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James F. Woodward, Secretary

BUREAU OF TOPOGRAPHIC AND GEOLOGICAL SURVEY
George H. Ashley, State Geologist

COAL BEDS IN CAMBRIA COUNTY, PENNSYLVANIA

By

J. D. Sisler

Introduction.

Cambria County ranks fourth in Pennsylvania as a producer of bituminous coal. It ships more bituminous coal for export than any other county in the State. A large quantity also is distributed by boat and rail along the Atlantic Coast. Its central location in the smokeless steam coal district of the State, its fine transportation facilities, and the great demand for the excellent coal, which, for its type, is the best in the State, increased the Cambria County production in 1918 to 20,569,253 tons; valued at \$60,909,198. The quantity made into coke was 1,260,038 tons, valued at \$3,625,612; 18,141,677 tons valued at \$54,055,305 were loaded at the mines for shipment, 881,503 tons were sold to local trade and used by employees, and 286,035 tons were used at the mines for steam and heat.

Cambria County is one of the few counties in the bituminous coal region having four important coal beds. These beds have good thickness in different parts of the county, and also are exceptionally free from impurities and remarkably uniform in composition. Cambria County has at least 24 recognizable coal beds including four important ones and five others which are workable locally; the rest are very thin. The total average thickness of all the beds is about 40 feet.

Although Cambria County has been a large producer for many years, there are enormous reserves of good coal just being prospected by the core drill. The coals still untested by the drill may be expected to maintain the thickness and quality shown in adjoining areas where they are now mined.

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Cambria County lies west of Allegheny Mountain. It is bounded on the north by Clearfield County, on the east by Blair County, on the south by Somerset County and on the west by Westmoreland and Indiana counties. It is roughly a parallelogram in shape, with the long sides on the east and west. The average width of the county is 20 miles, and the length 34 miles. Its area is about 717 square miles, and its population in 1920 was 197,839.

The coal is transported entirely by railroad and highway. The railroads of Cambria County are one of the greatest assets of its coal trade. The main line of the Pennsylvania Railroad follows Conemaugh River across the county. That line, with its branches to the mining towns, gives the best of facilities for moving coal to eastern cities, tide water, the Central States, and lake trade. The Baltimore and Ohio Railroad running from Johnstown to the main line at Rockwood is another direct route to both eastern and western coal trade centers. The New York Central and Hudson River railroad carries Cambria County coal north to the counties in Pennsylvania which are barren of coal, to New York State, and to the New England States. The railroad facilities, as well as the excellent quality and reputation of the coals, have made Cambria County one of the largest producers of bituminous coal in the State.

Cambria County is well supplied with State and Township roads. Recently the State roads have been improved in many localities, and plans have been made for improving many miles of them in the future. The township roads are dirt, but most of them are kept in good condition. The highways are not used extensively for transporting coal.

The northern part of the county is hilly, with summits ranging from 1500 to 2400 feet above sea level. The uplands have gently rounded outlines, cut by numerous valleys from 300 to 500 feet deep. The southern part of the county is decidedly hilly. The slopes are gentle, but there is very little level ground. Conemaugh River flows in a deep narrow gorge which it has cut across the geologic structure. The extreme eastern part of the county is mountainous.

STRUCTURE.

There are eight distinct major structural features in Cambria County, all of which affect the position and depth of the coal beds. These are, in order from east to west, as follows: Nittany anticline, Wilmore syncline, Ebensburg anticline, Bradley syncline, Johnstown syncline, Laurel Hill anticline, Barnesboro syncline, and Nolo anticline. Each structure has a general northeast-southwest trend. Some are more pronounced than others, but each plays a part in the formation of the different basins of the county. The Nittany anticline at the eastern edge of the county and the Laurel Hill anticline at the western edge are the most extensive and pronounced structural features.

The Allegheny Front, whose crest marks the east boundary of the county, is an escarpment made by upturned beds on the northwest flank of the eroded Nittany anticline.

The rocks descend sharply from this ridge into the Wilmore syncline, a drop of 1700 feet in $5\frac{1}{2}$ miles. This basin is narrow and shallow and in the northern part of the county tails out a few miles north of St. Augustine. The syncline is larger in the southern part of the county and rises rapidly to the southwest.

The Ebensburg (Viaduct) anticline, lying west of the Wilmore syncline, is small in the northern part of the county, having only 200 feet greater altitude than the synclines on either side of it. Farther south the rocks rise rapidly and regularly to the west.

The Bradley syncline, lying northwest and approximately parallel to the axis of the Ebensburg anticline, reaches its greatest development in the northern part of the county. This is a minor structure; the slope of the beds is gentle and the trough is shallow.

The Johnstown syncline lies farther west on the same general northeast-southwest line. The slope of the rocks is gentle on the east flank of this syncline, the maximum dip being about 100 feet to the mile. The beds rise rapidly on the west flank to the crest of the Laurel Hill anticline.

The Laurel Hill anticline is one of the largest folds in the plateau region. The dips are very uniform on both flanks of the anticline but increase from the north to the southwest line of the county where the greatest rise is 2100 feet in 9 miles on its eastern flank.

The Barnesboro syncline occupies a small area in the northwestern part of the county at Nipton. It is 2 miles wide at Nicktown. At Barnesboro and Westover the axis varies much in altitude.

The Nolo anticline barely cuts the northwestern corner of the county. It is a sharp fold, having as high as 5 per cent dip on its western flank.

STRATIGRAPHY.

The outcropping rocks of Cambria County are confined to the Quaternary system and to the Pennsylvanian and Mississippian series of the Carboniferous system. The Monongahela, Conemaugh, Allegheny, and Pottsville formations alone are coal-bearing.

The Quaternary system is present in the valleys and flood plains and is composed of clay, sand, and gravel.

The Monongahela formation has been entirely eroded excepting possibly a few acres of what has been called Pittsburgh coal under thin cover remaining in a hilltop in the Wilmore syncline. This coal is the highest stratigraphic unit in the county.

The Conemaugh formation, composed chiefly of shale and heavy sandstone, with many thin beds of impure limestone and thin coals, has been much eroded.

The Allegheny formation with its valuable coals outcrops well up on the hill slopes. It is composed of dark shales, local heavy beds of sandstone, and clay beds. This formation remains practically intact except where streams have cut channels through it; in large areas it will be necessary to shaft for the coals near its base.

The Pottsville formation composed of two massive sandstones, shales, a flint clay, and an unimportant coal bed, is also largely intact. Its outcrops are few, coming to the surface in the deepest valleys where streams have cut across anticlines.

The Mauch Chunk formation is red and green shale with a heavy sandstone near the center. It is exposed only in a few localities.

The Pocono formation is composed entirely of grayish green sandy shale and sandstone. It outcrops at one point in the deep channel of Conemaugh River.

COALS.

The coal-bearing formations in Cambria County contain some twenty coals. Four are of great importance in large areas.

Lower Kittanning ("B", Miller, White Ash) Coal. This coal is the most persistent bed in the county. It has great importance in the southern part of the county where it is highly prized as a steam coal. In the northern half of the county also it is a persistent bed with good thickness and quality; its development has been slow because it is below drainage under most of the county, and other good coals are more easily accessible.

Upper Kittanning ("C", Cement) Coal. This bed lies about 125 feet above the Lower Kittanning. It is mined extensively for steam coal in the southern part of the county where it reaches its greatest thickness and importance. Development of this coal began in the northern part of the county at Hastings and later spread to Patton, where it is thinner and of poorer grade than in the Johnstown region.

Lower Freeport ("D", Moshannon, Limestone) Coal. In the northern part of the county the Lower Freeport is an excellent coking coal with low sulphur content and is therefore more widely prospected and developed than the other beds. In the southern half of the county it is mined at many places, especially in the Johnstown region, but it is poorer than the other coals and has been tested in only a few places by drill. This bed is 120 to 190 feet above the Lower Kittanning coal.

Upper Freeport ("E", Lemon) Coal. Thirty to forty feet higher in the geologic column is the Upper Freeport bed. The coal is used in railroad locomotives and with varying results in making coke. It has been mined principally in the Barnesboro region although the quality is poorer in the north half of the county on account of higher percentage of ash and sulphur than in the other beds. The Upper Freeport is thicker and better in the southern part of the county and is mined in many places.

Five other beds are mined for custom coal; the remaining eleven are so thin that they may never be mined.

Mercer Coal. This is geologically the lowest coal in Cambria County. It is thin and mixed with many partings of bone and shale. At South Fork its horizon is of commercial importance because it is associated with a valuable bed of flint clay.

Brookville ("A") Coal. The Brookville bed lies from 40 to 100 feet below the Lower Kittanning coal. This bed is four feet thick at Dysart and on Stony Creek. Large numbers of "knife blades" and nodules of iron pyrite, and partings of shale and bony coal make it so high in ash and sulphur that it cannot be profitably mined, although the fixed carbon and the volatile matter compare well with the Lower Kittanning.

Clarion ("A'") Coal. This bed, lying 20 to 40 feet above the Brookville coal, is seldom over 1 foot thick in the county and is never mined.

Bens Creek (Lower Kittanning rider) Coal. A local coal fourteen feet above the Lower Kittanning has been mined on Bens Creek. Drill hole records in this region indicate that it is a persistent bed, having an average thickness of $2\frac{1}{2}$ feet. It has more ash than other coals of the same region; otherwise its quality is the same.

Middle Kittanning Coal. The Middle Kittanning coal is found at many places from 25 to 35 feet above the Lower Kittanning bed. In this county it is unimportant and of poor quality.

Conemaugh Coals. Numerous small beds of unmineable coal in the Conemaugh formation are scattered through 700 to 900 feet of strata above the Upper Freeport bed.

The Mahoning coal lies about 45 feet above the Upper Freeport coal and between the lower and upper parts of the Mahoning sandstone. The coal itself is not valuable, but the iron ore and clays associated with it are sometimes worth exploitation.

The Brush Creek or Gallitzin coal, lying 70 to 110 feet above the Upper Freeport coal, never exceeds one foot in thickness and is unmineable.

The Bakerstown coal is an unmineable bed lying some 225 feet above the Upper Freeport coal.

The Harlan coal lies from 300 to 400 feet above the Upper Freeport coal. It has been mined as custom coal in one locality. The bed is very thin, but it is reported to be a good smithing coal.

Many other beds only a few inches thick will not be mentioned in this report.

Pittsburgh Coal. An impure coal lying about 775 feet above the Upper Freeport and having an average thickness of less than two feet



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in a very small acreage on a knob two miles south of Wilmore, has been correlated as the eastern remnant of the Pittsburgh coal in Cambria County. The coal has been mined but is of little value.

BARNESBORO-PATTON DISTRICT.

Lower Kittanning Coal. This bed is very regular throughout the district, averaging 3 to 4 feet thick with one or two benches below which locally can be worked with the main bench. The principal outcrops are in the valley of Clearfield Creek south of Coalport, in the valley of Chest Creek between Patton and Altburn, and on the headwaters of West Branch of the Susquehanna. In the vicinity of Delaney the bed is split into two benches by 1 foot of bone and shale; the top bench is 2 feet 6 inches thick, and the lower one 12 inches thick. At Bakerton the bed is 6 feet 10 inches thick, and is parted by shale into three benches. The top or main bench of good clean coal is 3 feet 10 inches thick. A 6-inch middle bench is separated from the top bench by 6 inches of shale. The lower bench is 14 inches thick, with 4 inches of shale between it and the middle bench. In the Clearfield Creek region the bed is divided by a bony parting into a top bench 17 inches thick and a lower one 2 feet 6 inches thick. The lower bench also carries a small bony parting 13 inches from the bottom. At St. Benedict the coal is 2 feet 8 inches thick with 18 inches of bony coal on top. This bed is regarded as one of the most valuable coals in the northern part of the county. A large area of the coal lies at considerable depth, and remains practically untouched, since coals more easily reached for mining have had the preference. Its reputation as a superior steam coal indicates a large future production. It has a slightly higher sulphur content than the Lower Freeport coal of the same region, but it has less ash. The Lower Kittanning coal is not used alone for making coke, but when mixed with the Lower Freeport it gives a calculated coke value of 77 per cent.

Upper Kittanning Coal. This bed outcrops on Chest Creek and Brubaker Run north of Patton and Hastings, and along the valley of West Branch of the Susquehanna River. It is mined by drift and slope openings, chiefly in the vicinity of Patton and Hastings. Many country banks have been opened on Chest Creek and West Branch of the Susquehanna and their tributaries to supply house fuel. The coal locally has a maximum thickness of 5 feet, but the lower part is so cut by shale and bone partings that it is not mined. The average thickness of good coal is 3 feet 7 inches. In some places "knife blades of sulphur" are abundant and are the only impurity. The coal remains untested in large areas and it is impossible to state accurately its commercial value. It is safe to say, however, that the Upper Kittanning coal cannot be expected to have the excellent quality of the other beds now being mined in the district. After these beds have been exhausted, profitable production of the Upper Kittanning may be expected if the coal is picked and washed, for it is a good steam coal. No coking tests have been made on it.

Lower Freeport Coal. This bed is the largest producer in the

Barnesboro-Patton district, and in many localities it is fast becoming exhausted. The most extensive development is along West Branch, on Chest Creek, and on Brubaker Run. It has been mined for many years by drift in the vicinity of Barnesboro, Spangler, Elmore, Moss Creek, Carrolltown, St. Bonifacious, and Hastings. The coal is from 3 feet 1½ inches to 5 feet 1 inch thick, averaging nearly 4 feet. The areas of thickest coal are in the center of the Barnesboro basin. The coal thins to the south and southwest and loses its importance. A shale binder 1 to 3 inches occurs 8 to 12 inches from the bottom. The bed is much cut by clay veins, varying from 1 to 20 inches in thickness; the clay veins are so numerous in places that mining of the coal is unprofitable.

Locally a bone coal comes in between the coal bed and the roof. A local fold makes a disturbed area along West Branch; the coal is crumpled and thin here. The Lower Freeport coal carries a large amount of pyrite in the form of "knife blades" and nodules. These impurities appear to decrease to the westward, where the coal is used extensively for coking. The coal ranks very high in quality, and has a lower sulphur content than any other coal in the district; its ash is also below the average of the other coals.

Upper Freeport Coal. This bed is mined extensively in this district. It is considered a very valuable coal although it has more sulphur than the Lower Freeport; its ash content is above the average. The bed outcrops well up on the hills along West Branch and Chest Creek and their tributaries. Its most extensive development is in the vicinity of Barnesboro. The thickness of the bed is variable; the maximum is 5 feet; the average 3 feet 6 inches. It carries partings and binders of bone and slate, varying much in thickness, persistence and number. An 8-inch binder of shale, fire clay or bone is common near the bottom. A 4-inch bench of coal which is never worked is always present below this binder. This bed is free from roof and bottom "rolls", and clay veins which are present in the lower coals. The coal is excellent for steaming purposes, and does not clinker under the boiler as much as would be expected of a coal so high in sulphur. It has been coked with varying success at Hastings and Moss Creek.

MOUNTAIN DISTRICT.

A general rise to the northeast brings all the coals above drainage in the northeastern edge of the county, and the rise to the Allegheny Front lifts them all above Clearfield Creek between Dean and Ashville. In this region of folding the coals are irregular and should be prospected with the core drill before attempting development.

Lower Kittanning Coal. This bed outcrops in the valley of Clearfield Creek and its tributaries and on the western slope of the Allegheny Front. It has been opened and developed at many places from Daugherty to the north line of the county. The bed varies from 1 to 4 feet in thickness and is divided into an upper and lower bench by a characteristic binder. Where the lower bench has considerable thickness, the whole bed is mined and the parting of 2 to 5 inches of bone

is picked out before shipment. Where the lower bench is thin the upper bench forms the main part of the bed. The binder is then used as the bottom and the lower bench is not mined. The coal is fairly clean and the sulphur content is low; the ash is medium. This coal is used successfully as a steam coal. The bed is subject to local rolls both on roof and bottom, and to pinches and "swamps", which cause great variation in thickness.

Upper Kittanning Coal. This bed is also an important one in the district. It has been developed extensively at Daugherty, Floydsville and Blandburg. The coal has no characteristic impurities, although locally the bed is split into two benches by a thick bone parting. In such places the coal beneath the parting is not mined. In many localities the coal is overlain with a few inches of "draw slate", which is taken down in the rooms and headings for height. The bed varies much in thickness and quality. Its average thickness does not exceed 2 feet 6 inches. The coal does not rank with the Lower Kittanning in quality because iron pyrite makes the sulphur content very high. The ash is medium. Tests have shown that it is a very good steam coal, but is inclined to make large clinkers.

Lower Freeport Coal. This bed is thin and unimportant in most of the district. Its average thickness is less than 2 feet and its maximum thickness as observed by the writer does not exceed 2 feet 8 inches. The upper part is much cut by bone and shale partings. Numerous roof "rolls" cause much variation in thickness. Many "mush-room" mines opened during war time are now abandoned. A large future production cannot be predicted from this bed.

Upper Freeport Coal. The greatest number of openings in the district is in this bed. Many farm and custom coal drifts are opened midway on the hillsides and numerous large mines are operated. The bed is not as thick in this district as in other parts of the county, but its analyses compare favorably with those of the same coal in the Barnesboro-Patton district. The sulphur is rather high, but the ash is fairly low. No coking tests have been made on it in this district, but it is reputed to be a good steam coal. This bed is thickest from Figart north along the Bellwood Branch of the Pennsylvania Railroad and in the valley of Clearfield Creek, but probably does not exceed 3 feet 9 inches. The bed is divided into two benches by a characteristic 1 to 2 inch bone parting, which lies 4 to 14 inches from the bottom. This parting is readily separated by picking, so that both benches are mined profitably. The upper bench averages 2 feet 4 inches thick; the lower bench is 4 to 18 inches thick. New operations are beginning on Clearfield Creek and a good production is predicted in the future. The coal is of good quality, clean, with the exception of one small parting, and easily accessible by drift on the hill slopes. Large acreages remain unprospected and when the better known areas of Cambria County have been exhausted, Clearfield Creek will undoubtedly become one of the large mining centers of the county.

BLACK LICK DISTRICT.

Lower Kittanning Coal. This bed is by far the most important

one in this district. The coal is mined, mainly by drift, from Vintondale, where it first outcrops, eastward to Nanty-Glo and on the tributaries of Black Lick Creek. Enormous areas in Barr, Cambria, and Carroll townships, where the coal is deep, are undeveloped and have been prospected but little by core drill. It is hard to estimate the worth of this potential coal field at the present, but it probably contains large acreages of excellent coal. The Lower Kittanning coal closely resembles the same bed on Conemaugh River in its mode of occurrence and physical characteristics. The top or main bench averages from $3\frac{1}{2}$ to 4 feet thick over the entire district. A thin shale parting separates it from a thin middle bench, averaging less than 5 inches thick. The lower bench is separated from the middle bench by a shale parting never exceeding 2 or 3 inches thick. The lower bench has a maximum thickness of 2 feet and averages about 18 inches. The lower bench is inclined to be high in ash and sulphur and is not mined unless it is of unusual thickness. The top or main bench is a bright and lustrous coal, with columnar cleavage, and mines out in large lumps. The coal has a very uniform analysis over the entire district. The moisture is low; volatile matter also is low, and fixed carbon averages around 70 per cent. The ash varies but is low in most every analysis. The sulphur content is rather high. Steaming tests made by the United States Geological Survey have shown it to be a high class steam coal. The coal makes a light gray, silvery coke that is sometimes soft and high in sulphur. It has been coked successfully in several localities in both beehive and by-product ovens.

Middle Kittanning Coal. This unimportant bed, lying about 50 feet above the Lower Kittanning coal, has been worked along Blacklick Creek. It is a persistent bed having an average thickness of about 2 feet 4 inches. The top bench, averaging 2 feet thick, and the bottom bench, 6 inches thick, are separated by a thick clay parting. The quality of the coal in both benches is good. The bed has been mined for house coal.

Lower Freeport Coal. The correlation of the uppermost coal that is mined on Blacklick Creek is uncertain. The beds are not mined as much here as on the Conemaugh, and therefore are harder to correlate definitely. The interval above the Lower Kittanning coal, which varies from 150 to 165 feet, is taken to indicate, temporarily at least, that the top bed mined is the Lower Freeport coal. The Upper Freeport coal was not recognized. The bed is composed of three benches, having a total average thickness of nearly $3\frac{1}{2}$ feet. The top bench has an average thickness of nearly 2 feet; the middle bench is generally thin, and is separated by a thin bony parting from a lower bench about 15 inches thick. The benches and partings vary much in thickness. The partings are easily separated from the coal. After the supply of clean and thicker coal in other beds is exhausted, this bed may be of commercial importance.

JOHNSTOWN-SOUTH FORK-WINDBER DISTRICT.

This is one of the largest districts in the county both as to area and production. The steam coals of the Windber region, which are

classed with the well known Pocahontas coals of West Virginia, are valued greatly by the ocean trade for steaming purposes. Large quantities are used as locomotive steam coal. Although there has been a large production from this district for many years, large reserves of high grade coal remain.

Lower Kittanning Coal. This bed is the highest grade, most important, and most persistent coal in the district. At Johnstown the coal is at or below drainage level and is mined by shaft or slope. The Laurel Hill anticline and the Ebensburg anticline bring it to crop at different points along Conemaugh River. The coal is at considerable depth in the Wilmore basin, but in the vicinity of Windber it comes to the surface and is mined by drift.

In the vicinity of Johnstown the coal has a regular thickness of $3\frac{1}{2}$ to 4 feet; the latter is the maximum for the Johnstown basin. A lower bench 6 to 24 inches thick, which is not mined, is sometimes present, separated from the top bench by 1 foot of shale. The coal in the lower bench rarely has the good quality of the upper bench.

At South Fork and Mineral Point the main bench is thicker than it is at Johnstown, and will average nearly 4 feet, with a maximum of 5 feet. The lower bench which is also present in this vicinity has a regular thickness of 2 feet but is seldom mined.

In the Windber region the main bench of the Lower Kittanning coal has practically the same thickness as in the vicinity of Johnstown. In places a rider varying in thickness from 1 to 14 inches occurs $3\frac{1}{2}$ to 4 feet above the main bench; the characteristic lower bench 3 inches to 2 feet is present.

The Lower Kittanning coal of this district is high in fixed carbon, low in volatile matter and moisture. In the vicinity of Johnstown the bed has a larger percentage of ash and sulphur than in the South Fork area. The fuel ratio also is higher. It is a good steam coal throughout the entire district and has been coked with success in a few localities. The yield of coke is high, but it is also commonly high in sulphur.

Upper Kittanning Coal. This coal also is important in this district. It is best in the vicinity of Johnstown where its reputation as a steam coal is equal to, if not better than, that of the Lower Kittanning. Although its development is of more recent date than the latter bed, the Upper Kittanning coal furnishes a large percentage of the production in this district. Analyses show a high percentage of fixed carbon, and low content of volatile matter and moisture. The percentage of ash and sulphur is rather high.

The Upper Kittanning varies much in thickness in the area around Johnstown. The minimum is 2 feet 6 inches, the maximum 6 feet. The greatest thickness is along Stony Creek and in the Windber area. A local bony coal at the top and local "knife blades" of pyrite are the only marked impurities.

Along Conemaugh River the coal is thinner but it has less sulphur

and ash than in the Johnstown region.

The Upper Kittanning coal is not mined much in the Windber area where the importance of the Lower Kittanning coal has overshadowed it. Prospecting indicates that the bed will average between 3 and 4 feet thick. It retains its good quality and is marked by the absence of impurities.

Lower Freeport Coal. At the present time this coal is not mined extensively in this district although the analyses compare favorably with those from the Lower Kittanning. The coal has a high percentage of fixed carbon, low volatile and low moisture content; sulphur and ash are rather high. The bed varies in thickness and locally a few inches of bony coal comes in at the top. In the immediate vicinity of Johnstown the coal has no commercial importance at present but at South Fork it is locally workable. Here the bed is split into two benches by a thin bone parting. It does not exceed $2\frac{1}{2}$ feet thick.

South of Johnstown on Stony Creek the bed is persistent and workable, averaging about 2 feet 6 inches thick. It is divided into 3 benches. A top bench averaging 1 foot thick is separated by a shale or bone parting from the main bench averaging 2 feet thick. The lower bench is never mineable.

Upper Freeport Coal. This bed outcrops in many places in this district. The coal has a practically uniform composition with a high percentage of fixed carbon, comparatively low moisture, and high ash and sulphur content.

In the vicinity of Johnstown the bed will average about 3 feet 5 inches thick. The coal occurs in one main bench. Locally, a bench 3 or 4 inches thick comes in below, separated from the main bench by 5 to 6 inches of shale or bone; it is never worked. The coal is very clean and the only marked impurity is a local "draw slate". The bed is regular in thickness and has no marked "rolls" in either roof or bottom. Along Conemaugh River and on the west flank of the Wilmore basin the coal is rather dirty and unimportant, since it is split by small bone or shale partings into two or three benches, only the two lower benches being workable. The upper workable bench ranges from 1 to 2 feet and the lower one from $1\frac{1}{2}$ to 2 feet thick, separated by a bone or shale parting $\frac{1}{2}$ to 2 inches thick. The coal is mined at South Fork, where it resembles both in thickness and quality, the same bed at Dunlo. The bed here is divided into 2 benches by a thin shale or bone parting which is readily removed by picking.

The Upper Freeport bed has not been much prospected in the Windber area, but drill records show that it averages 3 feet thick. The coal is good in the main bench, as in the Johnstown area.

At the present time there are few openings in the bed because of the greater importance of the Lower Kittanning coal in the same district. Its value is not overlooked, however, and with the depletion of the more valuable coals this bed will become a large producer.

PORTAGE-GALLITZIN DISTRICT.

The Portage-Gallitzin district does not contain as many mines as the other districts in the county but it contributes greatly to the output. The production has been limited almost entirely to the Lower Kittanning and the Upper Freeport coals. Little is known of the other coals, as little prospecting has been done by the core drill in certain areas.

Lower Kittanning Coal. The Lower Kittanning coal has been the most important in this district for many years. It has high fixed carbon, medium volatile, low moisture, and medium ash and sulphur content. It is greatly in demand as a high grade locomotive steam coal. In the vicinity of Lilly it is mined and shipped as a smithing coal. It is equal in quality to the Lower Freeport bed of the Friedens district in Somerset County, the standard smithing coal in central Pennsylvania. The bed is a single bench, though locally a thin unmineable lower bench comes in, separated from the main bench by a shale parting about 3 inches thick. The main bench averages over $3\frac{1}{2}$ feet thick, with no well defined partings or binders. The bed is very thick, regular, and free from rock "rolls".

Upper Kittanning Coal. This bed is not important in this district. Although the coal compares favorably in composition with the Lower Kittanning, the ash and sulphur content is slightly higher. The mining of this bed is limited and cannot be expected to increase much in the future. The coal shows great variation in thickness and quality. In large areas the bed does not exceed 1 foot in thickness, and averages less than 2 feet. The coal is in one bench.

Lower Freeport Coal. This bed also is unimportant in the district. The outcrop and drill records indicate that it is workable in very few localities, although its entire area has not been tested by drill. A few mines have been opened in this bed in the vicinity of Portage where it has a maximum thickness of 2 feet 6 inches and an average thickness of 2 feet. Numerous bony partings are present in places, and locally a "draw slate" comes in above the coal. This coal has the same percentage of fixed carbon and volatile matter as the other coals of the district, but is very high in ash and rather high in sulphur.

Upper Freeport Coal. This coal is one of the most important in the district, and has had an enormous production for many years as a steam and coking coal. As a steam coal it is equal to the Lower Kittanning in the same region except that it is higher in sulphur. The coal has been coked with success in the beehive ovens in the vicinity of Gallitzin. The bed is very regular and averages 4 feet thick in the district; the greatest thickness is 5 feet 1 inch at Gallitzin. At Lilly the average thickness is 5 feet; at Portage the same; in the Puritan area 3 feet 11 inches; and in the Beaverdale Branch area 3 feet 5 inches. The only bone or shale binder rarely exceeds 6 inches in thickness. The bed is free from rock "rolls" and "faults"; no clay veins are present.

QUALITY.

The four important coals vary so much in the different districts that it is difficult to give an accurate idea of the quality in this brief text. A table of analyses made by the United States Bureau of Mines from samples collected by the Pennsylvania Geological Survey has been compiled and will be printed in a forthcoming publication, "Introduction to the Coals of Pennsylvania". Until that publication is ready for distribution, information can be had from this Survey on request.

GENERALIZED SECTION OF COAL BEDS

	Coal bed	Average interval in feet	Average thickness
Conemaugh 775-900	Coal	325	1'9"
	Coal	165	0'9"
	Bakerstown	135	0'6"
	Gallitzin	50	0'6"
Allegheny 220-375	Mahoning	50	0'6"
	Upper Freeport (E)	40	3'6"
	Lower Freeport (D)	35	2'6"
	Upper Kittanning (C')	70	2'6"
	Middle Kittanning (C)	20	0'6"
	Bens Creek	15	1'0"
	Lower Kittanning (B)	35	3'6"
Pottsville	Clarion (A')	25	0'6"
	Brookville (A)	10	1'0"
	Homewood SS	70	1'0"
	Mercer		0'6"

