 32 percent ash was an important element, equal to 11 percent of the sink product. However, 89 percent of the sink was bone coal and shale, with 30.6 percent ash. Petrographic study of Upper Freeport coal showed that no large reduction of ash could be attained by float-and-sink separation.

UPPER KITTANNING COAL

Eighty-three percent of the crushed sample was recovered in the 1.55-specific-gravity float, and the ash content was 8.3 percent. Float coal contained 86 percent anthraxylon and bright attrital coal, which, combined, had 7.1 percent ash. The remaining 14 percent of float consisted of dull attrital coal and fusain, with 17.5 percent ash.

The sink product (17 percent of sample), contained 48.3 percent ash. Ten percent of the sink was mineralized fusain, virtually all pyritic. More than 89 percent of the sink consisted of bone coal and shale, with 44.8 percent ash.

From the standpoint of relative quantities of float-and-sink products and ash content of the

different components, this was the "dirtiest" of the five coals tested. Separation at 1.55 specific gravity resulted in an ash reduction from 14.7 percent to 8.3 percent. A further ash reduction from 8.3 percent to 7.1 percent could have been attained by gravity separation, with a loss of 13.7 percent coal. The high sulfur content of the whole coal (5.3 percent) no doubt was considerably reduced in the float coal by removal of pyritic fusain, which amounted to 1.7 percent of the whole coal sample.

SUMMARY

Detailed petrographic study of five coal cores from hole 29-CB revealed that ash could be reduced by crushing coal to minus 8-mesh size and separating at 1.55 specific gravity. The percentage reduction for each coal is shown in table 11.

TABLE 11.—Ash content of whole coal and 1.55-specific-gravity float of cores from test hole 29-CB, percent

Coal	Ash of whole coal	Ash of float 1.55 specific gravity	Ash reduction
Harlem.....	13.6	9.3	31.6
Lower Bakerstown.....	11.5	7.5	34.8
Brush Creek.....	12.2	7.6	37.7
Upper Freeport.....	8.2	6.7	18.2
Upper Kittanning.....	14.7	8.3	43.5

The float coal consisted predominantly of two components of low ash content: Anthraxylon with less than 3 percent ash, and bright attrital coal with less than 8.4 percent ash, associated with lesser amounts of the two relatively high ash components, dull attrital coal, and fusain. Further ash reduction of float coal probably could be attained through elimination of dull attrital coal and fusain by gravity separation at some specific gravity lower than 1.55, but this gain would be offset by an appreciable sacrifice of combustible material. The sink products were revealed to consist of crystals of the common minerals: Kaolinite, calcite, and pyrite, associated with particles of carbonaceous shale, bone coal, and mineralized fusain. Presence of much pyrite and pyritic fusain in the sink suggested that the sulfur content, which for two of the coals was rather high, may have been materially reduced by the float-and-sink separation.

## PART III.—ANALYSES OF DRILL-CORE SAMPLES

By

Roy F. Abernethy and William H. Ode

The analyses of drill-core samples given in the appendix were obtained by standard procedures.<sup>22</sup> The percentages of moisture reported are not true values because of the method of sampling. The percentage of bed moisture should be 1.5 to 4.0 percent, as indicated by mine samples from other surveys in this field. The dry, ash-free volatile matter averages 24 percent for the various beds, with variations for individual analyses. The ash and sulfur percentages are erratic. Considerable variations are found in the same bed in the same vicinity. The weighted average ash of all samples analyzed on the moisture-free basis ranges from 9.9 percent for the Upper Freeport to 22.7 percent for the Upper Bakerstown bed. The weighted average sulfur on the same basis ranges from 1.5 percent for the Mercer bed to 4.3 percent for the Mount Savage bed. The softening temperatures of ash for the individual samples vary from 2,000° to 2,900° F. The averages for the Harlem, Upper Bakerstown, Lower Bakerstown, Brush Creek, and Upper Kittanning beds vary between 2,100° to 2,300° F. The Upper Freeport bed with a field average of 2,600° F. is the highest and the Middle Kittanning and Mount Savage beds slightly lower.

The coal substance on the moisture-, ash-, and sulfur-free basis is relatively constant, as shown by ultimate analysis and British thermal units.

The coal, classified by rank, falls into the low- and medium-volatile groups.

Calculated composite analyses for beds 14 inches or more thick are given in table 12. For example, the Harlem bed was found to be 14 inches or more thick in 16 drill holes, and the total length of core represented by analysis was 277 inches.

Agglutinating-value tests were made to determine the probable coking properties of the drill-core samples, as the agglutinating value is an approximate measure of the quantity and quality of the fusible material in coal that becomes plastic on heating in the absence of

air, which property is necessary for coals used for coke manufacture.

Briefly, the test procedure for determination of agglutinating values by the Bureau of Mines method<sup>23</sup> consists in mixing 1.250 grams of finely pulverized coal with 18.750 grams of sized silicon carbide (15:1 ratio of silicon carbide to coal), compressing the mixture in a cylindrical crucible, and carbonizing for 20 minutes at 950° C. The resulting carbonized button is crushed in a compression testing machine; and the crushing strength, expressed in kilograms, is reported as the agglutinating value.

The range of agglutinating values of the coals from the beds examined is as follows:

Coal bed:	Agglutinating value
Barton.....	9.0- 9.4
Federal Hill.....	10.0
Harlem.....	7.4-10.0
Upper Bakerstown.....	8.8-10.4
Lower Bakerstown.....	6.0- 9.5
Brush Creek.....	8.5-11.7
Upper Freeport Rider.....	9.3- 9.8
Upper Freeport.....	7.9-10.1
Upper Kittanning.....	4.2-10.0
Middle Kittanning.....	4.1- 9.8
Lower Kittanning and Mount Savage.....	5.3- 9.0
Mercer.....	3.3- 5.3

The four core samples collected from the Mercer bed showed relatively low agglutinating values, ranging from 3.3 to 5.3 kilograms. As shown in table 13, some of the samples from the Upper Kittanning, Middle Kittanning, and Lower Kittanning coal beds had relatively low agglutinating values, which probably are accounted for by their high ash content. With these exceptions, all of the core samples had agglutinating values of 6 or considerably higher. Generally coals of the Appalachian region with agglutinating values of 6 or more are suitable for coke making without blending with other coals, provided their ash and sulfur content and expansion properties are satisfactory. Table 13 shows that many of the coals are much too high in ash and sulfur content to be suitable for coke making unless their quality could be improved by coal-cleaning methods.

<sup>22</sup> Stanton, F. M., and Fieldner, A. C., Methods of Analyzing Coal and Coke: Bureau of Mines Tech. Paper 8, 1913, 42 pp. (rev. in 1938 by F. M. Stanton, A. C. Fieldner, and W. A. Selvig, 59 pp.)

<sup>23</sup> American Society for Testing Materials, Proposed Method of Test for Agglutinating Value of Coal: A. S. T. M. Standards on Coal and Coke, October 1949, pp. 725-729.

TABLE 12.—*Calculated weighted composite analyses by beds*<sup>1</sup>

Bed	Drill-hole numbers	Total length of cores in samples, inches	Dry				Moisture- and ash-free B. t. u.
			Volatile matter	Fixed carbon	Ash	Sulfur	
Harlem-----	2, 3, 4, 8, 9, 10, 16, 17, 18, 22, 27, 29, 31, 36, 38, 39.	277	23.8	62.3	13.9	2.7	15,490
Upper Bakerstown----	17, 22, 24, 26, 38-----	116	20.1	57.2	22.7	3.5	15,270
Lower Bakerstown----	21, 22, 24, 25, 26, 27, 29, 31, 32, 34, 35, 36, 37, 38, 39, 40.	728	20.4	67.4	12.2	3.9	15,430
Brush Creek-----	5, 8, 13, 14, 15, 16, 17, 21, 22, 24, 26, 27, 29, 31, 33, 34, 35, 36, 39.	338	21.7	65.9	12.4	3.0	15,450
Upper Freeport-----	2, 4, 6, 8, 9, 10, 12, 13, 15, 16, 17, 19, 21, 22, 24, 25, 26, 27, 29, 31, 32, 34, 35, 36, 37, 38, 39, 40.	842	19.9	70.2	9.9	1.6	15,600
Upper Kittanning----	2, 5, 7, 9, 13, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 31, 32, 34, 37, 38, 39.	625	21.3	64.9	13.8	3.8	15,490
Middle Kittanning----	2, 4, 5, 9, 10, 11, 12, 20, 23, 28, 32, 38, 40.	378	19.5	64.1	16.4	2.8	15,460
Lower Kittanning----	6, 12-----	37	23.5	58.4	18.1	3.5	15,320
Mount Savage-----	1, 3, 5, 6, 7, 21-----	119	21.4	61.1	17.5	4.3	15,290
Mercer-----	7, 16, 20-----	66	20.7	65.4	13.9	1.5	15,400

<sup>1</sup> See appendix for detailed analyses.

## PART IV.—STRATIGRAPHY OF CASTLEMAN COAL BASIN

By Karl M. Waage

### INTRODUCTION

The geologic studies in the Castleman Basin on which this report is based were conducted jointly by the Federal Geological Survey and the Maryland Department of Geology, Mines, and Water Resources, with the primary objective of studying the clay resources of the area. A preliminary study of the geology and clay resources was made intermittently by the writer during the period July 1945 to July 1946. He was assisted by C. N. Bozion of the Federal Geological Survey. In May 1947, the Federal Bureau of Mines began a program of core drilling as an aid to the further development of the minable coal beds of the basin, and the writer was assigned by the Geological Survey to geologic studies in furtherance of the objectives of this program. In this work, the writer was assisted by Herbert P. Bangs, Jr., a field assistant of the Federal Geological Survey and, during the summer of 1947, by Thomas W. Amsden of the Maryland Geological Survey.

Previous descriptions of the geology of the Maryland coal measures that include information on the Castleman coal basin have been published in reports of both the Federal and State Geological Surveys. The earliest reports with any appreciable geologic information on the geology and mineral resources of the area are those by G. C. Martin in 1902<sup>24</sup> and 1908.<sup>25</sup>

Information on the coal beds and their relationships also was given in the Maryland coal report for 1905.<sup>26</sup> In all three of these early reports, errors were made in the correlation of coal beds; as a result, the stratigraphy is inaccurate. In 1922, C. K. Swartz<sup>27</sup> corrected the errors in coal-bed correlation and established a standard section for the Maryland coal measures. This work includes some specific information on the stratigraphic section in the Castleman Basin.

The holes drilled by the Bureau of Mines and the collateral geologic studies have furnished

data for a far more detailed study of the stratigraphy of the Castleman Basin than has hitherto been possible. The pertinent results of this study are summarized here; more detailed accounts will appear in "Refractory Clays of the Maryland Coal Measures," a publication of the Maryland Department of Geology, Mines, and Water Resources.

### GENERAL GEOLOGIC FEATURES

The Castleman coal basin is in Garrett County, the westernmost county in Maryland. It is part of a syncline that begins in the west-central part of the county in the southwest corner of the McHenry quadrangle at Deep Creek Lake and plunges northeastward into Pennsylvania. Prominent bounding ridges of resistant sandstones in the Pennsylvanian Pottsville formation make the basin a topographic, as well as a structural, unit. As the syncline broadens northeastward from the lake, these ridges—Meadow Mountain on the southeast and Negro Mountain on the northwest—gradually separate. At the Pennsylvania State line, 16 miles northeast of Deep Creek Lake, the ridge crests are 7.5 miles apart. Coal-bearing beds of the Allegheny formation underlie the backslopes of the ridges. The hilly central portion of the basin is underlain by the Conemaugh formation. The youngest strata in the syncline in Maryland are in the upper 200 feet of the Conemaugh along the State line.

The drilling program explored a coal-measure section extending from the Barton coal, approximately in the middle of the Conemaugh formation, to the Mercer coal, in the upper part of the Pottsville formation. To furnish stratigraphic control, two of the holes were continued through the Pottsville formation and bottomed in the Mauch Chunk shale of the Mississippian series. The subdivisions and the terms applied to the principal units in this section are shown in figure 17, a generalized columnar section based on the 40 Bureau of Mines drill holes and on additional drill-hole records from other sources. Strata above the Barton coal, comprising the upper member of the Conemaugh formation, were not studied.

<sup>24</sup> Martin, G. C., and others, Garrett County; Maryland Geol. Survey, 1902, pp. 55-229.

<sup>25</sup> U. S. Geological Survey, Geologic Atlas, Accident-Grantsville folio (No. 160), 1908.

<sup>26</sup> Clark, W. B., and others, Report on the Coals of Maryland: Maryland Geol. Survey, 1905, pp. 241-315, 452-477.

<sup>27</sup> Swartz, C. K., and Baker, W. A., Jr., Second Report on the Coals of Maryland: Maryland Geol. Survey, 1922, pp. 35-120.

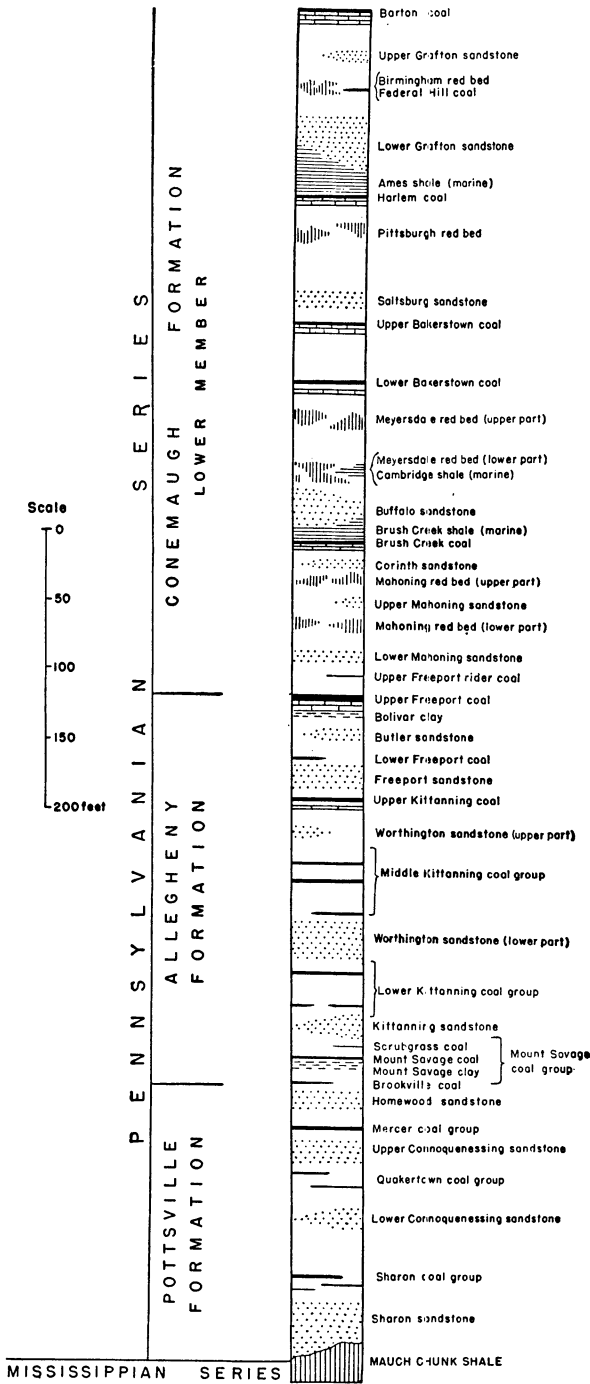


FIGURE 17.—GENERALIZED COLUMNAR SECTION FOR CASTLEMAN BASIN.

The stratigraphic section between the base of the Pottsville formation and the Barton coal consists of a sequence of relatively thin alternating units of sandstone, siltstone, shale, coal, clay, and limestone, totaling about 1,000 feet in thickness. The section is characterized by a

gradual change upward from highly irregular, predominantly sandy strata with discontinuous coal beds that prevail in the Pottsville and the lower three-fifths of the Allegheny, to regular, predominantly argillaceous strata with continuous coal beds, that characterize the upper part of the Allegheny and the overlying lower member of the Conemaugh formation. The lower member of the Conemaugh formation also has a greater diversity of lithologic types, including marine-shale units and red clay and shale units, neither of which is present in the Pottsville and Allegheny formations below.

Coal beds in the upper part of the Allegheny and lower member of the Conemaugh formation are fairly persistent and can be traced and correlated with little difficulty. In the Pottsville formation and lower part of the Allegheny formation, the coal beds, although more numerous, are generally discontinuous and vary considerably from one area to another. These nonpersistent beds are clustered or grouped within fairly well defined intervals that are separated from one another by arenaceous beds of varying thickness. The term "coal group" is used for variable units of this type that commonly contain two or more discontinuous coal beds. Coal groups are useful units in correlating and classifying strata in the lower part of the section, where the erratic distribution of rock types makes it difficult and at many places impossible to trace individual coal beds.

POTTSVILLE FORMATION

The Pottsville formation crops out on the crests and outer faces of the ridges that bound the Castleman Basin. Sandstone, much of it conglomeratic, is the predominant lithologic type and, together with siltstone, comprises an average of about 70 percent of the thickness of the formation. Measurements from drill-hole sections show that the Pottsville averages about 200 feet in thickness. A slight increase in thickness to the southwest is indicated, but the total increment probably does not exceed 80 feet.

The basal contact of the Pottsville formation with the red shales of the Mississippian Mauch Chunk shale is clear-cut in most places. The contact of the Pottsville formation with the overlying Allegheny formation is the base of the Brookville coal bed, the basal bed in the Mount Savage coal group. The Brookville coal, a thin and discontinuous bed, is present only in part of the Castleman Basin, and even its horizon is completely obliterated in many places by the coalescence of sandstones above and below it.

Pottsville strata are highly variable within short distances, but a fairly definite sequence of alternating sandstone units and coal-bearing

units can be recognized. This sequence includes (from the base upward) the Sharon sandstone, Sharon coal group, Lower Connoquenessing sandstone, Quakertown coal group, Upper Connoquenessing sandstone, Mercer coal group, and Homewood sandstone. (See fig. 17.) The sequence is similar in its gross characteristics to the section of the Pottsville formation in southwestern Pennsylvania, and essentially the same terminology is applied.

No coal beds of commercial value are present in the Pottsville formation of the Castleman Basin. Thin beds of bony coal occur locally in the Sharon and Quakertown coal groups. The Mercer coal is as much as 4 feet thick in some parts of the basin; and, in the past, one or two openings for local fuel were made in it along the south half of Negro Mountain. The high proportion of bone and shale in the bed renders it of little value, even for local use.

### ALLEGHENY FORMATION

The principal coal-bearing formation of the Castleman Basin is the Allegheny. It includes the strata lying between the base of the non-persistent Brookville coal and the top of the persistent Upper Freeport coal. The average thickness of the Allegheny penetrated by the drills was 280 feet, and individual thickness ranges from 245 to 310 feet.

#### MOUNT SAVAGE COAL GROUP

The Mount Savage coal group is a variable group of three coal beds comprising the lower 20 to 40 feet of the Allegheny formation. All three of the coal beds—in ascending order, Brookville, Mount Savage (equivalent to the Clarion coal of Pennsylvania), and Scrubgrass coals—are locally present in the Castleman Basin but seldom occur together in the same section. The Mount Savage bed is usually the thickest and most persistent of the three but rarely exceeds 30 inches in thickness. It has been strip-mined, together with the highly refractory Mount Savage clay that locally underlies it, in the Tarkiln Run area on Negro Mountain, but it does not in itself have commercial value.

#### KITTANNING SANDSTONE AND LOWER KITTANNING COAL GROUP

A variable unit, the Kittanning sandstone, occurs above the Mount Savage coal group and separates it from the overlying Lower Kittanning coal group. The sandstone ranges from a few feet of siltstone with interbeds of fine-grained sandstone to as much as 60 feet of massive quartzitic sandstone. The Lower Kittanning coal group consists of 10 to 60 feet of dominantly argillaceous strata lying between

the Kittanning sandstone and the lower part of the Worthington sandstone above. The top of the Lower Kittanning coal group lies between 180 and 220 feet below the Upper Freeport coal. In both character and thickness, the coal group is inconstant; but, in many places in the basin, it consists of two coal beds separated by 10 to 30 feet of strata that include a bed of soft clay and, in some sections, a thin sandstone unit. Lower Kittanning coal beds rarely exceed 24 inches in thickness and are not known to have been used, even for local fuel, in the Castleman Basin.

#### WORTHINGTON SANDSTONE AND MIDDLE KITTANNING COAL GROUP

The name "Worthington sandstone"<sup>28</sup> is applied to sandstones between the Lower Kittanning coal and the Upper Kittanning coal in western Pennsylvania, and it is used in the same sense in Maryland. The Middle Kittanning coal group is usually present in the middle part of this interval and divides the Worthington sandstone into lower and upper parts that distinctly separate the Middle Kittanning coal group from the Lower Kittanning coal group and the Upper Kittanning coal, respectively. In the Castleman Basin, the top of the Middle Kittanning coal group lies 115 to 135 feet below the Upper Freeport coal and commonly consists of 40 to 60 feet of strata. Throughout much of the basin, this coal group is characterized by a relatively regular sequence of three coal beds. Locally, in the north half of the drilled area west of Salt Block Mountain, the coal group thickens to as much as 90 feet and contains as many as six individual coal beds.

Where the characteristic sequence of three coal beds or benches is present, the basal bed is the thinnest of the three. The only place this bed is known to have been worked is at the east end of the strip mine on the Stone House property along U. S. Highway 40 on Meadow Mountain, where relatively little coal was taken. Both the middle and upper coal beds have been mined along Meadow Mountain. The middle bed is thicker south of the New Germany road and was mined in strip and underground workings by the Burnwell Coal Co. about a mile south of the road. North of the New Germany road, the middle coal bed of the group thins as the upper coal bed increases in thickness. In this area, the upper coal bed has been worked in several underground and surface operations between the New Germany road and U. S. Highway 40. The principal feature that distinguishes the upper and middle coal beds of the Middle Kittanning coal group along Meadow Mountain is the presence, beneath the

<sup>28</sup> Wilmarth, Grace, *Lexicon of Geologic Names of the United States*: U. S. Geol. Survey Bull. 896, 1938, p. 2374.



middle coal, of a thick, persistent bed of soft clay locally of semirefractory grade. The upper coal has only a thin, silty underclay.

#### UPPER KITTANNING COAL BED

The Upper Kittanning coal lies 60 to 100 feet below the Upper Freeport coal, the interval increasing with the thickness of its included sandstones. It is a persistent bed and was present in 31 of 38 drill holes that penetrated the horizon. In at least half of the holes that had no coal, the bed had been removed by channeling before deposition of the overlying Freeport sandstone.

#### LOWER FREEPORT COAL BED AND ASSOCIATED ROCKS

In the interval between the Upper Kittanning and Upper Freeport coals, the horizon of the Lower Freeport coal is marked throughout much of the drilled area by an underclay that locally contains freshwater limestone underlain by thin claystone. Along the east side of the basin, the coal itself is intermittently present, but it is bony and less than 20 inches thick. The Lower Freeport coal occurs as much as 70 feet below the Upper Freeport, where the intervening Butler sandstone is thick, but elsewhere the interval between these coal beds averages about 40 feet.

#### UPPER FREEPORT COAL BED

The Upper Freeport coal is the most persistent coal bed in the Allegheny formation; it was present in 32 of the 39 drill holes that penetrated the horizon. Throughout most of the Castleman Basin, the Upper Freeport coal has a thick underclay zone consisting of an upper part of freshwater argillaceous limestone and a lower part of clay and claystone, the Bolivar clay, that locally contains small bodies of refractory flint clay.

#### LOWER MEMBER OF CONEMAUGH FORMATION

The beds between the top of the Upper Freeport coal and the top of the Barton coal comprise the lower member of the Conemaugh formation. In the Castleman Basin, this interval has an average thickness of about 480 feet. A well-defined succession of key beds, including persistent coal beds, fossiliferous marine shales, and beds of red clay and shale, is present throughout. The coal beds, with the single exception of the Lower Bakerstown coal about the middle of the member, are too thin to have commercial value, although several are used as sources of local fuel.

#### UPPER FREEPORT RIDER COAL

A coal, known as the Upper Freeport rider, is commonly present 5 to 25 feet above the top of the Upper Freeport coal and thus in the basal part of the lower member of the Conemaugh formation.

#### MAHONING COAL HORIZON AND ASSOCIATED ROCKS

The Mahoning coal is not present in the Castleman Basin, but its horizon is marked by a clay bed locally associated with the lower of two splits of the Mahoning redbed. (See fig. 17.) In the Georges Creek coal basin, this clay (the Thornton bed) can be traced into the underclay of the Mahoning coal.

#### BRUSH CREEK COAL BED AND ASSOCIATED ROCKS

The persistent Brush Creek coal, 100 to 130 feet above the Upper Freeport coal, was encountered in 35 of the 38 drill holes that penetrated the horizon. It is in most places overlain by the Brush Creek shale, the lowest marine shale in the Maryland coal measures. In the three holes in which the Brush Creek coal was absent, it has been cut out by channeling preceding deposition of the Buffalo sandstone, which, in most places in the Castleman Basin, overlies the Brush Creek shale. The Brush Creek is a thin coal that rarely exceeds 20 inches in thickness.

#### CAMBRIDGE SHALE AND ASSOCIATED ROCKS

Above the Buffalo sandstone, the section includes the upper and lower splits of the Meyersdale redbed, which are separated by a thin siltstone. In the south half of the drilled area, this sequence shows little variation; but in the north half, the lower split of the redbed grades rapidly into a small, but fairly complete, coal-bearing unit consisting of a shale, an underclay, and, rarely, a coal bed an inch or two thick. The Cambridge shale contains marine fossils and is the equivalent of the Cambridge limestone of southwestern Pennsylvania and Ohio. The coal which is of no importance commercially is nameless.

#### LOWER BAKERSTOWN COAL BED

About 128 feet, on the average, above the Brush Creek coal is a persistent bed of coal, the Lower Bakerstown coal bed, that was present in every drill hole that cut the horizon. This bed is the only coal of the Conemaugh formation mined commercially in the Castleman Basin. It is, however, relatively thin, averaging about 30 inches in the areas where it is best-developed.

#### UPPER BAKERSTOWN COAL BED AND ASSOCIATED ROCKS

Approximately 40 feet above the Lower Bakerstown coal bed throughout the Castleman Basin is a characteristically bony coal of little value—the Upper Bakerstown coal bed. It varies considerably in thickness, locally being as much as 3 or 4 feet. The Saltsburg sandstone occurs above the coal and is separated from it by a few feet of shale. Above the Saltsburg sandstone is a sequence of argillaceous beds that includes the Pittsburgh redbed.

#### HARLEM COAL BED AND ASSOCIATED ROCKS

The Harlem coal occurs 75 to 85 feet above the Upper Bakerstown. It is similar to the Brush Creek bed in being persistent and thin and in having a thick marine shale (the Ames shale) above it. The Harlem coal can be, and often has been, mistaken for the Brush Creek coal. The persistent Lower Grafton sandstone that overlies the Ames shale is similar to, though generally thicker than, the Buffalo sandstone and adds to the resemblance between the two sections. The Harlem coal is somewhat thicker than the Brush Creek and averages about 18 or 20 inches in thickness. It has been used locally as fuel coal.

#### FEDERAL HILL COAL BED AND ASSOCIATED ROCKS

Where the Lower Grafton sandstone is well-developed, the thin Federal Hill coal bed, or its horizon, is present locally a short distance above it. This coal bed lies 65 to 75 feet above the Harlem. It is nonpersistent, and its underclay and roof shale grade laterally into the Birmingham redbed at several places in the drilled area.

#### BARTON COAL BED

In the Castleman Basin the Barton coal is a relatively thin bed, in few places exceeding 2 feet in thickness, that lies 120 to 130 feet above the Harlem. Coal was present in 11 of the 13 holes that cut the horizon; and, in the other two holes, the position of the bed was marked by the argillaceous limestone that commonly underlies it.

#### UPPER MEMBER OF CONEMAUGH FORMATION

Little information is available on the upper member of the Conemaugh formation. Only a few of the drill holes penetrated strata from this part of the formation, and no surface study was made of coal beds above the Barton coal. The presence of the Pittsburgh coal, which marks the base of the overlying Monongahela

formation, within a quarter of a mile north of the Pennsylvania State line, indicates that most of the upper member of the Conemaugh formation is present in the north end of the basin. No coal beds in the upper member have commercial value in the Castleman Basin, but several, including the Wellersburg coal, Upper Clarysville coal, and Lower Hoffman coal, have been opened for local fuel.

#### CORRELATION OF COAL BEDS

Two charts are presented to show the correlation of coal beds in the 40 holes drilled in the Castleman Basin. Figure 18 includes the 20 holes in the south half of the drilled area, and figure 19, the 20 holes in the north half. Only the more outstanding lithologic features are indicated on the chart, and the thicknesses shown for coal beds are approximate. Many of the hole-to-hole correlations in the complex lower part of the Allegheny formation are based on details of the lithology too small to be included on the charts.

#### COMPARISON WITH GEORGES CREEK BASIN

The coal-measures section of the Castleman Basin differs in several important respects from the equivalent section in the Georges Creek Basin, the principal coal-producing basin in Maryland. The axis of the Georges Creek syncline lies 12 to 14 miles east of the axis of the Castleman syncline and is only 6 miles across the Deer Park anticline between the adjacent bounding ridges of the two structures. Within this relatively short distance, appreciable changes are noticeable in all three formations described.

The Pottsville formation in the Castleman Basin is relatively uniform in thickness in contrast to the pronounced southwestward thickening that takes place in the Georges Creek Basin. The Castleman section of the Pottsville formation also shows a greater development of coal beds and a more uniform sequence of strata.

The changes observed in the Allegheny and Conemaugh formations are common to both. Briefly, these changes are a slight but pronounced decrease in the thickness of both formations westward from the Georges Creek Basin to the Castleman Basin, an accompanying increase in the regularity of the beds, and a pronounced decrease in the thickness of the coal beds. The last change, as it affects the Allegheny formation, is noticeable only in the thickness of individual beds, such as the Upper Kitting and Upper Freeport coals. Actually, there are more coal beds in the Allegheny for-

mation of the Castleman Basin than in that of the Georges Creek Basin, but none attains local thickness comparable to those in the Georges Creek Basin. Of the coal beds in the lower member of the Conemaugh formation, the Mahoning lenses out completely; the Lower Bakerstown, Upper Bakerstown, and Barton beds are all thinned appreciably; and the

Brush Creek and Harlem beds, which have no commercial importance in either basin, remain about the same. Partly because of this westward thinning of the principal producing coal beds and partly because the basin is too shallow to include the valuable coal beds at the base of the Monongahela formation, there is a paucity of commercial coal in the Castleman Basin.

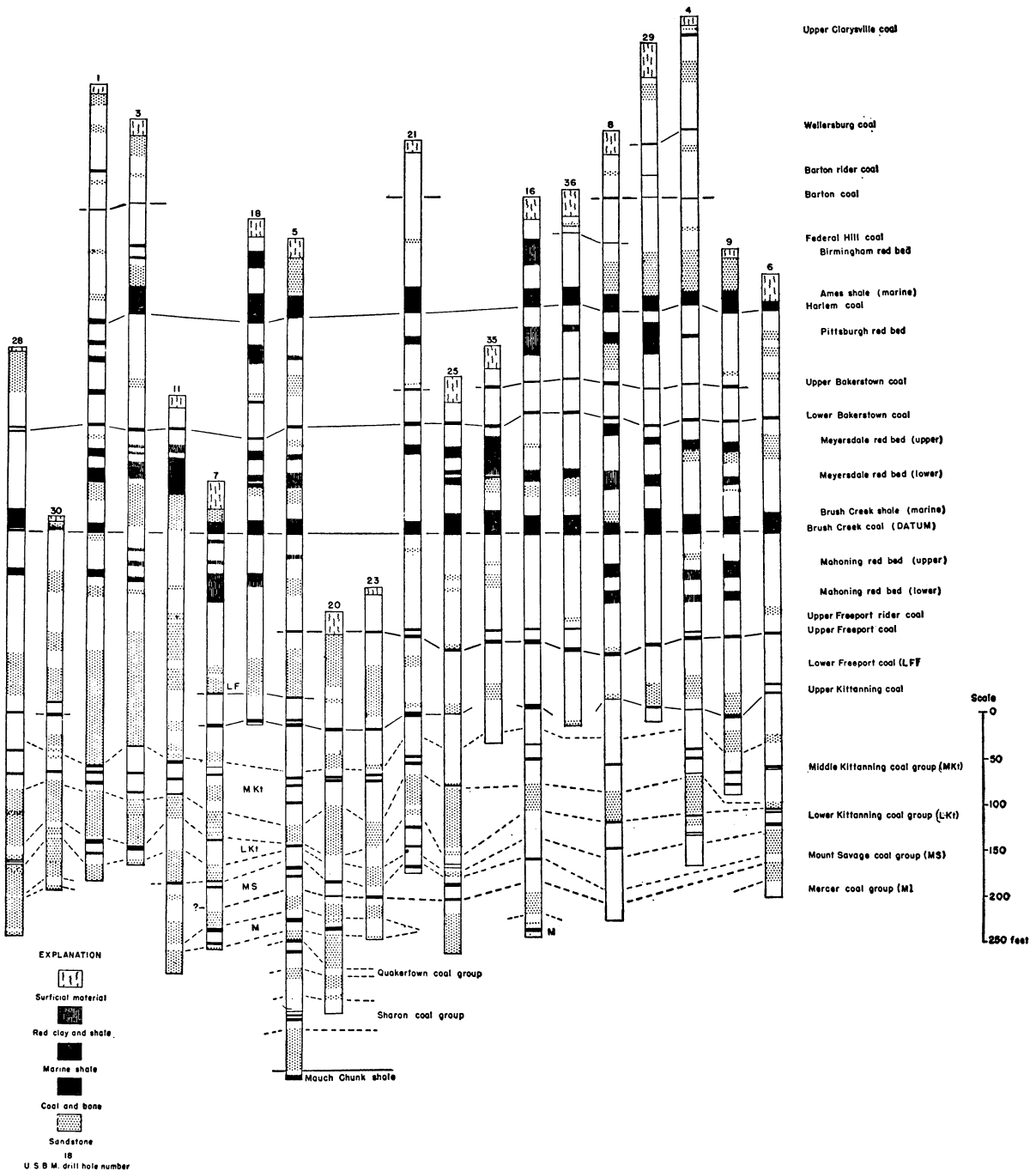


FIGURE 18.—DRILL-HOLE CORRELATION CHART FOR SOUTH HALF OF CASTLEMAN BASIN DRILLING AREA.

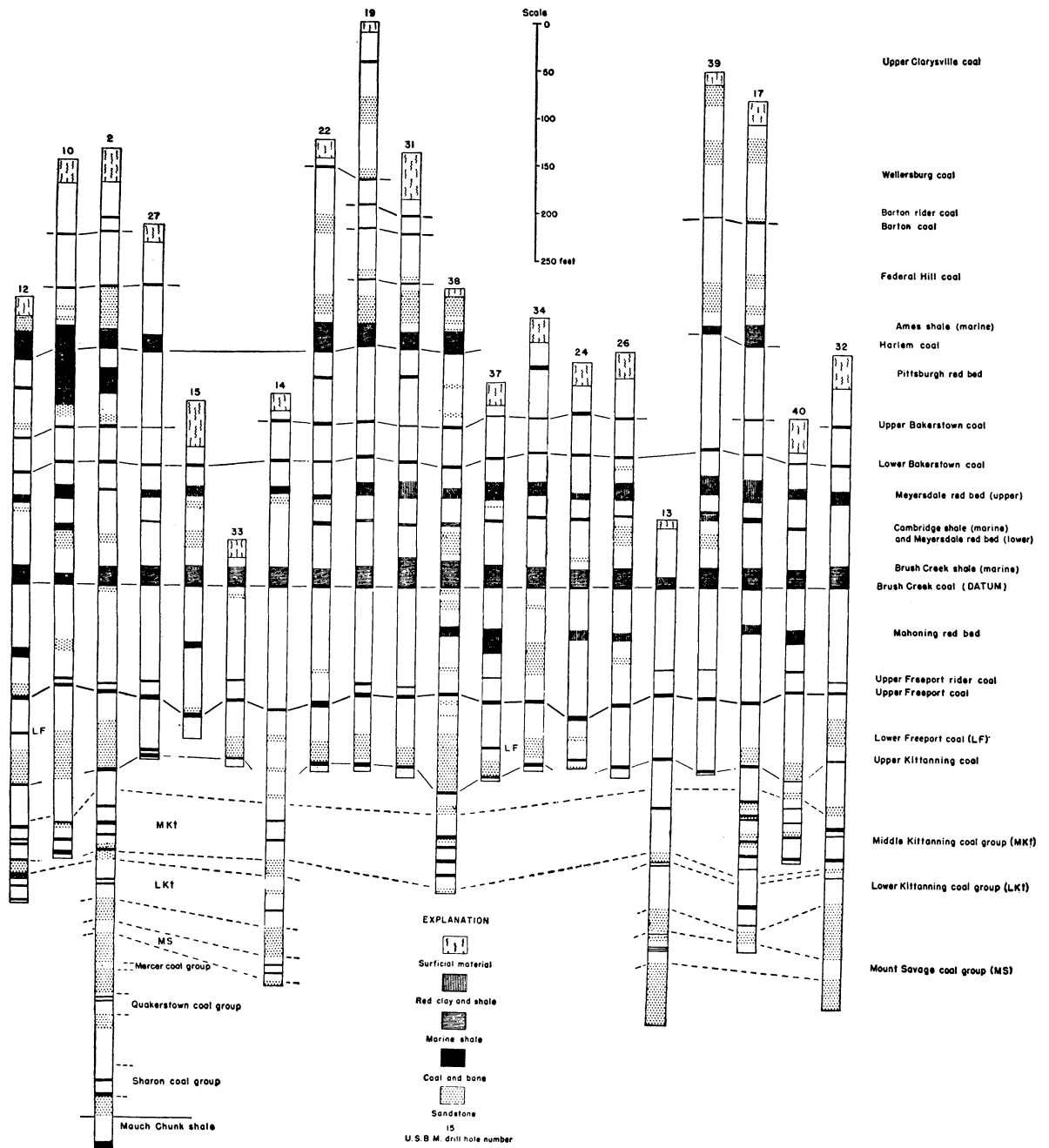


FIGURE 19.—DRILL-HOLE CORRELATION CHART FOR NORTH HALF OF CASTLEMAN BASIN DRILLING AREA.

## APPENDIX

The logs of drill holes in the appendix show, in the column headed "Remarks," the names, elevations of the bottom of coal beds penetrated, and the laboratory numbers of the coal cores analyzed.

The appendix also contains the analyses of the coal cores, which are grouped by coal beds. The column headed "Drill hole" shows the number of the drill hole and depth below the surface from which the sample was recovered. The columns "Core received," "Core rejected," and "Core analyzed" show how much of the core was analyzed. Most of the coal beds in the Castleman Basin contain partings of bone

and shale. All partings over  $\frac{3}{8}$  inch thick were removed before the core was analyzed.

Factual data regarding mines and outcrop prospects (operating and abandoned) were obtained during the investigation. These data are tabulated in the appendix under the heading "Description of Operating and Abandoned Mines and Outcrop Prospects." This table probably gives the most authentic and complete information available regarding mining operations in the area. The numbers in the table correspond to locations shown in figures 1 and 7 to 12, inclusive.

### DETAILED LOGS OF DRILL HOLES

#### *Log, hole 1-CB*

Location: 12,050 feet due S. of lat.  $39^{\circ}40'$ ; 10,000 feet due W. of long.  $79^{\circ}10'$ ;  $2\frac{1}{2}$  miles NE. of Bittering, on Old Gabriel and James Bowser farm, Garrett County, Md.  
Surface elevation: 2,607 feet.

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft.</i>	<i>in.</i>	
0 0	11 0	Unconsolidated material .....	11	0	
11 0	22 0	Medium sandstone .....	11	0	
22 0	45 5	Greenish-gray clay, lenses of silt in lower 5 ft. . .	23	5	
45 5	52 6	Fine to medium sandstone .....	7	1	
52 6	55 4	Gray, gritty clay .....	2	10	
55 4	57 0	Red and gray clay .....	1	8	
57 0	78 6	Interbedded greenish-gray clay and siltstone . . .	21	6	
78 6	93 10	Interbedded siltstone and fine sandstone, lower 4 ft. carbonaceous.	15	4	
93 10	94 $\frac{1}{2}$	Bone, pyritic lenses .....		$2\frac{1}{2}$	} Barton rider, el. 2,512 ft.
94 $\frac{1}{2}$	94 4	Carbonaceous shale .....		$3\frac{1}{2}$	
94 4	94 10	Coal .....		6	
94 10	95 $2\frac{1}{2}$	Bone .....		$4\frac{1}{2}$	
95 $2\frac{1}{2}$	100 0	Gray limestone .....	4	$9\frac{1}{2}$	
100 0	105 0	Gray clay .....	5	0	
105 0	107 5	Medium sandstone .....	2	5	
107 5	117 0	Dark-green clay .....	9	7	
117 0	117 6	Limestone .....		6	
117 6	133 6	Carbonaceous shale, plant fragments .....	16	0	
133 6	136 1	Black shale and siltstone .....	2	7	} Barton, el. 2,470 ft.
136 1	136 10	Coal, pyritic lenses .....		9	
136 10	150 0	Argillaceous limestone and limy clay .....	13	2	
150 0	175 6	Dark-gray clay .....	25	6	
175 6	180 0	Siltstone and clay .....	4	6	
180 0	184 0	Sandstone and siltstone .....	4	0	
184 0	193 0	Dark-gray gritty clay .....	9	0	
193 0	226 0	Interbedded greenish clay and siltstone .....	33	0	
226 0	236 6	Interbedded medium to fine sandstone, clay, and siltstone.	10	6	

## Log, hole 1-CB—Continued

Depth		Material	Thickness	Remarks		
From—	To—					
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
236	6	252	6	16	0	Harlem, el. 2,347 ft.
		Interbedded siltstone and carbonaceous clay, plant fragments.				
252	6	256	0	3	6	
256	0	259	6	3	6	
259	6	259	7		1	
259	7	259	7½		½	
259	7½	259	10½	3		
259	10½	259	11		½	
259	11	260	5	6		
260	5	260	6	1	1	
260	6	262	0	1	6	
262	0	278	5	16	5	
278	5	282	5	4	0	
282	5	296	6	14	1	
296	6	304	6	8	0	
304	6	312	6	8	0	
312	6	333	2	20	8	
		Interbedded siltstone and sandstone, lower 1 ft. carbonaceous clay.				
333	2	333	2½		½	Upper Bakerstown, el. 2,270 ft., C-76704.
333	2½	333	7½	5		
333	7½	333	9	11½		
333	9	334	½	3½		
334	½	334	3½	3		
334	3½	334	4½	1		
334	4½	334	6	11½		
334	6	334	8½	2½		
334	8½	335	11½	1	3	
335	11½	336	9½	10		
336	9½	336	11½	2		
336	11½	337	1	1½		
337	1	337	6	5		
337	6	338	3	9		
338	3	346	0	7	9	
346	0	356	0	10	0	
356	0	360	0	4	0	
360	0	370	5½	10	5½	
370	5½	370	10½	5		
370	10½	372	0	1	1½	
372	0	382	0	10	0	
382	0	393	0	11	0	
393	0	398	0	5	0	
398	0	409	0	11	0	
409	0	417	0	8	0	
417	0	420	6	3	6	
420	6	435	0	14	6	
435	0	455	0	20	0	
455	0	478	0	23	0	
		Dark, greenish-gray, micaceous clay and siltstone.				
478	0	487	8	9	8	Brush Creek, el. 2,118 ft., C-76723.
487	8	488	9	1	1	
		Black, carbonaceous siltstone, marine fossils.				
488	9	491	0	2	3	
491	0	498	0	7	0	
		Interbedded, light-gray, fine to medium sandstone, clay, and siltstone.				
498	0	499	6	1	6	
499	6	508	0	8	6	
508	0	511	0	3	0	
		Dark gray, gritty clay.				
		Light-gray clay.				

## Log, hole 1-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
511 0	519 6	Interbedded sandstone, siltstone, and clay	8 6	
519 6	530 0	Green gritty clay	10 6	
530 0	531 0	Green clay, red mottling	1 0	
531 0	539 0	Green gritty clay	8 0	
539 0	539 6	Mottled, red and green clay	6 6	
539 6	549 0	Light-green, gritty clay	9 6	
549 0	554 0	Interbedded fine sandstone, clay, and siltstone	5 0	
554 0	559 0	Gray coarse sandstone	5 0	
559 0	563 6	Dark greenish-gray clay	4 6	
563 6	565 0	Interbedded gray sandstone, clay, and siltstone	1 6	
565 0	570 6	Dark-green gritty clay	5 6	
570 6	572 0	Carbonaceous clay	1 6	
572 0	575 0	Dark-gray silty clay, thin beds of fine sandstone.	3 0	
575 0	575 6	Carbonaceous clay, streaks of coal	6 6	
575 6	592 0	Dark-gray carbonaceous clay	16 6	
592 0	594 0	Semiplastic to semiflint clay	2 0	
594 0	595 0	Carbonaceous clay	1 0	
595 0	598 0	Interbedded, light-gray sandstone, clay, and siltstone.	3 0	
598 0	616 6	Interbedded sandstone and siltstone	18 6	
616 6	620 6	Medium-gray quartzite	4 0	
620 6	622 0	Dark-gray sandstone and siltstone	1 6	
622 0	625 0	Medium quartzitic sandstone	3 0	
625 0	629 0	Interbedded, dark-gray siltstone and sandstone	4 0	
629 0	645 0	Coarse gray, quartzitic sandstone, dark-shale fragments.	16 0	
645 0	648 0	Interbedded carbonaceous siltstone and fine sandstone, plant fragments.	3 0	
648 0	726 0	Fine to coarse sandstone, stylitic at 683 and 695 ft.	78 0	
726 0	736 0	Interbedded sandstone and clay	10 0	
736 0	743 7	Medium stylitic sandstone	7 7	
743 7	743 9½	Bony coal	2½	} Middle Kittanning.
743 9½	744 1	Coal	3½	
744 1	749 7	Black, carbonaceous, silty clay, plants	5 6	} Do.
749 7	750 1	Bony coal	6 6	
750 1	750 6	Coal	5 5	
750 6	758 6	Interbedded sandstone, siltstone, and clay	8 0	
758 6	761 8	Dark shale	3 2	} Middle Kittanning, el. 1,844-ft., C-77263.
761 8	761 11½	Bony coal	3½	
761 11½	762 11	Coal	11½	
762 11	765 6	Dark-gray clay	2 7	
765 6	770 0	Interbedded sandstone, siltstone, and shale	4 6	
770 0	818 9	Fine to coarse sandstone, stylitic at 811 ft. to 813 ft. 6 in.	48 9	
818 9	822 9	Interbedded sandstone, siltstone, and clay	4 0	
822 9	823 7½	Sandy bone	10½	} Upper Mount Savage, el. 1,781 ft., C-77529.
823 7½	824 4	Shale	8½	
824 4	826 3	Coal	1 11	
826 3	838 2	Black, micaceous shale, sandstone stringers, and plant fragments.	11 11	
838 2	838 8	Coal	6 6	} Lower Mount Savage.
838 8	851 6	Sandy clay	12 10	
851 6	869 0	Interbedded, fine, stylitic sandstone, siltstone, and clay.	17 6	

## Log, hole 2-CB

Location: 1,120 feet due N. of lat. 39°40'; 3,200 feet due E. of long. 79°10'; 2 miles S. of Grantsville, on Old Jacob Otto farm, now Arthur Resh, Garrett County, Md.

Surface elevation: 2,474 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
0	0	34	0	
34	0	35	11	
35	11	37	2	
37	2	45	0	
45	0	63	9	
63	9	67	5	
67	5	71	9	
71	9	71	11½	
71	11½	72	1	
72	1	72	4	
72	4	73	9	
73	9	87	8	
				} Barton rider, el. 2,400 ft., C-76252.
87	8	88	6	
88	6	96	9	
96	9	100	9	
100	9	102	9	
102	9	117	6	
117	6	119	6	
119	6	126	0	
126	0	142	0	
142	0	144	0	
144	0	144	1	
144	1	144	5½	
144	5½	144	7½	
144	7½	144	10	
144	10	144	11	
144	11	145	7	
145	7	184	0	
				} Federal Hill, el. 2,329 ft., C-76253.
184	0	188	0	
188	0	206	0	
206	0	206	1	
206	1	207	3½	
207	3½	207	10	
207	10	227	0	
227	0	233	7	
233	7	236	9	
236	9	238	6	
238	6	255	9	
255	9	272	6	
272	6	275	6	
275	6	276	6	
276	6	288	10	
				} Harlem, el. 2,266 ft., C-76719.
288	10	289	2	
289	2	289	4	
289	4	289	6	
289	6	290	2½	
290	2½	290	5	
290	5	290	6½	
290	6½	290	7½	
290	7½	291	1	
291	1	291	3½	
291	3½	304	0	
304	0	323	9	
323	9	325	11	
				} Upper Bakerstown, el. 2,183 ft., C-76720.
288	10	289	2	
289	2	289	4	
289	4	289	6	
289	6	290	2½	
290	2½	290	5	
290	5	290	6½	
290	6½	290	7½	
290	7½	291	1	
291	1	291	3½	
291	3½	304	0	
304	0	323	9	
323	9	325	11	



## Log, hole 2-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
325 11	327 10	Coal.....	1 11	Lower Bakerstown, el. 2,146 ft., C-76721
327 10	347 0	Interbedded clay, siltstone, and sandstone.....	19 2	
347 0	354 0	Greenish clay, calcareous stringers.....	7 0	
354 0	357 0	Mottled, red and green claystone.....	3 0	
357 0	373 0	Sandstone and silty clay.....	16 0	
373 0	391 0	Silty clay.....	18 0	
391 0	393 6	Dark-gray clay.....	2 6	
393 6	395 0	Limestone.....	1 6	
395 0	402 0	Greenish-gray clay.....	7 0	
402 0	413 0	Medium sandstone.....	11 0	
413 0	434 6	Interbedded siltstone, sandstone, and claystone.....	21 6	
434 6	456 7½	Carbonaceous, silty shale, marine fossils.....	22 1½	
456 7½	456 9½	Bone.....	2 2	Brush Creek, el. 2,016 ft., C-77264.
456 9½	456 11½	Shale.....	2 2	
456 11½	457 4½	Coal.....	5 5	
457 4½	457 5	Bone.....	1 ½	
457 5	458 0	Coal.....	7 7	
458 0	467 6	Fine to medium sandstone, siltstone, and clay.....	9 6	
467 6	469 6	Argillaceous limestone.....	2 0	
469 6	472 10	Gray clay.....	3 4	
472 10	485 6	Fine sandstone, siltstone, and clay.....	12 8	
485 6	492 10	Claystone and semihard, silty clay, sandy zones.....	7 4	
492 10	496 0	Clay.....	3 2	
496 0	514 6	Shaly claystone.....	18 6	
514 6	515 6	Silty claystone.....	1 0	
515 6	552 10	Claystone.....	37 4	
552 10	559 11½	Black, micaceous shale.....	7 1½	Upper Freeport rider, el. 1,913 ft., C-77265.
559 11½	560 11½	Coal.....	1 0	
560 11½	563 0	Carbonaceous shale.....	2 ½	
563 0	565 9	Siltstone and sandstone.....	2 9	
565 9	568 6	Black shale.....	2 9	
568 6	569 ½	Coal.....	6 ½	Upper Freeport, el. 1,903 ft., C-77266.
569 ½	569 1½	Shale.....	1 1	
569 1½	571 4½	Coal.....	2 3	
571 4½	574 6	Black, limy shale.....	3 1½	
574 6	584 6	Argillaceous limestone.....	10 0	
584 6	597 0	Fragmental claystone and flint clay, sideritic matrix.....	12 6	
597 0	599 6	Silty clay.....	2 6	
599 6	619 6	Fine sandstone, siltstone in lower part.....	20 0	
619 6	635 9	Coarse, stylonitic sandstone.....	16 3	
635 9	645 6	Conglomeratic, stylonitic sandstone.....	9 9	
645 6	649 1	Interbedded shale and bone.....	3 7	
649 1	649 5	Bony coal.....	4 4	Upper Kittanning, el. 1,822 ft., C-77531.
649 5	651 7½	Coal.....	2 2½	
651 7½	651 9	Shale.....	1 ½	
651 9	652 3	Coal.....	6 6	
652 3	665 0	Interbedded siltstone and limy clay.....	12 9	
665 0	669 6	Green clay.....	4 6	
669 6	674 0	Carbonaceous, silty clay.....	4 6	
674 0	688 5	Gray to black, carbonaceous shale.....	14 5	
688 5	689 9½	Coal.....	1 4½	El. 1,784 ft. C-77530.
689 9½	705 8	Interbedded siltstone, sandstone, and shale.....	15 10½	
705 8	706 3½	Bony coal.....	7 ½	Middle Kittanning, el. 1,766 ft., C-77532.
706 3½	706 8½	Coal.....	5 5	
706 8½	706 9½	Bone.....	1 1	
706 9½	707 6	Coal.....	8 ½	
707 6	707 8	Bony coal.....	2 2	
707 8	708 2½	Coal.....	6 ½	

## Log, hole 2-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft.</i>	<i>in.</i>	
708 2½	713 2	Gray clay.....	4	11½	
713 2	717 1	Carbonaceous shale.....	3	11	
717 1	717 5	Bone.....		4	
717 5	718 8	Claystone.....	1	3	
718 8	718 9½	Bone.....		1½	
718 9½	720 1	Coal.....	1	3½	} Middle Kittanning, el. 1,754 ft., C-77765.
720 1	720 4	Bone.....		3	
720 4	730 0	Dark-gray shale.....	9	8	
730 0	733 8	Medium sandstone.....	3	8	
733 8	734 8	Sandy bone.....	1	0	
734 8	734 11	Coal.....		3	
734 11	735 4	Cannel coal.....		5	
735 4	736 6	Clay.....	1	2	
736 6	743 0	Fine sandstone.....	6	6	
743 0	744 7	Black shale.....	1	7	
744 7	750 7	Interbedded siltstone and sandstone.....	6	0	
750 7	756 6	Medium sandstone, micaceous partings.....	5	11	
756 6	766 10	Micaceous shale.....	10	4	
766 10	767 ½	Bone.....		2½	} Lower Kittanning, el. 1,703 ft.
767 ½	767 3½	Shale.....		3	
767 3½	767 8	Bony coal.....		4½	
767 8	767 11½	Coal.....		3½	
767 11½	770 5½	Shale.....	2	6	
770 5½	770 10	Coal.....		4½	
770 10	770 10½	Bone.....		½	
770 10½	787 0	Interbedded siltstone, sandstone, and clay.....	16	1½	
787 0	810 0	Medium to fine sandstone.....	23	0	
810 0	820 0	Micaceous siltstone.....	10	0	
820 0	842 0	Medium, quartzitic, stylonitic sandstone.....	22	0	
842 0	845 6	Interbedded siltstone and sandstone.....	3	6	
845 6	853 8	Fine quartzite, slightly stylonitic.....	8	2	
853 8	858 6	Silty clay, sideritic concretions at base.....	4	10	
858 6	887 0	Medium stylonitic sandstone.....	28	6	
887 0	890 2	Black, micaceous shale.....	3	2	
890 2	890 4	Coal.....		2	
890 4	891 3	Shale.....		11	
891 3	891 7½	Coal.....		4½	
891 7½	894 1	Shale.....	2	5½	
894 1	894 6	Coal.....		5	
894 6	896 9	Black shale.....	2	3	
896 9	904 6	Dark-gray siltstone.....	7	9	
904 6	907 6	Interbedded siltstone and sandstone.....	3	0	
907 6	922 9	Coarse sandstone, coal partings at 921 ft. 9 in.....	15	3	
922 9	940 10	Micaceous, carbonaceous siltstone, plants, sandstone partings.....	18	1	
940 10	948 0	Silty clay.....	7	2	
948 0	987 0	Black, micaceous siltstone, sandstone partings. Coal partings at 962 ft. and 4 in. coal at 975 ft.....	39	0	
987 0	990 5	Clay.....	3	5	
990 5	993 6	Interbedded shale and bone.....	3	1	
993 6	997 0	Black, micaceous siltstone.....	3	6	
997 0	1,012 6	Coarse, conglomeratic sandstone.....	15	6	} Base of Pottsville formation.
1,012 6	1,031 0	Green clay and sandstone.....	18	6	
1,031 0	1,045 0	Mottled, red and green clay.....	14	0	

Log, hole 3-CB

Location: 17,330 feet due S. of lat. 39°40'; 10,000 feet due W. of long. 79°10'; 1½ miles NE. of Bittering, on Browning Bear Hill, Garrett County, Md.  
Surface elevation: 2,579 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	16	9
16	9	Fine to medium sandstone, shale lenses, 6 in. conglomerate at base.	24	9
41	6	Argillaceous limestone	7	0
48	6	Fine sandstone, beds of silt and clay	8	0
56	6	Limestone	1	0
57	6	Interbedded sandstone, siltstone, and claystone.	12	0
69	6	Limestone	1	0
70	6	Carbonaceous shale	2	6
73	0	Micaceous clay, sandy at base	7	0
80	0	Black shale	3	6
83	6	Interbedded siltstone, sandstone, and claystone.	5	6
89	0	Shale	1	3
90	3	Coal		9
91	0	Argillaceous limestone	11	0
102	0	Gritty clay, calcite streaks	15	6
117	6	Gray siltstone and fine sandstone	18	6
136	0	Red and green clay	4	2
140	2	Green clay	9	2
149	4	Red and green clay	3	2
152	6	Interbedded sandstone, siltstone, and claystone.	7	0
159	6	Fine sandstone, siltstone, and clay	22	6
182	0	Black shale, marine fossils	29	0
211	0	Bone		½
211	½	Coal	3½	½
211	4	Shale	1½	
211	5½	Coal	5½	
211	11	Bone		½
211	11½	Coal	8	
212	7½	Black shale	1	2
213	9½	Limestone	19	2½
233	0	Greenish-gray clay	12	0
245	0	Interbedded sandstone, siltstone, and clay	9	0
254	0	Clay	3	0
257	0	Silty clay, calcareous streaks	18	6
275	6	Interbedded sandstone, siltstone, and clay	7	6
283	0	Fine quartzite	10	6
293	6	Sandy clay	2	6
296	0	Limestone	1	0
297	0	Clay	3	6
300	6	Limestone	6	6
307	0	Semiflint claystone	1	0
308	0	Dark-gray, silty clay	7	0
315	0	Interbedded sandstone, siltstone, and clay	7	6
322	6	Gray to black micaceous siltstone	16	4
338	10	Bone		6
339	4	Coal	1	4
340	8	Dark-gray clay	1	10
342	6	Limestone	5	4
347	10	Semiplastic clay	8	0

Barton, el. 2,488 ft.

Harlem, el. 2,366 ft., C-78393.

Lower Bakerstown, el. 2,238 ft., C-78777.

## Log, hole 3-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i> 355	<i>in.</i> 10		<i>Ft.</i> 366	<i>in.</i> 0	
		Mottled, red and green clay, silty and sandy beds.	10	2	
366	0	Interbedded sandstone, siltstone, and clay-----	7	6	
373	6	Mottled, red and green micaceous clay-----	18	6	
397	0	Greenish-gray clay-----	5	6	
397	6	Medium to fine sandstone, lenses of siltstone and shale.	47	0	
444	6	Black shale-----	2	0	
446	6	Interbedded sandstone, siltstone, and claystone.	7	6	
454	0	Greenish-gray clay, partly calcareous-----	16	0	
470	0	Mottled, red and green clay-----	3	7	
473	7	Green silty and sandy clay-----	10	0	
483	7	Mottled, red and green clay-----	5	11	
489	6	Gray, fragmental claystone-----	1	2	
490	8	Greenish-gray, silty clay-----	8	10	
499	6	Red and green clay-----	7	6	
507	0	Green, silty clay-----	8	0	
515	0	Coarse micaceous sandstone-----	5	6	
520	6	Gray, silty clay-----	3	4	
523	10	Light-gray, micaceous siltstone-----	4	2	
528	0	Silty claystone-----	32	4	
560	4	Medium sandstone, clay, and siltstone-----	124	4	
684	8	Coal-----		4	
685	0	Silty clay-----	1	6	
686	6	Siltstone and sandstone-----	12	6	
699	0	Carbonaceous clay-----	7	0	
706	0	Sandstone-----	3	8	
709	8	Black, micaceous shale-----	3	0	
712	8	Coal-----		10	Middle Kittanning, el. 1,866 ft.
713	6	Black shale-----	2	6	
716	0	Interbedded sandstone, siltstone, and clay, black clay in lower 8 in.	17	2	
733	2	Coal-----	1	7	Middle Kittanning el. 1,845 ft.
734	9	Silty to sandy, fragmental claystone-----	2	9	
737	6	Sandy clay-----	3	0	
740	6	Medium quartzitic sandstone, carbonaceous, stylonite partings.	26	6	
767	0	Coarse, conglomeratic sandstone-----	21	6	
788	6	Fine sandstone and shale, streaks of coal-----	3	10	
792	4	Fragmental claystone-----		8	
793	0	Bone-----		3½	
793	3½	Bony coal-----		6	
793	9½	Shale-----		4½	
794	2	Coal-----		3½	
794	5½	Shale-----		9	
795	2½	Coal, streaks of bone and shale-----	1	9	
796	11½	Interbedded coal, bone, and shale-----	1	3½	
798	3	Fragmental, semiplastic to semifint clay-----	4	1	
802	4	Brown, fragmental, flint and semifint clay-----	1	10	
804	2	Black shale-----	1	10	
806	0	Medium quartzitic sandstone-----	6	0	

Mount Savage, el. 1,781 ft., C-79616.

*Log, hole 4-CB*

Location: 1,500 feet due S. of lat. 39°40'; 3,200 feet due E. of long. 79°10'; 2½ miles S. of Grantsville on Old Sam Engle farm, Garrett County, Md.  
Surface elevation: 2,669 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	10 9	Unconsolidated material.....	10 9	
10 9	12 9	Weathered medium sandstone.....	2 0	
12 9	16 5	Gray to black, silty shale, bone fragments.....	3 8	
16 5	17 11	Coal.....	1 6	
17 11	23 0	Gray, silty clay.....	5 1	
23 0	36 0	Light-gray, micaceous siltstone, thin layers of sandstone.	13 0	
36 0	38 0	Gray, micaceous, shaly clay.....	2 0	
38 0	38 9	Black shale.....	9	
38 9	46 9	Gray, argillaceous limestone and limy clay stone.	8 0	
46 9	51 9	Medium to fine sandstone.....	5 0	
51 9	71 0	Medium to coarse sandstone.....	19 3	
71 0	79 0	Interbedded siltstone and sandstone.....	8 0	
79 0	85 4	Gray, argillaceous limestone.....	6 4	
85 4	86 4	Black, silty clay.....	1 0	
86 4	90 11	Dense-gray, argillaceous limestone, mottled buff.	4 7	
90 11	113 0	Greenish-gray clay, irregular lenses of buff limestone.	22 1	
113 0	120 9	Gray, silty clay, limestone layers 115 ft. to 115 ft. 3 in., and 116 ft. 10 in. to 117 ft. 10 in.	7 9	
120 9	121 3	Coal.....	6	
121 3	123 9	Fine sandstone, siltstone streaks.....	2 6	
123 9	125 9	Gray to black shale, plant remains.....	2 0	
125 9	138 6	Dark-gray to black, silty claystone, grading to siltstone.	12 9	
138 6	142 10	Coarse-gray sandstone.....	4 4	
142 10	153 10	Limy claystone and argillaceous limestone, limestone pellets.	11 0	
153 10	155 10	Dark-gray silty clay.....	2 0	
155 10	159 2	Dense, gray limestone.....	3 4	
159 2	167 0	Gray, silty claystone, sandy streaks, siderite concretions.	7 10	
167 0	173 0	Black, shaly clay, coaly streaks at top, plant fragments.	6 0	
173 0	190 0	Interbedded siltstone and silty claystone, sandy streaks.	17 0	
190 0	192 6	Medium to coarse sandstone, siltstone zone.....	2 6	
192 6	196 7	Dark-gray shale.....	4 1	
196 7	197 4	Coal.....	9	Barton, el. 2,472 ft.
197 4	198 0	Black, pyritic claystone.....	8	
198 0	212 0	Gray, limy claystone, limestone inclusions.....	14 0	
212 0	226 0	Gray, silty claystone, minor siltstone and shaly claystone.	14 0	
226 0	235 6	Siltstone, interbedded with claystone and limestone in lower 2 ft. 6 in.	9 6	
235 6	239 6	Medium sandstone.....	4 0	
239 6	246 6	Black shale, coaly partings.....	7 0	
246 6	251 6	Gray, silty, limy clay.....	5 0	
251 6	256 0	Siltstone and silty claystone, sandy streaks.....	4 6	
256 0	275 0	Medium sandstone.....	19 0	
275 0	300 0	Coarse sandstone, conglomerate from 284 to 286 ft.	25 0	
300 0	313 4	Black shale, marine fossils.....	13 4	
313 4	313 5	Bone.....	1	} Harlem, el. 2,354 ft., C-80045.
313 5	315 0	Coal.....	7	
315 0	341 9	Argillaceous limestone grading to claystone, limy stringers.	26 9	
341 9	344 7	Dark-gray, silty claystone.....	2 10	
344 7	348 0	Mottled, red and gray, silty clay.....	3 5	

## Log, hole 4-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 348 0	<i>Ft. in.</i> 351 6	Dark greenish-gray, silty claystone, limy stringers.	<i>Ft. in.</i> 3 6	
351 6	375 6	Gray to greenish claystone, argillaceous limestone inclusions.	24 0	
375 6	397 0	Siltstone, silty claystone, argillaceous limestone inclusions.	21 6	
397 0	400 0	Interbedded, fine sandstone and shale, coaly partings in lower 6 in.	3 0	
400 0	400 7½	Bony coal	7½	} Upper Bakerstown, el. 2,267 ft.
400 7½	400 11½	Claystone	4	
400 11½	401 9½	Bone	10	
401 9½	417 0	Gray, argillaceous limestone and limy claystone, limy pellets, carbonaceous, pyritic clay seam, 416 ft. 6 in. to 417 ft.	15 2½	
417 0	424 0	Greenish-gray, silty claystone	7 0	
424 0	438 7½	Shaly, gray siltstone and silty shale, plant fragments, shaly clay in lower 2 ft.	14 7½	
438 7½	440 10½	Coal	2 3	} Lower Bakerstown, el. 2,228 ft., C-80046.
440 10½	445 10	Gray, silty clay	4 11½	
445 10	459 0	Light-gray, silty claystone	13 2	
459 0	461 0	Dark-gray claystone	2 0	
461 0	466 0	Greenish-gray, silty clay, mottled red in lower part.	5 0	
466 0	472 0	Red and green claystone, minor semiplastic clay.	6 0	
472 0	482 6	Fine sandstone, interbedded with siltstone in lower half.	10 6	
482 6	498 3	Green, silty, shaly claystone	13 9	
498 3	505 6	Gray to greenish claystone, limestone inclusions	7 3	
505 6	510 6	Gray to green, semiplastic clay grading to claystone, limy stringers.	5 0	
510 6	528 0	Interbedded siltstone and fine sandstone, silty claystone at top 2 ft.	17 6	
528 0	544 4	Siltstone and silty to shaly claystone	16 4	
544 4	563 6	Dark-gray to black, shaly claystone, marine fossils.	19 2	
563 6	563 8½	Coal	2½	} Brush Creek, el. 2,104 ft., C-80408.
563 8½	563 10½	Bone	2	
563 10½	563 11	Coal	½	
563 11	563 11½	Shale	½	
563 11½	564 10	Coal	10½	
564 10	572 3	Interbedded siltstone and fine sandstone, limy inclusions in lower 1 ft.	7 5	
572 3	574 8	Silty claystone	2 5	
574 8	581 0	Claystone, limestone pellets, 8 in. argillaceous limestone at top.	6 4	
581 0	585 10	Dark- to light-gray, silty, semiplastic clay	4 10	
585 10	592 5	Fine sandstone	6 7	
592 5	603 8	Silty to sandy, fragmental claystone, gray to greenish.	11 3	
603 8	615 0	Dark gray-green and maroon, silty, semiplastic clay.	11 4	
615 0	619 6	Silty, gray claystone, limestone inclusions	4 6	
619 6	627 4	Gray siltstone, zones of fine sandstone	7 10	
627 4	632 0	Dark-gray claystone, finely fragmental	4 8	
632 0	638 0	Red and green, silty claystone	6 0	
638 0	640 0	Green, silty claystone, zones of fragmental claystone and semifint clay at top and bottom.	2 0	
640 0	641 6	Gray, silty claystone, grading to siltstone	1 6	
641 6	661 6	Interbedded, shaly siltstone and silty claystone, zones of fine sandstone.	20 0	
661 6	669 4	Shaly claystone grading to carbonaceous shale, silty in upper 2 ft.	7 10	

## Log, hole 4-CB—Continued

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>			
669	4	670	3	Coal	11	Upper Freeport rider.	
670	3	673	3	Carbonaceous clay and shale, coaly partings	3		0
673	3	676	0	Irregularly interbedded siltstone and fine sandstone, grading to silty shale, plant remains.	2		9
676	0	676	10	Coal	10	Upper Freeport, el. 1,990 ft., C-80874.	
676	10	676	11	Bone	1		1
676	11	678	10	Coal	1		11
678	10	686	0	Silty and limy claystone, argillaceous limestone lenses.	7		2
686	0	688	5	Brownish claystone, fragmental at bottom	2		5
688	5	694	0	Silty claystone	5	7	
694	0	695	9	Siltstone and fine sandstone	1	9	
695	9	697	3	Claystone and semifint clay	1	6	
697	3	699	1	Silty claystone, large siderite concretion in upper half.	1	10	
699	1	702	10	Dark brown-gray, semifint clay and fragmental flint clay, minor claystone, 6 in. semiplastic clay at bottom.	3	9	
702	10	717	4	Interbedded siltstone and fine sandstone	14	6	
717	4	743	6	Medium to coarse conglomeratic sandstone, coaly streaks in lower 3 ft.	26	2	
743	6	746	2	Fragmental siltstone, fine sandstone matrix	2	8	
746	2	754	0	Interbedded siltstone and fine sandstone	7	10	
754	0	754	4	Coal	4	Upper Kittanning, el. 1,915 ft.	
754	4	760	4	Gray, calcareous, silty claystone, plant remains in upper foot.	6		0
760	4	775	3	Interbedded fine sandstone and siltstone	14	11	
775	3	789	8	Interbedded shaly claystone and siltstone, zone of siderite concretion and flint clay at 776 ft. 10 in. to 777 ft. 4 in., zone of black shale 783 ft. to 783 ft. 6 in.	14	5	
789	8	792	0	Medium sandstone	2	4	
792	0	797	5	Shaly, silty claystone, siderite pellets in upper half.	5	5	
797	5	797	6½	Bone	1	11½	
797	6½	799	1	Coal	1	6½	
799	1	799	2	Bone	1	1	
799	2	800	8	Dark-gray to carbonaceous siltstone, minor sandstone, coaly partings.	1	6	
800	8	806	10	Carbonaceous to gray shale, plant fragments	6	2	
806	10	807	1½	Bony coal	3½	2	
807	1½	807	5½	Bone	4	Middle Kittanning, el. 1,860 ft., C-80876.	
807	5½	809	4	Coal	1		10½
809	4	816	4	Gray, silty, shaly claystone, minor silty in lower 1½ ft.	7	0	
816	4	823	9	Dark-gray, silty to shaly claystone, 9 in. carbonaceous shale at base.	7	5	
823	9	824	3	Coal	6	Middle Kittanning.	
824	3	825	9	Silty claystone grading to siltstone	1		6
825	9	848	6	Medium to coarse, crossbedded sandstone, quartzitic and stypolitic.	22		9
848	6	858	1	Coarse to conglomeratic, quartzitic sandstone	9	7	
858	1	864	6	Fine and medium sandstone, carbonaceous partings.	6	5	
864	6	867	6	Dark-gray, silty claystone and siltstone	3	0	
867	6	868	0	Carbonaceous shale, pyritic	6	6	
868	0	869	0	Coal	1	0	
869	0	869	9	Semihard to semifint clay, pyritic, silty in lower part.	9	Lower Kittanning, el. 1,800 ft., C-81488.	
869	9	873	6	Siltstone, clayey in upper half	3		9
873	6	880	0	Fine to medium sandstone	6		6
880	0	886	4	Gray, shaly siltstone, zones of siderite pellets	6		4

## Log, hole 4-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
886 4	888 4	Gray, shaly clay.....	2 0	Mount Savage, el. 1,778 ft.
888 4	888 10	Coaly shale, minor bone.....	6 6	
888 10	890 4	Carbonaceous, silty clay and siltstone.....	1 6	
890 4	891 1	Shaly claystone.....	9 9	
891 1	891 6	Coal.....	5 5	
891 6	892 7	Mottled, tan, semiplastic clay.....	1 1	
892 7	895 0	Silty, semiplastic clay grading to siltstone.....	2 5	
895 0	901 7	Gray siltstone.....	6 7	
901 7	927 0	Interbedded siltstone and fine sandstone.....	25 5	

## Log, hole 5-CB

Location: 12,650 feet due S. of lat. 39°40'; 4,700 feet due west of long. 79°10'; 1 mile S. of Jennings, on Harry E. Miller farm, part of "Lilly of the Valley," Garrett County, Md.  
Surface elevation: 2,522 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
0 0	20 0	Unconsolidated material.....	20 0	Harlem, el. 2,437 ft.
20 0	57 0	Medium to fine sandstone.....	37 0	
57 0	61 0	Dark-gray, silty and shaly clay.....	4 0	
61 0	83 5	Black shale, marine fossils.....	22 5	
83 5	85 1	Coal.....	1 8	
85 1	106 9	Gray, pyritic, limy claystone.....	21 8	
106 9	114 6	Greenish-gray, silty clay, dark-gray mottling.....	7 9	
114 6	119 6	Calcareous claystone.....	5 0	
119 6	124 6	Greenish-gray claystone, light-gray limestone lenses.....	5 0	
124 6	126 8	Red and green, silty clay.....	2 2	
126 8	128 6	Mottled, green and gray, silty clay.....	1 10	
128 6	138 0	Greenish-gray, silty claystone and clayey siltstone, argillaceous limestone lenses.....	9 6	
138 0	147 0	Greenish-gray siltstone, sandy streaks.....	9 0	
147 0	169 6	Fine to medium sandstone.....	22 6	
169 6	171 6	Silty claystone, fine sandstone streaks.....	2 0	
171 6	172 2	Argillaceous limestone.....	8 8	
172 2	173 6	Silty, gray clay.....	1 4	
173 6	174 0	Argillaceous limestone.....	6 6	
174 0	180 9	Calcareous claystone, 1 ft. 9 in. argillaceous limestone at base.....	6 9	
180 9	183 6	Silty, pyritic clay, limestone inclusions.....	2 9	
183 6	189 0	Shaly, silty, gray claystone.....	5 6	
189 0	190 7	Interbedded argillaceous limestone and silty claystone.....	1 7	
190 7	202 2	Interbedded, dark-gray, siltstone and fine sandstone, plant fragments.....	11 7	
202 2	203 10	Dark-gray, shaly claystone.....	1 8	
203 10	205 11	Coal.....	2 1	
205 11	213 0	Dark- to light-gray clay.....	7 1	Lower Bakerstown, el. 2,316 ft., C-80407.
213 0	217 5	Gray, silty claystone and siltstone.....	4 5	
217 5	224 11	Medium sandstone.....	7 6	
224 11	228 11	Shaly siltstone, sandy streaks in upper part.....	4 0	
228 11	229 8	Gray, semiplastic clay.....	9 9	
229 8	233 6	Light-gray, fine, silty, semiplastic clay, siderite in lower part.....	3 10	



*Log, hole 5-CB—Continued*

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
233	6	240	0	Mottled, red and green, semiplastic clay grading to claystone.	6	6	
240	0	242	0	Green, shaly claystone	2	0	
242	0	254	0	Interbedded siltstone and silty claystone, sandy streaks, calcareous zone at 247 ft.	12	0	
254	0	263	3	Red and gray, shaly siltstone	9	3	
263	3	269	6	Red, gray, and silty claystone, zones of argillaceous limestone.	6	3	
269	6	272	5	Silty to sandy, shaly claystone	2	11	
272	5	287	6	Fine sandstone, calcareous	15	1	
287	6	293	0	Gray, shaly siltstone, fine sandstone lenses	5	6	
293	0	306	0	Dark-gray to black, silty shale, minor siltstone, plant fragments.	13	0	
306	0	321	3	Dark-gray to black, silty, shaly claystone, marine fossils.	15	3	
321	3	322	6	Coal	1	3	Brush Creek, el. 2,200 ft., C-80871.
322	6	325	3	Dark-gray siltstone, silty, carbonaceous claystone at top.	2	9	
325	3	332	0	Interbedded siltstone and fine sandstone	6	9	
332	0	337	4	Silty to sandy claystone, limestone pellets	5	4	
337	4	344	6	Dark-gray claystone, grading to silty, semiplastic clay, limestone pellets.	7	2	
344	6	349	9	Mottled, red and green silty claystone	5	3	
349	9	357	3	Green, silty claystone, calcareous stringers	7	6	
357	3	371	2	Interbedded siltstone and fine sandstone	13	11	
371	2	391	0	Fine to medium sandstone	19	10	
391	0	392	3	Siltstone	1	3	
392	3	394	10	Claystone and minor silty claystone, 6 in. semiplastic clay at base.	2	7	
394	10	413	0	Silty claystone grading to siltstone, minor fine sandstone in lower part.	18	2	
413	0	416	0	Shaly claystone, sandy in lower part	3	0	
416	0	421	3	Interbedded siltstone and fine sandstone	5	3	
421	3	423	11	Semiplastic clay, silty at base	2	8	
423	11	427	0	Interbedded sandstone and siltstone	3	1	
427	0	427	9	Coal		9	Upper Freeport, el. 2,094 ft.
427	9	438	2	Silty claystone	10	5	
438	2	449	10	Interbedded siltstone and fine sandstone	11	8	
449	10	466	0	Fine sandstone	16	2	
466	0	500	3	Medium sandstone	34	3	
500	3	500	10	Coal		7	
500	10	508	2	Dark-gray claystone grading to silty claystone, limestone pellets in lower 3 ft.	7	4	
508	2	509	1	Argillaceous limestone		11	
509	1	511	10	Light-gray, limy claystone, grading to silty semiplastic clay.	2	9	
511	10	517	9	Silty claystone grading to siltstone	5	11	
517	9	520	8	Siltstone and sandstone	2	11	
520	8	525	8	Light-gray, shaly, silty claystone	5	0	
525	8	525	9	Coal		1	
525	9	527	3	Dark-gray claystone, grading to silty claystone	1	6	
527	3	528	3	Irregularly interbedded sandstone and siltstone.	1	0	
528	3	529	9	Silty claystone	1	6	
529	9	530	3	Bone and carbonaceous clay		6	
530	3	531	11	Coal	1	8	Upper Kittanning, el. 1,990 ft., C-80872.
531	11	534	11	Gray, silty claystone	3	0	
534	11	536	11	Sideritic zone	2	0	
536	11	539	9	Silty, semiplastic clay	2	10	
539	9	549	3	Silty claystone, grading to siltstone	9	6	
549	3	582	0	Interbedded siltstone and fine sandstone	32	9	

## Log, hole 5-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
Ft. 582	in. 0	Carbonaceous, silty claystone, shaly in lower part.	Ft. 6	in. 7	
588	7	Coal	1	3	Middle Kittanning, el. 1,932 ft., C-80873.
589	10	Interbedded siltstone and fine sandstone	3	5	
593	3	Silty claystone, plant fragments	3	8	
596	11	Bony coal		8	
597	7	Coal		5	
598	0	Interbedded siltstone and sandstone	17	7	
615	7	Coal	1	1	Middle Kittanning, el. 1,905 ft.
616	8	Bone		3	
616	11	Coal		4	
617	3	Siltstone, streaks of fine sandstone	2	0	
619	3	Fragmental, dark- and light-gray siltstone and silty clastone.	12	1	
631	4	Dark-gray, silty claystone, plant remains	8	0	
639	4	Medium styolitic sandstone	20	1	
659	5	Carbonaceous, silty claystone, 1 ft. of fine sandstone at base.	3	4	
662	9	Coal and carbonaceous clay		3	Lower Kittanning, el. 1,859 ft.
663	0	Shale		2	
663	2	Bone		5	
663	7	Gray, silty, semiplastic clay	1	10	
665	5	Interbedded siltstone and fine sandstone	0	7	
676	0	Dark-gray to carbonaceous, shaly claystone	9	3	
685	3	Coal		6	
685	9	Dark-gray, silty to sandy claystone	1	1	
686	10	Coal, bone, and shale		7	
687	5	Gray, silty claystone	1	4	
688	9	Olive, semiplastic clay, silty in upper half	3	9	
692	6	Gray claystone	2	10	
695	4	Bone		3½	Mount Savage, el. 1,825 ft., C-81486.
695	7½	Coal		6	
696	1½	Bone		3½	
696	5	Coal		11	
697	4	Olive to black, silty claystone, zones of semiplastic clay.	6	2	
703	6	Interbedded siltstone and fine sandstone	2	6	
706	0	Light-gray, silty shale	2	10	
708	10	Silty, gray claystone, zone of coaly claystone in upper 6 in.	2	2	
711	0	Fragmental sandstone, claystone at base	1	3	
712	3	Silty, semiplastic clay grading to silty claystone.	2	9	
715	0	Fine sandstone, zones of siltstone	3	10	
718	10	Medium sandstone	13	9	
732	7	Shale, gray clay, siderite concretions at top	9	0	Mercer, el. 1,775 ft., C-81487.
741	7	Cannel coal		6	
742	1	Shale		4	
742	5	Coal		6	
742	11	Claystone	1	3	
744	2	Coal	1	3	
744	2	Slightly silty, semiplastic clay	2	10	
745	5	Silty claystone, grading to siltstone	4	9	
748	3	Fine to medium sandstone	11	10	
753	0	Bone, shale, and coal	1	1	
764	10	Silty claystone and clayey siltstone, siderite pellets in lower 2 ft.	5	3	
765	11	Interbedded siltstone and fine sandstone	4	2	
771	2	Siltstone, grading to silty claystone	1	8	
775	4	Coaly shale	2	0	
777	0	Gray siltstone, minor silty claystone, and fine sandstone.	17	0	
779	0	Medium, styolitic sandstone, zone of fragmental siltstone and sandstone at base.	10	10	

*Log, hole 5-CB—Continued*

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
806 10	825 2	Interbedded siltstone and fine sandstone.....	18 4	
825 2	826 9	Dark-gray shale, plant fossils.....	1 7	
826 9	832 10	Dark-gray, silty claystone, plant fossils.....	6 1	
832 10	836 8	Interbedded siltstone and fine sandstone.....	3 10	
836 8	843 0	Dark-gray, silty claystone, plant fossils.....	6 4	
843 0	843 11	Bone and coaly claystone.....	11	
843 11	847 5	Dark-gray, silty claystone, grading to carbonaceous shale.	3 6	
847 5	848 7	Bone and bony shale.....	1 2	
848 7	850 9	Silty, gray, semiplastic clay.....	2 2	
850 9	851 8	Coal.....	11	
851 8	862 10	Silty claystone, grading to siltstone.....	11 2	
862 10	887 0	Fine to medium sandstone.....	24 2	
887 0	890 9	Conglomerate.....	3 9	
890 9	896 10	Fine sandstone, 1 ft. of conglomerate at base..	6 1	
896 10	897 4	Dark-gray, silty claystone.....	6	
897 4	907 7	Coarse to conglomeratic sandstone.....	10 3	Base of Pottsville formation.
907 7	915 0	Green, silty claystone.....	7 5	
915 0	920 0	Mottled, red and green, silty claystone.....	5 0	

*Log, hole 6-CB*

Location: 1,500 feet due S. of lat. 39°40'; 8,480 feet due E. of long. 79°10'; 2½ miles SE. of Grantsville, Salt Block Mountain on Jonas Beiler farm, Garrett County, Md.  
Surface elevation: 2,677 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	28 0	Unconsolidated material.....	28 0	
28 0	35 10	Dark, shaly claystone, marine fossils.....	7 10	
35 10	37 8	Coal.....	1 10	Harlem, el. 2,641 ft.
37 8	57 4	Argillaceous limestone and limy claystone.....	19 8	
57 4	66 2	Light-gray siltstone, lime inclusions.....	8 10	
66 2	70 8	Fine sandstone, iron-stained.....	4 6	
70 8	77 6	Light-gray, silty claystone, limy inclusions, grading to light-gray claystone and silty, semiplastic clay.	6 10	
77 6	87 4	Light-brown, fine sandstone.....	9 10	
87 4	102 10	Light-gray, silty claystone, limy inclusions.....	15 6	
102 10	105 2	Dark, shaly, silty claystone, sideritic zone in center.	2 4	
105 2	112 6	Fine sandstone.....	7 4	
112 6	119 10	Light-gray, shaly, silty claystone, limy inclusions.	7 4	
119 10	119 11	Coal.....	1	
119 11	154 5	Interbedded siltstone and fine sandstone, plant fossils.	34 6	
154 5	156 8	Coal.....	2 3	Lower Bakerstown, el. 2,520 ft. C-82384.
156 8	169 1	Light-gray, silty, semiplastic clay grading to silty claystone.	12 5	
169 1	175 1	Interbedded siltstone and fine sandstone.....	6 0	
175 1	199 9	Fine to medium sandstone.....	24 8	
199 9	217 3	Light-gray siltstone.....	17 6	
217 3	218 9	Medium sandstone.....	1 6	
218 9	224 7	Dark-gray siltstone grading to shaly claystone, plant fossils.	5 10	

## Log, hole 6-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
224	7	229	8	Artesian water flow.
229	8	243	8	
243	8	261	2	
261	2	283	3	
283	3	283	10	Brush Creek, el. 2,393 ft.
283	10	304	2	
304	2	307	4	
307	4	314	0	
314	0	323	8	
323	8	326	7	
326	7	327	5	
327	5	333	5	
333	5	345	8	
345	8	363	6	
363	6	371	9	
371	9	372	6	
372	6	380	2	
380	2	381	0	
381	0	387	0	
387	0	390	5	
390	5	391	4½	
391	4½	391	7	Upper Freeport, el. 2,284 ft., C-83212.
391	7	391	7½	
391	7½	392	1	
392	1	392	3	
392	3	393	4	
393	4	395	0	
395	0	422	6	
422	6	440	2	
440	2	445	5	
445	5	446	7	
446	7	455	4	
455	4	455	9	Upper Kittanning, el. 2,220 ft.
455	9	455	11	
455	11	456	7	
456	7	461	10	
461	10	467	8	
467	8	468	10	
468	10	472	2	
472	2	473	9	
473	9	519	6	
519	6	522	9	
522	9	525	3	Middle Kittanning, el. 2,137 ft.
525	3	536	0	
536	0	536	10	
536	10	537	6	
537	6	538	7	
538	7	539	3	
539	3	539	10	
539	10	542	1	

## Log, hole 6-CB—Continued

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
542	1	546 9	Gray-brown, shaly to black, carbonaceous claystone.	4 8	
546	9	557 1	Light-gray siltstone, fine sandstone, and silty claystone.	10 4	
557	1	574 7	Interbedded siltstone and fine sandstone	17 6	
574	7	581 9	Medium sandstone	7 2	
581	9	582 11	Coal	1 2	Lower Kittanning, el. 2,094 ft., C-83898.
582	11	583 11	Black claystone	1 0	
583	11	584 8	Dark-gray, medium sandstone, plant fossils	9 9	
584	8	585 2	Fragmental flint clay and silty claystone	6 6	
585	2	585 5	Coal	3 3	
585	5	585 11	Bony coal	6 6	
585	11	593 0	Interbedded siltstone and fine sandstone	7 1	
593	0	596 9	Black, shaly claystone	3 9	
596	9	598 0	Light-gray claystone	1 3	
598	0	598 3	Bone	3 3	
598	3	598 5½	Shale	2½ 2½	
598	5½	599 8	Coal	1 2½	Mount Savage, el. 2,076 ft., C-83899.
599	8	600 1½	Sandstone	5½ 5½	
600	1½	600 7½	Coal	6 6	
600	7½	602 8	Black, shaly clay	2 ½	
602	8	604 8	Light-gray, silty claystone	2 0	
604	8	606 2	Fragmental flint clay	1 6	
606	2	606 7	Carbonaceous claystone	5 5	
606	7	607 10	Dark-gray, silty, shaly claystone	1 3	
607	10	612 3	Medium sandstone, grading to stylonitic conglomerate.	4 5	
612	3	635 2	Medium sandstone, coaly partings in lower 3 ft.	22 11	
635	2	643 9	Interbedded siltstone and fine sandstone, 2 ft. of siltstone at top.	8 7	
643	9	669 0	Fine to medium stylonitic sandstone	25 3	
669	0	672 11	Dark-gray to black, silty, shaly claystone, plant fossils.	3 11	
672	11	674 3	Light-gray, silty claystone	1 4	
674	3	682 0	Interbedded siltstone and fine sandstone	7 9	

## Log, hole 7-CB

Location: 17,330 feet S. of lat. 39°40'; 4,700 feet W. of long. 79°10', 2 miles S. of Jennings; 132 feet N. 35° E. of Maynardier Ridge Church, Garrett County, Md.  
Surface elevation: 2,501 feet.

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
0	0	32 0	Unconsolidated material	32 0	
32	0	45 3	Medium sandstone	13 3	
45	3	56 1	Black, shaly claystone, marine fossils	10 10	
56	1	57 2	Coal	1 1	Brush Creek, el. 2,444 ft.
57	2	58 4	Gray, silty claystone	1 2	
58	4	67 1	Interbedded siltstone and fine to medium sandstone.	8 9	
67	1	86 10	Light-gray siltstone, grading to claystone, limy pellets.	19 9	
86	10	89 10	Light-gray and green claystone, grading to silty claystone, minor red mottling.	3 0	
89	10	99 0	Light-gray, silty claystone, grading to siltstone.	9 2	
99	0	112 0	Light-green, silty claystone, red mottling	13 0	



Log, hole 7-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i> 435	<i>in.</i> 7		<i>Ft.</i> 436	<i>in.</i> 4	
		Irregularly interbedded sandstone, claystone and siltstone.		9	
436	4	Dark-gray, shaly claystone	440	6	
440	6	Fine sandstone	440	11	
440	11	Coal	441	0	
441	0	Shale	441	1/2	
441	1/2	Coal	442	3 1/2	Mount Savage el. 2,058 ft.; C-83213.
442	3 1/2	Pyrite	442	4	
442	4	Coal	442	10 1/2	
442	10 1/2	Cannel coal	443	3	
443	3	Dark-gray, silty claystone and gray-brown, silty, semiplastic clay.	445	10	
445	10	Flint clay, 8 in. of plastic clay at top	450	4	
450	4	Dark-gray, silty, shaly claystone and interbedded siltstone and fine sandstone, plant fossils.	465	11	
465	11	Medium stylonitic sandstone	473	0	
473	0	Coarse to conglomeratic stylonitic sandstone	479	11	
479	11	Conglomerate	484	2	
484	2	Dark-gray, silty, shaly claystone, plant fossils	485	5	
485	5	Coal	485	10	
485	10	Bone	486	1	
486	1	Coal	486	10 1/2	Mercer, el. 2,012 ft.; C-83694.
486	10 1/2	Bone	487	4	
487	4	Bony coal	487	5 1/2	
487	5 1/2	Coal	488	1	
488	1	Bone	488	3 1/2	
488	3 1/2	Coal	489	1/2	
489	1/2	Bone	489	3	
489	3	Black, silty, shaly claystone, fine sandstone lenses.	490	7	
490	7	Light-gray, silty, semiplastic clay, grading to black, silty claystone.	495	9	
495	9	Light-gray, shaly claystone, plant fossils	501	8	
501	8	Bony coal, bone, and carbonaceous claystone	503	1	
503	1	Light-gray claystone grading to light-gray siltstone, plant fossils.	506	7	
506	7	Interbedded siltstone and fine sandstone	508	8	
508	8	Light-gray, silty claystone grading to light-gray siltstone, plant fossils.	510	0	

Log, hole 8-CB

Location: 1, 500 feet due S. of lat. 39°40'; 2, 080 feet due W. of long. 79°10'; 1 mile NE. of Jennings on Menno Yoder farm, part of Mount Aiary, Garrett County, Md.  
Surface elevation: 2, 454 feet.

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i> 0	<i>in.</i> 0		<i>Ft.</i> 24	<i>in.</i> 0	
		Unconsolidated material		0	
24	0	Light-gray, silty claystone grading to tan siltstone, limy stringers.	37	4	
37	4	Interbedded siltstone and fine sandstone	42	10	
42	10	Medium sandstone	47	4	
47	4	Dark-gray, silty claystone, plant fossils	56	0	
56	0	Interbedded siltstone and fine sandstone	64	5	

## Log, hole 8-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i> 64	<i>in.</i> 5		<i>Ft.</i> 6	<i>in.</i> 7	
		Light-gray to black, silty claystone, plant fossils.			
71	0	Bone		2	} Barton, el. 2,382 ft.
71	2	Coal		11	
72	1	Bone		1	
72	2	Light-gray, argillaceous limestone		9	
81	3	Light-gray claystone, limy pellets and stringers		27	
108	7	Interbedded siltstone, claystone, and fine sandstone.		9	
109	4	Light-gray, silty claystone		1	
111	2	Carbonaceous claystone		8	
119	4	Coal		2	} Federal Hill, el. 2,335 ft.
119	6	Interbedded, light-gray siltstone and fine sandstone.		4	
123	7	Light-gray, silty claystone		3	
127	4	Light-gray and greenish gray, silty claystone, limy pellets and stringers.		8	
136	2	Interbedded siltstone and fine sandstone, limy pellets and stringers in upper 5 ft.		8	
144	2	Fine to medium sandstone, conglomeratic zones in lower 4 ft.		29	
173	5	Irregularly interbedded siltstone and fine sandstone.		5	
178	10	Black, shaly claystone, marine fossils, 4-in. siderite nodule at 192 ft.		16	
194	11	Coal		3	} Harlem, el. 2,258 ft., C-84703.
195	2	Bony coal		1/2	
195	2 1/2	Coal		8	
195	10 1/2	Bony coal		1/2	
195	11	Coal		1/2	
195	11 1/2	Shale		1/2	
196	0	Coal		5	
196	5	Dark- to light-gray limy claystone		8	
204	11	Light-gray, argillaceous limestone, grading to limy claystone.		11	
216	10	Light-gray, silty claystone, mottled red, siderite pellets and stringers in upper 4 ft., limy pellets and inclusions.		11	
228	0	Fine sandstone and light-gray, silty to shaly claystone.		28	
256	1	Dark-gray to black, shaly claystone		13	
269	9	Interbedded siltstone, claystone, and fine sandstone.		2	
272	3	Dark-gray, silty claystone, plant fossils		1	
274	0	Bone		1	} Upper Bakerstown, el. 2,179 ft.
275	1				
279	5	Dark-gray claystone, limy pellets and stringers		4	
279	5	Dark- to light-gray, silty claystone, limy lenses and pellets.		12	
291	5	Dark-gray to black, silty, shaly claystone, limy stringers.		21	
313	3	Coal		1	} Lower Bakerstown, el. 2,139 ft., C-84900.
315	1			10	
315	1	Dark- to light-gray, silty claystone, limy pellets.		9	
324	2	Interbedded gray to green siltstone and fine sandstone.		8	
332	2	Light greenish-gray, silty claystone		3	
335	10	Light-gray and greenish claystone, mottled red, limy stringers.		14	
350	0	Interbedded siltstone and fine sandstone, limy lenses and stringers.		9	
359	6	Light green and gray, silty, shaly claystone, 3-in. siderite nodule at 365 ft.		14	
373	11	Light- to dark-gray, silty claystone, mottled red, limy pellets and stringers.		19	



## Log, hole 8-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
393 8	400 3	Dark-gray, silty, shaly claystone, limy stringers.	6 7	
400 3	418 9	Interbedded siltstone and fine sandstone	18 6	
418 9	429 8	Fine sandstone	10 11	
429 8	441 4	Dark-gray, silty, shaly claystone, marine fossils.	11 8	
441 4	442 11	Coal	1 7	Brush Creek, el. 2,011 ft., C-84901.
442 11	457 1	Dark- to light-gray, silty claystone, limy stringers.	14 2	
457 1	475 2	Light-gray, silty claystone	18 1	
475 2	480 11	Green claystone, red mottling	5 9	
480 11	482 4	Fragmental green claystone and semifint clay	1 5	
482 4	489 6	Gray and green, silty claystone	7 2	
489 6	499 2	Interbedded siltstone and fine sandstone	9 8	
499 2	501 6	Light-gray, silty claystone, 3-in. siderite nodule at 500 ft.	2 4	
501 6	518 0	Gray and green, silty claystone, red mottling, limy lenses and stringers.	16 6	
518 0	523 8	Interbedded siltstone and fine sandstone	5 8	
523 8	535 2	Light- to dark-gray, silty, shaly claystone, limy lenses and stringers.	11 6	
535 2	537 4	Tan, silty, semiplastic clay	2 2	
537 4	549 11	Light- to dark-gray, silty claystone, grading to siltstone, plant fossils.	12 7	
549 11	566 4	Interbedded siltstone and fine sandstone, plant fossils.	16 5	
566 4	570 1	Fine sandstone	3 9	
570 1	571 0	Dark-gray, silty, shaly claystone	11 11	
571 0	571 3	Coal	3 3	
571 3	571 3½	Sandstone	½ ½	Upper Freeport, el. 1,879 ft., C-85432.
571 3½	571 11	Coal	7½ 7½	
571 11	571 11½	Bone	½ ½	
571 11½	574 3	Coal	2 3½	
574 3	574 4	Bone	1 1	
574 4	574 8	Coal	4 4	
574 8	574 11½	Bony coal	3½ 3½	
574 11½	582 0	Light-gray, argillaceous limestone	7 1½	
582 0	587 11	Gray, silty, shaly claystone	5 11	
587 11	591 2	Fragmental flint and semifint clay	3 3	
591 2	607 2	Gray, silty, shaly claystone, siderite nodule from 599 ft. 6 in. to 600 ft. 6 in.	16 0	
607 2	616 8	Interbedded siltstone and fine sandstone	9 6	
616 8	622 8	Fine sandstone	6 0	
622 8	623 1	Bone	5 5	
623 1	623 6	Gray, silty claystone	5 5	
623 6	627 2	Light-tan, semiplastic clay	3 8	
627 2	631 6	Greenish gray claystone, siderite nodules	4 4	
631 6	632 7	Interbedded green siltstone and fine sandstone	1 1	
632 7	635 11	Fragmental, semifint claystone, flint and semiplastic clay.	3 4	
635 11	639 7	Gray, silty claystone	3 8	
639 7	664 11	Interbedded siltstone and fine sandstone	25 4	
664 11	694 6	Gray to black, silty claystone, plant fossils from 686 ft. to 690 ft.	29 7	
694 6	695 1	Bone	7 7	
695 1	695 5	Black and light-brown claystone	4 4	
695 5	696 2	Brown, silty, semiplastic clay	9 9	
696 2	701 7	Light-gray, silty claystone, siderite nodules	5 5	
701 7	708 7	Gray, silty claystone	7 0	
708 7	723 10	Interbedded siltstone and fine sandstone	15 3	
723 10	757 0	Fine to coarse, stylonitic sandstone, conglomeratic.	33 2	
757 0	758 1	Coal	1 1	Lower Kittanning, el. 1,696 ft., C-86220.
758 1	764 1	Silty claystone	6 0	

## Log, hole 8-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 764 1	<i>Ft. in.</i> 777 5	Interbedded siltstone and silty claystone, grading to black, shaly claystone, siderite in lower part.	<i>Ft. in.</i> 13 4	Mount Savage, el. 1,669 ft., C-86221
777 5	777 9	Bone	4	
777 9	784 1	Tan, silty claystone, plant rootlets in upper 1 ft.	6 4	
784 1	785 0	Coal	11	
785 0	793 2	Tan, silty claystone, grading to siltstone	8 2	
793 2	830 7	Interbedded siltstone and fine sandstone	37 5	
830 7	833 2	Dark-gray, silty claystone	2 7	
833 2	844 3	Siltstone	11 1	
844 3	845 0	Silty claystone	9	
845 0	864 0	Siltstone, interbedded sandstone in lower half	19 0	

## Log, hole 9-CB

Location: 1,500 feet due S. of lat. 39°40'; 5,850 feet due E. of long. 79°10'; 2½ miles S. of Grantsville, on Ellsworth O. Beachy farm, north of Big Laurel Run, Garrett County, Md.  
Surface elevation: 2,556 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 0 0	<i>Ft. in.</i> 10 0	Unconsolidated material	<i>Ft. in.</i> 10 0	Harlem, el. 2,487 ft., C-84655.
10 0	44 7	Medium to coarse sandstone	34 7	
44 7	67 9	Black, shaly claystone, marine fossils	23 2	
67 9	68 1½	Coal	4½	
68 1½	68 2	Bone	½	
68 2	68 8½	Coal	6½	
68 8½	68 9	Bone	½	
68 9	69 1½	Coal	4½	
69 1½	69 4	Bony coal	2½	
69 4	98 8	Gray, argillaceous limestone	29 4	
98 8	105 10	Greenish-gray claystone, limy pellets and stringers.	7 2	
105 10	122 3	Greenish-gray siltstone, limy stringers and pellets.	16 5	
122 3	126 11	Light-gray, silty claystone	4 8	
126 11	133 6	Light-gray, shaly claystone	6 7	
133 6	136 11	Fine sandstone	3 5	
136 11	145 5	Gray, silty, shaly claystone	8 6	
145 5	147 8	Gray, carbonaceous claystone, limy stringers	2 3	
147 8	149 8	Dark-gray, silty claystone	2 0	
149 8	150 5	Bony coal	9	
150 5	150 10½	Shale	5½	
150 10½	151 8½	Bone	10	
151 8½	161 3	Gray claystone	9 6½	
161 3	163 7	Gray, argillaceous limestone	2 4	
163 7	171 2	Light-gray, silty, semiplastic clay, grading to shaly claystone, limy stringers and inclusions.	7 7	
171 2	185 5	Interbedded siltstone and fine sandstone and silty claystone, plant fossils, limy lenses in upper 2 ft.	14 3	
185 5	187 0	Silty, shaly claystone, plant fossils	1 7	
187 0	188 11	Coal	1 11	
188 11	193 6	Dark- to light-gray, semiplastic clay, silty at top and bottom.	4 7	

Upper Bakerstown, el. 2,405 ft.

Lower Bakerstown, el. 2,367 ft., C-84656.

## Log, hole 9-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> 193 194	<i>in.</i> 6 10	<i>Ft.</i> 194 210	<i>in.</i> 10 1	
		Interbedded siltstone and fine sandstone.....	1 4	
		Gray, shaly claystone, beds of siltstone and fine sandstone.	15 3	
210	1	221 4	Light-gray and green, silty claystone, red mottling.	11 3
221	4	231 11	Interbedded, fine sandstone and siltstone.....	10 7
231	11	248 4	Greenish, light-gray, silty, shaly claystone.....	16 5
248	4	258 2	Light-gray and green, silty claystone, mottled red.	9 10
258	2	282 7	Interbedded siltstone and fine sandstone.....	24 5
282	7	292 2	Dark-gray, silty, shaly claystone, plant fossils in upper 4 feet.	9 7
292	2	310 3	Gray to black, silty, shaly claystone, marine fossils.	18 1
310	3	310 7	Coal.....	4
310	7	311 1	Bony coal.....	6
311	1	311 4	Bone.....	3
311	4	315 11	Interbedded siltstone and fine sandstone.....	4 7
315	11	317 8	Fine sandstone.....	1 9
317	8	331 8	Light-gray, silty claystone, limy pellets.....	14 0
331	8	340 10	Interbedded siltstone and fine sandstone.....	9 2
340	10	351 9	Light-gray and green, silty claystone, limy lenses.	10 11
351	9	355 4	Fragmental, green claystone and flint clay.....	3 7
355	4	359 2	Gray, silty claystone, mottled red and green.....	3 10
359	2	373 3	Interbedded, light-green siltstone and fine sandstone.	14 1
373	3	381 11	Light-gray claystone, red mottling.....	8 8
381	11	395 1	Interbedded siltstone and fine sandstone.....	13 2
395	1	419 9	Gray, silty, shaly claystone, limy stringers.....	24 8
419	9	422 1	Interbedded siltstone, fine sandstone, and silty claystone, plant fossils.	2 4
422	1	423 0	Dark-gray, silty, shaly claystone, plant fossils..	11
423	0	423 8	Coal.....	8
423	8	423 10	Bone.....	2
423	10	425 1	Coal.....	1 3
425	1	430 7	Gray siltstone, sandy streaks, limy pellets and stringers.	5 6
430	7	468 0	Interbedded siltstone and fine sandstone, limy pellets and stringers in upper 6 feet.	37 5
468	0	469 10	Interbedded siltstone, fine sandstone, coal and carbonaceous claystone.	1 10
469	10	470 10	Dark- to light-gray, silty claystone.....	1 0
470	10	482 6	Interbedded siltstone and fine sandstone.....	11 8
482	6	509 3	Fine to medium sandstone, conglomerate at 497 ft. 8 in., stylonitic at base.	26 9
509	3	509 8	Bone.....	5
509	8	511 6½	Coal.....	1 10½
511	6½	512 3	Bone.....	8½
512	3	514 9	Dark-gray, silty, shaly claystone.....	2 6
514	9	525 4	Interbedded siltstone and fine sandstone.....	10 7
525	4	540 11	Medium sandstone, siltstone beds.....	15 7
540	11	542 3	Fragmental siltstone and medium sandstone..	1 4
542	3	549 9	Medium sandstone.....	7 6
549	9	555 2	Interbedded siltstone and fine sandstone.....	5 5
555	2	560 6	Gray, silty claystone.....	5 4
560	6	561 11	Medium stylonitic sandstone, 6 in. of fragmental siltstone at base.	1 5
561	11	567 4	Dark-gray siltstone, grading to black, silty claystone.....	5 5
567	4	568 7	Interbedded siltstone and fine sandstone.....	1 3
568	7	570 6	Dark-gray, silty, shaly claystone.....	1 11
570	6	571 4	Bone.....	10
571	4	572 7	Coal.....	1 3
572	7	572 9	Bone.....	2

Brush Creek, el. 2,245 ft.

Upper Freeport, el. 2,131 ft., C-84704.

Upper Kittanning, el. 2,044 ft., C-84897.

Middle Kittanning, el. 1,983 ft., C-84898.

## Log, hole 9-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> 572	<i>in.</i> 9		<i>Ft.</i> 11	<i>in.</i> 0
		Light-gray, silty, semiplastic clay, grading to black, silty, shaly claystone.		
583	9	Carbonaceous shale	1	1
584	10	Sandstone		4
585	2	Coal		3
585	5	Bone		1
585	6	Carbonaceous shale		6
586	0	Coal	1	6½
587	6½	Bone		1
587	7½	Dark-gray, silty, shaly claystone	2	2½
589	10	Interbedded siltstone and fine sandstone	5	2

} Middle Kittanning, el.  
1,968 ft., C-84899.

## Log, hole 10-CB

Location: 1,140 feet due N. of lat. 39°40'; 5,830 feet due E. of long. 79°10'; 2 miles S. of Grantsville on Ellsworth O. Beachy farm, Garrett County, Md.  
Surface elevation: 2,572 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> 0	<i>in.</i> 0		<i>Ft.</i> 24	<i>in.</i> 0
		Unconsolidated material		
24	0	Interbedded siltstone and fine sandstone	29	0
53	0	Gray, silty claystone, limy pellets and lenses	9	11
62	11	Black to gray, silty claystone	4	4
67	3	Bone		6
67	9	Coal		7
68	4	Carbonaceous shale	1	11
70	3	Gray, silty, shaly claystone	7	4
77	7	Coal		11
78	6	Gray claystone, limy pellets and lenses	13	7
92	1	Light-gray, argillaceous limestone	1	11
94	0	Green to gray, silty claystone	6	5
100	5	Greenish-gray, silty, grading to shaly, claystone	12	6
112	11	Interbedded siltstone and fine sandstone	11	11
124	10	Light-gray, shaly clay	3	6
128	4	Interbedded siltstone and fine sandstone	2	0
130	4	Dark-gray to black, shaly claystone	2	7
132	11	Bony coal		5½
133	4½	Shale		1
133	5½	Coal		10
134	3½	Dark- to light-gray, silty claystone, limy pellets in lower 1 ft.	3	11½
138	3	Medium sandstone, limy inclusions	2	3
140	6	Gray claystone	2	3
142	9	Interbedded siltstone, fine sandstone, and silty claystone.	2	6
145	3	Gray, silty, shaly claystone	9	8
154	11	Medium sandstone	5	11
160	10	Interbedded siltstone and fine sandstone	1	10
162	8	Fine to coarse, conglomeratic sandstone	5	7
168	3	Dark-gray siltstone, grading to silty claystone	4	10
173	1	Black, shaly claystone, marine fossils	23	3

} Federal Hill, el. 2,438 ft.

## Log, hole 10-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
196 4	197 1½	Coal	9½	} Harlem, el. 2,374 ft., C-85529.
197 1½	197 3½	Bone	2	
197 3½	197 8½	Coal	5	
197 8½	197 9½	Bone	1	
197 9½	257 4	Gray to green claystone, grading to silty, shaly claystone, red mottling and limy pellets.	59 6½	
257 4	275 6	Fine sandstone grading to green siltstone	18 2	} Upper Bakerstown, el. 2,291 ft.
275 6	278 6	Shaly claystone	3 0	
278 6	279 3	Black, silty claystone	9	
279 3	280 1	Bone	10	
280 1	280 5½	Shale	4½	
280 5½	281 2½	Bone	9	
281 2½	296 5	Silty claystone, limy pellets	15 2½	
296 5	315 6	Shaly claystone, silty and sandy streaks	19 1	
315 6	317 9½	Coal	2 3½	} Lower Bakerstown, el. 2,254 ft. C-86222.
317 9½	319 8	Silty, semiplastic clay	1 10½	
319 8	338 6	Shaly claystone	18 10	} Brush Creek, el. 2,126 ft., C-86223.
338 6	340 0	Siltstone, grading to fine sandstone	1 6	
340 0	354 4	Green claystone, red mottling	14 4	
354 4	380 0	Interbedded greenish, shaly clay and siltstone, minor sandstone in upper half.	25 8	
380 0	387 10	Greenish-gray, red-mottled clay, limy stringers at base.	7 10	
387 10	414 10	Greenish, fine sandstone, grading to gray siltstone.	27 0	
414 10	434 4	Dark-gray siltstone, grading to shaly clay, plant fossils.	19 6	
434 4	444 10½	Dark-gray to black shale, marine fossils	10 6½	
444 10½	446 0	Coal	1 1½	
446 0	449 8	Silty claystone and siltstone	3 8	
449 8	451 0	Fine sandstone	1 4	} Upper Freeport Rider.
451 0	474 8	Silty claystone, limy pellets in upper 6 ft.	23 8	
474 8	481 4	Fragmental claystone, siltstone matrix	6 8	
481 4	485 0	Gray and green, silty claystone, 6-in. siderite nodule at base.	3 8	
485 0	502 10	Gray and greenish gray, shaly claystone	17 10	
502 10	516 1	Fine to medium sandstone, silty layers in upper part.	13 3	
516 1	523 11	Shaly claystone	7 10	
523 11	535 1	Interbedded siltstone and fine sandstone	11 2	
535 1	543 0	Shaly, black claystone	7 11	
543 0	543 10	Coal	10	
543 10	544 1	Shale	3	} Upper Freeport, el. 2,020 ft., C-86224.
544 1	544 3	Bone	2	
544 3	550 1	Dark-gray claystone, interbedded sandstone in middle part.	5 10	
550 1	550 10	Coal	9	
550 10	550 11	Bone	1	
550 11	552 3	Coal	1 4	
552 3	598 6	Gray to greenish-gray claystone, silty zones, fragmental in upper half.	46 3	
598 6	623 6	Fine to medium sandstone	25 0	
623 6	657 11	Styolitic conglomeratic sandstone	34 5	
657 11	663 10	Dark-gray, silty claystone	5 11	
663 10	686 3	Silty, shaly claystone, beds of fine sandstone	22 5	
686 3	691 10	Interbedded siltstone, fine sandstone, and silty claystone.	5 7	} Upper Freeport, el. 2,020 ft., C-86224.
691 10	694 9	Dark-gray, silty claystone	2 11	
694 9	695 2½	Carbonaceous claystone	5½	
695 2½	695 7½	Coal	5	

## Log, hole 10-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
695 7½	701 2	Fine to medium sandstone.....	5 6½	} Middle Kittanning, el. 1,857 ft., C-86544.
701 2	712 3	Black, silty to shaly claystone, sandstone beds.....	11 1	
712 3	712 5½	Coal.....	2½	
712 5½	712 7	Bone.....	1½	
712 7	713 5½	Coal.....	10½	
713 5½	713 7	Bone.....	1½	
713 7	713 10½	Shale.....	3½	
713 10½	714 11	Coal.....	1 ½	
714 11	721 8	Silty claystone, sandstone beds at base.....	6 9	
721 8	726 9	Dark-gray, shaly clay.....	5 1	
726 9	727 4	Bone.....	7	
727 4	727 10	Carbonaceous shale.....	6	
727 10	728 2	Carbonaceous sandstone.....	4	
728 2	728 4½	Shaly coal.....	2½	
728 4½	728 6½	Carbonaceous shale.....	2	
728 6½	730 2	Coal.....	1 7½	} El. 1,842 ft., C-86545.
730 2	734 0	Silty claystone, plant rootlets.....	3 10	

## Log, hole 11-CB

Location: 22,700 feet due S. of lat. 39°40'; 10,000 feet due W. of long. 79°10'; 1 mile E. of Bittinger, south of South Branch of Casselman River on State Forest land, Garrett County, Md.  
Surface elevation: 2,488 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	12 0	Unconsolidated material.....	12 0	} Lower Bakerstown, el. 2,451 ft., C-87191.
12 0	34 9	Light-gray, silty claystone, grading to black, shaly clay, plant fossils in lower half.....	22 9	
34 9	35 1	Bone.....	4	
35 1	36 10	Coal.....	1 9	
36 10	41 3	Clay.....	4 5	
41 3	43 3	Light-gray, semiplastic clay.....	2 0	
43 3	52 6	Clay.....	9 3	
52 6	63 3	Greenish-gray, silty claystone, red mottlings.....	10 9	
63 3	67 10	Interbedded greenish-gray claystone, siltstone, and fine sandstone.....	4 7	
67 10	108 10	Green, silty, shaly claystone, red mottling, limy pellets and stringers in center part.....	41 0	
108 10	149 5	Fine sandstone, coaly partings at base.....	40 7	
149 5	155 4	Dark-gray, silty claystone, limy stringers.....	5 11	
155 4	162 7	Green, silty claystone, siderite stringers.....	7 3	
162 7	164 4	Fragmental, green and silty claystone, siderite stringers.....	1 9	
164 4	177 4	Green, silty claystone, siderite pellets and lenses.....	13 0	
177 4	180 0	Fragmental, green claystone and tan semiflint clay.....	2 8	
180 0	186 4	Greenish-gray, silty claystone.....	6 4	
186 4	188 2	Interbedded, silty claystone, siltstone, and fine sandstone.....	1 10	
188 2	201 0	Light-gray siltstone, 1 ft. siderite at base.....	12 10	
201 0	207 4	Interbedded siltstone and fine sandstone.....	6 4	
207 4	212 4	Medium sandstone.....	5 0	
212 4	217 10	Olive-green, silty claystone.....	5 6	
217 10	223 4	Interbedded siltstone and fine sandstone.....	5 6	
223 4	232 3	Gray, shaly claystone, grading to siltstone.....	8 11	

## Log, hole 11-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
232	3	237	1	Interbedded siltstone and fine sandstone.....
237	1	244	4	Fine to medium sandstone, silty streaks.....
244	4	246	10	Dark-gray, silty claystone, plant fossils.....
246	10	262	6	Fine sandstone, siltstone fragments and beds.....
262	6	289	6	Fine to medium sandstone.....
289	6	297	3	Black, silty, shaly claystone, plant fossils.....
297	3	320	6	Medium sandstone.....
320	6	353	10	Dark-gray, silty, shaly claystone, interbedded siltstone and fine sandstone, plant fossils.....
353	10	364	0	Medium to coarse stylonitic sandstone, siltstone pebbles in lower 1 ft.
364	0	377	3	Gray, silty claystone.....
377	3	386	7	Fine sandstone.....
386	7	388	0	Gray claystone, grading to black, shaly clay.....
388	0	390	4	Gray, silty claystone, grading to siltstone.....
390	4	393	11	Fine to medium sandstone, siltstone beds.....
393	11	396	7	Carbonaceous claystone, grading to carbonaceous shale.
396	7	398	2	Black, silty claystone, interbedded fine sandstone.
398	2	399	0	Coal.....
399	0	399	7	Shale.....
399	7	399	11½	Bone.....
399	11½	400	2	Shale.....
400	2	400	8½	Bone.....
400	8½	417	3	Interbedded siltstone and fine sandstone, claystone in lower half, plant fossils.
417	3	419	0	Coal.....
419	0	420	7	Light-gray siltstone, plant rootlets.....
420	7	423	1	Fragmental siltstone and silty claystone.....
423	1	430	8	Tan siltstone, grading to silty claystone.....
430	8	431	0	Dark-gray, fragmental silty claystone and semiflint clay, pyrite seams in lower 3 in.
431	0	431	5	Bone.....
431	5	431	10	Coal.....
431	10	432	0	Bone.....
432	0	435	5	Tan, silty, shaly claystone, plant fossils.....
435	5	438	6	Interbedded siltstone and fine sandstone.....
438	6	461	6	Fine to medium sandstone, stylonitic.....
461	6	481	10	Gray siltstone, plant fossils.....
481	10	493	6	Gray, silty claystone, grading to shaly siltstone.....
493	6	500	3	Fine to medium stylonitic sandstone.....
500	3	500	10	Conglomerate.....
500	10	507	2	Fine sandstone.....
507	2	508	1	Dark-gray to black, shaly clay.....
508	1	529	10	Fine to medium, stylonitic sandstone.....
529	10	530	3½	Bone.....
530	3½	531	7½	Coal.....
531	7½	531	11	Bone.....
531	11	543	7	Black, silty, shaly claystone, minor interbedded siltstone, plant fossils.
543	7	545	11	Fine sandstone, 1 in. of coal at base.....
545	11	548	6	Coarse sandstone, grading to conglomerate.....
548	6	571	9	Interbedded, dark-gray siltstone, silty claystone, and fine sandstone.
571	9	594	5	Medium sandstone.....
594	5	596	3	Brown claystone.....
596	3	603	0	Interbedded siltstone and fine sandstone.....
603	0	630	0	Fine- to medium-grained stylonitic sandstone, silty beds in upper part.

Middle Kittanning, el.  
2,087 ft.

Middle Kittanning, el.  
2,069 ft., C-87924.

Artesian water flow.

Mount Savage, el. 1,956  
ft.

## Log, hole 12-CB

Location: 1,200 feet due N. of lat. 39° 40'; 8,500 feet due E. of long. 79° 10'; 2 miles SE. of Grantsville, W. of New Germany road on Jonas Beiler farm, Garrett County, Md.  
Surface elevation: 2,565 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	20	4
20	4	Medium sandstone	10	2
30	6	Light-gray siltstone	2	0
32	6	Black, shaly claystone, marine fossils	30	3
62	9	Coal	1	7
64	4	Light-gray, limy claystone	19	0
83	4	Light-gray siltstone, limy pellets and stringers	10	11
94	3	Gray, limy claystone, red mottling	3	0
97	3	Green, silty, shaly claystone	16	2
113	5	Interbedded, fine sandstone and green siltstone	2	3
115	8	Green, silty, shaly clay	13	2
128	10	Black, shaly clay	10	10
129	8	Green, silty, shaly claystone	1	8
131	4	Fine sandstone, 1 ft. fragmental siltstone at base.	7	8
139	0	Light-gray, silty, shaly claystone	5	3
144	3	Black, carbonaceous claystone	1	11
146	2	Bony coal	11	
147	1	Gray, silty claystone, limy inclusions	20	1
167	2	Interbedded siltstone, silty claystone, and fine sandstone.	4	7
171	9	Black, silty, shaly clay, plant fossils	9	7½
181	4½	Coal	2	3
183	7½	Gray, silty claystone	8	6½
192	2	Gray, silty, shaly claystone, limy stringers	12	6
204	8	Gray and green claystone, red mottling	10	0
214	8	Interbedded siltstone, silty claystone and fine sandstone, limy stringers.	5	1
219	9	Fine sandstone	3	2
222	11	Gray, silty, shaly clay, 3-in. siderite nodule at 239 ft. 7 in.	17	7
240	6	Gray and green claystone	7	2
247	8	Interbedded siltstone, silty claystone, and fine sandstone.	18	4
266	0	Black, shaly siltstone, grading to silty, shaly clay, plant fossils.	13	7
279	7	Black, silty, shaly clay, marine fossils	20	5
300	0	Bone	8	
300	8	Fine sandstone	2	9
303	5	Gray, silty claystone, limy lenses in upper 6 ft.	13	4
316	9	Interbedded siltstone, silty claystone, and fine sandstone.	3	7
320	4	Gray, silty claystone, siderite nodules at 324 ft. and 330 ft.	11	1
331	5	Green siltstone grading to silty claystone	6	7
338	0	Fragmental green claystone and semiflint clay	4	4
342	4	Green, silty, shaly claystone, 3-in. siderite nodule at base.	15	11
358	3	Medium sandstone	2	4
360	7	Gray, silty claystone, grading to siltstone	6	4
366	11	Gray and red claystone	9	1
376	0	Green, fragmental claystone and semiflint clay	10	10
376	10	Gray siltstone, some limy pellets and stringers at base.	10	2
387	0	Gray-black, silty, shaly claystone	2	8
389	8	Gray claystone, grading to siltstone	9	5
399	1	Interbedded siltstone and fine sandstone	7	8
406	9	Fine sandstone	12	6
419	3	Coal	1	9½
421	½	Dark-gray, silty claystone, plant rootlets in upper 1 ft., limy pellets in lower 2 ft.	6	2½

Harlem, el. 2,501 ft.

Upper Bakerstown, el. 2,418 ft.

Lower Bakerstown, el. 2,381 ft., C-87192.

Brush Creek, el. 2,264 ft.

Upper Freeport, el. 2,144 ft., C-87193.



## Log, hole 12-CB—Continued

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
427	3	430 10	Fragmental claystone, flint clay, and silty semi-plastic clay.	3 7	
430	10	433 10	Interbedded siltstone and fine sandstone, limy inclusions in upper 1 ft.	3 0	
433	10	444 10	Dark- to light-gray, silty claystone, 6-in. siderite zone at 437 ft. 2 in.	11 0	
444	10	447 10	Interbedded siltstone and fine sandstone	3 0	
447	10	455 7	Gray to black, shaly claystone	7 9	
455	7	456 9	Bone, clay streaks	1 2	
456	9	463 3	Gray, silty claystone, plant rootlets, grading to siltstone.	6 6	
463	3	473 9	Interbedded siltstone and fine sandstone	10 6	
473	9	492 8	Fine to medium stylonitic sandstone	18 11	
492	8	509 6	Medium to coarse stylonitic conglomeratic sandstone.	16 10	
509	6	511 0	Coal	1 6	Upper Kittanning, el. 2,054 ft.
511	0	532 4	Gray, silty, shaly claystone	21 4	
532	4	539 4	Gray siltstone	7 0	
539	4	548 11	Interbedded siltstone and fine sandstone	9 7	
548	11	551 4	Dark-gray, silty claystone, interbedded fine sandstone at base.	2 5	
551	4	553 6	Interbedded siltstone and fine sandstone	2 2	
553	6	554 0	Carbonaceous shale	6 6	
554	0	554 7½	Coal	7½ ½	Middle Kittanning, el. 2,010 ft., C-87623.
554	7½	554 8	Shale	1½ ½	
554	8	554 8½	Coal	1½ ½	
554	8½	554 9½	Shale	1 1	
554	9½	554 10½	Coal	1 1	
554	10½	554 11½	Shale	1 1	
554	11½	555 8	Coal	8½ ½	
555	8	565 9½	Dark-gray, silty claystone, interbedded siltstone and fine sandstone, plant rootlets.	10 1½	
565	9½	567 ½	Coal	1 3	Middle Kittanning, el. 1,998 ft., C-87624.
567	½	568 0	Black, shaly claystone, plant fossils	11½ ½	
568	0	570 11½	Fine sandstone, silty streaks	2 11½	
570	11½	572 1½	Coal	1 2	Middle Kittanning, el. 1,993 ft., C-87625.
572	1½	582 0	Gray, silty claystone and siltstone, plant rootlets.	9 10½	
582	0	588 0	Interbedded siltstone and fine sandstone	6 0	
588	0	589 7	Black, shaly clay	1 7	
589	7	590 0	Coal	5 5	
590	0	590 2	Carbonaceous claystone	2 2	
590	2	602 7	Fine sandstone	12 5	
602	7	603 3	Bone	8 8	
603	3	603 5	Shale	2 2	
603	5	603 7	Bone	2 2	
603	7	604 1½	Coal	6½ ½	Lower Kittanning, el. 1,959 ft., C-87626.
604	1½	604 8	Bone	6½ ½	
604	8	605 9½	Coal	1½ ½	
605	9½	606 6	Gray, silty claystone, plant rootlets	8½ ½	
606	6	607 7	Bone	1 1	
607	7	609 6	Interbedded siltstone and fine sandstone	1 11	
609	6	615 5	Black, shaly claystone	5 11	
615	5	615 11	Coal	6 6	
615	11	621 10	Tan, silty claystone, grading to siltstone, sandy streaks in lower 1 ft.	5 11	
621	10	623 7	Fine sandstone	1 9	
623	7	629 2	Gray to black, silty, shaly claystone	5 7	
629	2	630 10	Black, silty, shaly claystone, interbedded fine sandstone.	1 8	
630	10	631 3	Black, shaly claystone, coaly partings	5 5	
631	3	634 0	Black, silty, shaly claystone, interbedded fine sandstone.	2 9	

## Log, hole 13-CB

Location: 9,200 feet due N. of lat. 39°40'; 2,050 feet due W. of long. 79°10'; 1 mile W. of Grantsville in Shade Hollow ¼ mile S. of Rt. 40, Garrett County, Md.  
Surface elevation: 2,185 feet.

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>				
0	0	7	0	Unconsolidated material.....	7	0	
7	0	59	11	Interbedded siltstone and fine sandstone.....	52	11	
59	11	69	9	Black, shaly clay, marine fossils.....	9	10	
69	9	69	11½	Bone.....		2½	} Brush Creek, el. 2,113 ft., C-88414.
69	11½	71	1½	Coal.....	1	2	
71	1½	71	3	Bone.....		1½	
71	3	71	9	Coal.....		6	
71	9	77	11	Gray, limy claystone, limy inclusions.....	6	2	
77	11	86	7	Gray, silty claystone.....	8	8	
86	7	92	0	Siltstone to fine sandstone.....	5	5	
92	0	104	8	Dark- to light-gray, silty claystone.....	12	8	
104	8	106	6	Green, silty claystone.....	1	10	
106	6	108	7	Green; fragmental claystone and semiflint clay.....	2	1	
108	7	111	5	Gray, silty claystone, yellow stringers in upper part.....	2	10	
111	5	134	9	Green, silty claystone, shaly at base.....	23	4	
134	9	140	10	Interbedded siltstone and fine sandstone.....	6	1	
140	10	143	0	Gray, shaly clay to carbonaceous shale.....	2	2	
143	0	145	9	Interbedded siltstone, fine sandstone, and silty claystone.....	2	9	
145	9	147	3	Gray, silty, shaly clay.....	1	6	
147	3	155	10	Black, shaly clay, plant fossils.....	8	7	
155	10	156	3	Coal.....		5	
156	3	164	2	Dark-gray to black, silty claystone.....	7	11	
164	2	164	8	Carbonaceous shale.....		6	
164	8	179	6	Black, silty, shaly claystone, interbedded siltstone, and fine sandstone.....	14	10	
179	6	180	11	Carbonaceous shale.....	1	5	
180	11	181	8½	Coal.....		9½	} Upper Freeport, el. 2,000 ft., C-88415.
181	8½	181	9	Shale.....		1½	
181	9	183	11½	Coal.....	2	2½	
183	11½	184	1½	Shale.....		2	
184	1½	184	6	Coal.....		4½	
184	6	196	4	Argillaceous limestone.....	11	10	
196	4	197	5	Light-gray and brown, fragmental, semiplastic clay.....	1	1	
197	5	201	5	Light-gray siltstone, fragments of light-brown flint clay in lower half.....	4	0	
201	5	205	9	Fragmental, light-tan and blue-gray flint clay.....	4	4	
205	9	217	10	Gray, silty claystone.....	12	1	
217	10	222	9	Interbedded siltstone, silty claystone, and fine sandstone.....	4	11	
222	9	230	10	Gray, silty claystone.....	8	1	
230	10	234	8	Limy claystone.....	3	10	
234	8	237	0	Fragmental, light-brown flint and semiplastic clay.....	2	4	
237	0	244	7	Interbedded siltstone and fine sandstone, plant fossils.....	7	7	
244	7	247	7	Silty, shaly, carbonaceous claystone.....	3	0	
247	7	247	10	Bone.....		3	} Upper Kittanning, el. 1,935 ft., C-88416.
247	10	249	9	Coal.....	1	11	
249	9	249	10	Claystone.....		1	
249	10	250	5	Coal.....		7	
250	5	257	3	Gray, silty claystone, grading to siltstone.....	6	10	
257	3	260	7	Fine sandstone, grading to siltstone.....	3	4	
260	7	265	1	Gray claystone.....	4	6	
265	1	271	5	Interbedded siltstone and fine sandstone.....	6	4	
271	5	278	9	Dark-gray, silty, shaly claystone.....	7	4	
278	9	280	5	Interbedded siltstone and fine sandstone.....	1	8	
280	5	286	2	Gray, shaly claystone, grading to dark-gray, silty claystone, plant fossils.....	5	9	
286	2	290	5	Interbedded siltstone and fine sandstone.....	4	3	

## Log, hole 13-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
290 5	299 9	Dark-gray, silty, shaly claystone, plant fossils	9 4	} Middle Kittanning, el. 1,883 ft.
299 9	300 0	Bone	3	
300 0	301 0	Coal	1 0	
301 0	301 9	Bone	9 9	
301 9	320 6	Gray claystone, grading to siltstone	18 9	
320 6	336 9	Interbedded siltstone and fine sandstone	16 3	
336 9	346 8	Dark-gray, silty, shaly claystone	9 11	
346 8	356 4	Medium to coarse, stylonitic sandstone	9 8	
356 4	357 2	Bone	10	
357 2	359 1	Interbedded claystone and fine sandstone, coaly partings.	1 11	
359 1	360 2	Carbonaceous claystone	1 1	
360 2	361 2	Coal	1 0	
361 2	363 5	Light-brown claystone	2 3	
363 5	377 0	Gray siltstone	13 7	
377 0	381 6	Gray claystone, siderite pellets	4 7	
381 7	382 8	Light-brown, fragmental, semiflint clay, claystone matrix, siderite pellets.	1 1	
382 8	386 5	Dark-gray siltstone, grading to silty claystone	3 9	
386 5	388 8	Fine sandstone	2 3	
388 8	401 0	Black, shaly clay, grading to dark-brown, silty claystone, plant fossils.	12 4	
401 0	407 7	Gray siltstone, sandy streaks	6 7	
407 7	431 5	Fine, stylonitic sandstone	23 10	} Mount Savage, el. 1,753 ft.
431 5	432 0	Coal	7	
432 0	432 4	Cannel coal	4	
432 4	432 11	Dark-gray, silty claystone	7	
432 11	439 7	Fine sandstone, siltstone fragments in upper part.	6 8	
439 7	444 10	Dark-gray claystone	5 3	
444 10	445 9	Interbedded coal, sandstone, and shale	11	
445 9	447 1	Carbonaceous claystone	1 4	
447 1	447 9	Bone	8	
447 9	450 3	Carbonaceous claystone	2 6	
450 3	450 9	Bone	6	
450 9	460 2	Brown claystone, grading to gray siltstone	9 5	
460 2	518 3	Medium stylonitic sandstone	58 1	
518 3	527 0	Fine sandstone, minor interbedded siltstone	8 9	

## Log, hole 14-CB

Location: 3,800 feet due N. of lat. 39°40'; 2,150 feet due W. of long. 79°10'; 1½ miles SW. of Grantsville, on Guy Stanton farm, 670 feet N., 33° W. of Casselman Corner, Garrett County, Md.  
Surface elevation: 2,227 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i> <i>in.</i>	<i>Ft.</i> <i>in.</i>		<i>Ft.</i> <i>in.</i>	
0 0	16 9	Unconsolidated material	16 9	} Upper Bakerstown, el. 2,196 ft.
16 9	26 9	Siltstone and silty claystone, iron stains	10 0	
26 9	28 7	Dark-gray, silty claystone	1 10	
28 7	29 2	Limy claystone and bone	7	
29 2	29 6	Bony coal	4	
29 6	29 9½	Shale	3½	
29 9½	30 10	Bony coal	½	
30 10	33 0	Dark-gray, limy claystone	2 2	
33 0	35 7	Black claystone	2 7	
35 7	39 6	Gray, limy claystone	3 11	

## Log, hole 14-CB—Continued

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
39	6	43	4	Dark-gray claystone, 5-in. siderite nodule at center.	3	10	
43	4	70	3	Dark-gray to black, shaly claystone	26	11	Lower Bakerstown, el. 2,154 ft., C-89090.
70	3	72	10	Coal	2	7	
72	10	80	7	Gray, silty claystone, limy pellets	7	9	
80	7	84	9	Gray, silty claystone	4	2	
84	9	88	4	Interbedded siltstone and fine sandstone	3	7	
88	4	90	5	Greenish-gray, silty, shaly claystone, limy stringers.	2	1	
90	5	96	3	Gray, silty claystone	5	10	
96	3	104	10	Green claystone and clay, red mottling	8	7	
104	10	108	5	Light-green, silty, shaly claystone, siderite stringers and pellets.	3	7	
108	5	113	0	Medium sandstone	4	7	
113	0	129	7	Light-green, silty, shaly claystone, interbedded siltstone and fine sandstone, limy stringers in upper part.	16	7	
129	7	139	0	Dark-green, silty claystone, limy inclusions, dark-gray and shaly in upper part.	9	5	
139	0	176	0	Interbedded siltstone, fine sandstone, and green, silty claystone.	37	0	
176	0	182	5	Black, shaly claystone, plant fossils	6	5	Brush Creek, el. 2,024 ft., C-89743.
182	5	201	4	Black, shaly clay, marine fossils	18	11	
201	4	203	1	Coal	1	9	
203	1	213	2	Gray, silty claystone, limy pellets and lenses	10	1	
213	2	226	0	Gray and green, silty claystone	12	10	
226	0	228	0	Fragmental green and tan claystone and semiflint clay.	2	0	
228	0	249	6	Green and gray, silty claystone interbedded siltstone and fine sandstone.	21	6	
249	6	251	10	Fragmental, green claystone and semiflint clay	2	4	
251	10	262	2	Gray, silty claystone	10	4	
262	2	273	1	Interbedded siltstone and fine sandstone, micaceous.	10	11	
273	1	281	4	Gray and tan, silty claystone, limy inclusions	8	3	
281	4	313	7	Light-gray grading to dark-gray siltstone, plant fossils.	32	3	
313	7	324	3	Irregularly interbedded siltstone and fine sandstone.	10	8	
324	3	330	9	Dark-gray siltstone to silty claystone	6	6	Upper Freeport, el. 1,896 ft.
330	9	331	5	Coal	8	8	
331	5	342	10	Blue-gray, argillaceous limestone	11	5	
342	10	345	2	Gray, fragmental clay, 3 in. of limy lenses at base.	2	4	
345	2	346	5	Fragmental claystone and semiflint clay	1	3	
346	5	352	5	Gray, silty claystone	6	0	
352	5	355	10	Interbedded siltstone and fine sandstone	3	5	
355	10	357	4	Gray, silty claystone	1	6	
357	4	366	9	Fine sandstone	9	5	
366	9	386	6	Dark-gray, silty claystone, limy pellets and lenses, large siderite nodules in upper part.	19	9	
386	6	395	3	Dark-gray siltstone, sandy streaks	8	9	
395	3	397	0	Fine sandstone	1	9	
397	0	406	8	Interbedded siltstone and fine sandstone	9	8	
406	8	412	2	Light-green to tan, silty, shaly claystone	5	6	
412	2	413	11	Light-brown, fragmental claystone and flint clay.	1	9	
413	11	420	11	Dark-gray, silty claystone, limy inclusions	7	0	

## Log, hole 14-CB—Continued

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
420	11	425	1	Fine sandstone, silty streaks in upper part.....	4	2	Middle Kittanning.
425	1	442	7	Gray, silty, shaly claystone, sandy streaks, small siderite nodules.	17	6	
442	7	443	3	Irregularly interbedded siltstone and fine sandstone.	8		
443	3	447	10	Black, shaly clay.....	4	7	
447	10	448	5	Interbedded coal and bone.....		7	
448	5	469	7	Light- to dark-gray, silty claystone.....	21	2	
469	7	470	0	Coal.....		5	
470	0	489	0	Dark-gray, silty claystone, plant fossils.....	19	0	
489	0	506	11	Coarse to medium styolitic sandstone, few siltstone beds in upper 4 ft.	17	11	
506	11	519	4	Dark-gray siltstone.....	12	5	
519	4	521	10	Light-gray claystone.....	2	6	
521	10	524	6	Fine sandstone.....	2	8	
524	6	529	6	Gray, silty, shaly claystone.....	5	0	
529	6	530	4	Light-gray siltstone.....		10	
530	4	535	1	Black claystone, coaly partings at base.....	4	9	
535	1	541	2	Irregularly interbedded siltstone and fine sandstone.	6	1	
541	2	541	8	Interbedded coal and bone.....		6	
541	8	549	4	Black claystone grading to silty claystone.....	7	8	
549	4	559	3	Dark-gray siltstone, beds of fine sandstone.....	9	11	
559	3	590	10	Medium styolitic sandstone.....	31	7	
590	10	599	6	Interbedded siltstone and fine sandstone.....	8	8	
599	6	600	2	Interbedded coal, bone, and sandstone.....		8	
600	2	607	7	Black, silty claystone, plant fossils.....	7	5	
607	7	608	0	Coal.....		5	
608	0	610	9	Carbonaceous shale, streaks of coal.....	2	9	Mount Savage, el. 1,619 ft.
610	9	617	9	Interbedded siltstone and fine sandstone.....	7	0	
617	9	621	0	Fine styolitic sandstone.....	3	3	

## Log, hole 15-CB

Location: 1,150 feet due N. of lat. 39°40'; 2,080 feet due W. of long. 79°10'; 2 miles S. of Grantsville on Clarence Beachy farm, part of "Long Level", Garrett County, Md.  
Surface elevation: 2,199 feet.

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
0	0	47	2	Unconsolidated material.....	47	2	Lower Bakerstown, el. 2,130 ft., C-89131.
47	2	53	6	Gray, silty claystone.....	6	4	
53	6	67	3	Dark-gray, silty, shaly claystone.....	13	9	
67	3	69	8½	Coal.....	2	5½	
69	8½	89	3	Dark-gray, silty clay to light-gray, silty claystone, limy pellets and stringers.	19	6½	
89	3	100	2	Gray and green claystone and clay, red mottling, few siderite stringers.	10	11	
100	2	104	11	Light-green, interbedded siltstone, silty claystone and fine sandstone.	4	9	
104	11	111	10	Medium sandstone.....	6	11	

## Log, hole 15-CB—Continued

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
111	10	124	9	Light-green, silty, shaly claystone, interbedded siltstone, and fine sandstone.	12	11	
124	9	133	8	Gray, silty claystone, limy pellets	8	11	
133	8	158	6	Interbedded siltstone and fine sandstone	24	10	
158	6	170	9	Interbedded siltstone, silty claystone, and fine sandstone.	12	3	
170	9	173	8	Dark-gray, silty, shaly claystone	2	11	
173	8	193	6	Black, shaly claystone, marine fossils	19	10	
193	6	194	9	Coal	1	3	
194	9	194	10½	Bone		1½	} Brush Creek, el. 2,004 ft., C-90318.
194	10½	195	2	Coal		3½	
195	2	200	3	Dark-gray, silty claystone, limy pellets	5	1	
200	3	202	8	Fine sandstone, limy pellets	2	5	
202	8	222	3	Interbedded siltstone, silty claystone, and fine sandstone.	19	7	
222	3	229	4	Gray to green, silty claystone	7	1	
229	4	232	4	Green, fragmental claystone	3	0	
232	4	249	10	Green silty claystone, interbedded siltstone and fine sandstone.	17	6	
249	10	251	1	Fragmental, tan, semiflint clay, green claystone matrix.	1	3	
251	1	257	2	Gray claystone, red mottling	6	1	
257	2	275	3	Interbedded, silty claystone, siltstone and fine sandstone.	18	1	
275	3	281	3	Light- to dark-gray, shaly claystone, 3-in. siderite nodule at 280 ft. 4 in.	6	0	
281	3	285	0	Light-gray, silty claystone, 4-in. siderite nodule at base.	3	9	
285	0	299	5	Light-gray, shaly siltstone, interbedded silty claystone, and fine sandstone.	14	5	
299	5	313	0	Dark-gray siltstone, silty claystone, and fine sandstone.	13	7	
313	0	315	8	Dark-gray, silty claystone, plant fossils	2	8	
315	8	317	6	Interbedded siltstone and fine sandstone	1	10	
317	6	319	0	Medium sandstone	1	6	
319	0	321	0	Dark-gray siltstone, fragmental in lower 1 ft., sandstone matrix.	2	0	
321	0	327	4	Fine styolitic sandstone	6	4	
327	4	327	7	Coal		3	
327	7	327	7½	Shale		½	
327	7½	328	3	Coal		7½	} Upper Freeport, el. 1,868 ft., C-90319.
328	3	328	4	Bone		1	
328	4	330	5½	Coal	2	1½	
330	5½	330	6½	Bone		1	
330	6½	330	10	Coal		3½	
330	10	331	3	Bone		5	
331	3	336	1	Gray, limy claystone, limy pellets	4	10	
336	1	338	11	Fragmental, blue-gray and tan flint clay	2	10	
338	11	343	11	Light- to dark-gray claystone	5	0	
343	11	355	0	Interbedded siltstone and fine sandstone, siderite stringers.	11	1	

## Log, hole 16-CB

Location: 2,200 feet due S. of lat. 39°40'; 7,550 feet due W. of long. 79°10'; 1 mile NW. of Jennings on Ridgley Hill, Garrett County, Md.  
Surface elevation: 2,566 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	24	9
24	9	Interbedded siltstone, claystone, and fine sandstone.	9	1
33	10	Gray, silty claystone	7	2
41	0	Greenish-gray, silty claystone, red mottling, limy stringers and pellets.	33	0
74	0	Light-gray siltstone, limy stringers and silty claystone.	19	3
93	3	Dark-gray claystone	5	0
98	3	Black, shaly claystone, marine fossils	19	11
118	2	Bone	1	2
118	4	Coal	1	3
119	7	Light-gray, limy claystone, limy lenses and pellets.	20	10
140	5	Light-green claystone, red mottling, numerous large, limy pellets.	32	3
172	8	Interbedded, light-green siltstone, silty claystone, and fine sandstone.	16	5
189	1	Olive claystone, dark-gray streaks	1	1
190	2	Interbedded siltstone, silty claystone, and fine sandstone.	10	6
200	8	Bone	7	
201	3	Light- to dark-gray claystone, limy inclusions	12	6
213	9	Light-green, fragmental claystone	1	7
215	4	Dark-gray, shaly claystone to black, shaly clay	18	5
233	9	Coal	1	10
235	7	Dark-gray claystone	25	6
261	1	Light-gray claystone	6	3
267	4	Medium sandstone, green claystone, red mottling, limy lenses and pellets.	5	10
273	2	Interbedded, light-green siltstone, silty claystone, and fine sandstone.	22	3
295	5	Gray and green claystone, red mottling, limy pellets.	13	9
309	2	Interbedded siltstone and fine sandstone	4	1
313	3	Medium sandstone	12	2
325	5	Interbedded siltstone and fine sandstone, grading to claystone.	21	7
347	0	Black, shaly clay, marine fossils	21	2
368	2	Coal	1	6
369	8	Shale		2
369	10	Interbedded siltstone and fine sandstone	2	4
372	2	Gray, limy claystone	14	10
387	0	Interbedded siltstone, claystone, and fine sandstone.	15	8
402	8	Dark-gray to green, silty claystone, limy inclusions.	11	5
414	1	Interbedded siltstone, claystone, and fine sandstone, limy lenses and pellets.	13	0
427	1	Light-gray and green claystone, silty streaks	8	3
435	4	Interbedded siltstone, fine sandstone, and claystone.	27	10

} Harlem, el. 2,447 ft.,  
C-91448.

Upper Bakerstown, el.  
2,365 ft.

Lower Bakerstown, el.  
2,332 ft., C-91450.

Brush Creek, el. 2,196  
ft., C-91452.

## Log, hole 14-CB—Continued

Depth		Material	Thickness		Remarks	
From—	To—		Ft.	in.		
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>			
463	2	469	10	6	8	Upper Freeport, rider, el. 2,095 ft., C-91790.
469	10	470	11½	1	1½	
470	11½	471	0			
471	0	471	2	2	2	
471	2	473	7	2	5	Upper Freeport, el. 2,079 ft., C-91791.
473	7	484	3	10	8	
484	3	484	10		7	
484	10	484	11		1	
484	11	486	11½	2	1½	
486	11½	487	1		1½	
487	1	487	6		5	
487	6	491	4	3	10	
491	4	508	2	16	10	
508	2	514	8	6	6	
514	8	524	5	9	9	Upper Kittanning, el. 2,008 ft., C-92103.
524	5	554	3½	29	10½	
554	3½	554	6		2½	
554	6	554	10½		4½	
554	10½	557	9	2	10½	
557	9	557	10		1	
557	10	558	3		5	
558	3	567	10	9	7	
567	10	578	7	10	9	
578	7	581	8	3	1	
581	8	595	8	14	0	Middle Kittanning, el. 1,970 ft.
595	8	595	9½		1½	
595	9½	595	10		½	
595	10	595	11		1	
595	11	596	6		7	
596	6	616	6	20	0	
616	6	617	11	1	5	
617	11	638	8	20	9	
638	8	668	11	30	3	
668	11	669	3		4	
669	3	683	1	13	10	Mercer, el. 1,766 ft., C-92383.
683	1	686	10	3	9	
686	10	691	4	4	6	
691	4	692	8	1	4	
692	8	699	4	6	8	
699	4	718	11	19	7	
718	11	720	8	1	9	
720	8	722	4	1	8	
722	4	728	3	5	11	
728	3	730	0	1	9	
730	0	738	0	8	0	
738	0	740	6	2	6	
740	6	746	0	5	6	
746	0	746	8		8	
746	8	750	2	3	6	
750	2	753	2	3	0	
753	2	757	8	4	6	
757	8	782	1	24	5	
782	1	789	5	7	4	
789	5	792	6	3	1	Mercer, el. 1,766 ft., C-92383.
792	6	797	5	4	11	
797	5	798	1½		8½	
798	1½	798	10½		9	
798	10½	799	½		2	
799	½	799	6		5½	
799	6	800	0		6	
800	0	807	0	7	0	



## Log, hole 17-CB

Location: 9,000 feet due N. of lat. 39°40'; 3,200 feet due E. of long. 79°10'; less than ½ mile S. of Grantsville, on John Hershberger farm, Garrett County, Md.  
Surface elevation: 2,345 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	24 0	Unconsolidated material	24 0	
24 0	31 7	Gray, silty claystone	7 7	
31 7	40 2	Interbedded siltstone and fine sandstone	8 7	
40 2	65 8	Fine to coarse, stylonitic sandstone	25 6	
65 8	65 9	Coal	1 1	
65 9	66 10	Black claystone	1 1	
66 10	75 0	Gray, silty, limy claystone	8 2	
75 0	77 2	Gray, silty, semiplastic clay	2 2	
77 2	91 0	Light-gray, silty claystone and siltstone, siderite stringers.	13 10	
91 0	125 4	Interbedded, light-gray claystone, grading to black siltstone and fine sandstone.	34 4	
125 4	128 6	Medium sandstone	3 2	
128 6	129 6½	Coal	1 ½	} Barton, el. 2,216 ft., C-91449.
129 6½	129 7	Bone	½	
129 7	157 0	Green and gray, limy claystone, siderite stringers in lower 3 ft.	27 5	
157 0	171 3	Greenish gray, silty, shaly claystone, few siderite stringers.	14 3	
171 3	183 5	Shaly, interbedded siltstone, claystone, and fine sandstone.	12 2	
183 5	196 3	Fine sandstone, fragmental siltstone in lower part.	12 10	
196 3	203 3	Dark- to light-gray, silty claystone	7 0	
203 3	214 1	Interbedded siltstone and fine sandstone, limy stringers.	10 10	
214 1	223 10	Coarse, stylonitic sandstone	9 9	
223 10	235 9	Gray, silty, shaly claystone, limy lenses	11 11	
235 9	258 4	Black, shaly clay, marine fossils	22 7	
258 4	260 ½	Coal	1 8½	} Harlem, el. 2,085 ft. C-91451.
260 ½	282 7	Green claystone and light-gray, argillaceous limestone, limy pellets and lenses.	22 6½	
282 7	288 6	Gray claystone, greenish gray mottling and streaking.	5 11	
288 6	304 7	Gray and green claystone, 3-in. siderite nodule at base.	16 1	
304 7	327 10	Green, silty, shaly claystone, limy pellets and lenses, interbedded fine sandstone.	23 3	
327 10	332 1	Gray claystone, limy inclusions	4 3	
332 1	334 0	Black, silty claystone, coaly partings at base	1 11	
334 0	334 6½	Coal	6½	} Upper Bakerstown, el. 2,010 ft., C-91792.
334 6½	334 7	Bone	½	
334 7	335 8	Coal	1 1	
335 8	351 8	Gray, silty claystone, limestone inclusions	16 0	
351 8	370 6	Dark-gray to black, silty, shaly clay	18 10	
370 6	372 3½	Coal	1 9½	} Lower Bakerstown, el. 1,973 ft., C-91793.
372 3½	377 5	Gray, silty claystone, limy pellets	5 1½	
377 5	397 10	Shaly interbedded siltstone, silty claystone, and fine sandstone.	20 5	
397 10	421 6	Gray-green claystone, red mottling, 2-in. siderite nodule at base.	23 8	
421 6	437 4	Interbedded siltstone and fine sandstone, plant fossils.	15 10	
437 4	440 11	Gray, shaly siltstone to black, shaly clay, marine fossils.	3 7	
440 11	441 3	Coal	4 4	
441 3	450 7	Gray, silty claystone, limy inclusions	9 4	
450 7	489 8	Interbedded siltstone and fine sandstone	39 1	
489 8	510 9	Dark-gray to black, silty shaly claystone, marine fossils.	21 1	

## Log, hole 17-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
510 9	510 10½	Coal	1½	Brush Creek, el. 1,833 ft., C-92104.
510 10½	511 1½	Pyritic siltstone, fossils	3	
511 1½	512 5	Coal	1 3½	
512 5	521 11	Gray, silty claystone, limy inclusions	9 6	
521 11	547 10	Interbedded siltstone, silty claystone, and fine sandstone.	25 11	
547 10	559 0	Gray claystone, red mottling	11 2	
559 0	589 5	Interbedded siltstone, claystone, and fine sandstone, shaly at base.	30 5	
589 5	595 10	Black, shaly clay	6 5	Upper Freeport rider.
595 10	596 2	Coal	4	
596 2	603 4	Interbedded siltstone and fine sandstone	7 2	
603 4	628 9	Black, shaly claystone, interbedded siltstone and fine sandstone, plant fossils.	25 5	
628 9	629 9	Coal	1 0	
629 9	629 9½	Bone	½	Upper Freeport, el. 1,713 ft., C-92105.
629 9½	630 4	Coal	6½	
630 4	630 4½	Pyritic coal	½	
630 4½	631 7	Coal	1 2½	
631 7	631 9	Bone	2	
631 9	632 5	Coal	8	
632 5	640 6	Gray, argillaceous limestone	8 1	
640 6	644 3	Fragmental, blue and tan flint clay, silty in upper part.	3 9	
644 3	646 3	Gray, silty claystone	2 0	
646 3	646 11	Brown, fragmental, flint clay, claystone matrix, siderite in part.	8	
646 11	651 1	Gray, silty claystone	4 2	
651 1	678 11	Interbedded siltstone and fine sandstone	27 10	
678 11	695 11	Coarse, stylonitic sandstone, carbonaceous, shaly clay.	17 0	
695 11	698 2	Coal	2 3	Upper Kittanning, el. 1,646 ft. C-92384.
698 2	698 3	Shale	1	
698 3	698 5	Bone	2	
698 5	698 8½	Coal	3½	
698 8½	698 9½	Bone	1	
698 9½	700 1	Dark-gray, silty, limy claystone, plant rootlets.	1 3½	
700 1	717 2	Silty, shaly claystone, interbedded siltstone, and fine sandstone.	17 1	
717 2	719 5	Dark-gray, silty, interbedded claystone and semiplastic clay.	2 3	
719 5	725 1	Light-gray, silty claystone	5 8	
725 1	726 3	Carbonaceous clay	1 2	
726 3	734 5	Interbedded, gray claystone and siltstone	8 2	
734 5	735 5	Bone	1 0	
735 5	743 0	Interbedded, medium sandstone and siltstone	7 7	
743 0	745 9	Interbedded siltstone and claystone	2 9	
745 9	748 4	Dark-gray, silty, shaly clay, plant fossils	2 7	
748 4	749 8	Bone	1 4	Middle Kittanning.
749 8	750 3	Shale	7	
750 3	752 6	Sandstone	2 3	
752 6	753 3	Coal	9	
753 3	767 8	Gray, silty claystone	14 5	
767 8	772 0	Medium sandstone	4 4	
772 0	775 8	Dark-gray, silty, shaly claystone	3 8	
775 8	776 3	Bone and coal	7	
776 3	777 2	Gray, silty claystone	11	
777 2	784 6	Medium stylonitic sandstone	7 4	
784 6	789 0	Interbedded siltstone and fine sandstone	4 6	
789 0	790 0	Dark-gray, silty, shaly clay, plant fossils	1 0	
790 0	790 5	Cannel coal	5	Lower Kittanning.
790 5	791 0	Bone	7	
791 0	792 7	Coal	1 7	
792 7	793 0	Bone	5	

## Log, hole 17-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
793	0	795 6	2 6	
		Tan, silty, semiplastic clay, 2 in. of flint clay at base.		
795	6	800 0	4 6	
800	0	803 11	3 11	
803	11	804 3		
804	3	810 4	6 1	
810	4	819 6	9 2	
819	6	834 6	15 0	
		Dark-gray to black, silty, shaly claystone, 10-in. siderite nodule at 821 ft. 10 in.		
834	6	844 4	9 10	
844	4	844 9	5	Mount Savage, el. 1,500 ft.
844	9	844 10	1	
844	10	845 6	8	
845	6	847 7	2 1	
		Dark-gray claystone, grading to semiplastic clay.		
847	7	853 7	6 0	
853	7	856 9	3 2	
856	9	858 8	1 11	
858	8	862 2	3 6	
862	2	862 7	5	Mount Savage, el. 1,483 ft.
		Black, silty, shaly claystone and siltstone.		
862	7	868 6	5 11	
868	6	883 8	15 2	
883	8	890 4	6 8	
		Dark-gray to black, silty, shaly claystone, plant fossils.		
890	4	894 0	3 8	
		Interbedded siltstone and fine sandstone.		

## Log, hole 18-CB

Location: 14,700 feet S. of lat. 39°40'; 4,800 feet W. of long. 79°10'; 1½ miles S. of Jennings, near residence of Harry E. Miller, Garrett County, Md.  
Surface elevation: 2,621 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
0	0	18 0	18 0	
		Unconsolidated material.		
18	0	19 0	1 0	
		Fine sandstone.		
19	0	28 0	9 0	
		Interbedded siltstone, claystone, and fine sandstone.		
28	0	32 9	4 9	
32	9	53 10	21 1	
		Gray claystone.		
		Greenish-gray, silty claystone, red mottling, limy stringers.		
53	10	79 3	25 5	
79	3	110 11	31 8	
		Interbedded siltstone and silty claystone.		
		Dark-gray, silty claystone, grading to black, shaly clay, marine fossils.		
110	11	112 4	1 5	Harlem, el. 2,509 ft., C-93059.
		Coal.		
112	4	134 0	21 8	
134	0	157 6	23 6	
		Gray, limy claystone.		
		Gray-green and silty claystone, red mottling, limy pellets and stringers.		
157	6	172 0	14 6	
		Interbedded siltstone and claystone, limy stringers.		
172	0	185 5	13 5	
185	5	189 6	4 1	
189	6	194 0	4 6	
194	0	198 3	4 3	
		Interbedded siltstone and fine sandstone.		
		Interbedded siltstone and claystone.		
		Medium sandstone.		
		Dark-gray, silty claystone.		

## Log, hole 18-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
198	3	Bone	9		Upper Bakerstown, el. 2,421 ft.
199	0	Shale	5		
199	5	Bone	4		
199	9	Gray, limy claystone	13	8	
213	5	Bluish gray, shaly claystone, and fine sandstone	6	0	
219	5	Interbedded siltstone, claystone, and fine sandstone	16	2	
235	7	Dark-gray, silty, shaly claystone	2	3½	Lower Bakerstown, el. 2,381 ft., C-93060.
237	10½	Bone	5½		
238	4	Coal	2	1	
240	5	Gray, silty, semiplastic clay	2	9	
243	2	Gray, limy claystone, limy pellets	6	1	
249	3	Interbedded siltstone and fine sandstone, limy stringers	2	10	
252	1	Gray and green claystone, red mottling	11	10	
263	11	Interbedded siltstone, fine sandstone, and greenish gray claystone	14	1	
278	0	Red and green, silty claystone	7	4	Brush Creek, el. 2,276 ft., C-94131.
285	4	Gray claystone, grading to siltstone, limy pellets and stringers	3	4	
288	8	Red and green, silty claystone, limy pellets and stringers	6	0	
294	8	Medium sandstone	8	4	
303	0	Interbedded siltstone and fine sandstone	6	2	
309	2	Gray, silty, shaly claystone, sandy streaks	15	1	
324	3	Dark-gray, shaly claystone, plant fossils	5	8	
329	11	Black, shaly claystone, marine fossils	14	6½	
344	5½	Coal	1	0	
345	5½	Bone	1	1	
345	6½	Coal	1½		
345	8	Dark-gray, silty claystone, limy	29	4	
375	0	Green, silty, shaly claystone, two siderite nodules at base	7	3	
382	3	Fine, gray sandstone	2	2	Upper Freeport horizon.
384	5	Interbedded, green, silty claystone, and fine sandstone	2	3	
386	8	Green claystone, red mottling	13	6	
400	2	Bluish gray flint clay	3	10	
404	0	Gray and green, silty claystone, shaly in upper part, siderite zones	13	3	
417	3	Fragmental, green claystone, and semiflint clay	1	6	
418	9	Interbedded siltstone, claystone, and fine sandstone	14	5	
433	2	Dark-gray, silty claystone, carbonaceous partings	1	10	
435	0	Gray, silty claystone, interbedded fine sandstone, carbonaceous partings at base	4	5	
439	5	Gray claystone, grading to siltstone	5	11	
445	4	Interbedded siltstone and fine sandstone	34	11	
480	3	Medium to coarse sandstone, 1-ft. siderite beds at 503 ft. 6 in. and 512 ft. 8 in.	42	1	
522	4	Black claystone	1	4	
523	8	Dark-gray, limy claystone	13	4	
537	0	Light-tan, fragmental semiflint clay, claystone matrix	1	4	
538	4	Dark-gray, silty, semiplastic clay, limy pellets	2	3	
540	7	Interbedded siltstone, silty claystone, and fine sandstone	3	10	
544	5	Dark-gray, silty shaly claystone	4	7	Upper Kittanning, el. 2,070 ft., C-94132.
549	0	Bone	2		
549	2	Coal	1	8	
549	2	Coal	1	8	
550	10	Dark-gray siltstone	3	2	

## Log, hole 19-CB

Location: 3,800 feet N. of lat. 39°40'; 3,200 feet E. of long. 89°10'; 1½ miles S. of Grantsville on Olen Yoder farm, part of Mount Nebo, Garrett County, Md.  
Surface elevation: 2,528 feet.

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
0	0	Unconsolidated material	10	0	
10	0	Interbedded siltstone, silty claystone, and fine sandstone, limy inclusions.	31	1	
41	1	Bone	1	1	
42	2	Dark-gray, silty claystone, limy pellets and lenses, 8 in. siderite nodule at 44 ft. 8 in., small siderite nodules in lower 2 ft.	21	3	
63	5	Interbedded siltstone and fine sandstone, limy pellets in upper 3 ft.	13	8	
77	1	Medium to coarse sandstone	28	6	
105	7	Gray, argillaceous limestone	11	1	
116	8	Gray, silty claystone, grading to siltstone, limy stringers and lenses.	15	8	
132	4	Interbedded, dark-gray siltstone and fine sandstone.	21	5	
153	9	Medium to coarse styolitic sandstone, siltstone fragments in lower ft.	10	9	
164	6	Bone		8	
165	2	Dark-gray, argillaceous limestone	7	10	
173	0	Dark-gray, silty claystone, limy pellets and lenses.	18	6	
191	6	Coal		6	Barton rider.
192	0	Light- to dark-gray, silty, shaly claystone, some interbedded fine sandstone.	23	9	
215	9	Coal		9	Barton, el. 2,312 ft.
216	6	Dark-gray, argillaceous limestone	4	7	
221	1	Gray, limy claystone, limy pellets and lenses	15	11	
237	0	Gray, silty, shaly claystone	12	0	
249	0	Interbedded siltstone and fine sandstone	2	5	
251	5	Medium sandstone	14	9	
266	2	Dark-gray grading to black, silty claystone, plant fossils.	3	10	
270	0	Bone		7	
270	7	Gray, silty claystone, limy	7	7	
278	2	Interbedded siltstone and fine sandstone	9	1	
287	3	Coarse sandstone	28	6	
315	9	Black, shaly claystone, marine fossils	22	10	
338	7	Coal, shale, and bone	2	4½	Harlem, el. 2,187 ft., C-94204.
340	11½	Gray, argillaceous limestone	11	½	
352	0	Dark-gray, silty claystone, limy inclusions	7	0	
359	0	Light- and dark-gray, fragmental claystone	10	6	
369	6	Gray and green, silty claystone, limy stringers, pellets, and lenses.	42	0	
411	6	Interbedded, gray, silty claystone and siltstone	7	10	
419	4	Bone and shale	2	1	Upper Bakerstown, el. 2,107 ft.
421	5	Gray, limy claystone	15	7	
437	0	Gray, silty claystone	7	8	
444	8	Interbedded siltstone and fine sandstone to black, shaly clay.	9	11	
454	7	Coal	2	3	Lower Bakerstown, el. 2,072 ft., C-95162.
456	10	Gray, silty, semiplastic clay	7	11	
464	9	Gray, silty, shaly claystone, interbedded fine sandstone.	18	5	
483	2	Gray and red claystone, limy pellets, and lenses.	13	0	
496	2	Interbedded siltstone and fine sandstone	17	2	
513	4	Gray, silty, shaly claystone	6	8	
520	0	Black, shaly claystone, marine fossils	3	0	
523	0	Gray, silty claystone, limy pellets	0	17	

## Log, hole 19-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
540 0	551 6	Interbedded siltstone and fine sandstone	11 6	
551 6	569 7	Gray, shaly siltstone	18 1	
569 7	590 9½	Black, silty, shaly clay, marine fossils	21 2½	
590 9½	591 4½	Coal, bone, and shale	7	} Brush Creek, el. 1,937 ft.
591 4½	592 3	Coal	10½	
592 3	599 6	Gray, silty claystone, limy inclusions	7 3	
599 6	604 7	Gray, argillaceous limestone	5 1	
604 7	612 3	Gray, silty claystone	7 8	
612 3	617 4	Interbedded siltstone and fine sandstone	5 1	
617 4	662 0	Gray and green silty claystone	44 8	
662 0	667 4	Fragmental, tan, semiflint clay, matrix of sideritic claystone.	5 4	
667 4	684 8	Gray, silty, shaly claystone, interbedded siltstone and fine sandstone.	17 4	
684 8	691 8	Black, shaly claystone	7 0	
691 8	692 5½	Coal	9½	} Upper Freeport rider, el. 1,835 ft., C-95664.
692 5½	692 8	Shale	2½	
692 8	692 11	Coal	3	
692 11	693 5½	Claystone	6½	
693 5½	693 9	Bone	3½	
693 9	695 9	Black, silty claystone	2 0	
695 9	696 0	Interbedded siltstone and sandstone	7 3	
696 0	703 6	Black, shaly clay	7 6	
703 6	704 5	Coal	11	
704 5	704 6¾	Bone	1¾	} Upper Freeport, el. 1,822 ft., C-95665.
704 6¾	706 1¾	Coal	1 7	
706 1¾	706 3	Bone	1¼	
706 3	706 11	Coal	8	
706 11	713 3	Gray, silty claystone, limy fragments	6 4	
713 3	719 10	Fragmental, tan flint clay	6 7	
719 10	727 7	Gray, silty claystone grading to siltstone	7 9	
727 7	745 6	Interbedded siltstone and fine sandstone	17 11	
745 6	773 2	Medium stylonitic sandstone	27 8	
773 2	775 10	Interbedded fine sandstone and black siltstone	2 8	
775 10	776 0	Bony shale	2 2	
776 0	778 9½	Coal	2 9½	
778 9½	778 11	Shale	1½	} Upper Kittanning, el. 1,749 ft., C-95939.
778 11	779 1½	Coal	2½	
779 1½	779 2	Bone	½	
779 2	779 6½	Coal	4½	
779 6½	779 7	Bone	½	
779 7	785 0	Gray siltstone, light-tan claystone fragments, siderite in lower part.	5 5	

## Log, hole 20-CB

Location: 12,200 feet S. of lat. 39°40'; 580 feet E. of long. 79°10'; 1½ miles SE. of Jennings on Walter Bittinger farm, Garrett County, Md.  
Surface elevation: 2,502 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	19 0	Unconsolidated material	19 0	
19 0	79 9	Medium sandstone	60 9	
79 9	85 3	Gray, silty claystone, siderite nodules up to 5 in.	5 6	
85 3	93 4	Interbedded siltstone and fine sandstone	8 1	
93 4	97 0	Coarse, stylonitic sandstone	3 8	

## Log, hole 20-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
Ft.	in.		Ft.	in.	
97	0	Dark-gray, silty claystone, plant fossils	14	4	
111	4	Interbedded siltstone, silty claystone, and fine sandstone.	10	8	
122	0	Olive to black, shaly claystone	3	10	
125	10	Bone		4	} Upper Kittanning, el. 2,374 ft., C-94844.
126	2	Coal and claystone	2	1/2	
126	4 1/2	Coal	1	7 1/2	
128	0	Black, silty claystone to light-gray siltstone	6	4	
134	4	Interbedded siltstone and fine sandstone	18	8	
153	0	Medium stylonitic sandstone	16	11	
169	11	Interbedded siltstone and fine sandstone	6	4	
176	3	Black claystone, plant fossils	1	8	
177	11	Bone		2	
178	1	Coal		9	
178	10	Claystone	2	9	
181	7	Coal		6 1/2	} Middle Kittanning, el. 2,319 ft. C-94845.
182	1 1/2	Bone	1	1/2	
182	2 1/2	Coal	10	1/2	
183	1	Bone		2	
183	3	Tan claystone and silty, semiplastic clay	6	9	
190	0	Light and tan fragmental plastic clay, siderite pellets in lower 6 in.	1	4	
191	4	Tan claystone and silty, semiplastic clay	3	0	
194	4	Fragmental tan plastic and semiflint clay		5	
194	9	Interbedded siltstone and fine sandstone, tan, silty claystone, and silty, semiplastic clay.	14	3	
209	0	Medium stylonitic sandstone	54	1	
263	1	Brown, silty claystone	8	11	
272	0	Interbedded siltstone and fine sandstone	19	0	
291	0	Carbonaceous shale		8	
291	8	Bone		10	
292	6	Shale	6	6	
293	0	Bone		2	
293	2	Gray to tan, silty claystone	3	4	
296	6	Medium sandstone	1	3	
297	9	Tan and gray, shaly claystone to black clay shale.	3	2	
300	11	Interbedded siltstone and fine sandstone	7	5	} Mount Savage, el. 2,209 ft.
308	4	Bone and carbonaceous shale	1	4	
309	8	Tan, fragmental claystone and semiplastic clay	6	9	
316	5	Medium sandstone, interbedded siltstone at base.	15	3	
331	8	Gray and tan claystone		11	
332	7	Medium sandstone, interbedded siltstone at base.	5	5	
338	0	Interbedded shaly siltstone, fine sandstone and black claystone.	3	7	
341	7	Bone		1	
341	8	Coal		8	
342	4	Bone		1/2	
342	4 1/2	Coal	2	2 1/2	} Mercer; el. 2,157 ft., C-95163.
344	7 1/2	Coal		4	
344	7	Bone		11	
344	11	Brown, silty claystone, grading to siltstone	4	5	
349	4	Medium sandstone	18	5	
367	9	Coarse, conglomeratic, stylonitic sandstone	4	3	
372	0	Medium sandstone	16	8	
388	8	Dark-gray, silty, shaly claystone	6	3	
394	11	Medium to coarse sandstone, locally conglomeratic.	14	11	
409	10	Interbedded siltstone and fine sandstone, fragmental in lower part.	5	9	
415	7	Coarse sandstone	4	2	
419	9	Black and tan claystone grading to siltstone	3	1	
422	10	Interbedded siltstone and fine sandstone	8	2	
431	0	Tan, silty, semiplastic clay, grading to siltstone	6	0	

## Log, hole 21-CB

Location: 6,750 feet S. of lat. 39°40'; 550 feet E. of long. 79°10'; 1 mile E. of Jennings, on Harry Durst farm on Maynardier Ridge, Garrett County, Md.  
Surface elevation: 2,627 feet.

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
0	0	Unconsolidated material	12	0	
12	0	Interbedded siltstone and fine sandstone	49	4	
61	4	Coal		8	Barton, el. 2,565 ft.
62	0	Greenish-gray, silty claystone, limy pellets and lenses.	19	1	
81	1	Interbedded siltstone and fine sandstone	29	5	
110	6	Gray, silty claystone, limy inclusions	14	2	
124	8	Interbedded fine sandstone and green siltstone, limy stringers in upper 2 ft.	15	4	
140	0	Green, silty claystone, interbedded fine sandstone in upper part.	17	7	
157	7	Black, shaly claystone, marine fossils	27	3	
184	10	Bone		2	
185	0	Coal and limy siltstone	1	1	} Harlem, el. 2,440 ft.
186	1	Bone		2½	
186	3½	Coal		7½	
186	11	Coal		7½	
186	11	Gray, limy claystone, limy pellets	22	9	
209	8	Gray and red claystone	8	4	
218	0	Greenish-gray and red, limy claystone	5	8	
223	8	Interbedded claystone, siltstone, and fine sandstone, limy stringers and pellets.	38	5	
262	1	Fine sandstone, fragments of black clay shale	2	5	
264	6	Interbedded gray, shaly claystone, siltstone, and fine sandstone.	6	1	
270	7	Coal, bone, siltstone, and claystone	1	8	} Upper Bakerstown, el. 2,355 ft.
272	3	Gray, limy claystone	2	9	
275	0	Gray to black, silty claystone	1	10	
276	10	Gray claystone, limy pellets	5	7	
282	5	Gray, silty claystone and chalky, gray, silty semiplastic clay, limy pellets.	3	4	
285	9	Gray, silty, shaly claystone, limy lenses at base	7	6	
293	3	Shaly siltstone and fine sandstone to black, silty, clay shale.	15	11	
309	2	Bone		1	
309	3	Coal	2	2	Lower Bakerstown, el. 2,316 ft., C-96369.
311	5	Gray, silty, semiplastic clay	4	0	
315	5	Gray, silty, limy claystone	5	7	
321	0	Shaly siltstone, silty claystone, and fine sandstone.	7	0	
328	0	Greenish-gray, silty claystone, red mottling, limy stringers.	13	0	
341	0	Interbedded siltstone and fine sandstone	9	8	
350	8	Gray, silty, shaly claystone	13	10	
364	6	Irregularly interbedded limestone and greenish shale, marine fossils.		6	
365	0	Gray, silty, shaly claystone	2	0	
367	0	Interbedded siltstone and fine sandstone, limy in upper 3 ft.	26	4	
393	4	Light- to dark-gray, silty, shaly claystone	22	1	
415	5	Black clay shale, marine fossils	13	9	
429	2	Coal	1	4	Brush Creek, el. 2,197 ft., C-96370.
430	6	Black to gray siltstone, sandstone in lower ft.	5	6	
436	0	Shaly to silty claystone, limy nodules	7	0	
443	0	Dense-gray, calcareous, fine sandstone	6	9	
449	9	Dark-gray, silty clay and claystone, limy nodules.	17	7	
467	4	Gray, silty claystone	9	2	
476	6	Greenish-gray, sideritic siltstone	4	6	
481	0	Interbedded gray siltstone and sandstone	11	6	



## Log, hole 21-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
492	6	Silty claystone and semiplastic clay	4	4
496	10	Interbedded siltstone and fine sandstone	7	9
504	7	Gray, silty clay and claystone, ironstone concretions.	3	0
507	7	Gray, shaly siltstone, sandy streaks	7	5
515	0	Fine sandstone, silty streaks	2	4
517	4	Gray to carbonaceous shale, silty at top	15	4
532	8	Coal	1	1
533	9	Bone	1	1½
533	10½	Carbonaceous claystone, coal streaks	2	3½
536	2	Laminated, dark, shaly siltstone and white sandstone.	2	7
538	9	Black shale	1	0
539	9	Coal	2	7
542	4	Dense-gray silty claystone, limy pellets in lower half.	4	3
546	7	Argillaceous siltstone and sandstone, calcareous zones and limy pellets.	27	5
574	0	Fragmental claystone and semifint clay	4	0
578	0	Fine, silty, gray to greenish, semiplastic clay	8	6
586	6	Fragmental claystone, siltstone, and fine sandstone in siltstone matrix.	2	10
589	4	Argillaceous limestone		4
589	8	Light- and dark-gray, silty semiplastic clay, grading to claystone.	15	4
605	0	Silty and sandy-gray claystone	6	10
611	10	Sandstone, some interbedded siltstone	5	9
617	7	Dark to carbonaceous silty shale, sandy in upper 1½ ft.	6	0
623	7	Bone		1½
623	8½	Coal	2	9½
626	6	Shale		1½
626	7½	Bony coal		3½
626	11	Dark- and light-gray, silty claystone, 2 ft. fragmental, semifint clay at base.	8	10
635	9	Interbedded siltstone and sandstone, minor clay shale in middle part.	15	1
650	10	Carbonaceous, shaly clay		4
651	2	Dark-gray, clayey siltstone	5	9
656	11	Gray, shaly clay grading to silty, semifint clay	1	10
658	9	Laminated, dark, silty shale and light sandstone.	9	3
668	0	Dark-gray shale	2	2
670	2	Coal		7
670	9	Bone		3
671	0	Dark-gray to carbonaceous, shaly clay	6	4
677	4	Bone		4½
677	8½	Coal		2½
677	11	Bone		5
678	4	Coal		10½
679	2½	Bone		1½
679	4	Gray to brownish, silty and fragmental claystone.	3	4
682	8	Interbedded siltstone and fine sandstone	10	4
682	8	Medium sandstone	31	8
724	8	Quartzitic, stylonitic, medium sandstone	11	6
736	2	Irregularly interbedded, dark-gray siltstone and fine sandstone.	10	2
746	4	Dark-gray, semiplastic clay, coaly zones at top.	2	0
748	4	Coal and bone	1	7
749	11	Dark-gray, silty, semiplastic clay, 3 in. sandstone at base.	8	8

Upper Freeport rider,  
el. 2,093 ft., C-96552.Upper Freeport, el.  
2,085 ft., C-96553.Upper Kittanning, el.  
2,000 ft., C-96785.

Middle Kittanning.

Middle Kittanning, el.  
1,948 ft., C-97166.Mount Savage, el. 1,877  
ft.

## Log, hole 21-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
758 7	758 9	Bone.....	2	Mount Savage.
758 9	763 10	Gray, silty, semiplastic clay and claystone.....	5 1	
763 10	766 0	Carbonaceous shale, coal streaks.....	2 2	
766 0	769 6	Medium sandstone, carbonaceous partings.....	3 6	
769 6	770 0	Coal.....	6	
770 0	778 0	Gray to brownish, silty claystone grading to siltstone.	8 0	
778 0	785 4	Interbedded siltstone and fine sandstone.....	7 4	
785 4	787 6	Dark to carbonaceous claystone.....	2 2	
787 6	790 5	Dark to carbonaceous, shaly claystone, 2 in. coaly bone at top.	2 11	
790 5	792 2	Interbedded coal and bone.....	1 9	
792 2	799 0	Dark, argillaceous siltstone, grading to sandy siltstone.	6 10	

## Log, hole 22-CB

Location: 3,800 feet N. of lat. 39°40'; 550 feet E. of long. 79°10'; 1½ miles S. of Grantsville on Dan Folk Farm E. of the Casselman River, Garrett County, Md.  
Surface elevation: 2,408 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	18 0	Unconsolidated material.....	18 0	Harlem, el. 2,186 ft., C-97168.
18 0	25 7	Dark-gray, silty clay, grading to shaly siltstone, sandy at base.	7 7	
25 7	28 6	Gray to carbonaceous, pyritic, sandy shale.....	2 11	
28 6	29 5	Coal.....	11	
29 5	44 0	Gray, calcareous clay, zones of siltstone in lower 4 ft.	14 7	
44 0	78 6	Interbedded, shaly siltstone and fine sandstone.....	34 6	
78 6	97 2	Cross-laminated, medium sandstone, coarse zones and coaly parting, carbonaceous at base.	18 8	
97 2	99 2	Calcareous, silty clay.....	2 0	
99 2	104 0	Argillaceous limestone.....	4 10	
104 0	123 0	Calcareous, silty clay, limestone inclusions.....	19 0	
123 0	135 2	Greenish to gray, silty clay and claystone, ironstone nodules in upper part.	12 2	
135 2	141 7	Interbedded siltstone and fine sandstone.....	6 5	
141 7	150 6	Gray, silty shale and siltstone, carbonaceous shale inclusions in lower ft.	8 11	
150 6	156 9	Silty clay, grading to clayey siltstone.....	6 3	
156 9	162 4	Silty, gray clay, calcareous stringers.....	5 7	
162 4	183 0	Fine, calcareous sandstone, interbedded siltstone in upper part.	20 8	
183 0	191 4	Silty, gray shale.....	8 4	
191 4	220 7	Black shale, marine fossils.....	29 3	
220 7	222 4	Coal.....	1 9	
222 4	248 0	Gray, calcareous clay and claystone.....	25 8	
248 0	254 4	Mottled, greenish gray and red to black, shaly clay and silty, green claystone.	6 4	
254 4	257 6	Argillaceous limestone.....	3 2	
257 6	269 2	Greenish-gray, silty clay, limy pellets.....	11 8	
269 2	273 6	Gray to dark-gray, semiplastic clay.....	4 4	

## Log, hole 22-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
273	6	287 8	14	2	
		Greenish-gray, shaly siltstone, calcareous in lower foot.			
287	8	290 5	2	9	
290	5	295 0	4	7	
		Gray to black, shaly clay			
295	0	296 5	1	5	
296	5	296 6		1	
296	6	298 6½	2	½	Upper Bakerstown, el. 2,108 ft., C-97169.
298	6½	298 10	3	½	
298	10	299 9	11		
299	9	303 0	3	3	
		Black, pyritic, silty claystone			
303	0	305 0	2	0	
305	0	311 3	6	3	
311	3	336 9	25	6	
336	9	336 10	1	1	Lower Bakerstown, el. 2,069 ft., C-97170.
336	10	338 7	1	9	
338	7	346 6	7	11	
		Bone			
346	6	363 0	16	6	
363	0	373 0	10	0	
		Gray, silty clay with 6-in. zone argillaceous limestone in middle.			
373	0	377 8	4	8	
377	8	383 4	5	8	
383	4	402 0	18	8	
402	0	405 5	3	5	
		Red and green claystone, limy zone in middle			
405	5	405 6		1	
405	6	412 0	6	6	
412	0	434 0	22	0	
		Gray, silty clay, limy pellets			
434	0	451 0	17	0	
451	0	467 11	16	11	
		Greenish-gray siltstone, calcareous stringers, sandstone 430 to 433 ft.			
467	11	469 4½	1	5½	Brush Creek, el. 1,939 ft., C-97356.
		Black shale, calcareous nodules and marine fossils.			
469	4½	485 0	15	7½	
485	0	499 0	14	0	
		Coal			
499	0	506 6	7	6	
506	6	509 6	3	0	
509	6	529 8	20	2	
		Silty, gray clay and claystone, calcareous pellets and zones of argillaceous limestone.			
529	8	537 4	7	8	
537	4	558 6	21	2	
		Gray, silty claystone			
558	6	567 4	8	10	
567	4	568 1		9	Upper Freeport rider, el. 1,840 ft.
		Green to gray, shaly siltstone, fine sandstone in lower 4 ft.			
568	1	571 4	3	3	
571	4	577 9	6	5	
		Gray shale			
577	9	590 2	12	5	
590	2	591 3	1	1	
591	3	591 3½		½	Upper Freeport, el. 1,813 ft., C-97617.
591	3½	593 6	2	½	
593	6	593 7	1	1	
593	7	594 3		8	
594	3	594 6		3	
594	6	603 10	9	4	
603	10	607 10	4	0	
607	10	617 0	9	2	
617	0	621 8	4	8	
		Irregularly interbedded, dark-gray siltstone and white sandstone.			
		Dark-gray shale, sandy streaks			
		Coal			
		Bone			
		Coal			
		Shale			
		Coal			
		Bony coal			
		Argillaceous limestone and limy claystone			
		Fragmental, silty claystone			
		Light- to dark-gray, tough, silty clay			
		Gray, semiplastic clay, zones of argillaceous limestone and ironstone.			

## Log, hole 22-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 621 8	<i>Ft. in.</i> 631 2	Gray, silty claystone grading to siltstone, sandy zones in lower 2 ft.	<i>Ft. in.</i> 9 6	} Upper Kittanning, el. 1,752 ft., C-98100.
631 2	652 10	Quartzite, stylonitic medium sandstone	21 8	
652 10	652 11	Bone	1 1	
652 11	655 3	Coal	2 4	
655 3	655 4	Shale	1 1	
655 4	655 10	Coal	6 6	
655 10	660 0	Argillaceous limestone, grading to limy claystone.	4 2	
660 0	662 0	Gray siltstone	2 0	

## Log, hole 23-CB

Location: 6,700 feet S. of lat. 39°40'; 5,950 feet E. of long. 79°10'; 3½ miles S. of Grantsville on the Old Aza Durst farm, part of Savage River State Forest, Garrett County, Md.

Surface elevation: 2,543 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 0 0	<i>Ft. in.</i> 7 0	Unconsolidated material	<i>Ft. in.</i> 7 0	} Upper Kittanning, el. 2,390 ft., C-97618.
7 0	23 0	Claystone, siltstone, and sandstone	16 0	
23 0	33 0	Gray, silty claystone	10 0	
33 0	45 4	Olive-gray, silty claystone	12 4	
45 4	47 2	Interbedded siltstone and fine sandstone	1 10	
47 2	47 6	Dark-gray, silty claystone	4 4	
47 6	48 4	Bone and shale	10 10	
48 4	62 10	Gray, silty claystone, small siderite nodules in center.	14 6	
62 10	74 2	Interbedded siltstone and fine sandstone	11 4	
74 2	76 9	Black to gray, silty, shaly claystone	2 7	
76 9	138 3	Medium sandstone, few stylolites, large siderite nodule from 133 ft. 6 in. to 134 ft. 3 in.	61 6	
138 3	147 4	Interbedded siltstone and fine sandstone, some silty claystone in lower part.	9 1	
147 4	150 7	Gray, silty clay shale	3 3	
150 7	151 3	Carbonaceous claystone	8 8	
151 3	152 5	Coal	1 2	
152 5	152 7	Bone	2 2	
152 7	157 6	Dark-gray silty claystone, plant rootlets	4 11	
157 6	163 3	Gray silty claystone, locally fragmental	5 9	
163 3	190 9	Interbedded siltstone and fine sandstone, siderite stringers and pellets.	27 6	
190 9	194 5	Medium stylonitic sandstone, fragments of gray and brown siltstone and claystone, ½ in. of bone at 191 ft. 4 in.	3 8	
194 5	199 0	Interbedded siltstone and fine sandstone	4 7	
199 0	201 10	Black, silty, shaly clay	2 10	
201 10	203 4½	Coal	1 6½	} Middle Kittanning, el. 2,340 ft., C-98098.
203 4½	203 6	Bone	1 ½	
203 6	207 6	Black siltstone and silty claystone, some interbedded fine sandstone at center, plant fossils.	4 0	
207 6	208 2	Bone	8 8	} Middle Kittanning, el. 2,334 ft., C-98099.
208 2	209 6	Coal	1 4	
209 6	214 5	Gray claystone	4 11	
214 5	216 2	Light-tan, plastic clay	1 9	
216 2	218 4	Light-tan flint clay, few siderite nodules at base	2 2	

## Log, hole 23-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
218 4	221 8	Light-tan, semiplastic clay-----	3 4	
221 8	226 11	Tan, silty claystone, grading to siltstone, siderite pellets.	5 3	
226 11	253 0	Interbedded siltstone and fine sandstone-----	26 1	
253 0	280 8	Medium to coarse stylonitic sandstone, locally conglomeratic.	27 8	
280 8	296 1	Black, shaly siltstone to dark-gray, silty claystone, plant fossils.	15 5	
296 1	302 9	Brownish-gray siltstone-----	6 8	
302 9	325 2	Fine to medium, stylonitic, quartzitic sandstone, pyritic nodules, streaks of carbonaceous claystone and bone in lower 2 ft.	22 5	
325 2	330 8	Brown, silty claystone and clay-----	5 6	
330 8	333 0	Interbedded siltstone and fine sandstone-----	2 4	
333 0	335 5	Black claystone-----	2 5	
335 5	336 3	Bony coal-----	10 6	} Mount Savage, el. 2,206 ft.
336 3	336 9	Shale-----	6 8	
336 9	337 5	Bony coal-----	8 0	
337 5	338 5	Black claystone, coaly streaks-----	1 0	
338 5	344 7	Dark-gray, silty claystone-----	6 2	
344 7	360 2	Medium sandstone-----	15 7	
360 2	364 4	Dark-gray, silty claystone, plant fossils-----	4 2	
364 4	374 4	Interbedded siltstone and fine sandstone-----	10 0	
374 4	376 7	Carbonaceous claystone, coaly streak-----	2 3	
376 7	380 9	Dark-gray siltstone, plant fossils-----	4 2	
380 9	384 0	Fine sandstone, minor, interbedded brown siltstone.	3 3	

## Log, hole 24-CB

Location: 6,400 feet N. of lat. 39°40'; 500 feet E. of long. 79°10'; 1 mile S. of Grantsville at junction of Shade Run and Casselman River, Garrett County, Md.  
Surface elevation: 2,153 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	22 0	Unconsolidated material-----	22 0	
22 0	28 7	Gray, silty claystone, siderite pellets and stringers.	6 7	
28 7	44 11	Greenish-gray, silty, shaly claystone, minor interbedded siltstone and fine sandstone.	16 4	
44 11	46 9	Black, shaly clay-----	1 10	
46 9	52 7	Gray, silty, shaly claystone, few sideritic nodules.	5 10	
52 7	52 9½	Bone-----	2½	} Upper Bakerstown, el. 2,096 ft., C-98412.
52 9½	53 0	Shale-----	2½	
53 0	53 2	Bone-----	2 2	
53 2	54 6	Coal-----	1 4	
54 6	54 6½	Shale-----	½	
54 6½	55 4	Coal-----	9½	
55 4	55 8	Bone-----	4 4	
55 8	55 11	Shale-----	3 3	
55 11	56 7	Bony coal-----	8 8	
56 7	58 11	Gray, limy claystone-----	2 4	
58 11	67 6	Gray, silty claystone, limy pellets and inclusions.	8 7	
67 6	69 8	Argillaceous limestone-----	2 2	
69 8	76 7	Light-gray, silty claystone, small siderite nodules.	6 11	

## Log, hole 24-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
			Ft.	in.	
			19	1	
		Dark-gray to black, silty, shaly claystone, pyrite crystals in lower 2 ft.			
		Bone-----		2	} Lower Bakerstown, el. 2,056 ft., C-98413.
		Coal-----	1	6½	
		Dark-gray, silty claystone and clay, limy inclusions.	7	9½	
		Gray, silty, clay shale, minor interbedded siltstone and fine sandstone.	15	3	
		Interbedded siltstone, fine sandstone and gray, silty claystone.	13	7	
		Light gray and green claystone, red mottling-----	6	9	
		Interbedded siltstone and fine sandstone-----	23	0	
		Black clay shale, marine fossils-----	1	8	
		Dark- to light-gray, silty claystone, grading to siltstone, limy lenses and pellets.	9	9	
		Interbedded siltstone and fine sandstone-----	26	9	
		Medium sandstone-----	3	6	
		Gray, silty, shaly clay, minor interbedded siltstone, and fine sandstone in upper part, plant fossils.	9	7	
		Black, shaly clay, marine fossils-----	18	9	} Brush Creek, el. 1,918 ft., C-98786.
		Coal-----	1	3½	
		Bone-----		1½	
		Claystone, limy pellets, lenses, and inclusions-----	10	7	
		Gray, silty claystone, siderite stringers in upper part.	11	3	
		Gray and greenish-gray, silty claystone, sideritic zones.	17	7	
		Fragmental, green claystone-----	2	2	
		Gray and green claystone, red mottling-----	10	11	
		Greenish-gray, silty, shaly claystone, 4-in. sideritic lenses at 294 ft. 8 in.	12	1	
		Interbedded shaly siltstone, silty claystone, and fine sandstone.	19	3	
		Dark-gray to black, silty, shaly claystone-----	5	4	
		Gray, silty claystone and siltstone-----	7	8	
		Dark-gray siltstone, minor, interbedded, silty claystone, and fine sandstone.	20	2	
		Irregularly interbedded siltstone and fine sandstone.	15	10	
		Black, silty, shaly clay-----	1	11½	} Upper Freeport, el. 1 779 ft. C-98787.
		Coal-----		10	
		Shale-----		½	
		Coal-----	2	½	
		Shale-----		1½	
		Coal-----		2½	
		Bone-----		7½	
		Gray, argillaceous limestone-----	8	0	
		Tan and bluish gray, fragmental flint and semiflint clay.	5	3	
		Gray, silty claystone-----	8	5	
		Fine sandstone-----	4	8	
		Dark-gray, silty claystone-----	13	1	
		Dark-gray siltstone, minor, interbedded, fine sandstone.	1	1	
		Carbonaceous shale-----		5	
		Bone-----		2	
		Black to dark-gray, argillaceous limestone-----	2	0	
		Claystone; fragmental, calcareous ironstone zones at base.	1	11	
		Dark-gray, silty, shaly claystone-----		4	
		Interbedded siltstone and fine and medium sandstone.	4	10	

## Log, hole 25-CB

Location: 6,800 feet S. of lat. 39°40'; 5,130 feet W. of long. 79°10'; on W. side of Jennings, on Edward Swauger farm, Garrett County, Md.  
Surface elevation: 2,260 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	29 0	Unconsolidated material .....	29 0	
29 0	48 4	Gray, silty, shaly claystone.....	19 4	
48 4	50 5	Black, shaly claystone, plant fossils, and scattered pyrite crystals.	2 1	
50 5	52 5	Coal.....	2 0	Lower Bakerstown, el. 2,208 ft., D-1,854.
52 5	59 9	Dark-gray claystone and clay, limy pellets in lower part.	7 4	
59 9	70 5	Interbedded siltstone and fine sandstone.....	10 8	
70 5	77 2	Gray, shaly, silty claystone, sandy streaks.....	6 9	
77 2	89 8	Light greenish-gray claystone, red mottling.....	12 6	
89 8	103 10	Interbedded siltstone, claystone, and shale.....	14 2	
103 10	107 10	Red, silty, shaly clay .....	4 0	
107 10	110 4	Claystone and fine sandstone, limy nodule with marine fossils at base.	2 6	
110 4	116 5	Red and greenish-gray claystone.....	6 1	
116 5	137 0	Thin, irregularly interbedded siltstone and fine sandstone.	20 7	
137 0	149 6	Interbedded siltstone, fine sandstone, and shaly claystone.	12 6	
149 6	171 6	Dark-gray to black clay shale, marine fossils....	22 0	
171 6	172 7	Coal.....	1 1	Brush Creek, el. 2,088 ft., C-99232.
172 7	178 8	Interbedded siltstone and fine sandstone.....	6 1	
178 8	183 7	Gray, silty claystone.....	4 11	
183 7	183 8	White, crystalline limestone, fragments of silty claystone.	1	
183 8	190 5	Dark-gray, silty claystone, limy inclusions.....	6 9	
190 5	197 6	Interbedded siltstone, claystone, and fine sandstone, siderite zones.	7 1	
197 6	217 4	Gray claystone, green fragments.....	19 10	
217 4	224 3	Fine sandstone.....	6 11	
224 3	254 0	Interbedded siltstone, sandstone, and claystone....	29 9	
254 0	259 11	Fine, silty, shaly clay.....	5 11	
259 11	260 3	Fragmental, gray, silty claystone, white, soft-clay matrix.	4	
260 3	262 6	Gray, silty, shaly clay, 1 limy nodule at 262 ft.	2 3	
262 6	266 9	Light-gray claystone, grading to siltstone, few sandy streaks at base.	4 3	
266 9	294 7	Interbedded siltstone and fine sandstone.....	27 10	
294 7	299 7	Styolitic medium sandstone.....	5 0	
299 7	300 1½	Coal.....	6½	Upper Freeport, el. 1,958 ft., D-1485.
300 1½	300 2	Bone.....	½	
300 2	302 2	Coal.....	2 0	
302 2	302 9	Black, silty claystone.....	7	
302 9	307 3	Dark-gray, argillaceous limestone.....	4 6	
307 3	329 7	Dark-gray, silty claystone, lenses and pellets of argillaceous limestone.	22 4	
329 7	336 5	Bluish-gray, fragmental, flinty claystone.....	6 10	
336 5	337 6	Dark-gray clay.....	1 1	
337 6	348 4	Dark-gray, silty claystone, plant rootlets at base.	10 10	
348 4	352 7	Gray, silty claystone, grading to siltstone.....	4 3	
352 7	367 5	Interbedded siltstone and fine to medium sandstone.	14 10	

## Log, hole 25-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft. in.</i> 367 5	<i>Ft. in.</i> 368 6½	Coal .....	1	1½	Upper Kittanning, el. 1,892 ft., D-352.
368 6½	369 1	Dark-gray, silty claystone, plant rootlets.....	37	6½	
369 1	406 8	Interbedded siltstone and fine sandstone.....	1	2	Middle Kittanning, el. 1,813 ft.
406 8	407 10	Dark-gray ironstone.....	17	9	
407 10	425 7	Interbedded siltstone, silty claystone, and fine sandstone, plant fossils.	19	2	
425 7	444 9	Dark-gray to black, silty, shaly claystone, minor interbedded fine sandstone.	2	2	
444 9	446 11	Medium-grained, stylonitic sandstone.....	2	5	
446 11	447 4	Coal.....	2	10	
447 4	450 2	Light-gray siltstone, irregularly interbedded fine sandstone.	21	4	
450 2	471 6	Fine sandstone, siltstone beds, and fragments..	41	8	
471 6	513 2	Medium stylonitic, quartzitic sandstone.....	4	4	
513 2	513 6	Hard, pyritic, carbonaceous shale.....	4	5	
513 6	517 11	Silty, gray claystone, grading to siltstone.....	3	9	Mount Savage, el. 1,726 ft.
517 11	521 8	Medium to fine sandstone.....	8	11	
521 8	530 7	Gray shale, silty siderite pellets.....	2	8	
530 7	533 3	Carbonaceous, shaly clay.....	6½	1	
533 3	533 9½	Bone and coal.....	1	9½	
533 9½	535 7	Dark-gray siltstone, shaly in lower part, plant rootlets.	9	3	
535 7	536 4	Carbonaceous shale, laminated sandstone.....	3	10	
536 4	536 7	Coal and bone.....	6	4	
536 7	540 5	Silty claystone, zones of fine sandstone.....	7	8	
540 5	546 9	Interbedded shaly siltstone and fine sandstone..	7	7	
546 9	554 5	Gray, silty, carbonaceous shale and siderite pellet zones in lower half.	7	1½	Mount Savage, el. 1,703 ft., D-353.
554 5	555 0	Bone.....	1	1	
555 0	555 ½	Shale.....	5½	1	
555 ½	555 6	Cannel coal.....	1	9	
555 6	555 7	Shale.....	1	1	
555 7	557 4	Coal.....	4	8	
557 4	557 5	Bone.....	3	9	Mount Savage el. 1,689 ft.
557 5	562 1	Tan, semiplastic clay and shaly clay, thin beds of flint clay and claystone.	3	6	
562 1	565 10	Dark-gray to black siltstone and laminated fine sandstone.	1	10	
565 10	569 4	Dark-gray siltstone, grading to gray shale.....	7	6	
569 4	571 2	Bone and coal.....	7	4	Mercer, el. 1,652 ft.
571 2	578 8	Gray siltstone, plant rootlets, sandy in lower part.	19	4	
578 8	586 0	Interbedded siltstone and fine sandstone.....	3	5	
586 0	605 4	Medium quartzitic, stylonitic sandstone.....	3	5	
605 4	608 9	Conglomerate, inclusions of coal at 606 ft. 6 in. to 608 ft.	22	3	
608 9	631 0	Medium stylonitic sandstone, some coarse zones			



## Log hole 26-CB

Location: 6,570 feet N. of lat. 39°40'; 1,900 feet W. of long. 79°10'; 1 mile SW. of Grantsville, on Guy Stanton farm, Garrett County, Md.  
Surface elevation: 2,278 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	27	0
27	0	Weathered clay and claystone, limy pellets in upper part.	7	10
34	10	Greenish-gray, silty claystone, grading to siltstone; limy stringers and ironstone inclusions.	4	11
39	9	Interbedded greenish gray siltstone and silty shale.	18	3
58	0	Interbedded gray shale and argillaceous limestone.	4	4
62	4	Irregularly laminated, gray-black, pyritic shale, coaly streaks.	3	6
65	10	Coal	5	1/2
66	3 1/2	Bone	1	1/2
66	4	Coal	2	
66	6	Bone	1	1/2
66	6 1/2	Coal	10	1/2
67	5	Bone	2	1/2
67	7 1/2	Shale	4	
67	11 1/2	Coal	8	
68	7 1/2	Gray clay and claystone, limy nodules	2	10 1/2
71	6	Interbedded dark-gray claystone and argillaceous limestone.	12	6
84	0	Gray, shaly claystone, grading to shale, ironstone concretions in middle part.	8	0
92	0	Black shale, pyritic in lower part, ironstone concretions.	16	6
108	6	Pyrite	1	1/2
108	6 1/2	Coal	8	1/2
110	3	Dark- to light-gray clay and claystone, limy pellets.	4	9
115	0	Silty claystone, grading to siltstone	2	8
117	8	Fine sandstone	4	3
121	11	Interbedded siltstone and fine sandstone	12	1
134	0	Mottled, gray, semihard clay	1	8
135	8	Mottled red and green, semiplastic, silty clay	15	0
150	8	Green, silty, shaly claystone	2	0
152	8	Argillaceous limestone	1	6
154	2	Interbedded siltstone and fine sandstone	17	6
171	8	Gray and tan, shaly clay, marine fossils	7	10
172	6	Greenish, semiplastic clay, large inclusions of argillaceous limestone in upper zone.	7	3
179	9	Fine sandstone, minor siltstone	20	9
200	6	Interbedded, dark-gray, silty shale and siltstone, sandstone zone in upper 20 feet, plant fragments.	25	7
226	1	Silty, carbonaceous, pyritic shale, marine fossils, and ironstone nodules.	18	11
245	0	Coal	2	1/2
245	2 1/2	Bone	3	4
245	3 1/4	Coal	1	5 1/2

Upper Bakerstown, el. 2,209 ft., C-99526.

Lower Bakerstown, el. 2,168 ft., C-99527.

Brush Creek, el. 2,031 ft., D-354.

## Log, hole 26-CB—Continued

Depth		Material	Thickness		Remarks
From—	To—		Ft.	in.	
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
246	8 $\frac{3}{4}$	Bone	246	10	
246	10	Gray, silty claystone	248	7	
248	7	Limy, gray, fragmental claystone	255	0	
255	0	Gray, silty, fragmental, semiplastic clay	258	3	
258	3	Greenish-gray, silty claystone, sideritic zones	266	1	
266	1	Fine sandstone	269	0	
269	0	Shaly claystone	270	2	
270	2	Interbedded, gray and green, semiplastic clay and claystone.	290	0	
290	0	Green, shaly siltstone	293	0	
293	0	Mottled green, red, and gray, silty, semiplastic clay and claystone.	300	9	
300	9	Greenish-gray, silty claystone grading to siltstone, ironstone stringers and inclusions.	307	4	
307	4	Interbedded siltstone, fine sandstone, and shale	317	2	
317	2	Fine sandstone, minor siltstone	323	4	
323	4	Interbedded gray claystone, sandstone and siltstone.	325	0	
325	0	Gray, shaly clay	330	6	
330	6	Gray claystone, veinlets of dark, pyritic claystone.	333	4	
333	4	Silty, brownish gray claystone, zones of fine sandstone.	340	10	
340	10	Laminated, dark-gray to black, silty shale and white sandstone.	365	9	
365	9	Pyritic, carbonaceous shale	367	1	
367	1	Bone	367	2	
367	2	Coal	370	1	
370	1	Shale	370	2 $\frac{1}{2}$	
370	2 $\frac{1}{2}$	Coal	370	9 $\frac{1}{2}$	
370	9 $\frac{1}{2}$	Bone	370	11 $\frac{1}{2}$	
370	11 $\frac{1}{2}$	Argillaceous limestone	379	11	
379	11	Fragmental, flinty, claystone	383	5	
383	5	Silty claystone, grading to siltstone, zones of fine sandstone.	389	6	
389	6	Semiplastic clay, grading to silty claystone	393	6	
393	6	Interbedded siltstone, silty claystone, and fine sandstone.	406	0	
406	0	Dark-gray to black claystone	406	5	
406	5	Argillaceous limestone	408	5	
408	5	Fragmental claystone and limestone, ironstone concretions.	410	6	
410	6	Dark-gray, silty claystone	418	4	
418	4	Fragmental claystone	419	2	
419	2	Interbedded fine sandstone and siltstone	430	6	
430	6	Dark-gray, carbonaceous shale	432	1	
432	1	Bone	432	6 $\frac{1}{2}$	
432	6 $\frac{1}{2}$	Coal	435	4	
435	4	Bone	435	7	
435	7	Argillaceous limestone	438	0	
438	0	Fragmental claystone, ironstone inclusions at base.	439	10	
439	10	Gray siltstone and silty claystone	445	0	

} Upper Freeport, el.  
1,907 ft., D-355.

} Upper Kittanning, el.  
1,843 ft., D-356.

## Log, hole 27-CB

Location: 1,170 feet N. of lat. 39°40'; 870 feet E. of long. 79°10'; 2 miles S. of Grantsville, on Harold Baum farm or "Mount Airy," part of "Bucks Pasture," Garrett County, Md.  
Surface elevation: 2,350 feet.

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
0	0	Unconsolidated material	18	0	
18	0	Gray, silty claystone, limy lenses and pellets in upper part, siderite stringers in lower part.	27	4	
45	4	Gray to black, silty, shaly clay, interbedded limy sandstone.	18	0	
63	4	Bone	5	} Federal Hill, el. 2,285 ft.	
63	9	Coal	3		
64	0	Bone	3½		
64	3½	Shale	2½		
64	6	Coal	5		
64	11	Bone	1		
65	0	Gray, silty clay and siltstone	3		6
68	6	Interbedded siltstone and fine to medium sandstone, limy in middle part.	37		1
105	7	Gray, silty claystone, limy in lower part	10		11
116	6	Black, silty, shaly clay, marine fossils	15		3
131	9	Bone	1	5	
132	2	Coal	1	8	
133	10	Gray, argillaceous limestone	10	6	
144	4	Gray to green, silty claystone, limy nodules and siderite stringers.	10	9	
155	1	Gray, silty, semiplastic clay	5	5	
160	6	Black to green and gray claystone, shaly at top, sideritic stringers in middle, shaly at bottom, interbedded with siltstone and limy sandstone.	51	7	
212	1	Carbonaceous claystone	10	} Upper Bakerstown, el. 2,136 ft.	
212	11	Bone	10		
213	9	Gray, silty, shaly clay, lenses and pellets of argillaceous limestone.	13	8	
227	5	Gray, silty, shaly clay	22	11	
250	4	Coal	2	3	
252	7	Dark-gray, silty clay	3	1	
255	8	Interbedded siltstone and fine sandstone	4	10	
260	6	Gray, silty, shaly clay, sandy beds of claystone and clay at bottom.	11	6	
272	0	Light-gray, semiplastic clay	4	6	
276	6	Red and green mottled, silty claystone	8	9	
285	3	Interbedded siltstone and fine sandstone, silty, shaly clay at bottom.	25	7	
310	10	Gray to black, shaly clay, marine fossils	1	0	
311	10	Green, silty claystone, limy stringers	8	5	
320	3	Interbedded siltstone and fine sandstone, limy in upper foot, claystone in lower part.	38	9	
359	0	Black, shaly claystone, marine fossils	19	4	
378	4	Coal	1	4½	
379	8½	Interbedded silty claystone and siltstone, fine sandstone at 412 ft.	37	½	
				} Brush Creek, el. 1,980 ft., D-1855.	

## Log, hole 27-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
416 9	419 0	Fragmental, green claystone.....	2 3	
419 0	424 0	Gray to green, silty claystone.....	5 0	
424 0	439 0	Interbedded siltstone and fine sandstone.....	15 0	
439 0	447 4	Silty claystone.....	8 4	
447 4	453 1	Tan and gray, fragmental flint clay.....	5 9	
453 1	475 3	Gray, silty, shaly claystone, interbedded siltstone and fine sandstone.	22 2	
475 3	478 1	Black, shaly clay.....	2 10	
478 1	478 6	Bony coal.....	5	
478 6	478 8	Bone.....	2	} Upper Freeport rider, el. 1,871 ft.
478 8	478 10	Carbonaceous shale.....	2	
478 10	478 11	Coal.....	1	
478 11	479 0	Bone.....	1	
479 0	480 9	Black, shaly clay.....	1 9	
480 9	485 0	Interbedded black siltstone and sandstone.....	4 3	
485 0	493 6	Dark-gray, silty, shaly clay.....	8 6	
493 6	494 6	Coal.....	1 0	
494 6	494 6½	Shale.....	½	} Upper Freeport, el. 1,853 ft., D-2414.
494 6½	496 11	Coal.....	2 4½	
496 11	497 ½	Shale.....	1½	
497 ½	497 6	Coal.....	5½	
497 6	505 0	Gray, argillaceous limestone and tan, fragmental, silty claystone.	7 6	
505 0	549 6	Dark-gray, silty, shaly clay.....	44 6	
549 6	550 6	Coal.....	1 0	Upper Kittanning, el. 1,799 ft., D-2415.
550 6	551 1	Bone.....	7	
551 1	554 9	Interbedded siltstone and fine sandstone.....	3 8	
554 9	555 7	Carbonaceous claystone.....	10	
555 7	556 0	Bony coal.....	5	
556 0	558 4	Coal.....	2 4	} Upper Kittanning, el. 1,791 ft. D-2416.
558 4	558 5½	Shale.....	1½	
558 5½	558 10	Bony coal.....	4½	
558 10	560 0	Gray, silty claystone, plant fossils.....	1 2	

## Log, hole 28-CB

Location: 17,400 feet due S. of lat. 39°40'; 20,900 feet due W. of long. 79°10'; 1½ miles SW. of Bittinger, on the Wiley farm, owned by Edna Wiley Volk, part of "The Gleanings of Negro Mountain," Garrett County, Md.

Surface elevation: 2 682 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	7 5	Unconsolidated material.....	7 5	
7 5	53 0	Medium sandstone.....	45 7	
53 0	71 5	Gray, silty claystone, limy lenses and siderite nodules.	18 5	
71 5	86 9	Gray, silty, shaly clay, fine sandstone at top....	15 4	
86 9	88 8	Carbonaceous shale.....	1 11	
88 8	89 1½	Coal.....	½	} Lower Bakerstown, el. 2,592 ft., D-3137.
89 1½	89 2	Bone.....	½	
89 2	89 6½	Coal.....	4½	
89 6½	89 7	Bone.....	½	
89 7	89 10	Coal.....	3	

## Log, hole 28-CB—Continued

Depth		Material	Thickness		Remarks	
From—	To—		Ft.	in.		
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>			
89	10	110	10	21	0	
110	10	144	3	33	5	
144	3	151	0	6	9	
151	0	179	2	28	2	
179	2	201	9	22	7	
201	9	203	3	1	6	Brush Creek, el. 2,479 ft., D-3138.
203	3	207	0	3	9	
207	0	214	5	7	5	
214	5	224	6	10	1	
224	6	243	0	18	6	
243	0	253	5	10	5	
253	5	260	5	7	0	
260	5	262	4	1	11	
262	4	263	5	1	1	
263	5	266	3	2	10	
266	3	334	11	68	8	
334	11	382	11	48	0	
382	11	399	6	16	7	
399	6	399	8½		2½	Upper Kittanning, el. 2,280 ft., D-3970.
399	8½	399	11½		3	
399	11½	400	0		½	
400	0	401	11	1	11	
401	11	427	4	25	5	
427	4	431	5	4	1	
431	5	440	6	9	1	
440	6	441	7	1	1	Middle Kittanning, el. 2,240 ft.
441	7	447	2	5	7	
447	2	460	0	12	10	
460	0	466	8	6	8	
466	8	468	6	1	10	Middle Kittanning, el. 2,214 ft., D-3971.
468	6	478	7	10	1	
478	7	479	6		11	
479	6	481	1	1	7	
481	1	547	7	66	6	
547	7	555	6	7	11	
555	6	559	10	4	4	
559	10	560	1		3	Mount Savage, el. 2,121 ft.
560	1	560	8		7	
560	8	561	2		6	
561	2	565	4	4	2	
565	4	566	2		10	
566	2	566	5		3	
566	5	567	5	1	0	
567	5	599	6	32	1	
599	6	602	7	3	1	
602	7	636	0	33	5	
636	0	636	2		2	Mercer horizon, el. 2,046 ft.
636	2	638	7	2	5	
638	7	641	0	2	5	

## Log, hole 29-CB

Location: 1,500 feet due S. of lat. 39°40'; 550 feet due E. of long. 79°10'; 1½ miles NW. of Jennings, on Harold Baum farm, or "Mount Airy," part of "Bucks Pasture," Garrett County, Md.  
Surface elevation: 2,568 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	37	0
37	0	Weathered claystone	6	6
43	6	Medium to coarse sandstone	18	7
62	1	Gray, limy to silty claystone, grading to siltstone.	20	4
82	5	Interbedded siltstone and fine sandstone	9	5
91	10	Gray, silty to sandy, shaly clay	12	3
104	1	Interbedded bone, coal, and claystone	1	1
105	2	Gray, silty claystone, plant fossils	5	9
110	11	Bone and shale	5	5
111	4	Coal	5	7
111	9	Bone	7	
112	4	Dark-gray, argillaceous limestone	4	10
117	2	Gray, silty claystone, limy stringers	6	10
124	0	Interbedded siltstone and fine sandstone	10	8
134	8	Gray, silty claystone, fine sandstone in center	11	9
146	5	Bony coal	6	
146	11	Gray to black, silty, shaly clay	23	0
169	11	Bony coal	9	
170	8	Gray to green claystone, limy inclusions	17	8
188	4	Interbedded siltstone, claystone, and fine sandstone.	3	9
192	1	Gray and green, silty claystone	13	11
206	0	Interbedded siltstone and fine sandstone	11	6
217	6	Black to gray claystone to green siltstone, limy stringers.	11	8
229	2	Fine to coarse sandstone	49	1
278	3	Black, shaly claystone, marine fossils	15	5
293	8	Coal	1	9½
295	5½			
295	5½	Argillaceous limestone	11	6½
307	0	Red, green, and gray mottled claystone, limy 331 ft. to 337 ft.	39	3
346	3	Interbedded siltstone and fine sandstone, scattered limy pellets.	12	10
359	1	Green, shaly clay, black at base	7	3
366	4	Interbedded siltstone and fine sandstone	6	10
373	2	Gray, silty claystone, limy lenses	4	10
378	0	Shaly bone, pyrite lumps	1	10
379	10	Argillaceous limestone and claystone, limy pellets.	19	10
399	8	Black, shaly siltstone to shaly clay	19	0
418	8	Coal	2	6½
421	2½			
421	2½	Silty claystone, limy pellets	12	½
433	3	Red- and green-mottled claystone	7	11
441	2	Interbedded fine sandstone and green siltstone, limy at base.	15	4
456	6	Silty, shaly clay	17	11
474	5	Red- and green-mottled claystone	12	7
487	0	Interbedded siltstone and fine sandstone	25	2
512	2	Black, shaly claystone, marine fossils, plant fossils at top.	25	11
538	1	Coal	1	0
539	1	Bone	1	
539	2	Coal	3	
539	5			
539	5	Gray siltstone	4	7
544	0	Gray to green, limy claystone	33	6
577	6	Fragmental claystone and semiflint clay	5	1

} Wellersburg, el. 2,456 ft.

Barton rider.

Barton, el. 2,390 ft.

} Harlem, el. 2,273 ft., D-3972.

Upper Bakerstown, el. 2,188 ft.

Lower Bakerstown, el. 2,147 ft., D-3973.

} Brush Creek, el. 2,029 ft., D-4802.

## Log, hole 29-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 582 7	<i>Ft. in.</i> 618 5	Interbedded claystone, siltstone, and fine sandstone.	<i>Ft. in.</i> 35 10	
618 5	621 0	Fragmental claystone and silty plastic clay, matrix of fine sandstone and siltstone.	2 7	
621 0	635 2	Interbedded siltstone and fine sandstone-----	14 2	
635 2	642 2	Gray to black, shaly clay, plant fossils-----	7 0	
642 2	642 3	Bone-----	1 0	Upper Freeport rider.
642 3	647 0	Black to gray, silty claystone-----	4 9	
647 0	658 9	Interbedded shaly siltstone, silty, shaly clay, and fine sandstone.	11 9	
658 9	659 7½	Coal-----	10½	
659 7½	659 8½	Bone-----	1 1	Upper Freeport, el. 1,902 ft., D-4803.
659 8½	661 10	Coal-----	2 1½	
661 10	661 11	Shale-----	1 1	
661 11	662 3½	Coal-----	4½	
662 3½	675 4	Silty claystone, limy lenses-----	13 ½	
675 4	676 2	Fragmental flint clay-----	10	
676 2	695 10	Silty claystone, limy stringers-----	19 8	
695 10	726 8	Interbedded siltstone and fine to medium styolitic sandstone.	30 10	
726 8	726 10½	Bone-----	2½	Upper Kittanning, el. 1,839 ft., D-4804.
726 10½	729 ½	Coal-----	2 2	
729 ½	729 1½	Shale-----	1 1	
729 1½	729 6	Bony coal-----	4½	
729 6	734 4	Silty claystone, limy inclusions-----	4 10	
734 4	737 0	Fragmental siltstone-----	2 8	

## Log, hole 30-CB

Location: 9,400 feet due S. of lat. 39°40'; 17,850 feet due W. of long. 79°10'; 2½ miles N. of Bittinger, on Henry Beitzel farm, W. of North Branch, Casselman River, Garrett County, Md.  
Surface elevation: 2,642 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i> 0 0	<i>Ft. in.</i> 6 0	Unconsolidated material-----	<i>Ft. in.</i> 6 0	
6 0	14 0	Medium sandstone-----	8 0	
14 0	28 0	Weathered, silty clay-----	14 0	
28 0	59 11	Interbedded siltstone and fine sandstone-----	31 11	
59 11	82 6	Medium sandstone-----	22 7	
82 6	125 7	Interbedded claystone, siltstone, and fine sandstone.	43 1	
125 7	146 9	Medium, styolitic sandstone, coaly partings at base.	21 2	Upper Freeport horizon.
146 9	163 2	Silty claystone, grading to interbedded siltstone and fine sandstone.	16 5	
163 2	201 5	Medium styolitic sandstone-----	38 3	
201 5	202 0	Coal-----	7 7	
202 0	213 1	Gray to black, silty, shaly clay-----	11 1	
213 1	215 1	Coal-----	2 0	Upper Kittanning, el. 2,427 ft., D-7123.
215 1	237 3	Silty claystone, siderite nodules, shaly at base---	22 2	
237 3	250 8	Medium to coarse, styolitic sandstone-----	13 5	
250 8	251 10	Black siltstone-----	1 2	

## Log, hole 30-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
251 10	255 0	Styolitic quartzite.....	3 2	} Middle Kittanning, el. 2,364 ft.
255 0	261 6	Interbedded siltstone and fine sandstone.....	6 6	
261 6	269 1	Black, silty, shaly clay.....	7 7	
269 1	270 1	Styolitic quartzite.....	1 0	
270 1	276 8	Silty claystone.....	6 7	
276 8	277 4	Bone.....	8	
277 4	277 6	Shale.....	2	
277 6	278 2	Bone.....	8	
278 2	281 9	Silty claystone.....	3 7	
281 9	284 7	Interbedded siltstone and fine sandstone.....	2 10	
284 7	287 4	Interbedded, fine sandstone, coal, and bone.....	2 9	
287 4	331 4	Fine to medium styolitic quartzite, conglomeratic at base.	44 0	
331 4	339 6	Interbedded siltstone and fine sandstone.....	8 2	
339 6	346 6	Medium to coarse quartzite.....	7 0	
346 6	348 6	Silty claystone.....	2 0	
348 6	358 5	Medium to conglomeratic sandstone, quartzitic.	9 11	
358 5	359 1	Silty claystone.....	8	
359 1	367 4	Conglomerate.....	8 3	
367 4	392 3	Medium sandstone.....	24 11	
392 3	398 5	Interbedded siltstone and fine sandstone.....	6 2	
398 5	404 6	Shaly, silty claystone, fine sandstone at base.....	6 1	
404 6	407 0	Medium sandstone.....	2 6	

## Log, hole 31-CB

Location: 3,550 feet due N. of lat. 39°40'; 5,800 feet due E. of long. 79°10'; 1½ miles S. of Grantsville, on Floyd Durst farm on Mount Nebo, Garrett County, Md.  
Surface elevation: 2,471 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	49 0	Unconsolidated material.....	49 0	} Barton rider, el. 2,404 ft.
49 0	65 9	Gray, silty to shaly claystone.....	16 9	
65 9	67 2½	Bony coal.....	1 5½	
67 2½	85 5	Gray, silty, shaly claystone, interbedded fine sandstone.	18 2½	} Barton, el. 2,384 ft., D-7124.
85 5	86 8	Coal.....	1 3	
86 8	130 0	Limy gray to silty green claystone, limy pellets, shaly at bottom.	43 4	} Federal Hill, el. 2,333 ft.
130 0	133 5	Fine sandstone.....	3 5	
133 5	136 8	Black, silty, shaly clay.....	3 3	
136 8	136 11	Coal.....	3	
136 11	137 1½	Shale.....	2½	
137 1½	137 7	Bone.....	5½	
137 7	138 2	Coal.....	7	
138 2	145 1	Silty claystone, limy stringers.....	6 11	
145 1	178 5	Medium to coarse, styolitic sandstone.....	33 4	
178 5	189 2	Siltstone and interbedded sandstone.....	10 9	
189 2	205 0	Black, shaly claystone, marine fossils.....	15 10	} Harlem, el. 2,265 ft., D-7125.
205 0	206 7	Coal.....	1 7	
206 7	210 5	Gray, argillaceous limestone.....	3 10	
210 5	231 11	Green claystone, limy pellets.....	21 6	
231 11	235 3	Red claystone.....	3 4	
235 3	259 0	Green claystone, limy pellets.....	23 9	





## Log, hole 32-CB

Location: 9,200 feet due N. of lat. 39°40'; 16,400 feet due E. of long. 79°10'; 2½ miles E. of Grantsville, 1,000 feet S. of U. S. Route 40, back of White Oak Inn, Garrett County, Md.  
Surface elevation: 2,593 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material.....	33	4
33	4	Interbedded claystone, siltstone, and fine sandstone.	38	7
71	11	Bone.....	1	1
73	0	Shale.....	1	2
73	2	Bone.....	1	9
74	11	Claystone, lenses of argillaceous limestone.....	6	7
81	6	Claystone and siltstone.....	9	6
91	00	Claystone.....	1	2
92	2	Shaly, silty claystone.....	21	7
113	9	Coal.....	2	2
115	11	Gray, silty, semiplastic clay.....	4	7
120	6	Gray siltstone.....	2	6
123	0	Interbedded medium sandstone and siltstone.....	11	6
134	6	Silty, shaly clay.....	6	0
140	6	Red- and green-mottled, silty claystone.....	17	2
157	8	Interbedded siltstone and fine sandstone.....	9	9
167	5	Interbedded shaly claystone, siltstone, and fine sandstone, plant fossils.	50	7
218	0	Black, silty, shaly clay, marine fossils.....	23	9
241	9	Coal.....	1	1
242	10	Gray to green claystone and siltstone, limy stringers at 267 ft.	37	0
279	10	Fragmental green claystone and siltstone, silty semiflint clay.	8	6
288	4	Green, silty claystone.....	24	0
312	4	Fragmental, silty claystone and semiflint clay.....	5	3
317	7	Interbedded siltstone and claystone, minor fine sandstone.	16	9
334	4	Medium sandstone.....	4	11
339	3	Black, shaly claystone.....	10	10
340	1	Bone.....	3	3
340	4	Coal.....	5	5
340	9	Shaly siltstone, to black shaly clay.....	8	4
349	1	Coal.....	10½	10½
349	11½	Bone.....	1	1
350	11½	Coal.....	10½	10½
350	11	Gray, silty claystone.....	12	1
363	0	Fragmental, gray and tan, semiflint clay.....	3	0
366	0	Claystone, partly silty.....	6	3
372	3	Siltstone, sandy streaks.....	6	1
378	4	Medium sandstone.....	30	2
408	6	Black, silty claystone.....	7	7
416	1	Bony shale.....	1	11
418	0	Bony coal.....	5	5
418	5	Bony shale.....	7	7
419	0	Dark-gray, silty claystone.....	3	2
422	2	Bone.....	1	1
422	3	Coal.....	1	8
423	11	Dark-gray, silty claystone.....	22	1
446	0	Interbedded siltstone and fine sandstone.....	22	11
468	11	Medium sandstone.....	11	7
480	6	Black, silty, shaly clay, fine-sandstone beds.....	12	9
493	3	Coal.....	1	5
494	8	Bone.....	1	½
494	8½	Coal.....	1	11½
494	8½	Bone.....	3½	3½
496	11½	Coal.....	9½	9½
496	11	Black and tan claystone and clay.....	6	2
503	1	Coaly bone.....	1	1
504	2	Claystone.....	8	3
512	5	Black siltstone and fine sandstone.....	8	7
521	0	Brown claystone.....	4	4

} Upper Bakerstown, el. 2,518 ft.

} Lower Bakerstown, el. 2,477 ft., D-8018.

} Brush Creek, el. 2,350 ft., D-8019.

} Upper Freeport, el. 2,242 ft., D-8811.

} Upper Kittanning, el. 2,169 ft., D-8812.

} Middle Kittanning, el. 2,096 ft., D-8851.

## Log, hole 32-CB—Continued

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
525	4	527 8	Coal, interbedded with bone.....	2 4	Middle Kittanning, el. 2,065 ft.
527	8	535 3	Gray siltstone.....	7 7	
535	3	541 9	Fine sandstone, siltstone beds and fragments.....	6 6	
541	9	545 10	Black, shaly claystone.....	4 1	
545	10	546 5	Bony coal.....	7 7	
546	5	572 6	Shaly claystone and siltstone.....	26 1	
572	6	577 6	Coarse sandstone.....	5 0	
577	6	629 6	Medium stylonitic sandstone, quartzitic.....	52 0	
629	6	639 0	Shaly siltstone, plant fossils.....	9 6	
639	0	645 6	Brown claystone, siltstone at base.....	6 6	
645	6	654 6	Black, shaly claystone, coaly partings, plant fossils.....	9 0	
654	6	684 0	Medium stylonitic sandstone.....	29 6	

## Log, hole 33-CB

Location: 1,370 feet due N. of lat. 39°40'; 4,700 feet due W. of long. 79°10'; 2½ miles SW. of Grantsville, on N. side of North Branch, Casselman River, Garrett County, Md.  
Surface elevation: 2,168 feet.

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
0	0	19 0	Unconsolidated material.....	19 0	Brush Creek, el. 2,118 ft., D-9489.
19	0	29 0	Gray siltstone and claystone.....	10 0	
29	0	48 5	Black claystone, marine fossils.....	19 5	
48	5	50 5	Coal.....	2 0	
50	5	58 1	Gray claystone, limy pellets.....	7 8	
58	1	59 6	Brown, semiplastic clay.....	1 5	
59	6	63 2	Fine sandstone.....	3 8	
63	2	79 5	Green claystone.....	16 3	
79	5	80 9	Interbedded siltstone and fine sandstone.....	1 4	
80	9	99 0	Gray to green claystone, fragmental near top, siderite pellets in lower half.....	18 3	
99	0	100 5	Fragmental tan, semiflint clay and green claystone.....	1 5	
100	5	126 6	Green and gray claystone and siltstone, green and tan fragments in middle.....	26 1	
126	6	137 4	Interbedded siltstone, claystone, and fine sandstone.....	10 10	
137	4	145 9	Gray to black, shaly claystone.....	8 5	} Upper Freeport rider, el. 2,021 ft., D-9490.
145	9	146 6	Coal.....	9 9	
146	6	146 8	Shale and coal.....	2 2	
146	8	161 0	Interbedded siltstone and fine sandstone, plant fossils.....	14 4	
161	0	166 1	Gray, sandy claystone to carbonaceous shale.....	5 1	
166	1	166 10	Coal.....	9 9	} Upper Freeport, el. 1,998 ft., D-11794.
166	10	166 10½	Shale.....	2 ½	
166	10½	169 2	Coal.....	2 3½	
169	2	169 3	Shale.....	1 1	
169	3	169 9	Coal.....	6 6	
169	9	192 2	Gray, argillaceous limestone.....	22 5	} Upper Kittanning, el. 1,939 ft., D-9491.
192	2	206 2	Gray to green claystone.....	14 0	
206	2	227 8	Fine to medium sandstone.....	21 6	
227	8	228 9	Coal.....	1 1	
228	9	228 10	Shale.....	1 1	
228	10	228 11	Bone.....	1 1	
228	11	230 5	Dark-gray claystone.....	1 6	
230	5	232 0	Fragmental gray claystone and semiflint clay.....	1 7	
232	0	237 0	Siltstone.....	5 0	

## Log, hole 34-CB

Location: 6,650 feet due N. of lat. 39°40'; 3,100 feet due E. of long. 79°10'; 1 mile S. of Grantsville, on right side of Casselman River, facing downstream, Garrett County, Md.  
Surface elevation: 2,158 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
0	0	26	0	Unconsolidated material
26	0	52	2	Claystone, limy in upper half
52	2	55	0	Red and green claystone
55	0	56	6	Black claystone
56	6	72	0	Claystone, limy in upper half
72	0	105	0	Interbedded siltstone and fine sandstone
105	0	106	6	Bone and shale
106	6	110	2	Argillaceous limestone
110	2	140	5	Black and gray claystone, limy pellets and siderite nodules, shaly at bottom.
140	5	142	6	Coal
142	6	151	6	Silty claystone, limy pellets
151	6	169	5	Interbedded siltstone, claystone, and fine sandstone.
169	5	185	1	Red and green claystone
185	1	207	4	Interbedded siltstone and fine sandstone
207	4	210	3	Black, shaly claystone, marine fossils
210	3	221	6	Gray to green, silty claystone, limy pellets
221	6	260	0	Interbedded siltstone and fine sandstone
260	0	282	0	Black, shaly claystone, marine fossils
282	0	282	1½	Bone and pyrite
282	1½	283	6	Coal
283	6	300	5	Claystone and siltstone, limy pellets
300	5	303	0	Fine sandstone
303	0	319	0	Silty claystone, siderite nodules at top, limy in middle.
319	0	321	6	Fragmental, green claystone and tan, semiflint clay.
321	6	335	4	Green, silty, claystone, sandy streaks
335	4	340	1	Fragmental tan claystone, silty claystone, and tan, semiflint clay, quartz streaks in lower foot.
340	1	372	8	Medium sandstone
372	8	385	7	Silty, shaly claystone, plant fossils
385	7	393	6	Interbedded siltstone and fine sandstone, plant fossils.
393	6	400	4	Gray to black, shaly clay
400	4	401	3	Coal
401	3	401	4	Shale
401	4	403	2	Coal
403	2	403	4	Shale
403	4	403	11	Coal
403	11	407	3	Argillaceous limestone
407	3	410	0	Silty claystone, limy pellets
410	0	414	10	Fragmental tan, silty, flint clay
414	10	426	7	Claystone, grading to siltstone
426	7	439	1	Interbedded siltstone and fine sandstone
439	1	461	4	Medium to coarse, conglomeratic, stylonitic sandstone.
461	4	466	0	Dark-gray siltstone
466	0	466	6	Carbonaceous shale
466	6	469	1	Coal
469	1	469	2	Shale
469	2	469	8	Coal
469	8	472	6	Argillaceous limestone
472	6	473	0	Gray claystone

Upper Bakerstown, el. 2,051 ft.

Lower Bakerstown, el. 2,015 ft., D-12964.

Brush Creek, el. 1,874 ft., D-12965.

Artesian water flow.

Upper Freeport, el. 1,754 ft., D-12966.

Upper Kittanning, el. 1,688 ft., D-12967.

Log, hole 35-CB

Location: 4,180 feet due S. of lat. 39°40'; 500 feet due E. of long. 79°10'; 1 mile NE. of Jennings on S. side of Big Laurel Run, Garrett County, Md.  
Surface elevation: 2,311 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	27 0	Unconsolidated material.....	27 0	
27 0	41 2	Interbedded siltstone and fine sandstone.....	14 2	
41 2	44 0	Dark-gray, silty claystone.....	2 10	
44 0	45 10	Bony coal.....	1 10	} Upper Bakerstown, el. 2,267 ft.
45 10	46 1	Shale.....	3 3	
46 1	46 9	Bony coal.....	8 8	
46 9	68 6	Claystone, silty and limy inclusions at top.....	21 9	
68 6	71 6	Interbedded siltstone and fine sandstone.....	3 0	
71 6	86 8	Black, silty, shaly claystone.....	15 2	
86 8	89 1	Coal.....	2 5	Lower Bakerstown, el. 2,224 ft., D-10413.
89 1	95 4	Gray, silty, semiplastic clay.....	6 3	
95 4	97 2	Green claystone, limy inclusions.....	1 10	
97 2	102 4	Interbedded siltstone and fine sandstone.....	5 2	
102 4	145 10	Red- and green-mottled, silty, shaly claystone, fine sandstone streaks.	43 6	
145 10	146 4	Claystone, limestone fragments, marine fossils.....	6 6	
146 4	161 4	Fine sandstone.....	15 0	
161 4	181 5	Interbedded siltstone and fine sandstone.....	20 1	
181 5	205 10	Black, shaly claystone, marine fossils.....	24 5	
205 10	207 2	Coal.....	1 4	Brush Creek, el. 2,105 ft., D-10414.
207 2	217 0	Siltstone and fine sandstone, plant rootlets at top.	9 10	
217 0	226 8	Claystone, limy at top.....	9 8	
226 8	236 9	Interbedded siltstone and fine sandstone.....	10 1	
236 9	240 10	Medium sandstone.....	4 1	
240 10	249 0	Green, fragmental claystone.....	8 2	
249 0	267 9	Fine, limy sandstone, siltstone streaks.....	18 9	
267 9	283 8	Silty, fragmental claystone.....	15 11	
283 8	284 6	Fragmental tan and blue flint clay.....	10 10	
284 6	308 0	Interbedded claystone, siltstone, and fine sand- stone.	23 6	
308 0	310 5	Black, shaly clay.....	2 5	
310 5	311 7	Bone and coal.....	1 2	} Upper Freeport rider.
311 7	318 5	Black, silty, shaly clay, plant fossils.....	6 10	
318 5	323 5	Interbedded siltstone and fine sandstone, plant fossils.	5 0	
323 5	326 3½	Coal.....	2 10½	} Upper Freeport, el. 1,998 ft., D-10721.
326 3½	326 5	Shale.....	1½ 1½	
326 5	326 6½	Coal.....	1½ 1½	
326 6½	357 0	Gray claystone, limy inclusion, shaly and silty in lower half.	30 5½	
357 0	359 5	Fragmental claystone and semiflint clay.....	2 5	
359 5	361 3	Brownish-gray claystone.....	1 10	
361 3	364 3	Fragmental, blue-gray and tan, flint clay.....	3 0	
364 3	365 0	Siltstone.....	9 9	
365 0	369 5	Black, shaly clay.....	4 5	
369 5	388 6	Medium to coarse, stylonitic sandstone.....	19 1	
388 6	408 0	Gray siltstone.....	19 6	
408 0	421 0	Interbedded siltstone and fine sandstone.....	13 0	
421 0	428 6	Gray, shaly clay.....	7 6	
428 6	434 0	Interbedded siltstone and fine sandstone.....	5 6	

## Log, hole 36-CB

Location: 1,480 feet due S. of lat. 39°40'; 4,600 feet due W. of long. 79°10'; 1 mile N. of Jennings on E. side of Ridgley Hill, Garrett County, Md.  
Surface elevation: 2,434 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	30	0
30	0	Silty claystone	9	5
39	5	Fine sandstone, siltstone beds at bottom	2	7
42	0	Siltstone and claystone	3	7
45	7	Black, silty, shaly clay	1	2
46	9	Interbedded siltstone and fine sandstone, plant fossils.	1	7
48	4	Bone		5
48	9	Claystone, grading to siltstone, limy pellets	14	10
63	7	Interbedded siltstone and fine to medium sandstone.	42	7
106	2	Black, shaly claystone, marine fossils	19	0
125	2	Coal		8½
125	10½	Bone		½
125	11	Coal		7½
126	6½	Bone		½
126	7	Argillaceous limestone	10	11
137	6	Siltstone and claystone, limy pellets	11	2
148	8	Red and green claystone	7	3
155	11	Black claystone	1	0
156	11	Silty, shaly claystone, limy inclusions and sandy streaks.	32	1
189	0	Interbedded siltstone and fine sandstone	14	6
203	6	Silty claystone, bony partings at base	4	4
207	10	Bone		9
208	7	Argillaceous limestone	3	2
211	9	Claystone, limy inclusions	11	11
223	8	Gray to black, shaly clay	19	5
243	1	Coal	2	0
245	1	Gray, silty claystone	5	11
251	0	Interbedded siltstone and fine sandstone	10	7
261	7	Green, silty, shaly claystone, limy inclusions, and marine fossils at base.	45	3
306	10	Red- and green-mottled claystone, limy pellets	9	11
316	9	Fine sandstone, siltstone beds at base	18	3
335	0	Black, silty, shaly clay, plant fossils at top, marine fossils at base.	41	2
376	2	Pyritic shale	1	1
376	3	Coal	1	8½
377	11½	Interbedded siltstone and fine sandstone	5	½
383	0	Silty claystone, limy pellets, siderite stringers	33	6
416	6	Fragmental claystone	2	1
418	7	Claystone, shaly in middle	29	5
448	0	Fragmental claystone	1	11
449	11	Silty shale	10	1
460	0	Interbedded siltstone and fine sandstone	6	0
466	0	Dark-gray, silty claystone	3	10
469	10	Fine sandstone		8
470	6	Silty, shaly claystone, plant fossils	1	11
472	5	Siltstone and fine sandstone	7	8
480	1	Coal		6
480	7	Bone		3
480	10	Siltstone and fine sandstone, plant fossils	19	5
500	3	Black, silty, shaly clay, plant fossils	1	10

Federal Hill, el. 2,385 ft.

Harlem, el. 2,307 ft.,  
D-12968.Upper Bakerstown, el.  
2,225 ft.Lower Bakerstown, el.  
2,189 ft., D-12969Brush Creek, el. 2,056  
ft., D-12970.Upper Freeport rider,  
el. 1,953 ft.

Log, hole 36-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
502	1	Coal	10	Upper Freeport, el.1,928 ft., D-13653.
502	11	Shale	1	
503	0	Coal	2	
505	5	Bony coal	5	
505	9	Bone	4	
506	3	Limy claystone	6	
510	7	Gray, silty claystone	4	
510	7	Gray, silty claystone	4	
533	10	Interbedded siltstone and fine sandstone	23	
537	6	Blue and tan, fragmental flint clay	3	
537	6	Gray claystone	8	
540	2	Gray claystone	1	
540	2	Carbonaceous claystone	8	
540	10	Interbedded siltstone and fine sandstone	4	
544	11	Claystone, grading to shale	1	
552	6	Interbedded siltstone and fine sandstone	7	
552	6	Interbedded siltstone and fine sandstone	5	
557	6	Shale, grading to light-gray flint clay	0	
557	6	Shale, grading to light-gray flint clay	5	
562	10	Silty claystone, plant rootlets at top	4	
562	10	Silty claystone, plant rootlets at top	19	
562	10	Silty claystone, plant rootlets at top	2	
582	0	Fine sandstone	4	
582	0	Fine sandstone	0	

Log, hole 37-CB

Location: 6,380 feet due N. of lat. 39°40'; 5,900 feet due E. of long. 79°10'; 1 mile S. of Grantsville on S. side of Casselman River, Garrett County, Md.  
 Surface elevation: 2,147 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>
0	0	Unconsolidated material	24	Upper Bakerstown, el. 2,112 ft.
24	0	Medium sandstone	0	
24	0	Medium sandstone	1	
25	0	Green, silty claystone	2	
27	8	Black, shaly clay and siltstone	7	
27	8	Black, shaly clay and siltstone	2	
34	10	Bone	6	
35	4	Argillaceous limestone	4	Lower Bakerstown, el. 2,068 ft., D-14556.
39	6	Silty claystone, limy inclusions	2	
39	6	Silty claystone, limy inclusions	6	
46	2	Silty, shaly clay	30	
46	2	Silty, shaly clay	10	
77	0	Coal	2	
77	0	Coal	1	
79	1	Gray, silty claystone, limy inclusions in middle	24	Brush Creek, el. 1,932 ft., D-14554.
103	2	Gray, silty claystone, limy inclusions in middle	1	
103	2	Red and green claystone	19	
122	7	Red and green claystone	5	
122	7	Shaly siltstone and claystone	4	
127	3	Shaly siltstone and claystone	8	
127	3	Fine sandstone	1	
128	7	Fine sandstone	4	
128	7	Shaly, silty claystone	15	
144	0	Shaly, silty claystone	5	
144	0	Shaly clay, marine fossils	1	
145	5	Shaly clay, marine fossils	5	
145	5	Limy claystone	11	
157	0	Limy claystone	7	
157	0	Interbedded siltstone and fine sandstone	32	
189	5	Interbedded siltstone and fine sandstone	5	
189	5	Black shale, marine fossils	24	
189	5	Black shale, marine fossils	9	
214	2	Coal	1	
214	2	Coal	1	
215	3	Gray claystone, limy pellets	13	
228	6	Gray claystone, limy pellets	3	
228	6	Interbedded siltstone and fine sandstone	6	
235	1	Interbedded siltstone and fine sandstone	7	
235	1	Carbonaceous shale	5	
235	6	Carbonaceous shale	5	
235	6	Gray to green, silty claystone, fragmental at top	18	
235	6	Gray to green, silty claystone, fragmental at top	9	
254	3	Red and green, mottled claystone	29	
254	3	Red and green, mottled claystone	1	

Log, hole 37-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
283 4	307 4	Interbedded siltstone and fine sandstone	24 0	Upper Freeport rider.
307 4	308 4	Carbonaceous shale	1 0	
308 4	309 0	Coal	8 8	
309 0	315 0	Silty claystone	6 0	
315 0	323 0	Black, shaly claystone, coaly partings	8 0	
323 0	329 9	Shaly siltstone and fine sandstone	6 9	
329 9	332 11	Black to carbonaceous shale	3 2	
332 11	333 9	Coal	10 10	
333 9	333 10	Shale	1 1	
333 10	335 9	Coal	1 11	
335 9	336 0	Shale	3 3	
336 0	336 1	Coal	1 1	
336 1	339 0	Silty, gray claystone	2 11	
339 0	349 11	Interbedded siltstone and fine sandstone, flint-clay fragments at bottom.	10 11	
349 11	352 11	Fragmental, tan flint clay, siltstone matrix	3 0	Upper Freeport, el. 1,811 ft., D-14555.
352 11	354 10	Brown claystone	1 11	
354 10	355 10	Fragmental, brown flint clay, siltstone matrix	1 0	
355 10	379 6	Gray siltstone	23 8	
379 6	380 6	Dark-gray claystone	1 0	
380 6	380 10½	Bony coal	4½ 4½	
380 10½	381 2½	Shale	4 4	
381 2½	381 10½	Coal	8 8	
381 10½	382 0	Bone	1½ 1½	
382 0	389 0	Gray claystone and siltstone	7 0	
389 0	395 4	Interbedded siltstone and fine sandstone	6 4	
395 4	411 8	Coarse to conglomeratic sandstone	16 4	
411 8	413 5	Coal	1 9	
413 5	413 10	Bone	5 5	
413 10	416 0	Gray claystone, shaly at top	2 2	

Log, hole 38-CB

Location: 3,780 feet due N. of lat. 39°40'; 11,140 feet due E. of long. 79°10'; 2 miles SE. of Grantsville, on Soll Yoder farm, E. of New Germany road, Garrett County, Md.  
Surface elevation: 2,595 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	8 0	Unconsolidated material	8 0	Harlem, el. 2,526 ft., D-14624.
8 0	29 3	Cross-laminated, medium sandstone	21 3	
29 3	32 3	Coarse to conglomeratic sandstone	3 0	
32 3	34 0	Gray siltstone	1 9	
34 0	40 5	Coarse to conglomeratic sandstone	6 5	
40 5	67 5	Black shale, marine fossils	27 0	
67 5	68 7	Coal	1 2	
68 7	88 6	Gray to green claystone, limy pellets	19 11	
88 6	100 7	Interbedded silty claystone and sandstone	12 1	
100 7	106 11	Fine sandstone	6 4	
106 11	111 7	Green claystone, limy inclusions	4 8	
111 7	129 6	Green, shaly claystone, silty zones	17 11	
129 6	135 5	Fine sandstone	5 11	
135 5	144 9	Gray to black shale, sandy at top	9 4	



## Log, hole 38-CB—Continued

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	
144	9	145	0	Bony coal.....
145	0	147	3½	Coal.....
147	3½	147	6	Shale.....
147	6	148	4	Bony coal.....
148	4	153	7	Gray, semiplastic clay.....
153	7	164	11	Claystone, limy inclusions.....
164	11	174	3	Silty claystone and shale.....
174	3	185	10	Gray to black, pyritic shale.....
185	10	188	2	Coal.....
188	2	195	6	Gray, semiplastic clay, limy pellets.....
195	6	202	8	Siltstone and fine sandstone.....
202	8	209	5	Silty shale and claystone, limy pellets.....
209	5	222	5	Mottled red and green claystone.....
222	5	237	5	Interbedded siltstone and sandstone.....
237	5	246	10	Gray, silty shale.....
246	10	247	4	Limestone, marine fossils.....
247	4	248	10	Dark-gray shale.....
248	10	257	0	Gray claystone, limy pellets.....
257	0	279	7	Argillaceous sandstone.....
279	7	285	0	Sandy shale.....
285	0	312	9	Black shale, marine fossils.....
312	9	313	6	Coal.....
313	6	313	7	Black shale.....
313	7	317	4	Fine, calcareous sandstone.....
317	4	324	0	Gray clay, limy inclusions.....
324	0	336	8	Fine sandstone.....
336	8	351	5	Green, shaly claystone.....
351	5	365	0	Mottled red and green claystone.....
365	0	378	8	Green claystone, limy inclusion.....
378	8	398	6	Interbedded shale and sandstone.....
398	6	403	4	Gray claystone.....
403	4	412	9	Dark-gray shale.....
412	9	424	2	Interbedded shale and sandstone.....
424	2	425	7	Coal.....
425	7	425	8	Shale.....
425	8	426	1	Coal.....
426	1	429	7	Gray claystone, limy pellets.....
429	7	431	4	Fragmental semifint clay, limy.....
431	4	436	2	Argillaceous fine sandstone.....
436	2	445	3	Shaly claystone.....
445	3	447	3	Argillaceous sandstone.....
447	3	454	9	Claystone and siltstone.....
454	9	466	0	Siltstone, sandstone zones.....
466	0	480	0	Fine sandstone.....
480	0	510	0	Medium sandstone.....
510	0	526	3	Coarse to conglomeratic sandstone.....
526	3	526	5	Bone.....
526	5	527	4	Coal.....
527	4	527	4½	Shale.....
527	4½	529	1½	Coal.....
529	1½	529	1	Shale.....
529	1	529	8	Bone.....
529	8	549	4	Argillaceous sandstone.....
549	4	557	7	Gray, sandy shale.....
557	7	573	11	Interbedded dark shale and sandstone.....
573	11	574	0	Bone.....
574	0	575	7	Coal.....
575	7	581	6	Argillaceous sandstone.....
581	6	585	0	Dark-gray, sandy shale.....
585	0	585	11	Bone.....
585	11	586	5	Coal.....
586	5	592	5	Interbedded siltstone and sandstone.....
592	5	599	0	Laminated sandstone and shale.....

Upper Bakerstown, el.  
2,447 ft., D-14625.Lower Bakerstown, el.  
2,407 ft., D-14626.Brush Creek, el. 2,281  
ft.Upper Freeport, el.  
2,169 ft., D-15762.Upper Kittanning, el.  
2,066 ft., D-15763.

El. 2,020 ft., D-15857.

## Log, hole 38-CB—Continued

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
599	0	Coal.....	2	4	Middle Kittanning, el. 1,994 ft., D-15858.
601	4	Fragmental flint clay.....	1	11	
603	3	Interbedded siltstone and sandstone.....	2	3	Middle Kittanning, el. 1,979 ft., D-15859.
605	6	Gray to black shale.....	7	8	
613	2	Coal.....		6	
613	8	Bony coal.....		4	
614	0	Coal.....	2	2	
616	2	Interbedded sandstone, carbonaceous shale, and streaks of coal.	5	7	
621	9	Black claystone.....	1	1	
622	10	Conglomerate.....		8	
623	6	Black shale.....	1	1	
624	7	Bone.....		11	
625	6	Claystone and siltstone.....	3	2	
628	8	Fine, quartzitic, stylitic sandstone.....	4	4	

## Log, hole 39-CB

Location: 9,440 feet due N. of lat. 39°40'; 600 feet due E. of long. 79°10'; ½ mile SW of Grantsville, on Shade Hill, Garrett County, Md.  
Surface elevation: 2,426 feet.

Depth		Material	Thickness	Remarks	
From—	To—				
<i>Ft.</i>	<i>in.</i>		<i>Ft.</i>	<i>in.</i>	
0	0	Unconsolidated material.....	12	0	Barton rider. Barton, el. 2,275 ft.
12	0	Fine to medium sandstone.....	19	0	
31	0	Claystone, limy pellets.....	17	0	
48	0	Argillaceous siltstone.....	8	2	
56	2	Interbedded siltstone and fine sandstone.....	12	10	
69	0	Medium sandstone.....	25	6	
94	6	Gray shale, plant fossils.....		9	
95	3	Coarse sandstone.....	1	4	
96	7	Gray shale, plant fossils.....	2	8	
99	3	Silty claystone, limy inclusions.....	21	9	
121	0	Shaly siltstone and sandstone.....	2	4	
123	4	Carbonaceous claystone, pyrite nodules.....	2	6	
125	10	Bone.....		1	
125	11	Dark-gray to carbonaceous shale, plant fossils.....	24	2	
150	1	Coal.....	1	0	
151	1	Gray claystone, limy inclusions, limestone 166 to 168 ft.	22	7	
173	8	Silty claystone, iron stringers in middle.....	17	1	
190	9	Interbedded siltstone and fine sandstone.....	12	3	
203	0	Interbedded black shale and sandstone.....	16	5	
219	5	Fine and medium sandstone.....	31	0	
250	5	Interbedded siltstone and claystone.....	14	3	
264	8	Black shale, marine fossils.....	8	2	
272	10	Bone.....		2	
273	0	Coal.....	1	9	} Harlem, el. 2,154 ft., D-17975.
274	9	Gray claystone, limy pellets, limestone beds in upper part.	25	7	
300	4	Mottled, green and gray claystone, ironstone stringers.	6	5	
306	9	Gray claystone, limy pellets.....	14	7	
321	4	Gray siltstone, limy inclusions.....	8	2	
329	6	Interbedded shaly siltstone and sandstone.....	11	0	

## Log, hole 39-CB—Continued

Depth		Material	Thickness		Remarks	
From—	To—		Ft.	in.		
Ft.	in.	Ft.	in.	Ft.	in.	
340	6	355	0	14	6	
355	0	360	0	5	0	
360	0	375	6	15	6	
375	6	383	0	7	6	
383	0	393	6	10	6	
393	6	395	7	2	1	Lower Bakerstown, el. 2,030 ft., D-17976.
395	7	402	0	6	5	
402	0	422	5	20	5	
422	5	437	2	14	9	
437	2	461	0	23	10	
461	0	461	6		6	
461	6	468	4	6	10	
468	4	483	6	15	2	
483	6	498	4	14	10	
498	4	520	0	21	8	
520	0	538	11½	18	11½	
538	11½	540	7	1	7½	Brush Creek, el. 1,886 ft., D-18097.
540	7	542	0	1	5	
542	0	560	9	18	9	
560	9	565	2	4	5	
565	2	575	8	10	6	
575	8	580	0	4	4	
580	0	595	1	15	1	
595	1	606	8	11	7	
606	8	609	8	3	0	
609	8	611	4	1	8	
611	4	619	6	8	2	
619	6	624	3	4	9	
624	3	624	7		4	Upper Freeport rider.
624	7	630	0	5	5	
630	0	652	5	22	5	
652	5	654	3	1	10	
654	3	655	1¾	10¾	¾	
655	1¾	655	3½	1	10¾	Upper Freeport, el. 1,768 ft., D-18171.
655	3½	657	2¼		¾	
657	2¼	657	3		5½	
657	3	657	8½		7½	
657	8½	658	4		7½	
658	4	663	4	5	0	
663	4	667	0	3	8	
667	0	671	0	4	0	
671	0	680	6	9	6	
680	6	682	6	2	0	
682	6	699	4	16	10	
699	4	713	2	13	10	
713	2	714	2	1	0	
714	2	714	9		7	
714	9	717	0	2	3	
717	0	719	0	2	0	
719	0	721	0	2	0	
721	0	724	0	3	0	
724	0	729	11	5	11	
729	11	731	6	1	7	
731	6	731	7½		1½	Upper Kittanning, el. 1,694 ft., D-18172.
731	7½	732	0		4½	
732	0	735	0	3	0	

## Log, hole 40-CB

Location: 9,500 feet due N. of lat. 39°40'; 9,200 feet due E. of long. 79°10'; 1 mile E. of Grantsville, 24 feet S. 35° W. of S. corner of John Keister residence, on E. side of Casselman River, Garrett County, Md.

Surface elevation: 2,135 feet.

Depth		Material	Thickness	Remarks
From—	To—			
<i>Ft. in.</i>	<i>Ft. in.</i>		<i>Ft. in.</i>	
0 0	36 6	Unconsolidated material.....	36 6	
36 6	37 0	Medium sandstone.....	6 6	
37 0	47 0	Black, shaly clay.....	10 0	
47 0	48 10	Coal.....	1 10	Lower Bakerstown, el. 2,086 ft., D-17977.
48 10	54 5	Gray, silty, semiplastic clay.....	5 7	
54 5	71 2	Green, silty, shaly claystone.....	16 9	
71 2	84 0	Red and green claystone.....	12 10	
84 0	106 2	Interbedded siltstone and fine sandstone.....	22 2	
106 2	113 8	Gray, silty, shaly clay.....	7 6	
113 8	115 4	Black, shaly clay, marine fossils.....	1 8	
115 4	131 0	Green claystone, limy pellets.....	15 8	
131 0	156 6	Interbedded siltstone, shaly claystone, and fine sandstone, plant fossils at bottom.....	25 6	
156 6	176 10	Black, shaly clay, marine fossils.....	20 4	
176 10	177 10	Coal.....	1 0	Brush Creek, el. 1,957 ft.
177 10	184 5	Gray, silty claystone.....	6 7	
184 5	196 0	Gray clay, limy pellets at top.....	11 7	
196 0	202 3	Gray siltstone.....	6 3	
202 3	208 3	Green claystone, shaly at top.....	6 0	
208 3	214 3	Fragmental green claystone, semiflint clay.....	6 0	
214 3	216 8	Interbedded siltstone and fine sandstone.....	2 5	
216 8	218 2	Fragmental green claystone, semiflint clay, limy stringers.....	1 6	
218 2	233 10	Red and green claystone.....	15 8	
233 10	235 2	Fragmental claystone, tan, semiflint clay.....	1 4	
235 2	241 6	Silty shale.....	6 4	
241 6	260 9	Interbedded siltstone and fine sandstone.....	19 3	
260 9	264 8	Black, shaly clay.....	3 11	
264 8	265 5	Coal.....	9 9	Upper Freeport rider, el. 1,870 ft.
265 5	269 2	Gray claystone.....	3 9	
269 2	280 6	Interbedded black siltstone and fine sandstone.....	11 4	
280 6	285 6	Black, silty, shaly clay.....	5 0	
285 6	286 6	Coal.....	1 0	
286 6	286 8	Bone.....	2 2	Upper Freeport, el. 1,847 ft., D-17978.
286 8	287 9	Coal.....	1 1	
287 9	288 7	Gray claystone.....	10 10	
288 7	290 3	Fragmental, tan flint clay, black claystone.....	1 8	
290 3	303 5	Claystone, fragmental and limy at top.....	13 2	
303 5	309 8	Interbedded siltstone and fine sandstone.....	6 3	
309 8	314 2	Green, silty, shaly claystone.....	4 6	
314 2	321 5	Interbedded siltstone and fine sandstone.....	7 3	
321 5	338 5	Green to black claystone, sandy streaks.....	17 0	
338 5	338 11	Carbonaceous shale and bone.....	6 6	Lower Freeport, el. 1,796 ft.
338 11	363 4	Interbedded siltstone and fine sandstone.....	24 5	
363 4	380 0	Coarse, stylonitic sandstone, conglomeratic.....	16 8	Artesian water flow.
380 0	380 2	Coal.....	2 2	Upper Kittanning, el. 1,755 ft.
380 2	385 0	Interbedded siltstone and fine sandstone.....	4 10	
385 0	391 11	Shaly claystone.....	6 11	
391 11	397 10	Medium sandstone.....	5 11	
397 10	407 3	Siltstone and fine sandstone.....	9 5	
407 3	408 4	Coal.....	1 1	
408 4	408 5	Shale.....	1 1	
408 5	408 7	Coal.....	2 2	
408 7	423 0	Dark-gray siltstone, beds of fine sandstone at bottom.....	14 5	El. 1,726 ft., D-18098.

## Log, hole 40-CB—Continued

Depth		Material	Thickness	Remarks			
From—	To—						
<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>	<i>Ft.</i>	<i>in.</i>		
423	0	423	5½	Bony coal	5½	} Middle Kittanning, el. 1,711 ft.	
423	5½	423	10	Coal	4½		
423	10	427	10	Gray, silty claystone, plant rootlets	4	0	
427	10	431	5	Siltstone and fine sandstone	3	7	
431	5	436	10	Medium sandstone	5	5	
436	10	438	0	Coal	1	2	} Middle Kittanning, el. 1,697 ft.
438	0	440	2	Gray, silty, semiplastic clay	2	2	
440	2	451	8	Gray, shaly clay	11	6	
451	8	453	0	Brownish-gray, semiplastic clay	1	4	
453	0	453	6	Carbonaceous shale and bone		6	
453	6	454	2	Black, silty claystone, plant rootlets		8	
454	2	459	11	Siltstone and fine sandstone	5	9	
459	11	460	9	Coal		10	} Middle Kittanning, el. 1,673 ft., D-18099.
460	9	460	10	Shale		1	
460	10	461	9	Coal		11	
461	9	463	0	Claystone, plant rootlets	1	3	



UPPER BAKERSTOWN COAL BED

Sample ID	Dimensions	1	.9	22.4	62.9	13.8	3.1	4.5	74.2	1.3	3.1	13,250	2,080	2,170	2,340	1.39	9.7	20%	1	19%
C-91451	17-CB (2-58 ft. 4 in. to 260 ft. 7/2 in.)	1	.9	22.4	62.9	13.8	3.1	4.5	74.2	1.3	3.1	13,250	2,080	2,170	2,340	1.39	9.7	20%	1	19%
		2		22.6	63.2	13.9	3.1	4.4	74.9	1.3	2.4	13,380								
		3		26.3	73.7		3.6	5.1	87.0	1.5	2.8	15,540								
C-93059	18-CB (110 ft. 11 in. to 112 ft. 4 in.)	1	.9	22.4	59.8	16.9	2.0	4.4	71.4	1.2	4.1	12,730	2,420	2,520	2,710	1.41	9.4	17		17
		2		22.6	60.3	17.1	2.0	4.3	72.0	1.2	3.4	12,850								
		3		27.2	72.8		2.4	5.2	86.9	1.4	4.1	15,490								
C-94204	19-CB (338 ft. 7 in. to 340 ft. 11 1/2 in.)	1	.8	22.5	65.2	11.5	1.9	4.6	77.2	1.3	3.5	13,690	2,100	2,230	2,330	1.37	9.9	28 1/2	15	13 1/2
		2		22.8	65.6	11.6	2.0	4.5	77.8	1.3	2.8	13,800								
		3		24.8	74.2		2.2	5.1	88.0	1.5	3.2	15,610								
C-97168	22-CB (220 ft. 7 in. to 222 ft. 4 in.)	1	.9	22.6	60.8	15.7	2.3	4.4	73.1	1.2	3.3	12,890	1,970	2,230	2,360	1.41	9.3	21		21
		2		22.8	61.4	15.8	2.4	4.3	73.8	1.2	2.5	13,000								
		3		27.0	73.0		2.8	5.1	87.7	1.4	3.0	15,450								
D-1424	27-CB (132 ft. 2 in. to 133 ft. 10 in.)	1	1.1	22.5	65.1	11.3	2.9	4.5	76.3	1.3	3.7	13,540	2,030	2,100	2,310	1.38	10.0	20		20
		2		22.7	65.9	11.4	3.0	4.4	77.1	1.3	2.8	13,690								
		3		24.7	74.3		3.4	5.0	87.1	1.5	3.0	15,450								
D-35249	29-CB (293 ft. 8 in. to 295 ft. 5 1/2 in.)	1	.9	22.9	62.6	13.6	3.3	4.5	73.9	1.3	3.4	13,200	2,030	2,080	2,360			21 1/2		21 1/2
		2		23.1	63.8	13.8	3.4	4.4	74.5	1.3	2.6	13,310								
		3		26.8	73.2		3.9	5.1	86.4	1.5	3.1	15,480								
D-7125	31-CB (205 ft. 0 in. to 206 ft. 7 in.)	1	.8	23.1	62.7	13.4	2.2	4.5	75.1	1.0	3.8	13,340	2,130	2,230	2,490	1.38	9.3	19		19
		2		23.2	63.3	13.5	2.2	4.4	75.7	1.0	3.2	13,450								
		3		26.9	73.1		2.6	5.1	87.5	1.2	3.6	15,560								
D-12968	36-CB (125 ft. 2 in. to 126 ft. 6 1/2 in.)	1	.6	25.0	63.6	10.8	1.7	4.6	77.9	1.3	3.7	13,810	2,310	2,440	2,590	1.36	8.3	16 1/2	1/2	16
		2		25.1	64.0	10.9	1.7	4.5	78.4	1.3	3.2	13,890								
		3		28.2	71.8		1.9	5.1	87.9	1.4	3.7	15,580								
D-14624	38-CB (67 ft. 5 in. to 68 ft. 7 in.)	1	.6	25.5	56.6	17.3	2.3	4.3	71.1	1.3	3.7	12,600	2,050	2,130	2,360	1.43	10.0	14		14
		2		25.7	56.9	17.4	2.3	4.2	71.5	1.3	3.3	12,680								
		3		31.1	68.9		2.8	5.1	86.6	1.5	4.0	15,350								
D-17975	39-CB (273 ft. 0 in. to 274 ft. 9 in.)	1	.7	21.1	60.5	17.7	1.8	4.3	71.6	1.3	3.3	12,670	2,420	2,550	2,650	1.42	9.4	17		17
		2		21.2	61.0	17.8	1.8	4.2	72.1	1.3	2.8	12,760								
		3		25.8	74.2		2.2	5.1	87.7	1.5	3.5	15,530								
C-76704	1-CB (335 ft. 11 1/2 in. to 337 ft. 1 in.)	1	1.0	19.9	57.4	21.7	4.6	4.0	66.1	1.2	2.4	11,840	2,030	2,120	2,340	1.505	10.4	13 1/2	2	11 1/2
		2		20.7	58.0	21.9	4.6	3.9	66.7	1.3	1.6	11,960								
		3		23.7	74.3		5.9	5.0	85.4	1.6	2.1	15,310								
C-76720	2-CB (288 ft. 10 in. to 291 ft. 3 1/2 in.)	1	.9	20.6	56.7	21.8	3.9	3.9	65.9	1.2	3.3	11,790	2,160	2,220	2,360	1.507	8.8	29 1/2	18 1/2	11
		2		20.8	57.2	22.0	3.9	3.9	66.5	1.2	2.5	11,890								
		3		26.6	73.4		5.0	5.0	85.3	1.5	3.2	15,250								
C-91792	17-CB (334 ft. to 335 ft. 8 in.)	1	.8	20.7	56.2	22.3	4.1	3.9	65.6	1.2	2.9	11,750	2,080	2,170	2,450	1.50	9.1	20	1/2	19 1/2
		2		20.8	56.7	22.5	4.1	3.8	66.1	1.2	2.3	11,840								
		3		26.9	73.1		5.3	4.9	85.3	1.5	3.0	15,270								
C-97169	22-CB (296 ft. 6 in. to 298 ft. 6 1/2 in.)	1	.8	18.3	54.6	28.3	4.7	3.6	61.2	.9	3.3	11,080	2,030	2,180	2,310	1.55	9.2	17 1/2		17 1/2
		2		18.5	55.0	28.5	4.7	3.6	61.7	.9	2.6	11,170								
		3		23.1	74.9		6.4	4.9	83.9	1.2	3.6	15,190								
C-98412	24-CB (53 ft. 2 in. to 55 ft. 4 in.)	1	1.2	19.6	60.2	19.0	2.7	4.2	69.4	1.2	3.5	12,240	2,230	2,450	2,520	1.45	9.4	26	1/2	25 1/2
		2		19.8	61.0	19.2	2.7	4.1	70.2	1.2	2.6	12,390								
		3		24.5	73.5		3.3	5.1	86.9	1.5	3.2	15,330								
C-99526	26-CB (65 ft. 10 in. to 68 ft. 7 1/2 in.)	1	.9	20.6	53.5	25.0	4.0	3.8	63.2	1.1	2.8	11,210	2,030	2,130	2,280	1.53	9.4	33 1/2	7 1/2	26
		2		20.8	53.9	25.3	4.1	3.8	63.8	1.1	1.9	11,320								
		3		27.8	72.2		5.4	5.0	85.3	1.5	2.8	15,140								
D-14625	38-CB (145 ft. to 147 ft. 3 1/2 in.)	1	1.2	19.9	57.9	21.0	2.4	4.0	67.3	1.3	4.0	11,970	2,470	2,570	2,620	1.47	8.8	27 1/2		27 1/2
		2		20.1	58.6	21.3	2.4	3.9	68.1	1.3	3.0	12,130								
		3		23.6	74.4		3.0	5.0	86.5	1.6	3.9	15,390								

See footnotes at end of table.





C-91793	17-CB (370 ft. 6 in. to 372 ft. 3½ in.)	1	.8	20.2	65.4	13.6	4.0	4.0	74.1	1.3	3.0	13,050	2,030	2,130	2,360	1.43	7.2	21½	21½
		2		20.3	68.9	13.8	4.1	4.0	74.7	1.3	2.1	13,150							
		3		23.6	76.4		4.7	4.6	86.6	1.5	2.6	15,250							
C-93060	18-CB (238 ft. 2 in. to 240 ft. 5 in.)	1	1.2	21.3	64.7	12.8	2.5	4.1	74.3	1.3	5.0	12,940	2,050	2,100	2,210	1.42	6.9	24	2
		2		21.6	63.4	13.0	2.6	4.0	75.2	1.3	3.9	13,100							
		3		24.8	73.2		3.0	4.7	86.4	1.5	4.4	15,060							
C-95162	19-CB (434 ft. 7 in. to 456 ft. 10 in.)	1	1.2	18.9	63.4	16.5	6.2	4.0	69.9	1.2	2.2	12,570	2,040	2,170	2,280	1.49	6.0	17	17
		2		19.1	64.2	16.7	7.6	4.7	84.9	1.5	1.3	15,260							
		3		23.0	77.0		6.3	3.9	73.7	1.2	2.2	12,720							
C-96369	21-CB (309 ft. 3 in. to 311 ft. 5 in.)	1	1.4	20.0	67.9	10.7	2.4	4.5	77.1	1.4	3.9	13,650	2,360	2,420	2,550	1.38	6.5	25	25
		2		20.3	68.9	10.8	2.7	5.0	87.7	1.6	3.0	15,520							
		3		22.7	77.3		3.1	4.4	78.4	1.4	2.8	13,840							
C-97170	22-CB (356 ft. 9 in. to 358 ft. 7 in.)	1	1.4	19.9	67.7	11.0	3.0	4.4	77.1	1.3	3.2	13,560	2,100	2,230	2,440	1.39	6.9	20	1
		2		20.2	68.3	11.1	3.4	4.9	88.0	1.4	1.9	13,750							
		3		22.7	77.3		3.5	4.5	78.5	1.4	2.7	14,030							
C-98413	24-CB (95 ft. 10 in. to 97 ft. 4½ in.)	1	1.2	20.4	69.0	9.4	3.6	4.4	77.8	1.4	1.0	13,470	1,940	2,050	2,440	1.38	6.8	18½	18½
		2		20.6	69.9	9.5	3.9	4.9	87.9	1.6	1.7	15,500							
		3		22.8	77.2		4.1	4.9	88.2	1.6	1.2	15,460							
D-1854	25-CB (90 ft. 5 in. to 92 ft. 5 in.)	1	1.1	19.9	65.6	13.4	4.2	4.2	74.6	1.3	2.3	13,180	1,940	2,030	2,440	1.43	6.6	17	17
		2		20.1	66.4	13.5	4.8	5.0	87.2	1.5	1.5	15,400							
		3		23.3	76.7		4.1	4.4	76.8	1.4	2.2	13,470							
C-99527	26-CB (108 ft. 6½ in. to 110 ft. 3 in.)	1	1.3	20.0	67.1	11.6	3.6	4.4	76.8	1.4	1.9	13,010	1,920	2,060	2,280	1.40	6.6	20½	20½
		2		20.3	67.8	11.8	4.1	4.9	88.2	1.6	1.0	13,650							
		3		23.0	77.0		3.9	4.3	75.1	1.3	2.8	13,290							
D-1486	27-CB (240 ft. 4 in. to 252 ft. 7 in.)	1	1.3	18.9	67.2	12.6	3.9	4.3	75.1	1.3	1.6	13,470	2,050	2,150	2,310	1.42	6.6	27	27
		2		19.1	68.1	12.8	4.5	4.8	87.3	1.6	1.8	15,440							
		3		21.9	78.1		5.2	4.4	72.7	1.4	1.9	13,010							
D-3137	28-CB (88 ft. 8 in. to 89 ft. 10 in.)	1	1.0	24.0	60.6	14.4	5.2	4.4	72.7	1.4	1.0	13,140	1,940	2,030	2,380	1.44	6.6	11	1
		2		24.2	61.2	14.6	6.1	5.1	86.0	1.6	1.2	15,380							
		3		28.4	71.6		3.6	4.3	76.2	1.4	3.0	13,460							
D-3973	29-CB (418 ft. 8 in. to 421 ft. 2½ in.)	1	1.6	19.2	67.6	11.5	3.6	4.3	76.2	1.4	1.8	13,460	1,970	2,100	2,340	1.41	9.5	30½	30½
		2		19.6	68.7	11.7	4.1	4.8	87.7	1.6	1.6	15,490							
		3		22.2	77.8		4.5	4.2	77.5	1.4	1.6	13,670							
D-7126	31-CB (323 ft. 3 in. to 325 ft. 4 in.)	1	1.4	20.1	67.3	11.2	4.5	4.3	76.2	1.4	2.4	13,670	1,920	2,030	2,470	1.41	7.5	25	25
		2		20.3	68.3	11.4	5.1	4.8	87.1	1.6	1.3	15,410							
		3		22.9	77.1		5.9	4.2	72.0	1.3	1.8	12,870							
D-8018	32-CB (113 ft. 9 in. to 115 ft. 11 in.)	1	1.6	19.2	64.3	14.8	5.9	4.2	72.0	1.3	1.4	13,070	1,920	2,030	2,420	1.45	7.4	26	26
		2		19.9	63.4	15.0	7.0	4.8	86.1	1.6	.5	15,380							
		3		23.1	76.9		4.1	4.8	87.7	1.6	1.8	15,490							
D-12964	34-CB (140 ft. 5 in. to 142 ft. 6 in.)	1	.9	20.5	67.8	10.8	3.4	4.4	77.7	1.4	2.3	13,670	2,030	2,150	2,380	1.39	6.8	25	25
		2		20.7	68.4	10.9	3.9	4.3	78.4	1.4	1.2	13,790							
		3		23.2	76.8		3.7	4.4	75.9	1.3	3.2	13,330							
D-10413	35-CB (86 ft. 8 in. to 89 ft. 1 in.)	1	2.1	19.6	66.8	11.5	3.8	4.2	77.5	1.4	1.4	13,620	1,960	2,070	2,310	1.40	6.8	25	25
		2		20.0	68.3	11.7	4.3	4.8	87.8	1.6	1.5	15,430							
		3		22.7	77.3		4.3	4.2	77.5	1.4	1.4	13,330							
D-12969	36-CB (243 ft. 1 in. to 245 ft. 1 in.)	1	1.8	20.0	65.4	12.8	4.3	4.3	74.4	1.3	2.9	13,200	1,920	2,050	2,330	1.42	6.7	22	22
		2		20.3	66.7	13.0	4.4	4.2	75.8	1.3	1.3	13,440							
		3		23.4	76.6		5.1	4.8	87.1	1.5	1.6	15,460							
D-14556	37-CB (77 ft. to 79 ft. 1 in.)	1	1.3	20.8	69.3	8.6	3.3	4.4	79.2	1.4	3.0	13,970	1,960	2,050	2,400	1.37	7.7	20	20
		2		21.1	70.1	8.8	3.3	4.4	80.2	1.5	1.8	14,150							
		3		23.1	76.9		3.6	4.8	87.9	1.6	2.1	15,510							
D-14626	38-CB (185 ft. 10 in. to 188 ft. 2 in.)	1	1.5	20.2	67.5	10.8	3.7	4.4	76.8	1.4	2.9	13,610	1,930	2,040	2,360	1.40	7.6	28	28
		2		20.4	68.7	10.9	3.8	4.3	77.9	1.4	1.7	13,810							
		3		23.0	77.0		4.2	4.8	87.5	1.6	1.9	15,510							

See footnotes at end of table.



C-94131	18-CB (344 ft. 5½ in. to 345 ft. 8 in.)	1	1.1	23.2	64.0	11.7	3.9	4.5	75.6	1.2	3.1	1,970	2,000	2,050	1.40	9.7	14½	1	13½
		2	---	23.5	64.7	11.8	4.0	4.4	76.4	1.2	2.2	---	---	---	---	---	---	---	---
		3	---	26.6	73.4	---	5.0	5.0	86.6	1.4	2.5	---	---	---	---	---	---	---	---
C-96370	21-CB (429 ft. 2 in. to 430 ft. 6 in.)	1	1.1	21.5	64.2	13.2	3.1	4.4	74.4	1.3	3.6	1,970	2,100	2,260	1.39	10.0	16	---	16
		2	---	21.8	64.8	13.4	3.1	4.4	75.2	1.3	3.6	---	---	---	---	---	---	---	---
		3	---	25.1	74.9	---	5.0	5.0	86.8	1.5	3.1	---	---	---	---	---	---	---	---
C-97356	22-CB (467 ft. 11 in. to 469 ft. 4½ in.)	1	.6	21.4	66.4	11.6	2.3	4.4	76.8	1.3	3.6	2,080	2,130	2,470	1.38	9.5	17½	---	17½
		2	---	21.5	66.9	11.6	2.6	4.3	77.2	1.3	3.3	---	---	---	---	---	---	---	---
		3	---	24.3	75.7	---	2.6	4.9	87.4	1.5	3.6	---	---	---	---	---	---	---	---
C-98786	24-CB (233 ft. 9 in. to 235 ft. 2 in.)	1	.7	21.4	65.0	12.9	1.8	4.5	76.2	1.3	3.3	2,210	2,280	2,520	1.38	10.3	17	1½	15½
		2	---	21.5	65.5	13.0	1.8	4.4	76.7	1.3	3.8	---	---	---	---	---	---	---	---
		3	---	24.7	75.3	---	2.1	5.1	88.2	1.5	3.1	---	---	---	---	---	---	---	---
C-99232	25-CB (171 ft. 6 in. to 172 ft. 7 in.)	1	1.0	22.8	67.2	9.0	2.1	4.7	79.8	1.3	3.1	2,180	2,260	2,450	1.35	10.0	13	---	13
		2	---	23.0	67.9	9.1	2.3	4.6	80.6	1.4	2.2	---	---	---	---	---	---	---	---
		3	---	25.3	74.7	---	2.3	5.1	88.6	1.5	2.5	---	---	---	---	---	---	---	---
D-354	26-CB (245 ft. to 246 ft. 8½ in.)	1	1.0	21.1	67.9	10.0	1.9	4.6	78.2	1.3	4.0	2,230	2,280	2,520	1.35	9.8	20¾	¾	20
		2	---	21.3	68.6	10.1	1.9	4.5	79.0	1.3	3.2	---	---	---	---	---	---	---	---
		3	---	23.7	76.3	---	2.1	5.0	87.9	1.5	3.5	---	---	---	---	---	---	---	---
D-1855	27-CB (378 ft. 4 in. to 379 ft. 8½ in.)	1	.7	21.3	63.4	14.6	2.2	4.3	74.2	1.3	3.4	2,050	2,130	2,310	1.40	10.6	16½	---	16½
		2	---	21.5	63.8	14.7	2.6	4.2	74.7	1.3	2.8	---	---	---	---	---	---	---	---
		3	---	25.2	74.8	---	2.6	5.0	87.6	1.5	3.3	---	---	---	---	---	---	---	---
D-3138	28-CB (201 ft. 9 in. to 203 ft. 3 in.)	1	.9	24.1	65.6	9.4	3.4	4.8	78.3	1.4	2.7	1,950	2,050	2,360	1.36	8.5	12	---	12
		2	---	24.3	66.2	9.5	3.4	4.7	79.0	1.4	2.0	---	---	---	---	---	---	---	---
		3	---	26.8	73.2	---	3.8	5.2	87.3	1.6	2.1	---	---	---	---	---	---	---	---
D-4802	29-CB (538 ft. 1 in. to 539 ft. 5 in.)	1	.5	21.4	65.9	12.2	2.4	4.4	76.2	1.3	3.5	2,050	2,130	2,440	1.38	10.7	16	1	15
		2	---	21.5	66.2	12.3	2.4	4.4	76.6	1.2	3.0	---	---	---	---	---	---	---	---
		3	---	24.5	75.5	---	2.7	5.0	87.4	1.5	3.4	---	---	---	---	---	---	---	---
D-8015	31-CB (454 ft. 6 in. to 455 ft. 9 in.)	1	.9	21.7	63.7	13.7	2.3	4.4	74.8	1.2	3.6	2,030	2,100	2,340	1.40	10.7	15	1	14
		2	---	21.9	64.3	13.8	2.4	4.3	75.5	1.2	3.2	---	---	---	---	---	---	---	---
		3	---	25.4	74.6	---	2.8	5.0	87.6	1.4	3.2	---	---	---	---	---	---	---	---
D-8019	32-CB (241 ft. 9 in. to 242 ft. 10 in.)	1	1.5	21.0	64.2	13.3	3.7	4.4	74.3	1.2	3.1	1,900	2,000	2,100	1.40	10.1	13	---	13
		2	---	21.3	65.2	13.5	3.8	4.3	75.4	1.2	2.1	---	---	---	---	---	---	---	---
		3	---	24.7	75.3	---	4.4	4.9	87.2	1.4	2.1	---	---	---	---	---	---	---	---
D-9489	33-CB (48 ft. 5 in. to 50 ft. 5 in.)	1	1.0	21.1	65.2	12.7	4.4	4.4	74.3	1.2	3.0	1,940	1,970	2,180	1.41	9.9	24	---	24
		2	---	21.3	65.8	12.9	4.5	4.3	75.1	1.2	2.0	---	---	---	---	---	---	---	---
		3	---	24.5	75.5	---	5.1	4.9	86.1	1.4	2.5	---	---	---	---	---	---	---	---
D-12965	34-CB (282 ft. 1½ in. to 283 ft. 6 in.)	1	.9	20.9	65.4	12.8	2.5	4.3	76.2	1.2	3.0	2,050	2,100	2,380	1.39	10.1	16½	---	16½
		2	---	21.1	66.0	12.9	2.6	4.3	76.9	1.2	2.1	---	---	---	---	---	---	---	---
		3	---	24.2	75.8	---	3.0	4.9	88.3	1.4	2.4	---	---	---	---	---	---	---	---
D-10414	35-CB (205 ft. 10 in. to 207 ft. 2 in.)	1	1.5	20.8	62.9	14.8	4.4	4.3	72.2	1.2	3.1	1,940	2,050	2,180	1.42	9.8	16	---	16
		2	---	21.2	63.8	15.0	4.4	4.2	73.3	1.3	1.8	---	---	---	---	---	---	---	---
		3	---	24.9	75.1	---	5.2	4.9	86.2	1.5	2.2	---	---	---	---	---	---	---	---
D-12970	36-CB (376 ft. 3 in. to 377 ft. 11½ in.)	1	.7	21.1	68.2	10.0	2.9	4.5	78.6	1.3	2.7	1,940	2,050	2,280	1.36	9.8	20½	---	20½
		2	---	21.3	68.6	10.1	2.9	4.4	79.2	1.3	2.1	---	---	---	---	---	---	---	---
		3	---	23.6	76.4	---	3.2	4.9	88.1	1.4	2.4	---	---	---	---	---	---	---	---
D-14554	37-CB (214 ft. 2 in. to 215 ft. 3 in.)	1	.9	21.2	65.0	12.9	3.0	4.3	75.3	1.2	3.3	1,970	2,050	2,260	1.40	9.3	13	---	13
		2	---	21.4	65.6	13.0	3.0	4.2	76.0	1.2	2.6	---	---	---	---	---	---	---	---
		3	---	24.7	75.3	---	3.5	4.9	87.4	1.4	2.8	---	---	---	---	---	---	---	---
D-18097	39-CB (538 ft. 11½ in. to 540 ft. 7 in.)	1	.7	21.2	65.7	12.4	2.5	4.4	76.4	1.3	3.0	2,130	2,180	2,260	1.38	9.8	19½	---	19½
		2	---	21.4	66.1	12.5	2.5	4.4	76.9	1.3	2.4	---	---	---	---	---	---	---	---
		3	---	24.4	75.6	---	2.9	5.0	87.9	1.5	2.7	---	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 13.—Analyses of coal cores, Castleman Basin, Garrett County, Md.—Continued

Drill hole	Laboratory No.	Condition	Proximate (percent)			Ultimate (percent)			Calorific value (B. t. u.)	Fusibility of ash			Real specific gravity	Agglutinating index †	Core received (inches)	Core rejected (inches)	Core analyzed (inches)	
			Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen		Carbon	Nitrogen	Oxygen						Initial deformation temperature (°F.)
UPPER FREEPORT RIDER COAL BED																		
2-CB (559 ft. 11½ in. to 560 ft. 1½ in.)	C-77265	1	0.6	19.4	64.1	15.9	5.4	4.2	71.7	1.2	1.6	12,870	2,080	2,180	2,380	1.404	9.3	11½
2			19.5	64.5	16.0	5.4	4.1	72.1	1.2	1.2	12,950							
3			23.2	76.8		6.5	4.9	85.8	1.4	1.4	15,420							
16-CB (409 ft. 10 in. to 471 ft. 2 in.)	C-91790	1	1.2	20.8	63.6	14.4	2.9	4.4	73.9	1.2	3.2	13,090	2,130	2,810	2,470	1.40	9.7	16
2			21.1	64.3	14.6	2.9	4.3	74.8	1.2	2.2	13,250							
3			24.6	75.4		3.4	5.0	87.6	1.4	2.6	15,510							
19-CB (691 ft. 8 in. to 693 ft. 9 in.)	C-95664	1	.6	19.0	61.7	18.7	3.8	4.1	69.5	1.1	2.8	12,410	2,080	2,260	2,510	1.46	9.6	25
2			19.1	62.1	18.8	3.9	4.0	70.0	1.1	2.2	12,490							
3			23.6	76.4		4.8	5.0	86.2	1.4	2.6	15,390							
21-CB (532 ft. 8 in. to 533 ft. 9 in.)	C-96552	1	1.3	19.6	63.2	15.9	5.7	4.2	70.6	1.2	2.4	12,760	1,970	2,050	2,470	1.45	9.3	13
2			19.9	64.0	16.1	5.8	4.2	71.5	1.2	1.2	12,950							
3			23.7	76.3		6.9	4.9	85.3	1.5	1.4	15,420							
33-CB (145 ft. 9 in. to 146 ft. 8 in.)	D-9490	1	1.0	20.7	63.6	14.7	4.5	4.4	72.4	1.1	2.9	13,000	1,920	2,030	2,380	1.43	9.8	11
2			20.9	64.2	14.9	4.5	4.3	73.2	1.1	2.0	13,140							
3			24.6	75.4		5.3	5.0	86.0	1.3	2.4	15,440							
UPPER FREEPORT COAL BED																		
2-CB (698 ft. 6 in. to 571 ft. 4½ in.)	C-77266	1	1.3	18.9	71.0	8.8	1.3	4.6	80.1	1.4	3.8	14,070	2,640	2,780	2,830	1.366	9.1	20½
2			19.1	72.0	8.9	1.3	4.5	81.2	1.4	2.7	14,280							
3			21.0	79.0		1.4	5.0	89.2	1.5	2.9	15,660							
4-CB (676 ft. to 678 ft. 10 in.)	C-80874	1	1.2	20.1	69.8	8.9	1.9	4.6	80.0	1.3	3.3	14,040	2,420	2,550	2,610	1.37	9.1	28
2			20.4	70.6	9.0	1.9	4.5	80.9	1.4	2.3	14,210							
3			22.4	77.6		2.1	5.0	88.9	1.5	2.5	15,620							
6-CB (391 ft. 4½ in. to 393 ft. 4 in.)	C-83212	1	.9	21.5	62.7	14.9	2.6	4.4	73.3	1.2	3.6	12,990	2,150	2,310	2,480	1.42	8.9	23½
2			21.7	63.2	15.1	2.6	4.3	74.0	1.2	2.8	13,110							
2			25.6	74.4		3.1	5.1	87.1	1.5	3.2	15,440							
8-CB (571 ft. 3½ in. to 574 ft. 3 in.)	C-85432	1	1.2	20.0	70.2	8.6	.9	4.6	80.6	1.4	3.9	14,120	2,620	2,770	2,910+	1.35	8.9	35½
2			20.2	71.1	8.7	.9	4.5	81.5	1.4	3.0	14,290							
3			22.2	77.8		1.0	4.9	89.3	1.6	3.2	15,650							
9-CB (423 ft. to 425 ft. 1 in.)	C-84704	1	7.9	18.7	61.5	11.9	4.1	4.8	69.7	1.2	8.3	12,390	2,030	2,160	2,570	1.41	9.4	25
2			20.3	66.8	12.9	4.5	4.2	75.7	1.3	1.4	13,450							
3			23.3	76.7		5.2	4.8	87.0	1.4	1.6	15,450							
10-CB (550 ft. 1 in. to 552 ft. 3 in.)	C-86224	1	.8	20.6	67.7	10.9	2.1	4.5	78.3	1.3	2.9	13,750	2,130	2,460	2,520	1.38	9.7	22
2			20.8	68.2	11.0	2.1	4.4	78.9	1.3	2.3	13,860							
3			23.3	76.7		2.3	5.0	88.7	1.5	2.5	15,570							
12-CB (419 ft. 3 in. to 421 ft. ½ in.)	C-87193	1	1.4	21.4	65.4	11.8	3.7	4.4	75.8	1.2	3.1	13,460	1,940	2,150	2,420	1.40	9.0	21½
2			21.7	66.3	12.0	3.7	4.4	76.9	1.3	1.7	13,650							
3			24.7	75.3		4.3	4.9	87.3	1.4	2.1	15,500							
13-CB (180 ft. 11 in. to 184 ft. 6 in.)	C-88415	1	2.0	19.6	70.4	8.0	1.5	4.6	80.1	1.4	4.4	14,030	2,570	2,620	2,700	1.35	9.2	43
2			19.9	71.9	8.2	1.6	4.4	81.8	1.4	2.6	14,320							
3			21.7	78.3		1.7	4.8	89.1	1.5	2.9	15,600							

APPENDIX

C-90319	15-CB (327 ft. 4 in. to 331 ft. 3 in.)	1	1.2	18.6	71.1	8.1	1.7	4.6	80.2	1.5	3.9	14,210	2,180	2,470	2,530	1.35	10.0	47	7½	39½
		2	1.5	19.8	72.0	8.2	1.7	4.5	81.2	1.5	2.9	14,380								
		3	1.5	21.6	78.4	1.9	4.9	88.5	1.6	3.1	15,670									
C-91791	16-CB (484 ft. 3 in. to 487 ft. 6 in.)	1	1.5	20.1	67.9	10.5	1.5	4.5	78.2	1.4	3.9	13,730	2,620	2,700	2,840	1.36	8.8	39	2½	30½
		2	1.5	20.4	69.0	10.6	1.6	4.4	79.3	1.4	2.7	13,940								
		3	1.5	22.8	77.2	1.7	4.9	88.8	1.5	3.1	15,590									
C-92105	17-CB (628 ft. 9 in. to 632 ft. 5 in.)	1	1.7	18.0	71.8	8.5	1.2	4.5	80.0	1.4	4.4	14,040	2,730	2,780	2,870	1.35	9.9	39½	3	30½
		2	1.7	18.3	73.0	8.7	1.3	4.4	81.4	1.4	3.0	14,280								
		3	1.7	20.1	79.9	1.4	4.8	89.2	1.6	3.0	15,640									
C-95665	19-CB (703 ft. 6 in. to 706 ft. 11 in.)	1	1.0	19.3	69.6	10.1	2.2	4.5	78.9	1.3	3.0	13,900	2,470	2,540	2,570	1.37	8.6	24	3	21
		2	1.0	19.5	70.3	10.2	2.2	4.5	79.7	1.3	2.1	14,040								
		3	1.0	21.7	78.3	2.4	5.0	88.7	1.5	2.4	15,630									
C-96553	21-CB (539 ft. 9 in. to 542 ft. 4 in.)	1	1.6	19.9	68.2	10.3	1.6	4.7	77.7	1.4	4.3	13,710	2,540	2,580	2,730	1.36	8.9	28		28
		2	1.6	20.2	69.3	10.5	1.6	4.5	79.0	1.4	3.0	13,930								
		3	1.6	22.5	77.5	1.8	5.1	88.2	1.6	3.3	15,560									
C-97617	22-CB (590 ft. 2 in. to 594 ft. 3 in.)	1	1.3	19.2	69.0	10.5	1.8	4.5	78.3	1.4	3.5	13,770	2,150	2,280	2,550	1.37	7.9	40	1½	38½
		2	1.3	19.4	69.9	10.7	1.9	4.4	79.3	1.4	2.3	13,960								
		3	1.3	21.7	78.3	2.1	5.0	88.8	1.6	2.5	15,620									
C-98787	24-CB (369 ft. 11½ in. to 373 ft. 2½ in.)	1	1.3	19.3	70.8	8.6	.8	4.6	80.7	1.4	3.9	14,090	2,700	2,840	2,890	1.34	9.5	32	2	30
		2	1.3	19.5	71.8	8.7	.8	4.5	81.8	1.5	2.7	14,270								
		3	1.3	21.4	78.6	1.7	4.9	89.6	1.6	3.1	15,630									
D-1485	(25-CB (299 ft. 7 in. to 302 ft. 2 in.)	1	1.0	20.6	68.9	9.5	2.6	4.6	78.6	1.3	3.4	13,910	2,070	2,150	2,340	1.37	8.9	31	½	30½
		2	1.0	20.8	69.6	9.6	2.6	4.5	79.4	1.3	2.6	14,090								
		3	1.0	23.0	77.0	2.9	5.0	87.8	1.4	2.9	15,530									
D-355	26-CB (367 ft. 2 in. to 370 ft. 9½ in.)	1	1.3	19.3	70.6	8.8	1.5	4.6	80.0	1.4	3.7	13,980	2,380	2,490	2,650	1.36	9.0	43½	1½	42
		2	1.3	19.6	70.5	8.9	1.6	4.5	81.0	1.4	2.6	14,160								
		3	1.3	21.5	78.5	1.7	4.9	89.0	1.6	2.8	15,530									
D-2414	27-CB (493 ft. 6 in. to 496 ft. 11 in.)	1	1.5	18.7	72.2	7.6	1.5	4.6	81.2	1.4	3.7	14,230	2,420	2,570	2,620	1.35	10.1	32½	½	32
		2	1.5	19.0	73.3	7.7	1.6	4.5	82.4	1.4	2.4	14,430								
		3	1.5	20.6	79.4	1.7	4.9	89.3	1.6	2.5	15,690									
D-4803	29-CB (658 ft. 9 in. to 662 ft. 3½ in.)	1	1.4	19.6	70.8	8.2	1.2	4.6	80.3	1.3	4.4	14,110	2,730	2,780	2,910	1.34	9.9	42½	2½	40
		2	1.4	19.9	71.8	8.3	1.2	4.5	81.4	1.3	3.3	14,310								
		3	1.4	21.7	78.3	1.3	5.0	88.8	1.5	3.4	15,610									
D-8016	31-CB (569 ft. 4 in. to 571 ft. 9 in.)	1	1.5	18.9	70.4	9.2	1.7	4.6	79.5	1.3	3.7	13,940	2,570	2,650	2,800	1.36	10.0	22	1½	20½
		2	1.5	19.2	71.5	9.3	1.8	4.5	80.7	1.3	2.4	14,150								
		3	1.5	21.1	78.9	1.9	5.0	89.0	1.5	2.6	15,600									
D-8811	32-CB (349 ft. 1 in. to 350 ft. 11 in.)	1	1.4	21.5	63.9	13.2	1.3	4.6	75.4	1.2	4.3	13,300	2,780	2,850	2,910+	1.38	8.8	22	1	21
		2	1.4	21.8	64.8	13.4	1.3	4.5	76.5	1.2	3.1	13,480								
		3	1.4	25.2	74.8	1.5	5.1	88.3	1.4	3.7	15,560									
D-11794	33-CB (166 ft. 9 in. to 169 ft. 2 in.)	1	.6	20.8	70.7	7.9	.8	4.6	81.6	1.5	3.6	14,280	2,750	2,840	2,910+	1.34		14	½	13½
		2	.6	20.9	71.1	8.0	.8	4.6	82.1	1.5	3.0	14,370								
		3	.6	22.7	77.3	.9	5.0	89.2	1.6	3.3	15,610									
D-12866	34-CB (400 ft. 4 in. to 403 ft. 2 in.)	1	1.2	18.9	68.0	11.9	1.1	4.3	77.1	1.3	4.3	13,520	2,780	2,840	2,910+	1.37	8.8	27	1	26
		2	1.2	19.1	68.8	12.1	1.1	4.2	78.1	1.3	3.2	13,680								
		3	1.2	21.8	78.2	1.2	4.8	88.8	1.5	3.7	15,560									
D-10721	35-CB (323 ft. 5 in. to 326 ft. 6½ in.)	1	1.9	20.0	65.4	12.7	1.7	4.5	75.4	1.2	4.5	13,300	2,520	2,550	2,620	1.38	8.6	37½	1½	36
		2	1.9	20.4	66.6	13.0	1.7	4.3	76.8	1.2	3.0	13,560								
		3	1.9	23.4	76.5	2.0	5.0	88.3	1.4	3.3	15,580									
D-13653	36-CB (502 ft. 1 in. to 505 ft. 5 in.)	1	1.8	20.3	71.0	6.9	.7	4.7	81.4	1.4	4.9	14,310	2,760	2,810	2,910+	1.33	9.0	40	1	39
		2	1.8	20.7	72.2	7.1	.7	4.6	82.9	1.5	3.2	14,580								
		3	1.8	22.3	77.7	1.8	4.9	89.2	1.6	3.5	15,690									

See footnotes at end of table.

TABLE 13.—Analyses of coal cores, Castleman Basin, Garrett County, Md.—Continued

Drill hole	Laboratory No.	Condition	Proximate (percent)				Ultimate (percent)				Fusibility of ash				Agglutinating index <sup>2</sup>	Core received (inches)	Core rejected (inches)	Core analyzed (inches)		
			Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calorific value (B. t. u.)	Initial deformation temperature (°F.)	Softening temperature (°F.)					Fluid temperature (°F.)	Real specific gravity
UPPER FREFORT COAL BED—Continued																				
37-CB (332 ft. 11 in. to 336 ft. 1 in.)	D-14555	1	1.5	19.0	70.9	8.6	1.0	4.6	80.4	1.3	4.1	2,730	2,800	2,890	1.35	9.4	38	4	34	
		2	19.3	72.0	8.7	1.1	4.4	81.6	1.3	3.0	14,290									
		3	21.2	78.8			1.1	4.9	89.4	1.5	3.1	15,660								
38-CB (424 ft. 2 in. to 426 ft. 1 in.)	D-15762	1	1.2	19.5	67.6	11.7	.8	4.5	77.6	1.3	4.1	2,840	2,890	2,910+	1.37	9.5	20	1	19	
		2	19.7	68.5	11.8	.8	4.4	78.5	1.3	3.2	13,760									
		3	22.3	77.7			.9	5.0	89.1	1.5	3.5	15,600								
39-CB (654 ft. 3 in. to 657 ft. 8 in.)	D-18171	1	1.5	19.7	70.8	8.0	1.4	4.6	80.7	1.4	3.9	2,570	2,660	2,710	1.34	8.8	41½	2½	39	
		2	20.0	71.9	8.1	1.4	4.5	81.9	1.5	2.6	14,390									
		3	21.8	78.2			1.5	4.9	89.2	1.6	2.8	15,660								
40-CB (285 ft. 6 in. to 287 ft. 9 in.)	D-17978	1	1.0	18.4	69.8	10.8	1.6	4.4	78.7	1.3	3.2	2,310	2,520	2,600	1.38	8.9	26	2	24	
		2	18.5	70.6	10.9	1.6	4.4	79.5	1.3	2.3	13,950									
		3	20.8	79.2			1.8	4.9	89.2	1.4	2.7	15,660								
UPPER KITTANNING COAL BED																				
2-CB (649 ft. 5 in. to 652 ft. 3 in.)	C-77531	1	0.8	23.8	61.9	13.5	3.7	4.5	74.5	1.1	2.7	2,100	2,360	2,550	1.425	8.8	34	1½	32½	
		2	24.0	62.4	13.6	3.7	4.4	75.1	1.1	2.1	13,420									
		3	27.8	72.2			4.3	5.1	86.9	1.3	2.4	15,520								
5-CB (530 ft. 3 in. to 531 ft. 11 in.)	C-80872	1	1.2	22.1	64.8	11.9	2.5	4.6	76.4	1.3	3.3	2,220	2,470	2,590	1.41	9.1	20		20	
		2	22.3	65.6	12.1	2.5	4.5	77.4	1.3	2.2	13,700									
		3	25.4	74.6			2.9	5.1	88.0	1.5	2.5	15,580								
7-CB (264 ft. 3 in. to 267 ft.)	C-82839	1	1.5	19.5	68.6	10.4	2.2	4.4	78.5	1.4	3.1	2,380	2,520	2,570	1.39	10.0	33	1	32	
		2	19.8	69.6	10.6	2.2	4.3	79.7	1.4	1.8	14,000									
		3	22.1	77.9			2.5	4.9	89.1	1.6	1.9	15,650								
9-CB (509 ft. 8 in. to 511 ft. 6½ in.)	C-84897	1	.8	23.4	62.8	13.0	4.0	4.5	74.9	1.3	2.3	1,940	2,260	2,420	1.41	9.1	22½		22½	
		2	23.6	63.3	13.1	4.0	4.4	75.5	1.3	1.7	13,490									
		3	27.2	72.8			4.6	5.1	86.9	1.5	1.9	15,520								
13-CB (247 ft. 7 in. to 250 ft. 5 in.)	C-88416	1	1.4	18.5	63.6	16.5	4.3	4.1	71.0	1.4	2.7	1,970	2,130	2,470	1.45	9.0	34	4	30	
		2	18.7	64.6	16.7	4.3	4.0	72.0	1.5	1.5	12,750									
		3	22.5	77.5			5.2	4.8	86.5	1.8	1.7	15,310								
16-CB (554 ft. 3½ in. to 558 ft. 3 in.)	C-92103	1	1.4	19.8	62.7	16.1	3.8	4.2	72.0	1.2	2.7	2,130	2,270	2,510	1.44	8.3	47½	6½	41	
		2	20.1	63.6	16.3	3.8	4.1	73.0	1.3	1.5	12,930									
		3	24.0	76.0			4.6	4.8	87.3	1.5	1.8	15,450								
17-CB (695 ft. 11 in. to 698 ft. 9½ in.)	C-92384	1	.8	20.3	64.4	14.5	5.1	4.2	73.4	1.2	1.6	2,080	2,250	2,550	1.46	8.6	34½	4	30½	
		2	20.5	64.9	14.6	5.1	4.1	73.9	1.2	1.1	13,180									
		3	24.0	76.0			6.0	4.8	86.6	1.4	1.2	15,430								
18-CB (549 ft. 2 in. to 550 ft. 10 in.)	C-94132	1	1.2	21.1	65.3	12.4	2.9	4.4	76.1	1.3	2.9	2,080	2,330	2,540	1.40	8.7	20		20	
		2	21.3	66.1	12.6	2.9	4.4	77.0	1.3	1.8	13,590									
		3	24.4	75.6			3.3	5.0	88.0	1.5	2.2	15,540								
19-CB (776 ft. to 779 ft. 7 in.)	C-95939	1	.8	21.7	62.1	15.4	5.0	4.2	71.9	1.2	2.3	2,050	2,180	2,520	1.45	8.7	43	2½	40½	
		2	21.8	62.7	15.5	5.1	4.2	72.6	1.2	1.4	12,030									
		3	25.9	74.1			6.0	4.9	85.9	1.4	1.8	15,430								
20-CB (126 ft. 2 in. to 128 ft.)	C-94544	1	1.1	20.8	68.2	9.9	2.0	4.6	78.6	1.2	3.7	2,340	2,590	2,640	1.36	9.4	22	2½	19½	
		2	21.0	69.0	10.0	2.1	4.5	79.5	1.2	2.7	13,980									
		3	23.4	76.6			2.3	5.0	88.4	1.4	2.9	15,540								

C-96785	21-CB (623 ft. 8½ in. to 626 ft. 6 in.)	1	1.3	19.2	68.2	11.2	3.4	4.5	76.9	1.3	2.7	13,640	2,100	2,310	2,470	1.39	9.7	33½	33½
		2	19.4	69.2	11.4	3.4	4.4	77.9	1.3	1.6	13,810								
		3	21.9	78.1		3.9	4.9	87.9	1.5	1.8	15,580								
C-98100	22-CB (652 ft. 10 in. to 655 ft. 10 in.)	1	.8	20.0	68.0	11.2	2.5	4.5	78.2	1.3	2.3	13,760	2,150	2,330	2,570	1.39	8.6	34	2½
		2	20.2	68.5	11.3	2.6	4.5	78.8	1.3	1.5	13,870								
		3	22.7	77.3		2.9	5.0	88.9	1.5	1.7	15,640								
C-97618	23-CB (161 ft. 3 in. to 162 ft. 7 in.)	1	1.1	21.5	65.5	11.9	4.1	4.5	75.5	1.3	2.7	13,490	2,020	2,240	2,550	1.40	8.2	16	2
		2	21.7	66.2	12.1	4.1	4.4	76.3	1.3	1.8	13,640								
		3	24.7	73.3		4.7	5.0	86.8	1.5	2.0	15,510								
D-352	25-CB (367 ft. 5 in. to 368 ft. 6½ in.)	1	.9	17.2	57.7	24.2	9.0	3.9	66.1	1.0	3.9	11,480	2,910+			1.50	4.6	13½	13½
		2	17.4	58.2	24.4	1.0	3.8	66.7	1.0	3.1	11,580								
		3	23.0	77.0		1.3	5.0	88.2	1.4	4.1	15,320								
D-356	26-CB (492 ft. 6½ in. to 495 ft. 4 in.)	1	1.1	19.0	69.2	10.7	1.7	4.5	77.9	1.4	3.8	13,700	2,550	2,620	2,700	1.37	9.6	33½	33½
		2	19.2	70.0	10.8	1.7	4.4	78.8	1.4	2.9	13,860								
		3	21.3	78.5		1.9	5.0	88.3	1.6	3.2	15,530								
D-2415	27-CB (549 ft. 6 in. to 550 ft. 6 in.)	1	.9	21.1	61.9	16.1	3.2	4.3	71.9	1.4	3.3	12,760	1,970	2,420	2,520	1.43	9.2	11	11
		2	21.3	62.4	16.3	3.2	4.2	72.5	1.2	2.6	12,870								
		3	23.3	74.6		3.9	5.0	86.7	1.5	2.9	15,380								
D-2416	27-CB (556 ft. to 558 ft. 4 in.)	1	1.1	20.1	66.4	12.4	3.1	4.5	75.9	1.4	2.7	13,430	2,100	2,310	2,470	1.41	9.1	28	28
		2	20.3	67.0	12.6	3.2	4.4	76.7	1.4	1.7	13,590								
		3	23.3	76.7		3.6	5.0	87.7	1.6	2.1	15,540								
D-3970	28-CB (399 ft. 6 in. to 401 ft. 11 in.)	1	1.1	22.4	63.7	12.8	4.4	4.5	75.1	1.2	2.0	13,390	1,920	2,130	2,490	1.40	9.3	29	3
		2	22.7	64.4	12.9	4.4	4.4	76.0	1.2	1.1	13,540								
		3	26.1	73.9		5.1	5.0	87.2	1.4	1.3	15,540								
D-4804	29-CB (726 ft. 8 in. to 729 ft. ½ in.)	1	.5	23.6	61.2	14.7	5.3	4.2	72.8	1.2	1.7	13,040	1,940	2,030	2,440	1.26	8.9	26½	2½
		2	23.7	61.5	14.8	5.3	4.2	73.2	1.2	1.2	13,110								
		3	27.9	72.1		6.3	5.0	85.9	1.4	1.6	15,380								
D-7123	30-CB (213 ft. 1 in. 215 ft. 1 in.)	1	.9	19.0	59.2	20.9	1.4	4.0	69.2	1.1	3.4	12,100	2,680	2,730	2,840	1.46	4.2	11	11
		2	19.1	59.8	21.1	1.4	3.9	69.8	1.1	2.7	12,220								
		3	24.2	73.8		1.8	4.9	88.5	1.4	3.4	15,470								
D-8017	31-CB (643 ft. 5 in. to 645 ft. 6 in.)	1	.8	24.7	60.1	14.4	5.6	4.2	72.4	1.2	2.1	13,030	1,900	2,140	2,600	1.44	9.1	25	1½
		2	24.9	60.6	14.5	5.6	4.2	73.0	1.2	1.5	13,140								
		3	29.1	70.9		6.6	4.9	85.4	1.4	1.7	15,370								
D-8812	32-CB (422 ft. 2 in. to 423 ft. 11 in.)	1	1.0	21.7	61.3	16.0	3.7	4.3	72.5	1.1	2.4	12,990	2,050	2,250	2,460	1.43	8.8	21	1
		2	21.9	61.9	16.2	3.7	4.2	73.2	1.2	1.5	13,020								
		3	26.2	73.8		4.4	5.1	87.4	1.4	1.7	15,540								
D-9491	33-CB (227 ft. 8 in. to 228 ft. 9 in.)	1	.8	26.1	58.0	15.1	5.3	4.4	71.4	1.1	2.7	12,990	2,080	2,230	2,590	1.43	8.7	13	13
		2	26.3	58.5	15.2	5.3	4.4	72.0	1.2	1.8	13,090								
		3	31.0	69.0		6.3	5.1	84.9	1.4	2.3	15,440								
D-12967	34-CB (466 ft. 6 in. to 469 ft. 8 in.)	1	1.0	19.6	62.9	16.5	4.9	4.1	71.7	1.2	1.6	12,690	2,030	2,130	2,380	1.45	8.0	38	1
		2	19.8	63.5	16.7	5.0	4.0	72.5	1.2	.9	12,820								
		3	23.7	76.3		6.0	4.8	87.0	1.4	.8	15,390								
D-15160	37-CB (411 ft. 8 in. to 413 ft. 5 in.)	1	.6	24.6	61.6	13.2	5.7	4.4	74.6	1.2	.9	13,350	1,900	2,080	2,420	1.43	8.5	15	15
		2	24.8	62.0	13.2	5.8	4.4	73.1	1.2	.3	13,430								
		3	28.6	71.4		6.6	5.0	86.5	1.4	.5	15,480								
D-15763	38-CB (526 ft. 5 in. to 529 ft. ½ in.)	1	.9	23.5	61.3	14.3	4.5	4.4	73.5	1.3	2.0	13,100	1,970	2,180	2,440	1.43	8.8	31½	½
		2	23.7	61.8	14.5	4.5	4.3	74.2	1.3	1.2	13,220								
		3	27.7	72.3		5.3	5.0	86.7	1.5	1.5	15,450								
D-18172	39-CB (729 ft. 11 in. to 731 ft. 6 in.)	1	1.6	17.1	62.4	18.9	3.0	4.0	69.9	1.2	3.0	12,260	2,150	2,370	2,510	1.47	8.6	19	19
		2	17.4	63.4	19.2	3.1	3.9	71.0	1.2	1.6	12,460								
		3	21.5	78.5		3.8	4.8	87.9	1.5	2.0	15,430								

See footnotes at end of table.

TABLE 13.—Analyses of coal cores, Castleman Basin, Garrett County, Md.—Continued

Drill hole	Laboratory No.	Condition	Proximate (percent)				Ultimate (percent)				Calorific value (B. t. u.)	Fusibility of ash			Real specific gravity	Agglutinating index <sup>2</sup>	Core received (inches)	Core rejected (inches)	Core analyzed (inches)	
			Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen		Oxygen	Initial deformation temperature (°F.)	Softening temperature (°F.)						Fluid temperature (°F.)
MIDDLE KITTANNING COAL BED																				
1-CB (761 ft. 11½ in. to 762 ft. 11 in.)	C-77263	1 2 3	0.8	23.0	66.8	9.4	3.5	4.5	78.4	1.2	3.0	13,920	2,150	2,260	2,420	1.363	7.1	11½	11½	
2-CB (688 ft. 5 in. to 689 ft. 9½ in.)	C-77530	1 2 3	1.0	18.4	70.9	9.7	3.2	4.4	79.1	1.1	2.5	14,010	1,980	2,300	2,550	1.365	8.9	16	16	
2-CB (706 ft. 3½ in. to 708 ft. 2½ in.)	C-77532	1 2 3	1.5	16.8	62.7	19.0	4.4	4.0	69.1	0.9	2.6	12,210	2,000	2,380	2,530	1.500	7.8	16½	13½	
2-CB (718 ft. 9½ in. to 720 ft. 1 in.)	C-77765	1 2 3	0.7	19.3	55.8	24.2	4.3	3.7	63.9	0.8	3.1	11,240	2,260	2,490	2,570	1.56	5.0	15½	15½	
4-CB (797 ft. 6½ in. to 799 ft. 1 in.)	C-80875	1 2 3	0.9	19.0	68.9	11.2	2.3	4.4	78.0	1.2	2.9	13,720	2,250	2,490	2,600	1.40	8.4	18	18	
4-CB (807 ft. 5½ in. to 809 ft. 4 in.)	C-80876	1 2 3	0.9	19.5	68.0	11.6	2.0	5.0	76.8	1.1	3.5	13,650	2,550	2,620	2,680	1.40	7.9	13	13	
5-CB (588 ft. 7 in. to 589 ft. 10 in.)	C-80873	1 2 3	3.1	20.2	64.9	11.8	3.3	4.7	74.5	1.2	4.5	13,270	2,030	2,330	2,510	1.41	9.0	15	15	
9-CB (571 ft. 4 in. to 572 ft. 7 in.)	C-84898	1 2 3	0.9	20.5	63.4	15.2	1.6	4.4	74.0	1.2	3.6	13,020	2,750	2,800	2,910+	1.41	8.4	11	11	
9-CB (586 ft. to 587 ft. 6½ in.)	C-84899	1 2 3	0.6	18.9	57.3	23.2	2.7	3.8	65.6	0.8	3.9	11,530	2,860	2,890	2,910+	1.52	5.2	18½	18½	
10-CB (712 ft. 3 in. to 714 ft. 11 in.)	C-86544	1 2 3	2.1	17.8	65.3	14.8	1.6	4.3	73.7	1.1	4.5	12,930	2,620	2,730	2,800	1.41	9.3	32	6½	
10-CB (728 ft. 6½ in. to 730 ft. 2 in.)	C-86545	1 2 3	1.2	18.2	66.7	15.1	1.6	4.1	75.3	1.1	2.8	13,200	2,700	2,780	2,910	1.51	9.8	19½	19½	
11-CB (417 ft. 3 in. to 419 ft.)	C-87924	1 2 3	0.4	20.0	65.0	14.6	2.0	4.3	75.4	1.2	2.5	13,270	2,620	2,680	2,780	1.40	8.2	21	21	
12-CB (554 ft. to 555 ft. 8 in.)	C-87923	1 2 3	0.8	19.0	64.7	15.5	4.1	4.0	73.3	1.0	2.0	12,930	2,030	2,260	2,440	1.46	6.6	20	2½	
12-CB (565 ft. 9½ in. to 567 ft. ½ in.)	C-87924	1 2 3	0.9	19.5	62.5	18.0	3.0	4.0	71.8	0.9	3.0	12,480	2,080	2,490	2,570	1.47	6.5	15	15	
12-CB (570 ft. 11½ in. to 572 ft. 1½ in.)	C-87925	1 2 3	0.9	19.3	60.7	19.1	7.0	4.2	70.7	1.1	4.2	12,420	2,910	2,910+		1.44	8.0	14	14	



C-04845	20-CB (181 ft. 7 in. to 183 ft. 3 in.)	1	.7	20.4	59.8	19.1	2.7	4.1	69.8	1.0	3.3	12,310	2,590	2,680	2,700	1.46	6.5	20	3	17
		2	---	20.5	60.3	19.2	2.7	4.1	70.2	1.0	3.5	15,340								
		3	---	25.4	74.6	---	3.4	5.0	86.9	1.2	3.5									
C-07166	21-CB (177 ft. 8½ in. to 179 ft. 2½ in.)	1	1.4	18.2	65.2	15.2	2.4	4.3	73.5	1.1	3.5	12,970	2,510	2,560	2,730	1.42	7.7	18	5	13
		2	---	18.4	66.2	15.4	2.4	4.2	74.5	1.1	2.4	13,150								
		3	---	21.8	78.2	---	2.8	5.0	88.1	1.3	2.8	15,540								
C-08098	23-CB (201 ft. 10 in. to 203 ft. 4½ in.)	1	.6	23.0	59.3	17.1	6.0	4.2	70.3	1.2	1.2	12,680	1,920	1,970	2,360	1.47	8.8	18½		18½
		2	---	23.1	59.6	17.3	6.1	4.2	70.8	1.2	.4	12,760								
		3	---	28.0	72.0	---	7.4	5.1	85.5	1.5	.5	15,420								
C-08099	23-CB (208 ft. 2 in. to 209 ft. 6 in.)	1	.8	19.1	65.4	14.7	1.7	4.3	75.4	1.1	2.8	13,220	2,570	2,600	2,730	1.41	7.0	16		16
		2	---	19.3	65.8	14.9	1.7	4.2	76.0	1.1	2.1	13,330								
		3	---	22.7	77.3	---	2.0	5.0	89.3	1.3	2.4	15,660								
D-3971	28-CB (466 ft. 8 in. to 468 ft. 6 in.)	1	1.1	21.3	62.2	15.4	2.9	4.2	72.9	1.1	3.5	12,910	2,100	2,180	2,340	1.44	6.5	19		19
		2	---	21.5	62.9	15.6	2.9	4.2	73.7	1.1	2.9	13,060								
		3	---	25.5	74.5	---	3.5	4.9	87.4	1.3	2.9	15,480								
D-8851	32-CB (493 ft. 3 in. to 496 ft. 11 in.)	1	1.5	18.0	64.3	16.2	1.9	4.2	72.3	1.1	4.3	12,700	2,600	2,700	2,780	1.43	7.3	42½	4	38½
		2	---	18.2	65.4	16.4	1.9	4.0	73.4	1.1	3.2	12,890								
		3	---	21.8	78.2	---	2.3	4.8	87.9	1.3	3.7	15,430								
D-15857	38-CB (574 ft. to 575 ft. 7 in.)	1	.6	17.8	64.4	17.2	1.7	4.1	73.2	1.1	2.7	12,670	2,620	2,660	2,730	1.45	4.5	10		10
		2	---	17.9	64.8	17.3	1.7	4.0	73.7	1.1	2.2	12,750								
		3	---	21.7	78.3	---	2.1	4.9	89.1	1.4	2.5	15,420								
D-15858	38-CB (599 ft. to 601 ft. 4 in.)	1	1.8	17.7	65.5	15.0	2.4	4.2	73.7	1.2	3.5	12,940	2,470	2,540	2,650	1.42	8.2	28		28
		2	---	18.1	66.6	15.3	2.5	4.1	75.1	1.2	1.8	13,190								
		3	---	21.3	78.7	---	2.9	4.8	88.7	1.4	2.2	15,570								
D-15859	38-CB (613 ft. 2 in. to 616 ft. 2 in.)	1	.9	20.5	65.7	12.9	3.1	4.4	75.5	1.3	2.8	13,410	2,150	2,420	2,470	1.41	8.0	36	4	32
		2	---	20.7	66.3	13.0	3.2	4.3	76.2	1.3	2.0	13,520								
		3	---	23.8	76.2	---	3.6	5.0	87.6	1.5	2.3	15,550								
D-18098	40-CB (407 ft. 3 in. to 408 ft. 7 in.)	1	.6	17.5	64.1	17.8	3.3	4.1	71.9	1.0	1.9	12,730	2,080	2,310	2,450	1.45	8.1	15	1	14
		2	---	17.6	64.5	17.9	3.3	4.0	72.3	1.0	1.3	12,800								
		3	---	21.5	78.5	---	4.0	4.9	88.1	1.3	1.7	15,600								
D-18099	40-CB (459 ft. 11 in. to 460 ft. 9 in.)	1	.9	15.8	50.6	32.7	1.1	3.5	57.6	.9	4.2	10,160	2,860	2,910+		1.58	4.1	10		10
		2	---	16.0	51.0	33.0	1.1	3.4	58.1	.9	3.5	10,250								
		3	---	23.8	76.2	---	1.7	5.1	86.6	1.4	5.2	15,290								

LOWER KITTANNING AND MOUNT SAVAGE COAL BEDS

C-77529	1-CB (824 ft. 4 in. to 826 ft. 3 in.)	1	0.8	19.9	58.8	20.5	6.8	3.8	66.0	1.0	1.9	11,880	2,000	2,380	2,470	1.547	6.5	23		23
		2	---	20.0	59.3	20.7	6.9	3.8	66.6	1.0	1.0	11,980								
		3	---	25.3	74.7	---	8.7	4.7	83.9	1.2	1.5	15,100								
C-79616	3-CB (795 ft. 2½ in. to 796 ft. 11 in.)	1	.4	22.0	53.9	23.7	3.9	4.0	64.4	1.0	3.0	11,340	2,620	2,730	2,840	1.52	8.9	21	3	18
		2	---	22.0	54.2	23.8	3.9	4.0	64.7	1.0	2.6	11,380								
		3	---	28.9	71.1	---	5.1	5.2	84.9	1.3	3.5	14,930								
C-81488	4-CB (868 ft. to 869 ft.)	1	.6	25.3	54.6	19.5	3.5	4.3	67.9	1.0	3.8	12,140	2,700	2,780	2,910+	1.49	8.0	12		12
		2	---	25.4	55.0	19.6	3.5	4.2	68.3	1.0	3.4	12,200								
		3	---	31.6	68.4	---	4.4	5.3	85.0	1.2	4.1	15,180								
C-81486	5-CB (695 ft. 7½ in. to 697 ft. 4 in.)	1	1.0	18.8	64.1	16.1	5.3	4.2	71.2	1.0	2.2	12,730	2,080	2,510	2,670	1.47	8.9	20½	3½	17
		2	---	19.0	64.8	16.2	5.3	4.1	71.9	1.0	1.5	12,860								
		3	---	22.7	77.3	---	6.4	4.9	85.8	1.2	1.7	15,350								
C-83898	6-CB (581 ft. 9 in. to 582 ft. 11 in.)	1	.7	24.6	55.8	18.9	6.1	4.0	67.6	1.0	2.4	12,170	2,000	2,470	2,600	1.49	8.4	14		14
		2	---	24.8	56.1	19.1	6.1	4.0	68.0	1.1	1.7	12,250								
		3	---	30.6	69.4	---	7.6	4.9	84.1	1.3	2.1	15,140								
C-83899	6-CB (598 ft. 5½ in. to 599 ft. 8 in.)	1	.8	24.8	65.2	9.2	2.5	4.6	79.6	1.2	2.9	14,020	2,250	2,530	2,620	1.36	8.3	14½		14½
		2	---	25.0	65.7	9.3	2.6	4.5	80.2	1.2	2.2	14,130								
		3	---	27.6	72.4	---	2.8	5.0	88.4	1.3	2.5	15,580								

See footnotes at end of table.

TABLE 13.—Analyses of coal cores, Castleman Basin, Garrett County, Md.—Continued

Drill hole	Laboratory No.	Condition	Proximate (percent)			Ultimate (percent)				Calorific value (B. t. U.)	Fusibility of ash			Real specific gravity	Agglutinating index <sup>1</sup>	Core received (inches)	Core rejected (inches)	Core analyzed (inches)	
			Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon		Nitrogen	Oxygen	Initial deformation temperature (°F.)						Softening temperature (°F.)
7-CB. (440 ft. 11 in. to 443 ft. 3 in.)	C-83213	1	1.2	22.8	63.2	12.8	3.8	4.4	74.4	1.2	3.4	1,940	2,290	2,520	1.41	9.0	28	1	27
		2	23.1	64.0	12.9	3.8	4.4	75.3	1.2	2.4	13,360								
		3	26.5	73.5		4.4	5.0	86.4	1.4	2.8	15,520								
8-CB. (757 ft. to 758 ft. 1 in.)	C-86220	1	.5	24.3	62.6	12.6	3.5	4.4	75.6	1.1	2.8	1,940	2,420	2,530	1.41	8.1	13		13
		2	24.5	62.9	12.6	3.5	4.4	76.0	1.1	2.4	13,530								
		3	28.0	72.0		4.0	5.0	87.0	1.3	2.7	15,480								
8-CB. (784 ft. 1 in. to 785 ft.)	C-86221	1	.4	22.0	61.4	16.2	1.8	4.2	72.8	1.1	3.9	2,810	2,890	2,910+	1.43	8.6	11		11
		2	22.1	61.6	16.3	1.8	4.2	73.1	1.1	3.5	12,840								
		3	26.4	73.6		2.1	5.0	87.4	1.3	4.2	15,340								
12-CB (602 ft. 7 in. to 605 ft. 9½ in.)	C-87626	1	.8	22.5	59.5	17.2	1.9	4.3	72.0	1.2	3.4	2,730	2,820	2,910+	1.43	8.0	38½	16	22½
		2	22.7	59.9	17.4	1.9	4.2	72.6	1.2	2.7	12,760								
		3	27.5	72.5		2.3	5.1	87.8	1.5	3.3	15,440								
13-CB (360 ft. 2 in. to 361 ft. 2 in.)	C-88706	1	.6	24.0	61.0	14.4	2.1	4.4	74.4	1.0	3.7	2,740	2,820	2,910+	1.40	7.7	12		12
		2	24.1	61.4	14.5	2.1	4.4	74.9	1.0	3.1	13,160								
		3	28.3	71.7		2.5	5.1	87.6	1.2	3.6	15,390								
21-CB (790 ft. 5 in. to 792 ft. 2 in.)	C-97167	1	1.1	19.0	58.7	21.2	2.4	4.0	67.2	.8	4.4	2,910+			1.49	5.3	21	2	19
		2	19.2	59.4	21.4	2.4	3.9	67.9	.8	3.6	11,970								
		3	24.4	75.6		3.1	4.9	86.5	1.0	4.5	15,230								
25-CB (555 ft. ½ in. to 557 ft. 4 in.)	D-853	1	1.1	19.7	60.4	18.8	7.4	4.0	67.5	1.0	1.3	2,050	2,180	2,520	1.509	7.5	12½	1	11½
		2	19.9	61.1	19.0	7.4	3.9	68.3	1.0	.4	12,330								
		3	24.6	75.4		9.2	4.8	84.3	1.3	.4	15,220								

MERCER COAL BED																			
Drill hole	Laboratory No.	Condition	Proximate (percent)			Ultimate (percent)				Calorific value (B. t. U.)	Fusibility of ash			Real specific gravity	Agglutinating index <sup>1</sup>	Core received (inches)	Core rejected (inches)	Core analyzed (inches)	
			Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon		Nitrogen	Oxygen	Initial deformation temperature (°F.)						Softening temperature (°F.)
5-CB. (744 ft. 2 in. to 745 ft. 5 in.)	C-81487	1	0.4	20.6	67.7	11.3	1.8	4.3	78.5	1.0	3.1	2,760	2,870	2,910+	1.42	4.3	11		11
		2	20.7	67.9	11.4	1.8	4.3	78.8	1.0	2.7	13,660								
		3	23.3	76.7		2.0	4.8	88.9	1.2	3.1	15,410								
7-CB. (485 ft. 5 in. to 489 ft. ½ in.)	C-83694	1	.9	21.3	62.8	15.0	1.3	4.2	73.8	.9	4.8	2,910+			1.43	4.9	42	12½	29½
		2	21.5	63.3	15.2	1.3	4.2	74.4	.9	4.0	13,030								
		3	25.3	74.7		1.6	4.9	87.7	1.1	4.7	15,350								
16-CB (798 ft. 1½ in. to 800 ft.)	C-92383	1	.9	21.2	65.2	12.7	2.3	4.3	76.5	1.0	3.2	2,660	2,750	2,810	1.42	5.3	22½		15
		2	21.4	65.7	12.9	2.3	4.2	77.1	1.0	2.5	13,500								
		3	24.5	75.5		2.7	4.8	88.5	1.2	2.8	15,490								
20-CB (341 ft. 7 in. to 344 ft. 11 in.)	C-95163	1	1.3	18.8	67.1	12.8	1.1	4.2	76.3	1.1	4.5	2,910+			1.43	3.3	27	6	21
		2	19.0	68.1	12.9	1.1	4.1	77.3	1.1	3.5	13,410								
		3	21.8	78.2		1.3	4.7	88.8	1.2	4.0	15,400								

1, Sample as received; 2, dried at 105° C.; 3, moisture- and ash-free. <sup>2</sup> Ratio silicon carbide to coal, 15: 1, crushing strength in kilograms.

## DESCRIPTION OF OPERATING AND ABANDONED MINES AND OUTCROP PROSPECTS

All information available regarding operating and abandoned mines and outcrop excavations is summarized, and numbers correspond to locations shown in figures 1 and 7 to 12, inclusive. The elevations given were estimated from Federal Geological Survey 7.5-minute series topographic quadrangle maps.

1. *Location:* About 2½ miles west of Grantsville, south of U. S. route 40—abandoned.

*Elevation:* 2,780 feet.

*Name:* Bill prospect.

*Coal bed:* Mount Savage.

2. *Location:* About 2 miles west of Grantsville, south of U. S. route 40—abandoned.

*Elevation:* 2,710 feet.

*Owner:* Ashby.

*Coal bed:* Lower Kittanning.

3. *Location:* About 1½ miles west of Grantsville, south of U. S. route 40—abandoned.

*Elevation:* 2,480 feet.

*Operator:* C. H. Bill.

*Coal bed:* Upper Kittanning.

4. *Location:* About 1½ miles west of Grantsville, north of U. S. route 40—abandoned.

*Elevation:* 2,420 feet.

*Name:* Rufus Slaybaugh prospect.

*Coal bed:* Upper Kittanning.

5. *Location:* About 1 mile northwest of Grantsville, east bank of Little Shade Run—open—abandoned.

*Elevation:* 2,250 feet.

*Name:* Shade No. 1 mine.

*Operator:* John Hersker.

*Owner:* Sam Yoder.

*Coal bed:* Upper Kittanning.

*Dip:* 5°, S. 55° E.

*Section of bed:*

Shale top.	
Coal	24
Shale	1
Coal and bone	3
Claystone bottom.	

6. *Location:* About 1 mile northwest of Grantsville, east of Little Shade Run—operating.

*Elevation:* 2,295 feet.

*Name:* Old Patton mine.

*Owner:* Sam Yoder.

*Coal bed:* Upper Freeport (local name, Beachy).

*Dip:* 6°, S. 70° E.

*Section of bed (200 feet inby):*

	<i>Inches</i>
Shale top.	
Coal and bone	1½
Coal	9½
Shale	1
Coal	25
Claystone bottom.	

7. *Location:* About 1 mile northwest of Grantsville, east of Little Shade Run—open—abandoned.

*Elevation:* 2,285 feet.

*Name:* Gumshoe slope.

*Owner:* John Hersker.

*Coal bed:* Upper Freeport (local name, Beachy).

*Dip:* 7°, S. 50° E.

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal and bone	1½
Coal	9½
Shale	1
Coal	25
Claystone bottom.	

8. *Location:* About ½ mile west of Grantsville west of Big Shade Run—abandoned.

*Elevation:* 2,250 feet.

*Mine:* Josiah Durst.

*Owner:* John Hersker.

*Coal bed:* Upper Bakerstown.

*Dip:* 5°, S. 70° E.

*Section of bed:*

Claystone top.	
Bone, shale, and coal	<i>Inches</i> 30

9. *Location:* About ½ mile west of Grantsville, south of U. S. route 40—abandoned.

*Elevation:* 2,280 feet.

*Name:* Fossil mine.

*Coal bed:* Harlem (local name, Fossil).

*Section of bed:*

Fossil shale top.	
Coal	<i>Inches</i> 18
Limestone bottom.	

10. *Location:* About 1 mile west of Grantsville, east of Little Shade Run—abandoned.

*Elevation:* 2,220 feet.

*Name:* H. L. Bowman slope mine.

*Owner:* Selina Bowman.

*Coal bed:* Upper Freeport (local name, Beachy).

11. *Location:* About 1 mile west of Grantsville, north of U. S. route 40—abandoned.

*Elevation:* 2,320 feet.

*Name:* Melvin Butler mine.

*Coal bed:* Upper Freeport (local name, Beachy).

12. *Location:* About 1 mile west of Grantsville, north of U. S. route 40—operating.

*Elevation:* 2,300 feet.

*Name:* J. A. Beachy mine.

*Owner:* Joel Beachy.

*Coal bed:* Upper Freeport (local name, Beachy).

*Dip:* 6°, S. 55° E.

*Section of bed (100 feet inby):*

	<i>Inches</i>
Shale top.	
Coal	10
Shale	½
Coal	24
Shale	1½
Coal	7
Shaly limestone bottom.	

13. *Location:* About 1 mile west of Grantsville, north of U. S. route 40—abandoned.

*Elevation:* 2,210 feet.

*Name:* Beachy No. 1 mine (rock slope to coal).

*Owner:* Meyers Coal Co. (Beachy & Bender).

*Coal bed:* Upper Freeport (local name, Beachy).

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal	9
Shale	1
Coal	23
Shale	1½
Coal	7
Shale bottom.	

14. *Location:* About 1 mile west of Grantsville, south of U. S. route 40—abandoned.

*Elevation:* 2,300 feet.

*Owner:* Joel Beachy.

*Coal bed:* Brush Creek.

15. *Location:* About 1 mile west of Grantsville, south of U. S. route 40—abandoned.

*Elevation:* 2,400 feet.

*Name:* Bender & Beachy mine (rock slope to coal)

*Owner:* Joel Beachy.

*Coal bed:* Upper Freeport (local name, Beachy).

16. *Location:* About 1½ miles west of Grantsville, south of U. S. route 40—operating.

*Elevation:* 2,430 feet.

*Name:* Sloan or Shaw mine (slope).

*Operator:* Norman Patton or Grantsville Coal Co.

## 16—Continued

*Coal bed:* Upper Freeport (local name, Beachy).

*Dip:* 8°, S. 55° E.

<i>Section of bed (300 feet inby):</i>	<i>Inches</i>
Coal.....	10
Bone.....	1½
Coal.....	25½
Shale.....	1
Coal.....	5

17. *Location:* About 1 mile west of Grantsville, west bank of Little Shade Run—abandoned.

*Elevation:* 2,200 feet.

*Owner:* Elmer Miller.

*Coal bed:* Brush Creek.

18. *Location:* About 1 mile southwest of Grantsville, west bank of Little Shade Run—abandoned.

*Elevation:* 2,250 feet.

*Owner:* Elmer Miller.

*Coal bed:* Lower Bakerstown (local name, Honeycomb).

*Dip:* 4°, S. 55° E.

19. *Location:* About 1½ miles west of Grantsville, north of Spiker Run—abandoned.

*Elevation:* 2,330 feet.

*Name:* Shaw mine.

*Owner:* George Sloan.

*Coal bed:* Upper Freeport (local name, Beachy).

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal.....	11
Shale.....	1½
Coal.....	22½
Shale.....	2
Coal.....	8

20. *Location:* About 1½ miles west of Grantsville, north of Spiker Run—abandoned.

*Elevation:* 2,220 feet (east opening).

*Name:* Opel mine.

*Owner:* Joel Beachy.

*Coal bed:* Upper Freeport (local name, Beachy).

*Dip:* 5°, S. 70° E.

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal.....	11
Shale.....	1½
Coal.....	23½

Limy shale bottom.

21. *Location:* About 1½ miles southwest of Grantsville, west of Spiker Run—abandoned.

*Elevation:* 2,240 feet.

*Name:* Hockman mine.

*Coal bed:* Upper Freeport (local name, Beachy).

*Dip:* 7°, S. 50° E.

*Section of bed (200 feet inby):*

	<i>Inches</i>
Coal.....	8
Bone.....	1
Coal.....	20

22. *Location:* About 1½ miles southwest of Grantsville, south of Spiker Run—operating.

*Elevation:* 2,200 feet.

*Owner:* Guy Stanton.

*Coal bed:* Lower Bakerstown (local name, Honeycomb).

*Dip:* 6°, S. 60° E.

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal.....	29

Claystone bottom.

23. *Location:* About 1½ miles southwest of Grantsville, north of Spiker Run—abandoned.

*Elevation:* 2,220 feet.

*Name:* Spring mine.

*Owner:* Guy Stanton.

*Coal bed:* Upper Bakerstown.

24. *Location:* About 1 mile southwest of Grantsville, north of Shade Run—abandoned.

*Elevation:* 2,220 feet.

*Owner:* Leslie Stanton.

*Coal bed:* Harlem (local name, Fossil).

25. *Location:* About 1 mile southwest of Grantsville, north of Shade Run—abandoned.

*Elevation:* 2,280 feet.

*Owner:* Leslie Stanton.

*Coal bed:* Federal Hill.

26. *Location:* About 1 mile southwest of Grantsville, north of Shade Run—abandoned.

*Elevation:* 2,210 feet.

*Owner:* Leslie Stanton.

*Coal bed:* Harlem.

27. *Location:* About 1 mile southwest of Grantsville, west of Jennings road—abandoned.

*Elevation:* 2,280 feet.

*Owner:* Leslie Stanton.

*Coal bed:* Barton.

28. *Location:* About 1 mile southeast of Grantsville, east bank of Casselman River—abandoned.

*Elevation:* 2,125 feet.

*Name:* Dahlgren mine.

*Owner:* Galen Beachy.

*Coal bed:* Lower Bakerstown.

*Dip:* 5°, N. 25° W.

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal.....	25
Shaly clay bottom.	

29. *Location:* About 1 mile southeast of Grantsville, east bank of Casselman River—abandoned.

*Elevation:* 2,145 feet.

*Name:* U. M. Stanton mine.

*Owner:* Galen Beachy.

*Coal bed:* Lower Bakerstown.

*Dip:* 5°, N. 25° W.

*Section of bed:*

	<i>Inches</i>
Shale top.	
Coal.....	27
Shale bottom.	

30. *Location:* About 1 mile east of Grantsville, east of Casselman River—abandoned.

*Elevation:* 2,170 feet.

*Owner:* Galen Beachy.

*Coal bed:* Upper Bakerstown.

31. *Location:* About 1 mile east of Grantsville, east bank of Casselman River—abandoned.

*Elevation:* 2,115 feet.

*Owner:* Galen Beachy.

*Coal bed:* Lower Bakerstown.

32. *Location:* About 1 mile east of Grantsville, east side of New Germany road—abandoned.

*Elevation:* 2,260 feet.

*Owner:* Ray Doer.

*Coal bed:* Harlem.

33. *Location:* At Little Crossing, south of U. S. route 40—abandoned.

*Elevation:* 2,150 feet.

*Name:* McKenzie prospect.

*Coal bed:* Harlem.

*Section of bed:*

	<i>Inches</i>
Fossiliferous limestone top.	
Coal.....	12
Shale.....	1½
Coal.....	9
Limestone bottom.	

34. *Location:* About 1½ miles northeast of Grantsville, south of Casselman River—abandoned.

*Elevation:* 2,200 feet.

*Owner:* Cris Yoder.

*Coal bed:* Federal Hill.

35. *Location:* About 1½ miles northeast of Grantsville, south of Casselman River—abandoned.  
*Elevation:* 2,300 feet.  
*Owner:* Eli Kinsinger.  
*Coal bed:* Federal Hill.  
*Dip:* 6°, N. 50° W.  
*Section of bed (150 feet inby):*
- |               |               |
|---------------|---------------|
| Bone top.     | <i>Inches</i> |
| Coal          | 7             |
| Shale         | 15            |
| Coal          | 14            |
| Shale bottom. |               |
36. *Location:* West bank of Meadow Run, south of U. S. route 40—abandoned.  
*Elevation:* 2,560 feet.  
*Mine:* Sensenbaugh slope.  
*Owner:* Sam Yoder.  
*Coal bed:* Upper Freeport.
37. *Location:* East of Meadow Run, south of U. S. route 40—abandoned (open).  
*Elevation:* 2,610 feet.  
*Name:* Meadow Mountain mine.  
*Owner:* Sam Uoder.  
*Coal bed:* Upper Kittanning.  
*Dip:* 10°, N. 70° W.  
*Section of bed:*
- |               |               |
|---------------|---------------|
| Shale top.    | <i>Inches</i> |
| Bone and coal | 35            |
| Shale bottom. |               |
38. *Location:* East of Meadow Run, south of U. S. route 40—stripping.  
*Elevation:* 2,660 feet.  
*Owner:* Sam Yoder.  
*Coal bed:* Middle Kittanning.
39. *Location:* South of U. S. route 40, east of East Shale road—abandoned.  
*Elevation:* 2,670 feet.  
*Name:* Wagner slope.  
*Coal bed:* Upper Kittanning.
40. *Location:* About 2 miles southeast of Grantsville on Salt Block mountain—abandoned.  
*Elevation:* 2,620 feet.  
*Owner:* Forrest Beachy.  
*Coal bed:* Lower Bakerstown.
41. *Location:* About 3 miles southeast of Grantsville, headwaters of Meadow Run—abandoned.  
*Elevation:* 2,600 feet.  
*Operator:* Phinas Bloucher.  
*Coal bed:* Upper Kittanning.  
*Section of bed:*
- |               |               |
|---------------|---------------|
| Shale top.    | <i>Inches</i> |
| Coal          | 28            |
| Shale         | 2             |
| Bone and coal | 5             |
| Clay bottom.  |               |
42. *Location:* About 3 miles southeast of Grantsville, headwaters of Meadow Run—abandoned.  
*Elevation:* 2,600 feet.  
*Operator:* Phinas Bloucher.  
*Coal bed:* Middle Kittanning.  
*Section of bed:*
- |                    |               |
|--------------------|---------------|
| Black shale top.   | <i>Inches</i> |
| Coal               | 28            |
| Shale              | 2             |
| Bony coal          | 5             |
| Shaly clay bottom. |               |
43. *Location:* About 3 miles southeast of Grantsville on west slope of Meadow Mountain—stripping.  
*Elevation:* 2,760 feet.  
*Operator:* Albert Bowman.  
*Owners:* Sam Otto and Simon Orendorff.
- Coal bed:* Middle Kittanning (formerly named Upper Kittanning).  
*Dip:* 7°, N. 30° W.  
*Section of bed:*
- |               |               |
|---------------|---------------|
| Shale top.    | <i>Inches</i> |
| Coal          | 18            |
| Bone          | 1             |
| Coal and bone | 23            |
| Clay bottom.  |               |
44. *Location:* About 3½ miles southeast of Grantsville on west slope of Meadow Mountain—stripping.  
*Elevation:* 2,800 feet.  
*Operator:* Albert Bowman.  
*Coal bed:* Middle Kittanning (formerly named Upper Kittanning).  
*Dip:* 8°, N. 35° E.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal         | 14            |
| Bone         | 1             |
| Shale        | 2             |
| Coal         | 25            |
| Clay bottom. |               |
45. *Location:* About 2½ miles southeast of Grantsville, east of New Germany Road—abandoned (open).  
*Elevation:* 2,660 feet.  
*Owner:* Harry O. Miller.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 4°, N. 50° E.  
*Section of bed (250 feet inby):*
- |               |               |
|---------------|---------------|
| Shale top.    | <i>Inches</i> |
| Coal and bone | 3             |
| Coal          | 30            |
| Clay bottom.  |               |
46. *Location:* About 3 miles southeast of Grantsville, west of New Germany Road—abandoned (open).  
*Elevation:* 2,630 feet.  
*Name:* Cris Durst mine.  
*Owner:* Jonas Beiler.  
*Coal bed:* Upper Bakerstown.  
*Dip:* 2°, N. 70° W.  
*Section of bed:*
- |                   |               |
|-------------------|---------------|
| Claystone top.    | <i>Inches</i> |
| Coal and bone     | 23            |
| Bone              | 18            |
| Claystone bottom. |               |
47. *Location:* About 3 miles southeast of Grantsville, west of New Germany Road—abandoned.  
*Elevation:* 2,690 feet.  
*Owner:* Lou Broadwater.  
*Coal bed:* Upper Bakerstown.
48. *Location:* About 3½ miles south of Grantsville on Shale road—abandoned.  
*Elevation:* 2,620 feet.  
*Name:* Big Laurel Run mine (formerly Jenkins mine).  
*Operator:* John Keister.  
*Coal bed:* Middle Kittanning (formerly named Upper Kittanning).<sup>29</sup>  
*Dip:* 6°, N. 70° W.  
*Section of bed:*
- |               |               |
|---------------|---------------|
| Shale top.    | <i>Inches</i> |
| Coal          | 9             |
| Bone          | 1             |
| Coal          | 34            |
| Shale bottom. |               |

<sup>29</sup> Crentz, W. L., and Fraser, Thomas, Preparation Characteristics of Maryland Coals: Bureau of Mines Tech. Paper 701, 1947, pp. 32 and 56.

49. *Location:* About 3½ miles southeast of Grantsville, east side of Shale road—stripping.  
*Elevation:* 2,630 feet (north end).  
*Operator:* Burnwell Coal Co.  
*Coal bed:* Middle Kittanning (formerly named Upper Kittanning).<sup>30</sup>  
*Dip:* 6°, N. 70° W.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Shale top. | <i>Inches</i> |
| Coal-----  | 23            |
| Shale----- | 12            |
| Coal-----  | 10            |
| Bone-----  | 2             |
| Coal-----  | 32            |
50. *Location:* About 2 miles east of Jennings, north of Big Laurel Run—abandoned (prospect).  
*Elevation:* 2,500 feet.  
*Owner:* United States Government.  
*Coal bed:* Brush Creek.
51. *Location:* About 2 miles east of Jennings, east bank of Big Laurel Run—abandoned (prospect).  
*Elevation:* 2,420 feet.  
*Owner:* United States Government.  
*Coal bed:* Brush Creek.
52. *Location:* About 2 miles northeast of Grantsville, west of Big Laurel Run—abandoned.  
*Elevation:* 2,440 feet.  
*Name:* J. C. Swauger mine.  
*Owner:* United States Government.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |                  |               |
|------------------|---------------|
| Black-shale top. | <i>Inches</i> |
| Coal-----        | 24            |
| Shale bottom.    |               |
53. *Location:* About 2 miles northeast of Jennings, east bank of Big Laurel Run—abandoned.  
*Elevation:* 2,400 feet.  
*Owner:* Ellsworth Beachy.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |                    |               |
|--------------------|---------------|
| Shale top.         | <i>Inches</i> |
| Coal-----          | 26            |
| Shaly clay bottom. |               |
54. *Location:* About 2 miles northeast of Jennings, north bank of Big Laurel Run—abandoned.  
*Elevation:* 2,375 feet.  
*Owner:* Ellsworth Beachy.  
*Coal bed:* Upper Bakerstown.
55. *Location:* About 3 miles south of Grantsville, south of Big Laurel Run—abandoned.  
*Elevation:* 2,430 feet.  
*Operator:* Sam Hare.  
*Coal bed:* Harlem.  
*Section of bed:*
- |                   |               |
|-------------------|---------------|
| Fossil shale top. | <i>Inches</i> |
| Coal-----         | 19            |
56. *Location:* About 2½ miles south of Grantsville on Mount Nebo—abandoned.  
*Elevation:* 2,620 feet.  
*Name:* Jerry Yost prospect.
57. *Location:* About 2½ miles south of Grantsville on Mount Nebo—abandoned.  
*Elevation:* 2,610 feet.  
*Name:* Jerry Yost prospect.
58. *Location:* About 2 miles south of Grantsville, east of Casselman River—abandoned.  
*Elevation:* 2,230 feet.  
*Name:* Henry Yost prospect.  
*Coal bed:* Federal Hill.
59. *Location:* About 2 miles southwest of Grantsville, west of Casselman River.  
*Elevation:* 2,220 feet.  
*Owner:* Paul Kinsinger.  
*Coal bed:* Upper Bakerstown.
60. *Location:* About 2 miles southwest of Grantsville, west of Casselman River—abandoned.  
*Elevation:* 2,185 feet.  
*Owner:* Paul Kinsinger.  
*Coal bed:* Lower Bakerstown.
61. *Location:* About 2 miles southwest of Grantsville, west of Casselman River—abandoned.  
*Elevation:* 2,190 feet.  
*Owner:* Orvil Kinsinger.  
*Coal bed:* Lower Bakerstown.
62. *Location:* About 2 miles southwest of Grantsville, west of Casselman River—abandoned.  
*Elevation:* 2,200 feet.  
*Owner:* Orvil Kinsinger.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 5°, S. 50° E.  
*Section of bed (20 feet inby):*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal-----    | 27            |
| Clay bottom. |               |
63. *Location:* About 1½ miles north of Jennings, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,220 feet.  
*Operator:* Harry Broadwater.  
*Coal bed:* Lower Bakerstown.
64. *Location:* About 2½ miles southwest of Grantsville, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,225 feet.  
*Owner:* Paul Kinsinger.  
*Coal bed:* Brush Creek.
65. *Location:* About 2½ miles southwest of Grantsville, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,235 feet.  
*Owner:* Earl Stanton.  
*Coal bed:* Brush Creek.
66. *Location:* About 2½ miles southwest of Grantsville, north of North Branch of Casselman River—abandoned.  
*Elevations:* 2,180 feet (east drift); 2,210 feet (west drift).  
*Mine:* Henry McKenzie.  
*Owner:* John Hersker.  
*Coal bed:* Upper Freeport.  
*Dip:* 5°, N. 80° E.  
*Section of bed:*
- |                   |               |
|-------------------|---------------|
| Shale top.        | <i>Inches</i> |
| Coal-----         | 9½            |
| Bone-----         | ½             |
| Coal-----         | 22            |
| Limy clay bottom. |               |
67. *Location:* About 3 miles southwest of Grantsville, south of North Branch of Casselman River—operating.  
*Elevation:* 2,260 feet.  
*Operator:* John Keister, Laurel Run Coal Co.  
*Name:* Stanton mine No. 1.  
*Owner:* Earl Stanton.  
*Coal bed:* Upper Freeport.  
*Dip:* 4°, S. 70° E.  
*Section of bed (300 feet inby):*
- |                   |               |
|-------------------|---------------|
| Sandstone top.    | <i>Inches</i> |
| Coal-----         | 11            |
| Shale-----        | 1             |
| Coal-----         | 26            |
| Claystone bottom. |               |
68. *Location:* About 3 miles southwest of Grantsville, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,280 feet.  
*Owner:* Earl Stanton.  
*Coal bed:* Upper Freeport.

<sup>30</sup> Crentz, W. L., and Fraser, Thomas, Work cited in footnote 29.

69. *Location:* About 3 miles southwest of Grantsville, west side of Amish Road—clay stripping.  
*Elevation:* 2,460 feet.  
*Operator:* Union Mining Co.  
*Coal bed:* Mount Savage.<sup>31</sup>  
*Dip:* 12°, S 45° E.  
*Section of bed:*
- |                    |               |
|--------------------|---------------|
| Clay top.          | <i>Inches</i> |
| Coal.....          | 24            |
| Flint-clay bottom. |               |
70. *Location:* About 2 miles northwest of Jennings, west of Casselman River—abandoned.  
*Elevation:* 2,350 feet.  
*Name:* Davis mine.  
*Coal bed:* Middle Kittanning.  
*Dip:* 12°, N. 60° W.  
*Section of bed:*
- |                |               |
|----------------|---------------|
| Sandstone top. | <i>Inches</i> |
| Coal.....      | 28            |
| Clay bottom.   |               |
71. *Location:* About 1½ miles northwest of Jennings, east bank of Casselman River—operating.  
*Elevation:* 2,315 feet.  
*Name:* Ridgely mine.  
*Owner:* Norman Baker.  
*Coal bed:* Upper Freeport.  
*Dip:* 4°, S. 65° E.  
*Section of bed at pit mouth:*
- |                     |               |
|---------------------|---------------|
| Shale top.          | <i>Inches</i> |
| Coal.....           | 14            |
| Bone.....           | 1             |
| Coal.....           | 25            |
| Shale.....          | 1             |
| Coal and bone.....  | 9             |
| Sandy shale bottom. |               |
72. *Location:* About 1½ miles northwest of Jennings, east of North Branch of Casselman River—abandoned.  
*Elevation:* 2,325 feet.  
*Name:* Old Ridgely opening.  
*Owner:* Norman Baker.  
*Coal bed:* Upper Freeport rider.
73. *Location:* About 1 mile northwest of Jennings on Ridgely Hill—abandoned.  
*Elevation:* 2,530 feet.  
*Owner:* Norman Baker.  
*Coal bed:* Barton.
74. *Location:* About 1 mile northwest of Jennings on Ridgely Hill—abandoned.  
*Elevation:* 2,520 feet.  
*Name:* Ella Bevan's mine.  
*Owner:* Norman Baker.  
*Coal bed:* Barton.
75. *Location:* About 2½ miles southwest of Grantsville, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,330 feet.  
*Name:* McKinley Beachy prospect.  
*Coal bed:* Harlem.  
*Dip:* 5°, S. 70° E.  
*Section of bed:*
- |                   |               |
|-------------------|---------------|
| Fossil shale top. | <i>Inches</i> |
| Coal.....         | 20            |
| Shale bottom.     |               |
76. *Location:* About 1 mile north of Jennings, west bank of South Branch of Casselman River—abandoned.  
*Elevation:* 2,160 feet.  
*Name:* Tadpole mine.  
*Coal bed:* Lower Bakerstown.  
*Dip:* Flat.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Shale top. | <i>Inches</i> |
| Coal.....  | 23            |
77. *Location:* About 1 mile north of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,195 feet.  
*Owner:* John Hersker.  
*Coal bed:* Upper Bakerstown.
78. *Location:* About 1 mile north of Jennings, west of Casselman River—abandoned.  
*Elevation:* 2,280 feet.  
*Owner:* Harry Durst.  
*Coal bed:* Harlem.
79. *Location:* About 1 mile northeast of Jennings, north of Big Laurel Run—abandoned.  
*Elevation:* 2,400 feet.  
*Owner:* Albert Wiley.  
*Coal bed:* Barton.
80. *Location:* About 1 mile northeast of Jennings, east of South Branch of Casselman River—operating.  
*Elevation:* 2,390 feet.  
*Owner:* Albert Wiley.  
*Coal bed:* Barton.  
*Dip:* 4°, S. 30° E.  
*Section of bed:*
- |                        |               |
|------------------------|---------------|
| Shale top.             | <i>Inches</i> |
| Coal.....              | 14            |
| Shale.....             | 1½            |
| Bone.....              | 3             |
| Limy claystone bottom. |               |
81. *Location:* About ½ mile north of Jennings, east of South Branch of Casselman River—abandoned.  
*Elevation:* 2,260 feet.  
*Name:* Jason Wilburn prospect.  
*Coal bed:* Harlem.
82. *Location:* About ½ mile north of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,180 feet.  
*Name:* Old Orendorff mine.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal.....    | 26            |
| Clay bottom. |               |
83. *Location:* About ½ mile north of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,180 feet.  
*Operators:* Jonas Folk and Lloyd Baker.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal.....    | 26            |
| Clay bottom. |               |
84. *Location:* Just north of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,190 feet.  
*Operators:* Gregory Bevans and Williams Bros.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal.....    | 25            |
| Clay bottom. |               |
85. *Location:* Just north of Jennings, west of South Branch of Casselman River—operating.  
*Elevation:* 2,200 feet.  
*Operator:* Lee Broadwater.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 3°, S. 65° E.  
*Section of bed (100 feet inby):*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Bone.....    | 2             |
| Coal.....    | 27            |
| Clay bottom. |               |

<sup>31</sup> Crenetz, W. L., and Fraser, Thomas, Preparation Characteristics of Maryland Coals: Bureau of Mines Tech. Paper 701, 1947, pp. 40 and 65.

86. *Location:* Just north of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,200 feet.  
*Owner:* Lee Broadwater.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal .....   | 26            |
| Clay bottom. |               |
87. *Location:* Just north of Jennings, east bank of Casselman River—abandoned.  
*Elevation:* 2,180 feet.  
*Operator:* George Hoover.  
*Coal bed:* Lower Bakerstown.
88. *Location:* East of Jennings, north of Big Laurel Run—abandoned.  
*Elevation:* 2,195 feet.  
*Owner:* James Wiley heirs.  
*Coal bed:* Lower Bakerstown.
89. *Location:* About ½ mile east of Jennings, east of Big Laurel Run—abandoned.  
*Elevation:* 2,240 feet.  
*Name:* John Yommer prospect.  
*Coal bed:* Upper Bakerstown.  
*Dip:* 5°, N. 70° W.
90. *Location:* About ½ mile east of Jennings, south of Big Laurel Run—abandoned.  
*Elevation:* 2,320 feet.  
*Operator:* Charles Ross.  
*Coal Bed:* Harlem.  
*Dip:* 7°, S. 80° W.
91. *Location:* About 1 mile east of Jennings, north of Little Laurel Run—abandoned.  
*Elevation:* 2,400 feet.  
*Name:* Yommer mine.  
*Coal bed:* Upper Bakerstown.
92. *Location:* About 1½ miles east of Jennings, north of Little Laurel Run—abandoned (open).  
*Elevation:* 2,540 feet.  
*Operator:* Jack Stanton.  
*Coal bed:* Upper Bakerstown.  
*Dip:* 7°, N. 60° W.  
*Section of bed:*
- |                     |               |
|---------------------|---------------|
| Shale top.          | <i>Inches</i> |
| Coal and bone ..... | 28            |
| Shale .....         | 2             |
| Bone .....          | 11            |
93. *Location:* About 1½ miles southeast of Jennings, north of Little Laurel Run—abandoned.  
*Elevation:* 2,500 feet.  
*Operator:* Dan Yommer.  
*Coal bed:* Upper Freeport.
94. *Location:* About 1½ miles southeast of Jennings, north bank of Little Laurel Run—abandoned.  
*Elevation:* 2,460 feet.  
*Operator:* Dan Yommer.  
*Coal bed:* Upper Freeport.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Shale top. | <i>Inches</i> |
| Coal ..... | 18            |
95. *Location:* About 1½ miles southeast of Jennings, north bank of Little Laurel Run—abandoned.  
*Elevation:* 2,380 feet.  
*Operator:* Dan Yommer.  
*Coal bed:* Upper Freeport.  
*Dip:* 7°, N. 40° W.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Claystone. | <i>Inches</i> |
| Coal ..... | 20            |
| Claystone. |               |
96. *Location:* About 1½ miles southeast of Jennings, south of Little Laurel Run—abandoned.  
*Elevation:* 2,425 feet.  
*Operator:* Walt Bittinger.  
*Coal bed:* Upper Freeport.
97. *Location:* About 1½ miles southeast of Jennings on Maynardier Ridge—abandoned.  
*Elevation:* 2,580 feet.  
*Owner:* Hampton Butler.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 15°, N. 45° W.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Bone ..... | <i>Inches</i> |
| Coal ..... | 36            |
98. *Location:* About 1½ miles southeast of Jennings on Maynardier Ridge.  
*Elevation:* 2,570 feet.  
*Owner:* Hampton Butler.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Shale top. | <i>Inches</i> |
| Bone ..... | 8             |
| Coal ..... | 32            |
99. *Location:* About 1½ miles southeast of Jennings on Maynardier Ridge—operating.  
*Elevation:* 2,560 feet.  
*Owner:* Hampton Butler.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 8°, N. 50° W.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Bone ..... | <i>Inches</i> |
| Coal ..... | 32            |
100. *Location:* About 1 mile southeast of Jennings on Maynardier Ridge—abandoned.  
*Elevation:* 2,600 feet.  
*Name:* Hampton Butler prospect.  
*Coal bed:* Harlem.
101. *Location:* About 1 mile southeast of Jennings, south of Little Laurel Run—abandoned.  
*Elevation:* 2,360 feet.  
*Owner:* Myrtle Custer (coal only).  
*Coal bed:* Brush Creek.
102. *Location:* About 1 mile southeast of Jennings, south of Little Laurel Run—abandoned.  
*Elevation:* 2,440 feet.  
*Owner:* Hampton Butler.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 6°, N. 45° W.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Coal ..... | <i>Inches</i> |
|            | 30            |
103. *Location:* About 1 mile southeast of Jennings, south of Little Laurel Run—abandoned.  
*Elevation:* 2,400 feet.  
*Owner:* Hampton Butler.  
*Coal bed:* Lower Bakerstown.
104. *Location:* About 1 mile south of Jennings in Deep Hollow.  
*Elevation:* 2,310 feet.  
*Name:* Harry Miller prospect.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 4°, N. 50° W.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal .....   | 25            |
| Clay bottom. |               |
105. *Location:* About 1 mile south of Jennings, in Deep Hollow—abandoned.  
*Elevation:* 2,280 feet.  
*Operators:* Ross & Ambrose.  
*Coal bed:* Upper Bakerstown.
106. *Location:* About 1 mile south of Jennings in Deep Hollow—abandoned.  
*Elevation:* 2,250 feet.  
*Operators:* Ross & Ambrose.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal .....   | 25            |
| Clay bottom. |               |



107. *Location:* About 1 mile south of Jennings, east of South Branch of Casselman River—abandoned.  
*Elevation:* 2,245 feet.  
*Operator:* Elijah Livingood.  
*Coal bed:* Lower Bakerstown.
108. *Location:* About 1 mile south of Jennings, east of South Branch of Casselman River—abandoned.  
*Elevation:* 2,255 feet.  
*Operator:* Harry Wilt.  
*Coal bed:* Lower Bakerstown.
109. *Location:* About 1 mile southwest of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,205 feet.  
*Operator:* Ray Billmeyer.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal .....   | 25            |
| Clay bottom. |               |
110. *Location:* About ½ mile south of Jennings, east of South Branch of Casselman River—abandoned.  
*Elevation:* 2,210 feet.  
*Owner:* Everett Platter.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |                    |               |
|--------------------|---------------|
| Black shale top.   | <i>Inches</i> |
| Coal .....         | 27            |
| Shaly clay bottom. |               |
111. *Location:* About ½ mile south of Jennings, west of South Branch of Casselman River—operating.  
*Elevation:* 2,205 feet.  
*Owner:* Victor Miner.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 2° NW.  
*Section of bed:*
- |            |               |
|------------|---------------|
| Bone ..... | <i>Inches</i> |
| Coal ..... | 1             |
|            | 28            |
112. *Location:* About ½ mile south of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,205 feet.  
*Operator:* Cris Yommer.  
*Coal bed:* Lower Bakerstown.
113. *Location:* About ½ mile south of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,205 feet.  
*Owner:* Edward Swauger.  
*Coal bed:* Lower Bakerstown.  
*Section of bed:*
- |              |               |
|--------------|---------------|
| Shale top.   | <i>Inches</i> |
| Coal .....   | 27            |
| Clay bottom. |               |
114. *Location:* About ½ mile south of Jennings, east of South Branch of Casselman River—abandoned.  
*Elevation:* 2,220 feet.  
*Owner:* Elmer Miller.  
*Coal bed:* Lower Bakerstown.
115. *Location:* Just southeast of Jennings, south of Little Laurel Run—abandoned.  
*Elevation:* 2,235 feet.  
*Owner:* Elmer Miller.  
*Coal bed:* Lower Bakerstown.
116. *Location:* Just west of Jennings—abandoned.  
*Elevation:* 2,250 feet.  
*Operator:* Hooker Billmeyer.  
*Coal bed:* Upper Bakerstown.
117. *Location:* Just west of Jennings—abandoned.  
*Elevation:* 2,205 feet.  
*Name:* Swauger mine.  
*Coal bed:* Lower Bakerstown.
- 118 and 119. *Location:* About 1½ miles west of Jennings, east foot of Resh Hill—abandoned.  
*Elevation:* 2,410 feet.  
*Owner:* Jervis Resh.  
*Coal bed:* Lower Bakerstown.
120. *Location:* About 1½ miles west of Jennings, east of North Branch of Casselman River—abandoned.  
*Elevation:* 2,340 feet.  
*Owner:* Kermit Bittinger.  
*Coal bed:* Brush Creek.
121. *Location:* About 1½ miles west of Jennings, east bank of North Branch of Casselman River—abandoned—stripping.  
*Elevation:* 2,320 feet.  
*Owner:* Kermit Bittinger.  
*Coal bed:* Upper Freeport.
122. *Location:* About 1½ miles west of Jennings, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,370 feet.  
*Owner:* Arthur Resh.  
*Coal bed:* Upper Freeport.
- 123 and 124. *Location:* About 2 miles west of Jennings, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,410 feet (east opening).  
*Operator:* James Resh.  
*Coal bed:* Upper Freeport.
125. *Location:* About 2 miles west of Jennings, south bank of North Branch of Casselman River—abandoned—open.  
*Elevation:* 2,370 feet (bottom of slope).  
*Operator:* Clarence Resh.  
*Coal bed:* Upper Kittanning.  
*Dip:* 5°, S. 60° E.  
*Section of bed (30 feet in by):*
- |                     |               |
|---------------------|---------------|
| Coal and bone ..... | <i>Inches</i> |
|                     | 30            |
126. *Location:* About 2½ miles west of Jennings on south bank of a small stream—abandoned.  
*Elevation:* 2,560 feet.  
*Name:* James P. Willey prospect.  
*Coal bed:* Upper Kittanning.
127. *Location:* About 3 miles west of Jennings, east side of Amish Road—abandoned.  
*Elevation:* 2,760 feet.  
*Name:* Burkholder prospect.  
*Coal bed:* Upper Kittanning.
128. *Location:* About 3 miles west of Jennings, west side of Amish Road—abandoned.  
*Elevation:* 2,830 feet.  
*Owner:* Albert Hetrick.  
*Coal bed:* Upper Kittanning.
- 129 and 130. *Location:* About 2½ miles west of Jennings, west bank of North Branch of Casselman River—abandoned.  
*Elevation:* 2,400 feet (south opening).  
*Owner:* Ellis Snyder.  
*Coal bed:* Upper Kittanning.
131. *Location:* About 2½ miles west of Jennings, west bank of North Branch of Casselman River—operating.  
*Elevation:* 2,400 feet.  
*Owner:* Ellis Snyder.  
*Coal bed:* Upper Kittanning.  
*Dip:* 8°, S. 80° W.  
*Section of bed (20 feet in by):*
- |                |               |
|----------------|---------------|
| Sandstone top. | <i>Inches</i> |
| Coal .....     | 11            |
| Shale .....    | 6             |
| Coal .....     | 14            |
| Shale .....    | 15            |
| Coal .....     | 5             |
| Clay bottom.   |               |
132. *Location:* About 2 miles west of Jennings, east of North Branch of Casselman River—abandoned.  
*Elevation:* 2,510 feet.  
*Owner:* Ellis Snyder.  
*Coal bed:* Brush Creek.

133. *Location:* About 2 miles west of Jennings, east of North Branch of Casselman River—abandoned.  
*Elevation:* 2,600 feet.  
*Operator:* George Bittinger.  
*Coal bed:* Lower Bakerstown.
134. *Location:* About 2½ miles west of Jennings, east of North Branch of Casselman River—abandoned.  
*Elevation:* 2,420 feet.  
*Owner:* Ellis Snyder.  
*Coal bed:* Upper Freeport.
135. *Location:* About 2 miles north of Bittinger, north side of Bear Creek road—abandoned.  
*Elevation:* 2,440 feet.  
*Owner:* Orvis Resh.  
*Coal bed:* Brush Creek.
136. *Location:* About 1½ miles north of Bittinger, west bank of North Branch of Casselman River—abandoned.  
*Elevation:* 2,460 feet.  
*Operator:* Levi Resh.  
*Coal bed:* Lower Bakerstown.
137. *Location:* About 2 miles northwest of Bittinger, south of Bear Creek road—abandoned.  
*Elevation:* 2,660 feet.  
*Operator:* Ernest Bowser.  
*Coal bed:* Lower Bakerstown.
140. *Location:* About 2 miles northwest of Bittinger, south of Bear Creek road—abandoned.  
*Elevation:* 2,540 feet.  
*Operators:* Christian Orendorff and Ernest Bowser.  
*Coal bed:* Brush Creek.
141. *Location:* About 2½ miles northwest of Bittinger, north of Bear Creek road—abandoned.  
*Elevation:* 2,700 feet (east opening).  
*Operator:* M. Lageer.  
*Coal bed:* Upper Kittanning.  
*Dip:* 4°, S. 55° E.  
*Section of bed:*
- |                   |               |
|-------------------|---------------|
| Sandstone top.    | <i>Inches</i> |
| Coal .....        | 39            |
| Claystone bottom. |               |
142. *Location:* About 1½ miles northwest of Bittinger, west bank of North Branch of Casselman River—abandoned.  
*Elevation:* 2,630 feet.  
*Name:* Clarence Wiley prospect.  
*Coal bed:* Harlem.
143. *Location:* About 1 mile northwest of Bittinger, north of North Branch of Casselman River—abandoned.  
*Elevation:* 2,500 feet.  
*Operator:* Clarence Wiley.  
*Coal bed:* Harlem.
144. *Location:* About 1 mile west of Bittinger, south of North Branch of Casselman River—abandoned.  
*Elevation:* 2,500 feet.  
*Coal bed:* Harlem.
145. *Location:* About 2 miles southeast of Jennings on Browning Bear Hill—abandoned.  
*Elevation:* 2,350 feet.  
*Operator:* Louis Hoover.  
*Coal bed:* Harlem.
146. *Location:* About 2 miles southeast of Jennings on Browning Bear Hill—abandoned.  
*Elevation:* 2,360 feet.  
*Name:* Louis Hoover prospect.  
*Coal bed:* Harlem.
147. *Location:* About 2 miles south of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,300 feet.
- Name:* Old Morgart No. 4 mine.  
*Coal bed:* Upper Bakerstown.
148. *Location:* About 1½ miles south of Jennings, east bank of South Branch of Casselman River—operating.  
*Elevation:* 2,280 feet.  
*Name:* Morgart or Allegheny mine No. 1.  
*Coal bed:* Lower Bakerstown.  
*Dip:* 5° N. 40° W  
*Section of bed (75 feet inby.):*
- |                   |               |
|-------------------|---------------|
| Shale top.        | <i>Inches</i> |
| Coal .....        | 30            |
| Claystone bottom. |               |
149. *Location:* About 1½ miles south of Jennings on Maynardier Ridge—abandoned.  
*Elevation:* 2,600 feet.  
*Name:* Warnick prospect.  
*Coal bed:* Barton.
150. *Location:* About 2 miles south of Jennings, east bank of South Branch of Casselman River—abandoned.  
*Elevation:* 2,300 feet.  
*Name:* Morgart No. 2 mine.  
*Coal bed:* Lower Bakerstown.
151. *Location:* About 2 miles south of Jennings, east of South Branch of Casselman River—abandoned.  
*Elevation:* 2,380 feet.  
*Operator:* Jess Bittinger.  
*Coal bed:* Lower Bakerstown.
152. *Location:* About 2 miles south of Jennings on Maynardier Ridge—abandoned.  
*Elevation:* 2,460 feet.  
*Name:* Brennaman prospect.  
*Coal bed:* Upper Bakerstown.
153. *Location:* About 2½ miles south of Jennings, west of South Branch of Casselman River—abandoned.  
*Elevation:* 2,360 feet.  
*Operator:* Fred Stein.  
*Coal bed:* Lower Bakerstown.
154. *Location:* About 2½ miles south of Jennings on Maynardier Ridge—abandoned.  
*Elevation:* 2,490 feet (west opening).  
*Name:* Old Brennaman mine.  
*Coal bed:* Lower Bakerstown.
155. *Location:* About 1½ miles south of Jennings on Maynardier Ridge—abandoned.  
*Elevation:* 2,520 feet.  
*Operator:* Jacob Kinsinger.  
*Coal bed:* Lower Bakerstown.
156. *Location:* About 2 miles southeast of Jennings on west slope of Meadow Mountain—abandoned.  
*Elevation:* 2,680 feet.  
*Name:* Morgart—clay stripping.  
*Coal bed:* Middle Kittanning (formerly named Upper Kittanning).  
*Dip:* 10°, N. 35° W.  
*Section of bed:*
- |                 |               |
|-----------------|---------------|
| Shale top.      | <i>Inches</i> |
| Bony coal ..... | 18            |
| Shale .....     | 9             |
| Bone .....      | 6             |
| Shale .....     | 1             |
| Bony coal ..... | 25            |
| Shale .....     | 1             |
| Bone .....      | 6             |
| Clay bottom.    |               |

157. *Location:* About 1½ miles northeast of Bittering, east bank of Casselman River—abandoned.

*Elevation:* 2,340 feet.

*Name:* Morgart No. 3 mine.

*Coal bed:* Upper Freeport.

*Dip:* 10°, N. 50° W.

*Section of bed (250 feet inby):*

	<i>Inches</i>
Shale top.	
Bone-----	2
Coal-----	46
Clay bottom.	

158. *Location:* About 1 mile northeast of Bittering on south bank of South Branch of Casselman River—operating.

*Elevation:* 2,400 feet.

*Name:* Broadwater mine.

*Owner:* George Diefenbaugh.

*Coal bed:* Lower Bakerstown.

*Dip:* 6°, W. 50° W.

*Section of bed:*

	<i>Inches</i>
Sandy shale top.	
Bone-----	3½
Coal-----	4
Bone-----	1
Coal-----	17½

159. *Location:* About 1 mile northeast of Bittering, south of North Branch of Casselman River—abandoned.

*Elevation:* 2,470 feet (east opening).

*Operators:* Sam Brennaman and Herman Opel.

*Coal bed:* Harlem.

as lessee, recorded at page\_\_\_\_, in Book \_\_\_\_\_ records of said county.

3. The Owner grants to the Government the right to enter upon said parcel of land to investigate coal deposits therein. If the investigation of the area referred to in Article 1 is begun within one year from the date of this agreement, the right granted to the Government to enter upon the Owner's parcel and to investigate coal deposits therein shall continue until the Government has performed the minimum of work within the area specified in Article 1, and for as long thereafter as the Government continues its investigation of the area until \_\_\_\_\_, 19\_\_\_\_. The operations of the Government may or may not extend onto the Owner's parcel, the consideration for this agreement being the potential benefits to the Owner from the investigation of the area.

4. If, in its investigation of the area the Government's operations do extend onto the Owner's parcel, the Government may do all things customary and reasonably necessary for that purpose including prospecting, drilling, boring, and otherwise exploring, and the construction, maintenance, and repair of camp buildings, mining structures and appurtenances, all at such locations on the land as the Government may choose. The Government may use any existing mine workings, machinery, equipment, water, and facilities now on the Owner's parcel or appurtenant thereto to the extent that such use shall not unreasonably interfere with any operations of the Owner thereon. The Government may remove samples of coal at such points and in such quantities as it deems desirable for testing purposes. All tools, equipment, structures, and improvements, placed in or upon the property by the Government shall remain its property and may be removed by it at any time. The Government shall not be required to make any restoration of the premises nor shall it be liable in damages on account of reasonable use of the land under the terms of this agreement.

5. When the Government shall have completed within the area the minimum of work specified in Article 1, all coal thereafter produced or mined from the Owner's parcel of land shall be subject to a royalty of 5 mills per ton of 2,000 pounds which the Owner agrees to pay to the Government, as follows: Quarterly, on or before the 10th day after each third month for coal produced or mined the previous quarter. Each payment shall be accompanied by a true statement of account supporting the amount paid.

6. The royalty above provided for shall be and is declared to be a lien upon all of the Owner's right, title, and interest in the coal in or extracted or removed from the said parcel. The Owner shall keep and maintain adequate books, records, and account relating to its obligations under this agreement. The Government shall have the right at all reasonable times to enter upon the land and observe, inspect, and check all operations, and may inspect the production, shippings and other pertinent records covering the Owner's obligations hereunder.

7. Any lease, sublease, assignment, mortgage, grant, or other conveyance of said parcel or any interest therein, made while this agreement is in effect, shall be subordinate and subject to this agreement and shall expressly refer to and be made subordinate and subject to this agreement, and shall contain a provision that the lessee, sublessee, assignee, grantee, or other transferee assumes and agrees to be bound by all of the terms and conditions of this agreement.

8. The Government shall furnish the Owner with a report of the factual data obtained by it from operations hereunder.

**AGREEMENT FOR INVESTIGATION OF COAL DEPOSITS**

THIS AGREEMENT, entered into this \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_\_\_, between the United States of America acting through the Department of the Interior, Bureau of Mines, hereinafter called the "Government" and \_\_\_\_\_

hereinafter called the "Owner", \_\_\_\_\_

WITNESSETH, that the parties hereto mutually agree as follows:

1. The Government represents that it is considering making an investigation of coal deposits in the following described area:

Castleman Coal Basin, Garrett County, Maryland; bounded on the north by U. S. Highway 40, on the south by a road running east and northwest through Bittering, on the west by Negro Mountain and on the east by Meadow Mountain

and undertakes that if it does begin such investigation within 1 year from the date of this agreement, it shall thereupon prosecute such operations with reasonable diligence and shall perform the following minimum of work within the area:

If the Government does not begin the investigation of the area within one year from the date of this agreement, this agreement shall be of no further force or effect.

2. The Owner represents and undertakes that it is the owner in fee, including all mineral and subsurface rights, of that certain parcel of land within the above described area, in the County of \_\_\_\_\_, State of \_\_\_\_\_, described as follows:

subject to a lease dated \_\_\_\_\_, to \_\_\_\_\_

9. No Member of or Delegate to Congress, or Resident Commissioner, shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

10. This agreement shall be binding upon the heirs, executors, administrators, successors, and assigns of the Owner.

IN WITNESS WHEREOF the parties hereto have executed this agreement on the day and year first above written.

UNITED STATES OF AMERICA  
By \_\_\_\_\_  
\_\_\_\_\_

Owner

I, \_\_\_\_\_, certify that I am the  
\_\_\_\_\_ secretary of the corporation

named as owner herein; that \_\_\_\_\_  
\_\_\_\_\_ who signed this contract on behalf of the  
owner, was then \_\_\_\_\_ of said corpo-  
ration; that said contract was duly signed for and in  
behalf of said corporation by authority of its governing  
body, and is within the scope of its corporate powers.

\_\_\_\_\_ [Corporate Seal]

State of \_\_\_\_\_ }  
County of \_\_\_\_\_ }

Before me, \_\_\_\_\_, on  
this day personally appeared \_\_\_\_\_  
\_\_\_\_\_ known to me (or, proved to me on the oath  
of \_\_\_\_\_) to be the person  
whose name is subscribed to the foregoing instrument,  
and acknowledged to me that he executed the same for  
the purposes and consideration therein expressed.

Given under my hand and seal of office this \_\_\_\_\_  
\_\_\_\_\_ day of \_\_\_\_\_, 194\_\_\_\_.

