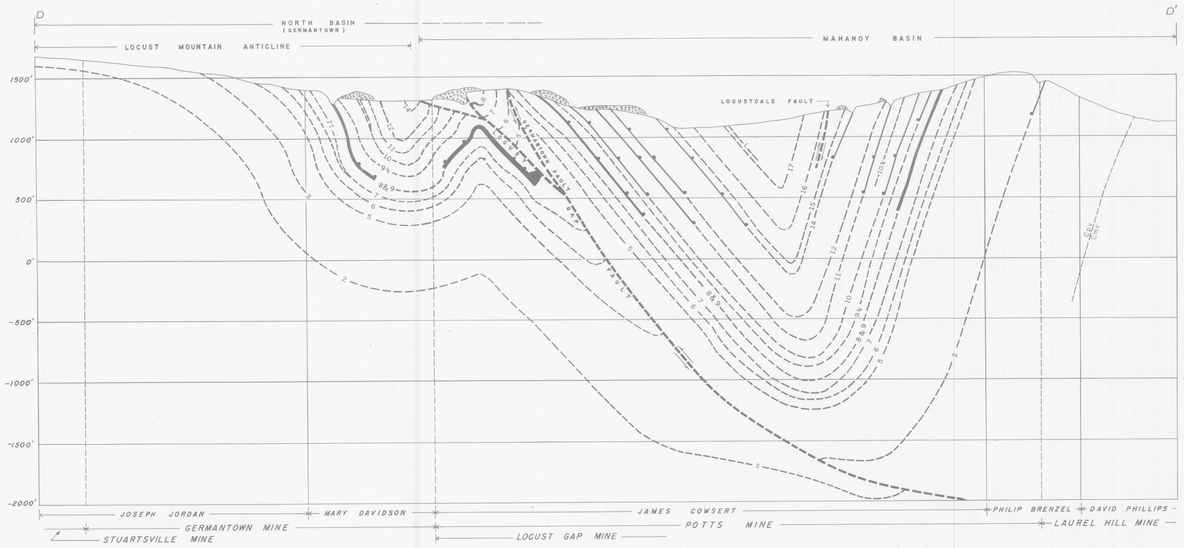
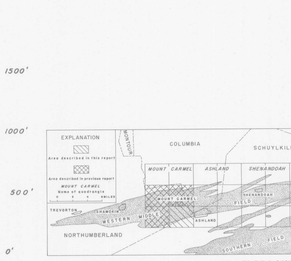
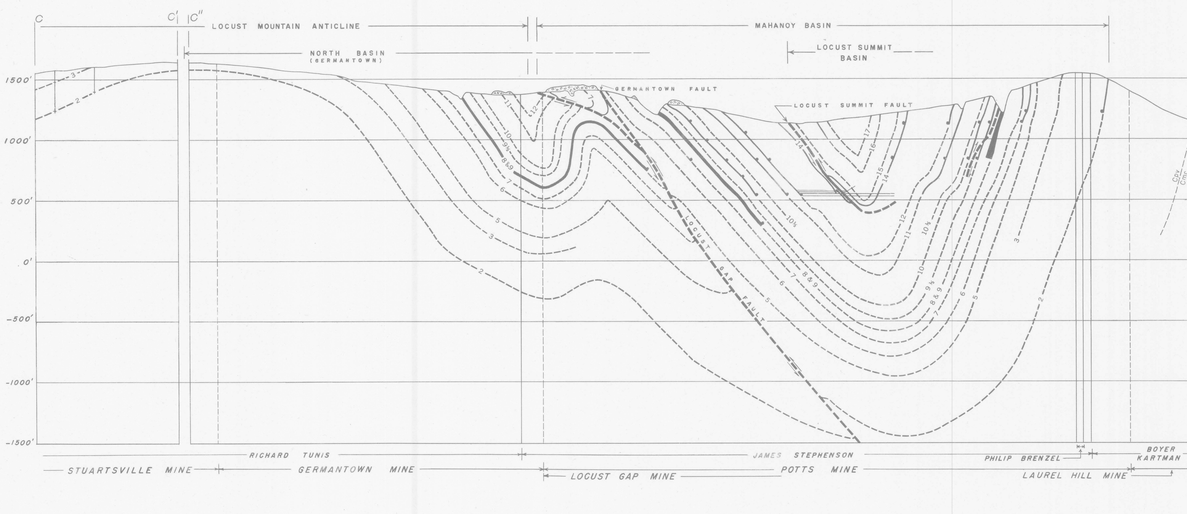
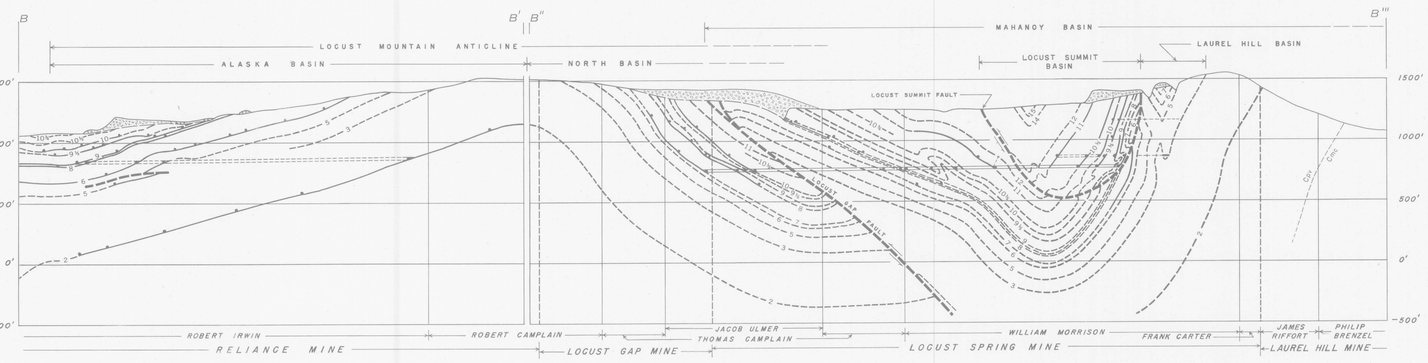


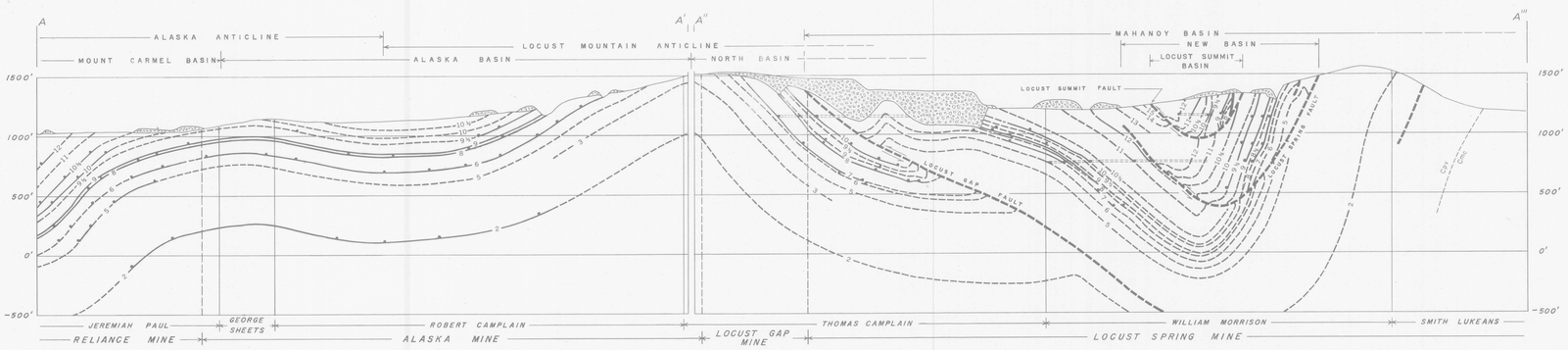


INDEX MAP OF THE WESTERN MIDDLE ANTHRACITE FIELD SHOWING THE LOCATION OF THE MAPPED AREAS





INDEX MAP OF PENNSYLVANIA SHOWING THE LOCATION OF THE ANTHRACITE FIELDS



CROSS SECTIONS SHOWING THE STRUCTURE OF THE COAL BEDS IN THE SOUTHEASTERN PART OF THE MOUNT CARMEL QUADRANGLE

SCALE 1:6000

500 0 500 1000 2000 3000 Feet

Datum is mean sea level.

Prepared in 1950 from data supplied by the Raven Run Coal Co., Lehigh Valley Coal Co., and the Philadelphia and Reading Coal and Iron Co., with modifications by the U. S. Geological Survey.

GEOLOGY OF ANTHRACITE IN THE SOUTHEASTERN PART OF THE MOUNT CARMEL QUADRANGLE, PENNSYLVANIA

INTRODUCTION

This report is the fourth in a series describing the coal deposits of the anthracite fields of Pennsylvania. The three previous reports—Maps C5, C7, and C10 (Rothrock et al., 1950a, 1950b)—and this report of the U. S. Geological Survey's Coal Investigations series complete the general description of the anthracite fields in the Mount Carmel quadrangle.

The Mount Carmel quadrangle is near the center of the Western Middle Anthracite field in the Appalachian Mountains in the east-central part of Pennsylvania. (See index maps of Pennsylvania and the Western Middle field, sheet 3.) The southeastern part of the Mount Carmel quadrangle is about 100 miles northwest of Philadelphia, which is Northumberland County; the remainder is in Columbia and Schuylkill Counties. The town of Mount Carmel is in the southeastern boundary of the area; Locust Gap and Locustdale are near the western and eastern boundaries, respectively.

This report has been prepared as aid in planning exploration, development, and mining operations by showing: (a) the location of all known coal outcrops (sheet 1), (b) the depth, pitch, and other structural features of representative coal beds (sheet 2), (c) the normal and reverse faults, known mines, and the stratigraphic relationships between the various coal beds (sheets 1, 2, and 3), (d) the stratigraphy and generalized lithologic coal beds (sheet 3), and (e) a standard nomenclature of the coal beds (sheet 3).

The information presented in this report was obtained in part from actual and theoretical data shown on mine maps, cross sections, core drill records, and other information made available by the Philadelphia and Reading Coal and Iron Co., the Raven Run Coal Co., the Lehigh Valley Coal Co., and by John F. Beasley, State Mine Inspector.

STRATIGRAPHY

Rocks of the Carboniferous and Quaternary systems crop out in the mapped area. The Carboniferous rocks are, in ascending order, the upper part of the Mauch Chunk formation (Mississippian series), the Pottsville formation, and the lower part of the Conemaugh formation (Pennsylvanian series). Alluvium has been deposited along streams upon the eroded surface of these Carboniferous rocks. (See columnar sections, sheet 3.)

MISSISSIPPIAN SERIES

Mauch Chunk formation

The Mauch Chunk formation consists predominately of lenticular fine-grained sandstone and shale and siltstone with occasional thin beds of red claystone. Along Big Run, about a quarter of a mile east of the area, the upper 100 ft of the section is red, conglomerate and sandstone and siltstone make up 80 percent of the expenses and red claystone the remainder.

The Mauch Chunk formation crops out in the southern part of the area only. Its contact with the overlying Pottsville formation is concealed beneath alluvium and is not shown on the mapped area, consequently the exact thickness of the formation is not known. The top of the formation is gradational with the overlying Pottsville formation, and the contact is mapped at that horizon below which the beds are predominantly red and above which they are predominantly gray, green, or brown.

PENNSYLVANIAN SERIES

The Pennsylvanian series is composed of conglomerate, sandstone, siltstone, claystone, and coal. The coal beds are the most persistent of these rock types. They vary in thickness rapidly in lithologic both vertically and laterally.

Pottsville formation

The Pottsville formation, which conformably overlies the Mauch Chunk formation, includes the oldest Pennsylvanian rocks in the area. This formation is composed mainly of conglomerate, interbedded with subordinate amounts of gray, green, or brown siltstone and sandstone. Siltstone and sandstone are most abundant in the lower part of the formation. The conglomerate pebbles consist mainly of milky quartz, quartzite, black and dark-green chert, black and brown claystone, and gray or green sandstone in a well-indurated, medium-grained sand matrix. Red siltstone and sandstone pebbles are common in the lower part of the formation. The formation is characterized by abrupt lateral changes in thickness, which are caused by the irregular erosional surface on which the Pottsville rests. The thickness of the Pottsville formation in the mapped area ranges from 900 to 1,600 ft.

The Lykens Valley No. 2 coal is the only persistent coal bed in the Pottsville formation within the mapped area. Two coal beds of local importance occur above the Lykens Valley No. 2 coal.

Allegheny formation

The Allegheny formation, which conformably overlies the Pottsville formation, contains the most important coal beds in the area. The base of the Allegheny is placed at the bottom of the Buck Mountain (No. 5) coal bed (White, 1900, p. 416). Other important coal beds in this formation in upward succession are as follows: the Seven-foot (No. 6), Skidmore (No. 7), Mammoth zone (Nos. 8, 8½, and 9), and the Four-foot (No. 9½) beds. Conglomerate, sandstone, siltstone, claystone, and coal beds of lesser importance separate these major coal beds. In some places a light-brown siltstone containing large round ironstone concretions occurs at the base of the Mammoth. Boroon Split (No. 10) coal bed and can be used for correlation. A massive-bedded conglomeratic sandstone above the Mammoth Top Split (No. 9) coal bed is also locally useful for correlation. The Allegheny formation ranges in thickness from 347 ft in the northwestern corner of the area to nearly 600 ft in the east-central part.

Conemaugh formation

The Conemaugh formation lies conformably on the Allegheny formation. At the base of the Conemaugh is the Holmes (No. 10) coal bed (Lesley, 1917, p. 46). Seven persistent coal beds and several local coal beds occur in the lower part of the formation. These beds are separated by beds of sandstone, siltstone, and claystone; lenticular beds of conglomerate occur above the Holmes, Little Orchard, and Little Tracy coal beds. (See columnar section, sheet 3.) The upper part of the formation has been eroded, leaving only the lower 1,100 ft in the area covered by this report.

QUATERNARY DEPOSITS

Unmapped deposits of boulders, gravel, sand, and silt occur in the valleys but are covered in many places by refuse from the mines and breakers.

STRUCTURE

Each of the Pennsylvania anthracite fields is a compound syncline consisting of a group of roughly parallel overlapping folds, some of which have been faulted. The general trend of these folds is northeastward. The synclines are called basins by the miners, a practice that is followed in this report. The term generally designates a complete structural unit bounded by adjacent anticlines, but it is also sometimes applied to the structural part of a faulted syncline, as in the North, New, and Locust Summit basins. (See cross section A''–A''' and B''–B''', sheet 3.)

The mapped area includes the south half of the composite syncline that is the Western Middle field and extends south of the coal-bearing rocks to include part of the non-coal-bearing anticline between the Western Middle and the Southern anthracite fields. Measurements on the Lykens Valley No. 2 coal bed show a maximum structural relief of approximately 1,700 ft, as measured in the North basin from a point 1,000 ft below sea level on the projection of the coal bed to 1,700 ft above sea level on the Locust Mountain anticline. (See cross section D-D', sheet 3.)

FOLDS

The folds in the area are asymmetrical, with both northward- and southward-dipping axial planes. Some of the folds are obvious, as exemplified by the Alaska basin in the north (cross section A''–A''', sheet 3), others are acute, as exemplified by the Mahanoy basin in the south (cross section D-D').

The principal basins, listed from north to south, are the Mount Carmel, Alaska, North, and Mahanoy basins. The Mount Carmel basin, of the Mount Carmel basin-syncline in southwest corner of the area, is a southward-dipping syncline that extends south of the Mount Carmel basin, is a southwestward-plunging syncline that dies out in the southwestern part of the mapped area. The North basin, a prominent structure in this part of the Mount Carmel quadrangle, extends across the mapped area. It is essentially the north limb of a basin that has been truncated by the Locust Gap fault. The limb has been folded into minor anticlines and synclines, to which such local names as Germantown basin and North basin have been applied. The syncline south of the Locust Gap fault, the Mahanoy basin, is the largest in the area. It is an asymmetrical syncline that plunges eastward, being 300 ft deeper in the eastern part of the area than in the western part. The Mahanoy basin is complicated by close folding and thrust faulting that has formed the New, Locust Summit, and Laurel Hill basins. These subsidiary basins die out eastward as displacements on the Locust Spring and Locust Summit faults, which in turn decrease until they eventually merge into the limbs of the Mahanoy basin.

FAULTS

Most faults in the area are thrusts and are the result of compression. The largest faults are longitudinal and are parallel with the strike of the folds. The more prominent of these is the Locust Gap fault, which traverses the entire area; others of importance are the Germantown, Locust Spring, Locust Summit, and Locustdale faults. The Locust Gap fault cuts the beds at angles ranging from less than 1° to more than 15° and displaces them as much as 2,000 ft. Folding subsequent to the development of this fault has tilted the fault plane so that at depth it now dips steeply (from 15° to the western part of the area to almost 60° S. in the eastern part of the area. The Germantown fault, and other faults that are parallel to the Locust Gap fault, apparently formed in the eastern part of the area as the Locust Spring and Locust Summit faults developed.

The Locust Spring fault, a prominent feature in the southeastern part of the Mount Carmel quadrangle, and the Locust Summit fault, prominent in the western part of this area, are both dominantly plunging thrust faults that have been folded in such a manner that the northdipping side is generally a normal fault. The authors interpret the Locust Spring and Locust Summit faults as hinge faults that rotated about an area of no displacement at their eastern ends.

The Locustdale fault in the east-central part of the area represents another type of longitudinal fault. It is a high-angle shear resulting from compression of the strata in the center of the folds. This fault, which transects the beds at angles ranging from less than 1° to almost 15°, is a north-dipping reverse fault along which younger beds in the hanging wall are uplifted with respect to the older beds in the footwall.

Oblique faults which are so nearly parallel with the bedding that they cut only a few coal beds occur at angles of about 45° to the trend of the major folds. Compared with the longitudinal faults they have small displacements, but they are important in mining. Some have caused slear zones, in which the coal is sheared and crushed to such an extent that mining is not profitable, or pinch faults, in which the coal is squeezed out from between the top rock and the floor rock.

NOMENCLATURE AND CORRELATION OF THE COAL BEDS

Coal beds in the anthracite fields are generally known as veins, following very early custom. As the veins, "in geology, mean, when applied to tabular mineral deposits that are foreign to, and younger than, the rocks in which they occur," the term is not applicable to the coal beds. In this report, the coal beds are designated by names or numbers, or by both, but the nomenclature has not been standardized. In the early days of mining, different names were given to beds in isolated mines and no correlation was attempted. Some of the early erroneous correlations have been corrected but many problems of correlation still exist because of gaps between mine workings, complexity of structure and lithology, the scarcity of outcrops, and the difficulty of changing established records.

The names of the coal beds used in this report conform to the consensus of usage among operators and to the recommendations of the previous reports of this series. These names do not necessarily agree with those used in the reports of the Second Geological Survey of Pennsylvania which confounded to local usage only (Ashburner, 1883, p. 86).

DESCRIPTION OF THE COAL BEDS

The coal beds in the mapped area occur in the upper half of the Pottsville formation, throughout the Allegheny formation, and in the lower part of the Conemaugh formation. (See columnar sections, sheet 3.) The younger coal beds that occur elsewhere in the anthracite fields have been removed by erosion from this area.

Natural outcrops of coal are seldom found because of the cover of soil. The outcrops shown on sheet 1 indicate the positions on the surface of the ground that the coal would occupy if it were projected through this cover. This position may not agree with libraries of weathered coal that are occasionally seen because such blocks, affected by creep of the weathered soil, occur at various distances down the slope from their original position. Explorations for the unweathered coal, therefore, should be started at positions of the outcrops shown on the map and extended in the direction of dip of the strata.

Coal beds less than 3½ ft (36 in.) thick are generally not recorded in this report. Unmapped coal beds 18 in. or more thick, that occur within a relatively small area and are not branches or splits from named beds, are herein termed "local" beds, and are shown on sheet 3 only when mined or located by prospecting. Outcrops of such local beds are persistent beds are shown for long distances beyond any known point of mining, but their continuity between outcrops and the position of the horizon of the bed but do not signify that the bed is necessarily minable throughout this extent.

INTERVALS BETWEEN COAL BEDS

The intervals between the coal beds vary considerably. The interval between the No. 8 and No. 7 coal beds thickens eastward from 190 ft in the western part of the area to 360 ft in the eastern part, and the interval between the No. 8 and the No. 2 coal beds thickens from 700 ft in the north to 880 ft in the south. The splitting and merging of the Mammoth coal zone and the occurrence of local beds above the Mammoth zone account for the greatest variations, but no regular trend has been observed.

THICKNESS OF THE COAL BEDS

The coal thicknesses shown in this report were obtained chiefly from underground measurements made by the operators. These measurements, selected from a great many such observations, were chosen so as to reflect the minimum thickness of the bed and by included coal in amounts not greater than 1 foot. Where possible, at least three measurements were averaged for each coal bed. Measurements that were obviously affected by local conditions, such as those affected by deformation, such as faulting, pinching, or swelling, were not used; hence, extreme dimensions of the bed are not included. The following table shows the average and range of thickness of these coal seams in the mines of the mapped area. These figures generally are in agreement with the thickness of the coal beds shown in the columnar sections, but not necessarily so, because the columnar sections represent only parts of the area and contain outcrop data, extreme measurements in mines, and other data that may have been excluded from the thickness in the coal seam within the mines.

AVERAGE AND RANGE OF THICKNESS OF COAL BEDS MINED IN THE SOUTHEASTERN PART OF THE MOUNT CARMEL QUADRANGLE

Bed number	Bed Thickness: Average	Bed Thickness: Range	Coal Thickness: Average	Coal Thickness: Range	Percentage of refuse
	Ft In.	Ft In. – Ft In.	Ft In.	Ft In. – Ft In.	
17	4 8	3 – 6	4 8	3 – 6	14.6
16	4 0	2 6 – 8 4	3 0	1 8 – 4 0	25.0
15	5 5	3 1 – 8 00	5 10	3 1 – 8 00	17.6
14	7 7	3 7 – 12 10	5 4	2 4 – 9 5	29.5
13	4 6	2 00 – 7 2	3 10	1 8 – 6 2	19.6
12	6 5	3 0 – 10 1	5 1	1 8 – 7 8	22.2
11	8 8	4 0 – 15 0	5 8	2 0 – 9 0	34.2
10½	8 8	4 5 – 12 10	5 7	1 10 – 5 5	35.0
10	5 3	3 0 – 8 0	3 10	2 0 – 5 0	26.8
10½	4 5	3 9 – 5 4	3 11	2 4 – 5 4	12.5
10	5 1	4 9 – 11 0	4 4	3 0 – 8 11	14.7
9½	4 6	2 7 – 12 1	3 8	0 9 – 9 11	17.7
9	9 5	5 11 – 18 6	6 6	1 11 – 15 1	0.5
8½	10 11	4 1 – 18 7	5 8	1 7 – 16 8	14.6
8	8 11	3 0 – 16 6	7 7	2 10 – 16 1	14.6
8 and 9	18 4	4 10 – 37 0	10 6	4 8 – 37 0	19.7
7	7 7	1 0 – 14 1	5 6	0 10 – 9 7	17.6
6	5 9	1 11 – 9 9	4 4	0 7 – 6 10	20.5
5	5 11	1 8 – 9 1	5 3	0 5 – 8 9	10.7
3					
2	5 1	2 0 – 10 6	4 8	1 0 – 10 6	7.8

COAL BEDS OF THE POTTSVILLE FORMATION

Lykens Valley No. 2 coal bed

The Lykens Valley No. 2 coal bed, the oldest coal bed in the mapped area, crops out on the south side of Mahanoy Mountain, in the southern part of the area. The No. 2 bed contains less than 8 percent refuse, which is less than any other coal bed in the area covered by this report. It is mined in the southwestern part of the area in the Reliance and Alaska mines and has been mined both underground and by stripping methods in the Laurel Hill mine on the south flank of Mahanoy Mountain. Thickness of the bed was obtained only for the Alaska-Reliance mine area, where the bed averaged about 5 ft. In the southwestern part of the mapped area a bed designated as 2L occurs from 2 to 12 ft above the Lykens Valley No. 2 coal, and is probably the same bed as one that occurs in a similar position in the adjoining area to the west.

Whites (No. 3) coal bed

The Whites (No. 3) coal bed, which lies about 200 ft above the Lykens coal, crops out on both sides of Locust Mountain in the south, and along the crest of Mahanoy Mountain in the south. The bed has not been mined in the mapped area but it has been run in been holes in the Stracenville and Locust Spring mines. No reliable data on thickness of the coal are available in the authors.

COAL BEDS OF THE ALLEGHENY FORMATION

Buck Mountain (No. 5) coal bed

The Buck Mountain (No. 5) coal, at the base of the Allegheny formation, crops out on both flanks of the Locust Mountain anticline, in the Mahanoy basin, and in the Laurel Hill basin, where it has been extensively strip-mined. This bed was mined underground in the Reliance mine and in Brenner's tunnel. The Buck Mountain bed is the only major coal bed with more than 40 percent refuse. The thickness of the No. 5 bed is especially variable, ranging from 1 ft 6 in to 13 ft 3 in. within the mapped area.

Seven-foot (No. 6) coal bed

The interval between the Seven-foot (No. 6) coal bed and the Buck Mountain coal bed increases northeastward from 75 to 95 ft in the southern part of the area to a maximum of 120 ft in the northwestern part. The Seven-foot coal bed crops out on both sides of Locust Mountain and on the north side of Mahanoy Mountain. It has been mined extensively strip-mined on the north side of Locust Mountain and has been strip-mined in conjunction with the Buck Mountain bed on the south side of Mahanoy Mountain. The bed also crops out in the west-central part of the area, south of the Locust Gap fault in the Mahanoy basin.

The Seven-foot coal has been mined underground in the northwestern part of the area in the Alaska basin, in the east-central part of the Mahanoy basin, and in the Laurel Hill mine. This bed is thicker in the northwestern and southeastern parts of the mapped area and thinnest in the northeastern part. The Seven-foot coal bed ranges from 1 ft 11 in. to 9 ft 9 in. in thickness in the mapped area and contains an average of 20 percent refuse.

Skidmore (No. 7) coal bed

The Skidmore coal bed, which is separated from the Seven-foot coal bed by 60 to 100 ft of sandstone and claystone, crops out in all the basins in the mapped area. In the eastern part of the Locust Spring mine these splits of the Skidmore bed have been mined, and terracing and independent mining has exposed two splits in the western part of the Germantown mine. The Skidmore has been mined underground in the Locust Spring, Locust Gap, and Potts mines, where the bed ranges in thickness from 1 ft 8 in. to 10 ft 3 in. and has an average refuse content of 27.6 percent.

Mammoth coal zone

The base of the Mammoth coal zone is 215 ft stratigraphically above the Buck Mountain coal bed. This interval, however, tends to increase in the eastern part of the mapped area. The Mammoth coal zone in this area contains, in ascending order, of the Boroon Split (No. 6) coal, the Middle Split (No. 8½) coal, a local coal bed called the Local Split (No. 9½) coal, and the Top Split (No. 9) coal. The splits are separated by claystones; the intervals between the Middle Split and the Top and Boroon Splits of the zone vary considerably throughout the area. In some localities the Middle Split and Top Split were recorded and mined as one bed, and in other places the Middle Split and Boroon Split appear to merge. In many places the pairings between the splits are so thin that the entire Mammoth zone is mined as one bed, as in parts of the Locust Spring, Locust Gap, Potts, and Germantown mines. In such places thicknesses as great as 37 ft are recorded. The average thickness of the coal in the zone, exclusive of waste and partings, is 12 ft 6 in.

Mammoth Bottom Split (No. 8) coal bed. The Boroon Split (No. 8) coal crops out in all the basins in the mapped area and has been extensively strip-mined. It is mined underground in the Locust Spring, Locust Gap, Alaska, and Reliance mines, where it has been mined in places from 3 ft to 12 ft 6 in. The average thickness of the bed is about 9 ft and contains 15 percent refuse.

Mammoth Middle Split (No. 8½) coal bed. The Mammoth Middle Split coal bed, where it is mined separately, is from 10 to 50 ft above the Mammoth Bottom Split coal bed. The Middle Split crops out in the Mahanoy and Reliance basins in the southwestern part of the mapped area. It is 1 ft 7 in. to 10 ft 8 in. thick in the Locust Spring mine, where it is mined as a separate bed.

Local Split (No. 9½) coal bed. In the southwestern part of the mapped area, the Local Split, or Top Split, a local coal bed called the No. 9½ by the authors, has been recognized but has not been mined. Immediately west of the mapped area, this local bed was mined by underground methods and by surface stripping. As no corresponding coal is found elsewhere in the mapped area, it is assumed that the No. 9½ coal merges into the No. 9 coal to the east.

Mammoth Top Split (No. 9) coal bed. The Mammoth Top Split (No. 9), when present as a separate bed, lies approximately 50 ft stratigraphically above the Mammoth Bottom Split. Where the Middle Split is present, the Top Split may be as much as 100 ft above the Bottom Split. The Top Split crops out on the south flank of Locust Mountain and in the central part of the mapped area in the Locust Summit and Mahanoy basins. In the Locust Spring, Locust Gap, Alaska, and Reliance mines the bed, as shown by mining records, is 5 ft 1 in. to 17 ft 6 in. thick, and the included coal has an average thickness of 8 ft 6 in.

Four-foot (No. 9½) coal bed

The Four-foot coal bed lies 50 to 100 ft stratigraphically above the bottom of the Mammoth coal zone. The larger mineral is in the Mahanoy and Locust Summit basins, where it has been cut in tunnels, conglomerate, and in the Locust Spring mine and has been mined in all the basins in the mapped area and has been mined locally in the Germantown, Potts, Alaska, and Reliance mines. The coal ranges in thickness from 3 inch seams to nearly 10 ft. The average thickness of the bed in the mines is 4 ft 6 in., of which 18.2 percent is refuse.

Holmes Leader (No. 10½) coal bed

The Holmes Leader is a local coal bed that lies on the south dip of the Mahanoy basin in the southeastern part of the mapped area. The bed has not been mined but has been cut in tunnels in the Potts mine, and occurs 10 to 20 ft under the Holmes (No. 10) coal bed in that area. No information regarding thickness of bed or coal is available.

Holmes (No. 10) coal bed

The Holmes (No. 10) coal bed, at the base of the Conemaugh formation, ranges from 100 to 250 ft above the bottom of the No. 8 coal bed. The Holmes coal, which, next to the Mammoth coal zone, is the most extensively mined bed in the area, crops out in all of the major basins. It is mined in the Alaska, Reliance, Locust Spring, Locust Gap, Potts, and Germantown mines, where the average thickness of the bed and its included coal is 5 ft 1 in. and 4 ft 4 in., respectively.

Holmes Top Split (No. 10?) coal bed

A local bed, the Holmes Top Split (No. 10?) coal, splits from the Holmes coal bed in the central part of the area. It has been found in an exploration trench south of the Mammoth shaft of the Germantown mine and in diamond drilling in the same area. The Holmes Top Split has been mined locally, but no information on thickness is available. Drill hole records show coal 4 ft 2 in. thick.

Rough (No. 10½) coal bed

The Rough (No. 10½) coal bed, which is about 60 ft stratigraphically above the Holmes coal, is not a persistent bed. It crops out in the Alaska basin northwest of Locust Mountain, where it has been stripped, and also crops out in the Mahanoy, Locust Summit, and New basins. The Rough coal has been mined underground in the northwestern part of the area and in the Mahanoy and Locust Summit basins. The average thickness of the coal in this bed in the mined area is about 4 ft.

Local (No. 10¾) coal bed

The Local (No. 10¾) coal bed is mined in the southwestern part of the mapped area and in the east-central part of the Mount Carmel quadrangle (Rothrock et al., 1951). A bed that is correlated with the Local coal crops out on the south side of Locust Mountain and on the north side of Mahanoy Mountain. The average thickness of the bed in the mined area is 3 ft 0 in., and 40 percent of this is refuse.

Primrose (No. 11) coal bed

The Primrose (No. 11) coal bed is about 150 ft stratigraphically above the Holmes coal bed in the western part of the area and 130 to 170 ft above it in the eastern part. This thinning of interval, which continues eastward into the adjoining area, is accounted for by lensing of the conglomeratic beds above the Holmes. The Primrose crops out in all the major basins in the area except the Alaska basin; it has been mined in the Potts, Locust Spring, Locust Gap, and Germantown mines. The Primrose is one of the lower coal beds in the area and averages about 8 ft in thickness, with little waste.

Orchard (No. 12) coal bed

The Orchard (No. 12) coal bed is 80 to 100 ft stratigraphically above the Primrose coal. The intervening rock is mostly claystone. The Orchard coal crops out in the North, Mahanoy, and Mount Carmel basins and has been mined underground in the Potts, Locust Spring, and Reliance mines. This coal bed is locally 16 ft 1 in. thick, but its average thickness is only 4 ft 5 in.

Little Orchard (No. 13) coal bed

The Little Orchard (No. 13) coal bed is about 130 ft stratigraphically above the Orchard coal in the western part of the area, but this interval thins to 60 ft in the east. The intervening strata consist of claystones and sandstones. The Little Orchard crops out in the North, Mahanoy, and Locust Summit basins, where it has been cut in tunnels. It has been mined in the Potts and Locust Spring mine and has been mined in the Potts mine. The average thickness of the bed in the mined area is 6 ft 6 in., 15.3 percent of which is waste.

Diamond (No. 14) coal bed

The Diamond (No. 14) coal bed lies 130 ft stratigraphically above the Orchard coal. In the mapped area the Diamond occurs in the New, Locust Summit, Mahanoy, and Germantown basins and is mined in the Germantown, Locust Spring, and Potts mines. The bed is 3 ft 5 in. to 12 ft 10 in. thick and contains 10 percent of waste.

Little Diamond (No. 15) coal bed

The Little Diamond (No. 15) coal bed occurs about 20 ft above the Diamond coal in a tunnel and in local workings in the Locust Spring and Potts mines, where the coal averaged 2 ft 10 in. in thickness.

Tracy (No. 16) coal bed

The Tracy (No. 16) coal bed lies approximately 100 ft stratigraphically above the Diamond coal bed in the eastern part of the Mahanoy basin. The Tracy coal has been mined underground in small areas in the Potts and Locust Spring mines. The average thickness of the Tracy bed in this area is 4 ft, 25 percent of which is refuse.

Little Tracy (No. 17) coal bed

The Little Tracy (No. 17) coal bed is the youngest coal in the mapped area. It occurs in the southeastern part of the area in the Mahanoy basin where it is approximately 200 ft stratigraphically above the Tracy coal. The Little Tracy has not been mined but has been cut in diamond-drill holes in the area and in the Keystone water-level tunnel. Core-drill records show the bed to be 4 ft 8 in. thick and the included coal to be 4 ft 3 in. thick.

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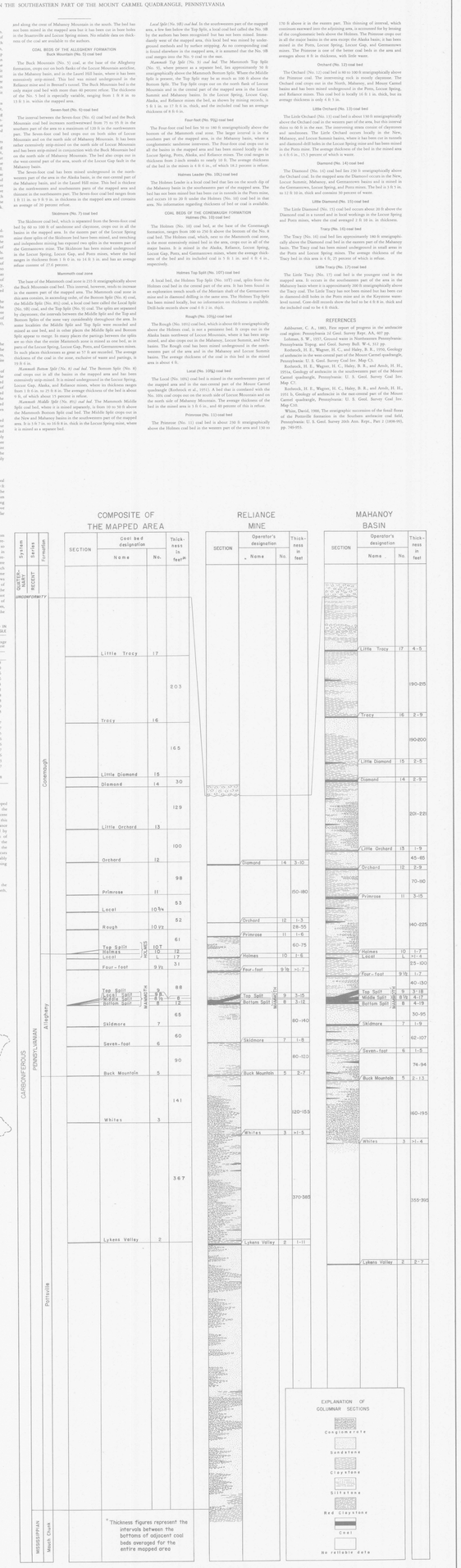

COLUMNAR SECTIONS

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.

GEOLOGY OF ANTHRACITE IN THE SOUTHEASTERN PART OF THE MOUNT CARMEL QUADRANGLE, PENNSYLVANIA

By
Howard E. Rothrock, Holly C. Wagner, Boyd R. Haley and Harold H. Arndt

1953

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