
THE COALS
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The coal areas of Carboniferous age in the United States are five in number. They are—
The Massachusetts-Rhode Island area, comprising approximately 500 square miles;
The Alleghany area, about 59,000 square miles;
The Michigan area, about 6,700 square miles;
The Illinois, Indiana, and West Kentucky area, about 47,000 square miles; and
The Iowa, Missouri, Kansas, Arkansas, and Texas area, about 78,000 square miles;
Forming a total of about 191,200 square miles, underlaid by coal-bearing strata, of which not over 120,000 square miles contain workable coal-beds.

Two general classes of coal are recognized, viz, anthracite and bituminous, the latter being often subdivided into bituminous and semi-bituminous coal.

Anthracite forms the whole of the coal found in the Massachusetts-Rhode Island area and in that portion of Pennsylvania occurring in the neighborhood of Pottsville, Mahanoy City, Shamokin, Hazleton, Mauch Chunk, Wilkes-Barre, and Scranton. It also occurs to a limited extent in Virginia.

Bituminous coal occupies the rest of the districts just named.

A glance on a map of the coal-fields shows how unequally the coal areas are distributed over the United States. While New England and the seaboard Atlantic states contain practically no coal, the greatest development of the workable coal strata is in the Alleghany mountains and to the west of them, extending from Pennsylvania and Ohio in an unbroken line to Alabama.

Next to the one just mentioned the most important field is the one occurring in Illinois, Indiana, and western Kentucky. The coal area which extends from Iowa to Texas is of much less importance and extent, and the Michigan coal-field has scarcely been opened.

Let us now consider these different areas a little more in detail.

(1) THE MASSACHUSETTS-RHODE ISLAND AREA.—The coal is confined to eastern Rhode Island and Bristol and Plymouth counties in Massachusetts. At present the only mine worked is at Portsmouth, Rhode Island, where one of the three beds found is being exploited. The coal-beds in this area seem to vary from 1 to 13 in number, but the explorations made in the past have been so unsystematic and, peculiarly, so unsatisfactory, that the data on which these views are founded are not very reliable. The character of the coal is the hardest kind of anthracite, often containing spangles and plates of graphite disseminated through it, which characteristics are due to the highly metamorphic action it has undergone. To this same action is due in a great measure the peculiarly folded character of the deposits, which has locally caused expansions and contractions of the coal-beds, so that in some places they are 13 feet thick, and in others but a few inches. Such an irregularity renders the cost of mining the coal very great, owing to the large amount of "dead-work" required, and to this cause may in part be ascribed the slight progress which has been made in the development of the region. The working is now confined to a single mine.

Another potent cause for slight progress in development of this region has been the extreme hardness of the anthracite. The extreme metamorphism which the coal has undergone has expelled the whole of the volatile ingredients and converted a portion of the carbon to graphite. It requires a very considerable degree of heat to burn this coal, and hence either a strong draft or blast is requisite. At present the use of the coal is confined to copper-smelting. The disadvantages in the exploiting and using the anthracite of this region are the more to be regretted, as it is situated in a district where its profitable extraction would be of the greatest use to other industries. All around it are large manufactories, and but a short distance off are valuable deposits of iron ore, all of which have to utilize either wood, anthracite from Pennsylvania, or bituminous coal from Nova Scotia, Pennsylvania, and Maryland. While the coal of this field is lying unused in the ground, that from other districts is brought hundreds of miles to be burnt directly over it. It is greatly to be desired that some means of successfully exploiting and burning the coal of this area shall be found.

a II. THE ALLEGHANY AREA, the most important in the United States in its extent in the number of workable coal-beds and in the quality and variety of the coals found, is situated in Pennsylvania, Ohio, West Virginia, Virginia, eastern Kentucky, East Tennessee, and northern Alabama. This area is divided into numerous different fields, more or less contiguous to one another, and of which a brief mention follows:

1. *The anthracite coal fields of eastern Pennsylvania.*—These anthracite fields are confined to a limited area of not over 475 square miles, situated in the counties of Carbon, Schuylkill, Northumberland, Columbia, Dauphin, Luzerne, and Lackawanna. Three districts are commonly recognized in this region, known as the first, second, and third coal-fields. The Coal Measures within this region are almost universally surrounded by two mountain-ridges, the exterior one consisting of sub-Carboniferous sandstone. This is separated from the interior ridge by a valley, more **b** or less broad, of easily decomposing red shale, overlying which occurs the true conglomerate, holding in its bosom the valleys or basins in which the anthracite occurs. These two series of ridges were the efficient protectors of the coal from the denuding agents, which removed it from the intervening barren districts, separating the different anthracite basins from each other and from the bituminous coal-fields of central Pennsylvania.

In the first, southern or Schuylkill coal-field, fifteen coal-beds have been recognized, varying from 2 to 25 feet in thickness, the total thickness of the coal being 113 feet, 80 of which are in workable beds.

The second or middle coal-field includes the Shamokin, Mahanoy, and Lehigh basins, the latter having Hazleton as its focus. These names must only be taken in a general sense, as in reality each basin is subdivided into two or more smaller ones, which must be passed by for lack of space. In these basins the principal coal-beds **c** are the Buck mountain, Wharton, and Mammoth or Big Vein. The latter is often over 29 feet thick and the Buck mountain over 15 feet thick.

In the third, northern or Wilkes-Barre basin, there are about twenty beds, the coals being divided into two groups, similar to those described in the bituminous coal area of Pennsylvania. The lower group, while containing some ten independent beds, rarely contains more than five fit for profitable working, in many places but two or three. The upper group, while containing seven or eight beds, never contains more than four which are worked, and the number is often less. The upper coal group is very circumscribed, being confined to a short and narrow elliptical belt in the very central tracts of the coal-field.

While the Alleghany coal area shows in a marked way the increase in the gaseous constituents of its coals, on passing westward, so, too, a decided change can be recognized on a smaller scale in the anthracite coal-fields. The **d** most easterly field contains the hardest variety of the anthracite, and the most westerly contains the softest or that least metamorphosed. The coal from the Wilkes-Barre region appears to be best adapted of all the anthracite for steam-raising purposes; that from the Lehigh basins seems best adapted to the manufacture of pig-iron, and of gas, and for foundry use; that from the Mahanoy, Shamokin, and Schuylkill fields seems best adapted to domestic use, although more wasteful than either of the other. It is, however, difficult to specify the advantages of the coals from one of the anthracite basins over those from another, the peculiar properties claimed for some special variety being often due to the fact that the proprietors of some colliery have had peculiar advantages, and hence claim or imagine some special advantage which often does not exist. The great advantages in burning anthracite are cleanliness, lack of smoke, compactness, rapidity with which steam can be raised, concentration of great heating power, adaptability for household use, and in some varieties great purity for iron-making. On the other hand, a **e** considerable quantity of the fuel must be aggregated in order to produce combustion.

Another great advantage of the anthracite of Pennsylvania is its favorable situation to many important industries. All of the coal-basins are tapped by two or more railroads which carry the coal directly, by favorable grades, to the two cities of New York and Philadelphia, whence the coal is distributed by water transportation to the various important industries of New England, New York, New Jersey, Pennsylvania, and Delaware. Other railroads carry the coal by grades, not quite so favorable, to lakes Erie and Ontario, whence it is distributed to the various great cities of the west and Canada.

2. North of the anthracite coal-fields proper is the semi-anthracite of the *Bernice basin* in Sullivan county, Pennsylvania, where the principal coal-bed, 8 to 9 feet thick, contains 8 to 9 per cent. volatile matter. The coal, while classed as an anthracite, lacks the brilliant anthracitic luster and conchoidal fracture, generally breaking **f** in cubes; in composition it closely resembles the semi-anthracite of Lykens valley, in Dauphin county. The whole of this coal is carried north and west, for distribution and consumption.

3. *The Broad Top coal-field of Pennsylvania.*—The coals of this basin, which occupies about 25 square miles, all belong to the Lower Productive Coal Measures, of which more presently, with the exception of a few acres of coal of the Pittsburgh bed. The measures in this coal-field have been much disturbed, so that the relations of the strata are not fully understood, and consequently frequent errors have been made in identifying the coal in different portions of the district. There are apparently three workable beds. The coal of this district, while actually bituminous in character, is commonly called semi-bituminous on account of the comparatively small amount of volatile matter it contains, often as low as 8 per cent. At one time the mines of this district were actively worked, the coal being used for steam-raising and rolling-mill purposes. Since the opening of the Clearfield coal-district and the more active exploitation of the Cumberland coal-beds, the mining interests of this district have languished,

owing in part to an inferiority in quality of this coal to either of the others; in part to the greater cost of extraction, **a** due to the more disturbed condition of the strata.

4. *The bituminous coal-fields of Pennsylvania.*—While the bituminous coal-fields of Pennsylvania are contiguous to those of Ohio and West Virginia, the latter being actually but extensions of the former, they are, for the sake of description, separated geographically.

In the bituminous coal area of Pennsylvania, Ohio, and West Virginia geologists and engineers have recognized (1) Upper Barren Measures; (2) Upper Productive Coal Measures; (3) Lower Barren Measures; (4) Lower Productive Coal Measures; (5) Inter-conglomerate coals.

The Washington coal-bed occurs in the Upper Barren Measures, and can only be profitably mined in Pennsylvania in Washington county. **b**

The following coal strata occur in the Upper Productive Coal Measures, commencing with the upper bed: Waynesburg coal-bed, Sewickley coal-bed, Redstone coal-bed, Pittsburgh coal-bed. Of these the Pittsburgh is of far the greatest economical value, but the others are locally of importance.

In the Lower Barren Measures are a few beds which are most uncertain in character and of but little economical value; they are most unreliable in character, and while locally they thicken so as to be of some local value, they speedily thin out again.

Below the Lower Barren Measures are found the following coal strata, viz: Upper Freeport coal-bed, Lower Freeport coal-bed, Upper Kittanning coal-bed, Lower Kittanning coal-bed, Clarion coal-bed, and Brookville coal-bed.

Still lower, geologically, are the coals occurring in the Great Conglomerate, which include the Clarion group; **c** the Quakertown bed of Lawrence county, and the Sharon bed of Mercer county. These coals occur in six different basins, of which the sixth is the most southwesterly in position and least distinct as to its division. Each basin is separated from its neighbor by an anticlinal wave, or rather by a series of separate anticlinals, the ends of which lap past each other.

Having the Alleghany mountains as an eastern barrier, the coal-fields extend westwardly in a more or less unbroken succession into Ohio. But the coal-beds are by no means equally distributed over this area. As middle Pennsylvania and middle New York were lifted, by geological action, much higher above the old sea-level than southwestern Pennsylvania, Ohio, and Virginia were, the destruction of the coal measures has been greatest in the north and northeast, gradually diminishing toward the southwest. Only the lowest, or two or three lowest, beds of coal have been left as isolated patches on the mountain tops of Wyoming, Sullivan, Lycoming, Clinton, Bradford, **d** Tioga, Potter, Cameron, McKean, and Warren counties.

The great productive bituminous coal-field may be said to commence in the belt of counties composed of Clearfield, Jefferson, Clarion, Venango, and Mercer counties, a distance of 140 miles to the Ohio line from the crest of the Alleghanies. In the counties last mentioned, as well as in Cambria, Indiana, Armstrong, Butler, Lawrence, Beaver, Somerset (with the exception of the Salisbury patch), eastern Westmoreland, and eastern Fayette, only the Lower Productive coal-beds, and in places the inter-conglomerate coals have been left, while the Upper Productive Measures have been swept away. These latter are found in great part with all the Lower Productive Coal Measures in Alleghany, western Westmoreland, and western Fayette counties, while the whole of the Upper and Lower Productive Measures occur in Washington and Greene counties. In brief, the Coal Measures are most eroded toward the northeast, and are least disturbed toward the southwest. **e**

We will now consider the different coal-beds mentioned a little more fully.

The Washington coal-bed is only found of workable thickness in Washington county, where it is 10 feet thick; where found elsewhere in Pennsylvania it is too thin to be profitably mined. It occurs in the Upper Barren Measures and about 140 feet above the bottom of these.

About 150 feet below the Washington bed occurs the Waynesburg main coal, from 6 inches to 10 feet thick. It is the chief source of coal supply in Greene county, and is also mined in eastern Washington county, but grows thin and poor towards the west. It is commonly a triple bed, but sometimes has but two benches, and is occasionally much split up.

The Sewickley coal-bed lies about 270 feet below the Waynesburg bed. It occupies about the same area in the four southwestern counties of Pennsylvania as the Pittsburgh bed, but the isolated hills in Alleghany, Beaver, **f** and Indiana counties, which contain the Pittsburgh, are rarely high enough to reach the Sewickley. It occupies a narrow strip of the Salisbury basin in Somerset county, where it is thin and only 90 feet above the Pittsburgh bed. West of the Monongahela river it is only of importance in the southeastern portion of Greene county, being found 5½ feet thick on Dutkard's creek and in two benches. In the Blairsville-Connellsville basin it is usually workable, and becomes 5 feet thick south of the Youghiogheny, thinning down northward almost to nothing on crossing the Loyalhanna. It is thin and poor in the Greensburg basin, and in the Lisbon basin loses its size and value north of Sewickley creek.

The Redstone coal bed lies between the Sewickley and Pittsburgh beds. It is coextensive with the latter, except in the isolated hill-tops north and east of Pittsburgh too low to contain it. On the Monongahela it overlies the Pittsburgh bed about 60 feet, varying from 1 to 4 feet in thickness. In Westmoreland and Fayette counties it varies from 2 to 4 feet in thickness, being a good workable bed along the Youghiogheny river and

a Sewickley creek. Along the Pennsylvania railroad it is 1 foot to 3 feet thick. In the Connellsville basin the Redstone bed is very variable, being in some places but 6 inches thick, in others 4 feet thick. In the Salisbury basin it is 4 to 5 feet thick, and about 45 feet above the Pittsburgh bed.

The Pittsburgh bed "is the principal coal-bed of southwestern Pennsylvania; and most of the mineral fuel which is mined along the Youghiogheny and Monongahela rivers, to be used in the coke-ovens of the Connellsville region and in the blast-furnaces, mills, and factories of Pittsburgh and its vicinity, and to be shipped to southern and western markets, comes from this bed. The Pittsburgh bed underlies all Greene county and nearly all of Washington county, and long synclinal areas in Westmoreland and Fayette counties, west of Chestnut ridge. Outlying patches of it occupy the hill-tops in Allegheny and Indiana counties, and there is a small patch of it in Somerset county.

b From all the rest of the state the bed has been removed by erosion; but there is good reason for believing that it formerly extended beyond the Susquehanna river, and that it has been preserved as one of the beds of the anthracite basins of eastern Pennsylvania" (the Mammoth or Big bed). It is 11 to 12 feet thick at Connellsville, while but 6 to 7 feet thick in the hills around Pittsburgh. "This bed is best developed in the Connellsville trough, between the Conemaugh river at Blairsville and the mouth of the Cheat river at the Maryland state line. It becomes thinner westward, and, after passing Pittsburgh and descending the Ohio river toward the Ohio state line, it loses almost all its value as a source of fuel." This coal varies very greatly in character, so that good shipping coal can only be got from the Lisbon, Waynesburg, and Nineveh troughs, and along the Youghiogheny and Monongahela rivers. While it is too soft to bear much handling in the Greensburg and Blairsville basins and near the Maryland state line,

c and contains less volatile combustible matter than that from the more western basins, it is not so well adapted to the manufacture of gas, but it makes a most excellent coke, which has no superior in this country. In the Lisbon or Irwin trough it is a most excellent gas-coal, and is shipped great distances to be used for the manufacture of gas. The coal from the northern portion of the Irwin trough is unexcelled for raising steam, and is shipped for this purpose from Westmoreland county to Jersey City to be so employed. In the district described the Pittsburgh bed is always found as a most excellent coking coal; in some places it is slaty and has first to be washed. In others it is too rich in gas to permit the lump-coal to be economically used for this purpose. The coke made from this coal is unrivaled in the United States, especially for blast-furnace use, as it is tough and strong and will stand well in the highest furnaces without crushing. The coke basin, as generally understood, is co-extensive with the Blairsville trough, but the coke made varies greatly. That made on the Youghiogheny is compact, silvery, **d** and retains its luster indefinitely on exposure, while that made near the Conemaugh is comparatively tender, dull-looking, and soon loses its luster unless the coal is washed. If the latter be done the coke produced is equal in quality to that made on the Youghiogheny. The coke made is all produced in beehive ovens.

The Upper Freeport coal-bed, which is about 600 to 700 feet below the Pittsburgh bed, is the top bed of the Lower Productive Measures. It underlies, generally at great depths, the whole of Pennsylvania south of the Ohio and west of the Monongahela rivers. It is also found in Westmoreland, Fayette, Indiana, Armstrong, Allegheny, Beaver, Lawrence, Clarion, Cambria, Clearfield, and Jefferson counties. It is a good coal, of 4 to 6 feet in thickness, over extensive districts, being best adapted, when washed, to coking and to steam-raising; but there are extensive districts where it is utterly valueless.

The Lower Freeport coal bed lies from 30 to 70 feet below the Upper Freeport bed. It has been developed but **e** locally, and is not of great economic value.

The Upper Kittanning coal-bed is locally of value, as at Darlington, in Beaver county, and in Jefferson county, where it is overlaid by 8 to 12 feet of cannel coal. In Jefferson county it attains 10 to 12 feet in thickness and rivals the Pittsburgh bed as a gas-coal. It lies from 50 to 80 feet below the Lower Freeport coal.

The Lower Kittanning coal-bed is mined but locally.

The Clarion coal-bed is that extensively worked in Clearfield county, and which gives the celebrated steam-coal which comes into competition along the Atlantic seaboard with that raised in the Cumberland region of Maryland. For steam-raising and rolling-mill work it is unexcelled, except by portions of the Pittsburgh coal.

The Brookville coal-bed is generally too thin and full of sulphur to be mined. This is the lowest coal above the great conglomerate.

f Among the inter-conglomerate coals are the so-called Clarion group, whose identification is not yet complete. They occur at Fall Brook, Tioga county, and are there of considerable value. The other inter-conglomerate coals are of little value in Pennsylvania.

The coals of the bituminous region of Pennsylvania are almost entirely dependent on the Pennsylvania and the Baltimore and Ohio railroads and their controlled lines for outlets to markets. In many cases the distances which the coals have to be carried before reaching a market are very great, and the freights paid amount to double or treble the cost of the coal. This is a very great disadvantage, when compared with the short distances coals are hauled in Europe, and greatly enhances the cost of our manufactures. Except for markets along the Ohio river and great lakes the bituminous coals of Pennsylvania are at a great disadvantage when compared with the anthracites. Fortunately a large proportion of them is locally consumed in manufacturing industries; while the gas-coals are of such a value that they will bear transportation at high prices.

5. *The coal-fields of Ohio.*—The Ohio coal-fields are but the western extension of the bituminous coal-region of Pennsylvania, consequently the coal-beds which are found in them are the same, with local modifications, as those

of the latter state. Commencing at the Pennsylvania-Ohio line we find that "the margin of the coal-basin forms a tortuous line commencing in the northern part of Trumbull county, passing thence southwesterly to the Mahoning valley, where it is deflected far to the southeast. West of Youngstown it runs through the southern townships of Trumbull county, where it is deflected north nearly to the center of Geauga county, where it incloses a long tongue, and two or three small islands of coal. Thence returning into Portage, it passes southeasterly through the southern part of Summit, where it is deflected to the northwest. From here it runs southwesterly again to the southwest corner of Holmes. Thence it passes nearly southward along the western margin of Holmes and Coshocton; thence southwesterly through the eastern part of Licking. From here its course for 50 miles is nearly south to the center of Hocking, where it turns slightly westward, and passes through Viuton, Jackson, Pike, and Scioto to the Ohio, where it crosses" into Kentucky. The counties more or less underlaid by coal in Ohio are Mahoning, Columbiana, Portage, Stark, Holmes, Carroll, Tuscarawas, Jefferson, Harrison, Belmont, Guernsey, Coshocton, Muskingum, Perry, Noble, Morgan, Washington, Monroe, Meigs, Athens, Jackson, Gallia, Lawrence, Trumbull, Summit, Medina, Wayne, Licking, Hocking, Pike, and Scioto.

Thirteen coal-beds have been recognized in Ohio, and the geologists who have there given them numbers, call the top bed No. XIII. Of these beds Nos. I to VII belong to the Lower Productive Measures, and Nos. VIII to XIII to the Upper Productive Measures. No reliable coal-beds have been found in the Lower Barren Measures.

Coal-bed No. XIII, which is the Washington bed of Pennsylvania, is limited to Belmont county, and is of no practical value.

Coal No. XII is sometimes 6 feet thick in the highlands of the Ohio river opposite Wheeling, but is so heavily charged with pyrite as not to be mined except for local use.

Coal No. XI, known locally as the "Jumping 6-foot seam", is the equivalent of the Waynesburg coal of Pennsylvania. It is locally of some value in Belmont county, but is very unreliable both in quality and in thickness. Within 100 yards it varies from 6 inches to nearly 6 feet. It is rarely of any economical value, and nowhere yields good coal. In Jefferson and Harrison it is found in the highest hill-tops, but is never more than 2 feet thick.

Coal No. X is a more persistent bed than the preceding, and has been traced in Belmont, Harrison, and Jefferson counties, but in all of these is of far less value than the Pittsburgh bed. It is mined extensively in parts of the counties mentioned to supply local demand. At the west it is rarely less than 4 feet thick, but rapidly thins out until it has entirely disappeared at the Ohio river.

Coal No. IX, which occurs in Belmont, Jefferson, and Harrison counties, is from 18 to 30 inches thick and of no value. In places it has been let down upon the Pittsburgh coal.

Coals Nos. VIII^b and VIII^c, which are supposed to be the equivalents of the Sewickley bed, are of no value.

Indeed, all the coals of the Upper Productive Measures in Ohio, except VIII, of which more anon, are of but little value.

Coal No. VIII, which is the equivalent of the Pittsburgh bed, enters Ohio in Jefferson county. In Ohio it is commonly known as the Pomeroy bed. From Jefferson it outcrops in Muskingum, Morgan, Athens, and Meigs counties, underlying all the counties to the southeast of these, and crosses the Ohio into West Virginia at Pomeroy. This coal-seam, which is one of the most important beds in Ohio, is an excellent coking coal, generally somewhat more sulphury than in Pennsylvania, but locally quite free from this. While in some localities quite thin, in Morgan, Athens, and Meigs counties it varies from 5 to 9 feet in thickness, and is often divided into one or more benches. Where mined in Meigs county it is much liked as a steam- and mill-coal.

While the coal-beds of the Lower Barren Measures of Ohio are generally of little importance, there is one bed which is quite persistent, known to Ohio geologists as coal No. VII; it is a very variable coal. In Tuscarawas, Coshocton, Holmes, and Stark counties, lying about 100 feet above coal No. VI, it is valuable as being associated with black band ore and locally, also, with limestone. In the counties named the bed is $1\frac{1}{2}$ to 3 feet thick, soft and sulphurous, and only valuable for calcining the iron ore. In the eastern part of Carroll and in Jefferson county it is 3 to 4 feet thick and of a much better quality, as at Salineville. In southern Carroll and the adjoining portions of Harrison it is 4 or 5 feet thick, and of fair quality. It is the "Cambridge" coal of Guernsey county, and the "Alexander" coal of Muskingum county, at the latter point being 6 feet thick, and of fair quality. This same bed is called the "Sheridan" or "Bayley's Run" in Athens county, where it is $4\frac{1}{2}$ to 5 feet thick, and is extensively worked. Next to the Straightsville (No. VI) or Nelsonville bed it is the most important coal in this section of Ohio. It is a coking coal, generally containing more sulphur than bed No. VI, but in places is pure enough to make an excellent coke. It extends south through Jackson, Gallia, and Lawrence counties to the Ohio.

The coals of the Lower Productive Measures in Ohio are of much greater value than those just briefly enumerated. In a descending series, the first coal-bed met with is—

Coal No. VI, or the Upper Freeport coal of Pennsylvania. This is the most important coal-bed in the state, as being thicker, occupying a greater area, and supplying a greater amount of valuable fuel than any other. In northern Ohio it is a rather soft coking coal, containing a moderate amount of sulphur, but too much to be used in gas manufacture. But it makes an excellent coke if washed. It occurs almost everywhere in Holmes county, being 3 to 6 feet thick, and is the fuel most in use. In Tuscarawas county it is of the same character as in Holmes, being 4 to 7 feet thick. In Stark county it is 4 to 6 feet thick in the neighborhood of Osnaburgh and Mapleton, but thence

a southward loses its thickness and its importance. Crossing into Columbiana county it stretches continuously through the highlands of the water-shed to the Pennsylvania line. At Salineville and elsewhere it ranges from 5 to 7 feet, but is not so pure as farther west. Just above Steubenville it dips below the Ohio. It is here 4 feet thick, a partially open-burning coal of great excellence. It is used both raw and coked for iron-smelting, being now generally coked. At Rush run it is 7 to 8 feet thick, but not so pure. In the eastern part of Columbiana county it is purer, and at the Sterling colliery it is mined as a gas coal. In Coshocton county it is in places harder and purer than farther north, and if rightly prepared would make an excellent coke. South of the National road it acquires a much greater magnitude. While in Muskingum county it has the same property as in Holmes, and is not so thick and pure as in Coshocton, it acquires its greatest importance in Perry, Hocking, and Athens counties. b In this district, known as the Hocking Valley region, the coal attains a thickness of 4 to 13 feet. The coal which is locally known as the Straightsville or Nelsonville coal becomes here very hard and dry burning; it swells but slightly in the fire, and is in some places very free from sulphur, while in others it contains too high a percentage to be used in iron-smelting. Where best developed it is almost as compact and homogeneous as anthracite, and after the volatile matter is driven off leaves a mass of glowing coals resembling an anthracite fire. In places it resembles a cannel coal, again in others is a splint coal; occasionally it is sufficiently pure to be sold as a gas coal; nor is it excelled by any coal in the state as a domestic fuel. In the Mahoning region this coal is apparently very variable in quality, and as a consequence great care should be taken in testing its character. South of Athens county coal No. VI has not been certainly recognized; if it exists it is much diminished in thickness and value on c its western outcrop.

Coal No. V is the equivalent of the Lower Freeport coal of Pennsylvania. In Tuscarawas county it is mined at Mineral Point, being an open-burning coal of good quality, 4 feet thick. It is generally mined in the southern and eastern townships of Stark county, but is only 30 inches thick. At Alliance, while 4 feet thick, it is softer and more sulphurous. It does not seem to have been tested as to quality elsewhere in Ohio.

Coal No. IV is the Upper Kittanning coal of Pennsylvania. It is of very variable character and but little mined for more than local use, except at Leetonia, in Columbiana county. Here it is a very pure coal, and at Canfield and Darlington it is a cannel coal. In some parts of the state it is an open burning coal; in others a cannel, as in Coshocton county. In thickness it varies from 2 to 6 feet.

Coal No. III is the equivalent of the Lower Kittanning coal of Pennsylvania. It is a very variable bed, d exhibiting marked changes of thickness within limited areas. Near the eastern border of the state it is a coking coal, 2 to 4 feet thick, and contains considerable sulphur. It is extensively worked at New Lisbon, Columbiana county, and is coked there. It is mined in the southwestern corner of Stark county, where it is 3½ feet thick, partially open-burning, and of excellent quality. In Holmes county it becomes a cannel in places where it is 5 feet or more thick.

Coal No. II is of no economic importance.

Coal No. I is probably the equivalent of the Brookville coal of Pennsylvania.

In Ohio this is the lowest coal bed of the series, usually 20 to 25 feet above the Great Conglomerate. It is best known in the state as the Briar Hill, Mahoning Valley, Massillon, or Jackson coal. With the exception of Coal No. VI, it is the most valuable seam in the state, from the fact that in many localities it is of good thickness, of remarkable purity, and well adapted in the raw state to the smelting e of iron ores. It is a typical furnace coal, and forms the fuel by which fully one-half the iron produced in Ohio is manufactured. Unfortunately it is an exceedingly irregular seam.

Its best development is in the Mahoning valley. It is here very compact, working in large blocks, from which fact it has received the name of block-coal. It is mined at Palmyra, in Portage county. It is largely mined in Wayne, Summit, and Stark counties, having been extensively worked for years, a large amount being sent to Cleveland, as well as for iron-making and other manufacturing purposes at home.

In Summit and Stark counties this coal is generally more bituminous than in the Mahoning valley, and has less of the block character. While less pure than in the latter locality, it is still a very pure and highly esteemed coal. It is used in the raw state in the furnaces of the neighborhood with satisfactory results; but from its inflammable character its combustion is not quite so easily regulated as that of the Mahoning valley. As a household coal it has no superior, and is preferred by those who use it to every other variety, even to the best cannel.

f From Massillon to the Ohio, along its line of outcrop, it is, as a rule, of little importance, being commonly thin, of inferior quality, and often absent. It is mined a little in Holmes county, but south of this is of no value until reaching Jackson county. Here it is 4½ feet thick, pure, much resembling the Mahoning Valley coal, and is extensively mined and used as a furnace-coal.

With the exception of the coal of the Mahoning and Hocking valleys, none of the Ohio coals will be extensively transported except for domestic use. The two coals named will be transported some distance to be used in manufacturing, where they occur of a sufficient degree of purity. What is needed in many parts of the state are better railroad facilities for the transportation of these coals. It is not likely that the No. VIII coal will be extensively mined along the Ohio river for transportation for years to come, as it does not equal in quality the same (Pittsburgh) coal from Pennsylvania, which can be floated down the river at a low cost. Still, the coal industry in Ohio is but in its infancy.

6. *The coal-fields of West Virginia and Virginia.*—No state in the Union surpasses West Virginia in the variety of coals it contains, nor does any contain an equal amount in proportion to its area, for of the fifty-four counties in

the state but six are entirely destitute of this important fuel. In many of them, however, the coal is so deeply buried, and in others the means of transportation are so inadequate, that it will be many years before the mineral wealth they contain will even commence to be developed. In Virginia, on the other hand, there are but six counties which contain coal of Carboniferous age, and they are in the extreme southwestern corner of the state, adjoining West Virginia and Kentucky. The coal-field of West Virginia and Virginia is but an extension of the Appalachian coal-field from Pennsylvania, Maryland, and Ohio, and the general system of the measures is the same, with the exception that locally some of the coal-beds in the Great Conglomerate are of a sufficient thickness to be profitably worked. The great drawback to the development of this coal-field at present is a lack of transportation facilities; consequently, except at points hereafter mentioned, the coal-seams have only been slightly developed for local use, and their thickness and value are not fully known. West Virginia has two markets for its coals—one is that of the Atlantic sea-board states, which are reached by the Baltimore and Ohio and Chesapeake and Ohio railroads; the other is that of the Mississippi valley. From the eastern margin of the coal-field the strata have a general inclination to the northwest, so that on leaving the Alleghanies the rocks belonging to the formations below the coal disappear, and the Coal Measures themselves become buried and are succeeded by the Upper Barren Measures on approaching the Ohio. The Coal Measures in Ohio form the other half of this geo-synclinal trough or basin, in which the Ohio river flows the greater part of its course, a little to the west of the center line of this basin.

The eastern and western margins of this trough gradually approach each other as they extend northward, and bending around—the former in Pennsylvania and the latter in Ohio—at length meet and form the northern termination of the basin. Fortunately for the counties of West Virginia forming the so-called "Pan-Handle", this northern termination occurs at no great distance, so that the Ohio in its western course along the margin of the Pan-Handle intersects the southerly dipping coal-beds in a direction highly favorable for the development of their rich mineral contents. In fact it does still better, as it cuts the successive coal strata along the whole river-front, for, beginning at the northern extremity of the state near the mouth of the Little Beaver, the Ohio river flows in the lower part of the Lower Coal Measures, which crops out farther north. Descending the river, the inclination of the rocks being toward the south, the lower coals pass below the river-bed, and at the top of the hills opposite Steubenville the lowest coal-bed of the Upper Coal Measures (the Pittsburgh bed) appears; this descends slowly, until it also disappears, a short distance below Wheeling.

The superior strata come lower and lower, till Fishing creek, in Wetzel county, is reached. Below this point, flowing more toward the west, it is west of and parallel to the axis of the Appalachian basin, still exposing only the upper strata, but bending northwest. Near Marietta the river displays lower formations, in which it continues until reaching Parkersburg. By a series of flexures it works back into higher strata till it reaches Jackson county, when by a sudden turn it penetrates into the western side of the basin, and the rocks dipping southeast, the strata, which were buried below its bed, gradually emerge to the surface, thus bringing to light the Pittsburgh bed, worked at Pomeroy, which had disappeared just below Wheeling. It continues to expose nearly the same beds until reaching Guyandotte. Then bending west, it enters the Lower Coal Measures about 3 miles above the Big Sandy, which measures have been buried since leaving Brooke county, in the northern part of the state, and finally emerges from the Coal Measures near Portsmouth.

The Coal Measures of the New and Kanawha rivers are those which have been most widely explored and extensively mined. In Mercer county are extensive coal-beds, which seem to belong to the sub-Conglomerate Measures, and are developed to a greater thickness than elsewhere in the state, but the developments have hitherto been too slight to accurately determine their precise geological position. At Quinimont, in Raleigh county, two sub-Carboniferous coal-beds are worked in the Great Conglomerate—the lower one, 4 feet thick, supplies the Quinimont furnace with fuel; the upper one has been but slightly developed, and seems to be 3 feet thick. The former of these two beds is a semi-bituminous coal, soft and friable, and makes a hard, silvery coke of excellent quality. The coal is also well adapted for steam-raising purposes and household use, as it makes a very hot, red fire. Continuing down the New river, we find the Brookville bed of Pennsylvania, worked by various parties in Fayette county. It is here $3\frac{1}{2}$ feet thick, is a tender, friable, semi-bituminous coal, yielding an excellent coke. Passing down toward and to the Kanawha river, this lower bed is succeeded by the other beds of the Lower Coal Measures, which yield all the varieties of bituminous coal, viz, semi-bituminous, bituminous, splint, and cannel. Nowhere is a richer gas-coal found, and one which is more prized by the gas companies as an enricher for the leaner, cheaper coals, except in Kentucky. Properly washed, the coals when coked yield a product fully the equal in quality of that from the Connellsville region. Again, the splint coals are fully up to standard as steam- and furnace-coals, and are much liked for those purposes. The great advantage of the coals along this section is that they occur above water-level and can be mined by tunnels, without shafting and pumping. In the Monongahela basin the coals met with belong to the Lower and Upper Freeport, the Pittsburgh, the Redstone, the Sewickley, and the Waynesburg beds.

In Monongahela county the Lower Freeport seam is $4\frac{1}{2}$ feet thick; the Pittsburgh, 11 feet; the Redstone, 5 feet; the Sewickley, 6 feet; and the Waynesburg, 5 to 6 feet. The Pittsburgh is the only bed worked to any extent, and here, as elsewhere throughout the state—except in the Potomac basin—is a valuable gas-coal and yields a

a good, firm, solid coke. At times, however, it is high in sulphur, which renders it unfit for iron-making purposes. The sulphur is not so detrimental for gas purposes, as it can be neutralized by lime, and the coal contains more gas than the Westmoreland coals of Pennsylvania.

In the Preston County basin are all the coals of the Lower Productive Measures, and in the southern end the hilltops contain the Pittsburgh bed. The only coal-bed worked is the Upper Freeport, which, while 8 to 9 feet thick, only affords 4 feet of good coal in its lower bench.

The Potomac basin is only a prolongation of the Maryland Cumberland basin. Here are all the coals of the Lower Productive Measures occur, as well as two beds of the Upper Productive Measures. The main bed is the Pittsburgh, which here attains a thickness of 14 feet, but the coal is so soft that not over 60 per cent. goes to market. The coal is semi-bituminous in character, and contains but little gas. It is chiefly used for steam- and rolling-mill purposes. (a)

Finally we come to the coals of Virginia proper, which are confined to Tazewell, Russell, Scott, Lee, Buchanan, and Wise counties. The coals, but little developed hitherto, belong to the Lower Productive Measures. It is known that they will coke, and are sufficiently pure to make an excellent blast-furnace fuel. From the railroad developments now going on in that region it will not be long before these coals are utilized for iron-making purposes.

7. *The Maryland coal-field*, better known as the Cumberland coal-basin, is but a prolongation of the Potomac basin mentioned under West Virginia. This coal-field is one of the most important in the United States, due to the thickness of the main bed, its good quality, and the large annual production. The coal is most extensively c used for rolling-mill and steam-raising purposes, its chief and only competitor among the bituminous coals being that from the Clearfield region of Pennsylvania. This coal-field is an outlier of the main Alleghany coal area, of which there are several others in Pennsylvania, such as the Broad Top, Snowshoe, Ralston, and Blossburg basins. The coal is semi-bituminous in character, and does not coke quite so readily as those which contain more gas. Nowhere are the whole of the Coal Measures, both Upper and Lower Productive Measures, better displayed than they are here, but without the Upper Barren Measures. The best coals are those of the Upper Productive Measures, which occur here of full thickness, while those of the Lower Productive Measures are small, being split up into a large number of thin seams. The main bed is the Pittsburgh, which occurs here 14 feet thick. The whole of the coal is shipped, both coarse and fine, and sent to market. It is usually mined out in large lumps, but being unfortunately of a friable nature, it becomes much pulverized in handling and transporting.

d A great advantage of this coal-field is its proximity to market, as it has the canal and two railroads by which the coal can be brought to the seaboard. The chief market is New York. While the Pittsburgh is the chief bed now mined, it will take but a few years to exhaust it owing to the enormous demand and the wasteful methods of mining which are in vogue. When this is done, recourse will necessarily be had to the overlying beds, which are much thinner. The Redstone is here $4\frac{1}{2}$ feet thick, the Sewickley $3\frac{1}{2}$ feet, the Waynesburgh 6 feet, and the Washington or Brownsville but 2 feet. The extent of this basin is small, the Pittsburgh bed having originally covered 27 square miles.

Turning from this small and important coal district, we come next to that portion of the Alleghany coal area included in eastern Kentucky.

8. *The eastern Kentucky coal-field* is but a continuation of that described in Ohio and West Virginia. The e western boundary of the Alleghany coal area in Kentucky is approximately as follows, in a north-south direction: Starting at the Ohio river near Tygart's creek, the line runs through Greenup, Carter, Rowan, Morgan, Powell, Estill, Jackson, Laurel, Pulaski, Wayne, and Clinton counties to the Tennessee line. This coal field underlies the whole of fifteen counties and a portion of five others, containing 8,983 square miles. The boundary line is very crooked, throwing off numerous spurs, extending west of the line mentioned. While two separate divisions of the

a Since the above was written development has shown that of the 14 feet thickness of the Pittsburgh seam 12 feet are excellent coal, high in fixed carbon and low in sulphur, as appears from the following analyses from differential samples taken by the writer and analysed by Dr. F. A. Goeh.

	Whole thickness mined 12 feet.	Bottom bench, i. e. lower 2 feet mined.
Water	0.19	0.26
Volatile combustible matter .	19.98	20.56
Fixed carbon	71.77	72.89
Ash	8.06	6.79
	100.00	100.00
Sulphur	1.045	1.737

Sulphur in upper bench (10 feet) 0.891 per cent.

f While the Pittsburgh bed is confined to the hill tops and covers a limited area south of Elk Garden, the whole basin is underlaid by a group of coal-beds corresponding apparently to the Kittanning and Clarion beds. One at least of these appears—1882—to be persistent as a workable bed from 6 to 9 feet thick with from 4 to 8 feet of fine bituminous coking coal, high in fixed carbon and low in sulphur and ash.—R. PUMPELLY.

coal strata can be observed, they differ from the northern portion of the Alleghany area in the fact that the coals **a** belonging to the Upper Productive Measures are wholly lacking. The Upper Coal Measures of Kentucky belong to the Lower Productive Measures farther north, while the lower coal-beds are inter-conglomerate coals, belonging to the Great Conglomerate. The Upper Measures of Kentucky are known to contain twelve coal-beds, while in the southeastern counties two, and possibly three beds occur in the conglomerate. These latter coals occur along the western margin of the coal-field, being at times 4 to 5 feet thick, but generally much thinner. Their remoteness from market and the presence of coal in thicker beds and much superior in quality, will probably confine their exploitation and development to the requirements of the neighboring population.

The general dip of the Coal Measures is about southeast, or at right angles to the trend of Pine mountain. This chain, ranging from the southern part of Whitley county in a northeast direction through Harlan county to the War gap, and thence to the Sounding gap, at the junction of Letcher and Pike counties, has been produced **b** by a dislocation of the Coal Measures, which has upheaved the sub-Carboniferous limestone more than 500 feet up into Pine mountain, thus dividing this coal-field by a vast fault into two basins, one on each side of the mountain.

Of the twelve beds belonging to the Lower Productive Measures, the lowest, or No. I, is the equivalent of the Brookville coal of Pennsylvania, and of the Brier Hill coal of Ohio. It varies in thickness, being at times too thin to be profitably mined, but it has, when developed, a local uniformity, which will permit of its being easily mined where sufficiently thick. Its thickness gradually increases from the Ohio, where it is 15 inches, to Warfield, in Martin county, where it is 5 feet. Toward the west, where it occurs in the hill-tops, it generally thins out along the line of its outcrop. This bed varies in quality at different points, but is generally a splint or open-burning coal in character. It has not been tried in the blast-furnace, but is in places too high in sulphur to be adapted to iron-smelting in its raw state. Near the Ohio this coal is less reliable in quality than in Carter and Lawrence **c** counties.

Bed No. II (the Clarion coal-bed of Pennsylvania) is less important than bed No. I. It covers a wide extent of country, and is in places of good quality and thick enough to mine. It varies from 2 to 3½ feet in thickness, and is locally mined for domestic use.

Bed No. III (the Lower Kittanning bed of Pennsylvania) varies from 3 to 6 feet in thickness, the latter being at Peach Orchard, on the Big Sandy river. Usually the coal is a bituminous one, but at times it contains a layer of cannel coal.

Bed No. IV (which may be the equivalent of the Upper Kittanning of Pennsylvania, but is probably only a local coal) is a cannel coal, portions of the bed being bituminous. It is known in the market as "Hunnwell cannel". The bed is 2½ to 5 feet thick, but it seems to be entirely wanting in places, as in Lawrence county. The **d** amount of volatile matter in this cannel coal is remarkable (66 per cent.), while the fixed carbon is very small (28 per cent.). Consequently it is a valuable coal for gas-making purposes.

Bed No. V is locally known as the Pennington and Cooksie Fork coal, its greatest development being in Lawrence and Carter counties. It is only mined at Buena Vista furnace, where it is 3½ feet thick, and of good quality. The general character of the coal is unknown, owing to lack of developments.

Bed No. VI is locally known as the Keys Creek or River Hill coal, and has its greatest development in Boyd county. Where mined, at Louisa, in Lawrence county, it is a little over 2 feet thick and a good quality of bituminous coal. It is also found in Boyd county, but is less reliable, both in quality and thickness.

Bed No. VII is widely known as the Coalton coal. It is extensively mined at Coalton and a number of other points on the eastern division of the Lexington and Big Sandy railroad. The coal is a splint, and widely used in **e** the blast-furnaces of eastern Kentucky in its raw state, for which purpose it enjoys a high reputation. Its usual thickness is 3½ to 6 feet.

Bed No. VIII is also mined at Coalton, where it is said to be 4 feet thick, but inferior in quality to No. VII.

Of the four upper beds little is known beyond the fact of their existence.

Owing to a lack of transportation facilities the coal of Kentucky has been hitherto but slightly developed, except in Greenup and Boyd counties, which are on the Ohio, a little on the Licking river, and a few entries on the Kentucky river. Consequently the quality of the coals is but imperfectly known. This state contains a larger proportion of cannel coal than any other, but it has never been developed and still lies buried in the ground. (*a*)

a Since the above was written, a large amount of exploratory work has been done near the headwaters of Rockcastle creek, a branch of the Tug fork of the Big Sandy river, in Martin county, and near the headwaters of John's creek, a branch of the Levisa fork of the Big **f** Sandy, in Johnson county. This work has proved the existence of a valuable coal-field. There are here 5 seams of coal, each sufficiently thick to be exploited. The equivalency of these seams has not been fully made out, but it is believed that the seam locally known as "D" is the same as the Peach Orchard seam, No. III. This seam is 9 to 10 feet thick, but it contains so many slate and bone partings as to make its working unprofitable. Below "D" two seams have been opened upon, *i. e.*, "C," 30 to 60 inches thick, and "B," 36 to 40 inches thick. Above "D" the seam "E" varies from 50 to 72 inches in thickness, the average of thirteen measurements being nearly 58 inches. This is the most important seam thus far opened in this part of the state, and it has been explored sufficiently to determine its regularity and value over a considerable extent of territory. Above "E" the seam "F" is, at one opening, 11 feet thick; but it lies so high above drainage level that it is caught in the highest hills only, and it is probable, too, that the great thickness of the seam is but a local phenomenon. The coal from all these seams is free-burning, and it contains but little sulphur. The average of 8 cross-section samples from different openings on the seam "E," which were collected and analyzed by the writer of this note in 1882, is as follows: Water, 3.29 per cent.; volatile combustible matter, 36.16 per cent.; fixed carbon, 50.39 per cent.; ash, 10.16 per cent.; sulphur, 0.75 per cent. A railroad has recently been surveyed to this coal-field from the Ohio river.—BAYARD T. PUTNAM.

a 9. *The Tennessee coal-field* is but a prolongation southward of the eastern Kentucky field. Its area is co-extensive with that of the Cumberland mountain or table-land. The Cumberland mountain crosses Tennessee obliquely, and although much indented by valleys and coves, is nowhere completely cut in two by them. The eastern border of this table-land is comparatively a nearly direct or gracefully curving line, the indentations made by the streams on this side being scarcely noticeable. It is very irregular, however, along its western border, being cut out and notched by deep valleys and coves, separated from each other by long spurs jutting to the west. These deep indentations give the western outline a very ragged appearance. Along the Kentucky line the coal-field is about 70 miles wide, while it narrows along the Alabama line to 50 miles. The coal-field includes within its limits the whole of Scott, Morgan, and Cumberland counties, together with portions of Fentress, Van Buren, Bledsoe, Grundy, Sequatchie, Marion, Claiborne, Campbell, Anderson, Rhea, Overton, Putnam, White, Franklin, **b** Warren, and Coffee counties. A little east of the center this coal-field is split north and south by the Sequatchie valley, dividing it into parallel but unequal arms, extending through Bledsoe, Sequatchie, and Marion counties.

The sub-conglomerate coals embrace the whole of the coal region of Tennessee, except the northeastern and a part of the eastern section, and are apparently the coals which have been most thoroughly explored. The chief bed of the sub-conglomerate coals is worked at the *Zetna* mines in Marion county, where it is 3 feet thick. Hitherto the coals of Tennessee have not been carefully examined, so that it is extremely difficult to correlate them and put them in their proper places. It is known that there are three to nine sub-conglomerate coal-beds, which are none of them thought to be of very regular thickness, but to swell and contract locally. There are known to be twenty-one beds in the Coal Measures proper above the conglomerate, of which but one or two have been worked, and these chiefly at the *Sewanee* mines in Grundy county, where the main *Sewanee* seam is 3 to 7 **c** feet thick. More geological explorations are needed in order to locate the position of these coal beds precisely.

The market for the Tennessee coals, while comparatively local, is capable of great development for manufacturing purposes and local use. There are known to be both coking and splint or open-burning coals in the state which can be used for blast-furnace and rolling-mill purposes. Some of the coals are rich enough in volatile ingredients and sufficiently low in sulphur to be used for gas-making purposes. Then there are the great adjoining markets of South Carolina, Georgia, western Tennessee, and Mississippi, in which the coals will, in the future, be largely used as the manufacturing interests are developed. It is said that there is good cannel coal in the state, but if so, it has certainly not been developed.

10. *The Georgia coal field.*—The Tennessee coal-field west of the Sequatchie valley extends over the border into Alabama and then soon dies out. That on the eastern side of the valley, on the contrary, extends through **d** Dade, Walker, and Chattooga counties in Georgia into Alabama. Almost the whole of the former is underlaid by an excellent quality of bituminous coal, while there is not quite such an extent of it in the other two counties. The coal is largely mined to be shipped in a raw state and as coke to Chattanooga and other iron producing centers, as well as to the cotton factories and the Atlantic seaboard.

11. *The Alabama coal region* is an extension southward of the Georgia into northern Alabama. It is divided into three fields, the *Black Warrior*, the *Cahaba*, and the *Coosa*. Of these three the first is much the largest, extending from the Georgia line almost to Mississippi, covering the whole of Hancock and Walker counties, and parts of Tuscaloosa, Fayette, Marion, Franklin, Lawrence, Morgan, Blount, Jefferson, Marshall, Jackson, and De Kalb counties. The spurs of the Cumberland table-land which extend from Tennessee into Alabama have been but little explored, but the coals which occur are sub-conglomerate coals. Of about the same relative position are **e** the coals which are found in the *Lookout* mountain in Alabama. The lower part of the *Warrior* basin has been very little explored, except along the line of the South and North Alabama railroad. The coals which are worked in this basin seem all to be of sub Carboniferous age belonging to the conglomerates, but the identification of the beds seems to be still very doubtful.

With regard to the *Coosa* coal-basin, but little is known beyond the fact that there are at least three workable coal-seams, which are, respectively, 3, 4, and $3\frac{1}{2}$ feet thick.

In the *Cahaba* coal-basin the coals vary in character, some being coking-coals, others dry open-burning coals. The field has been too little opened and explored to enable us to form a correct idea of its value. There seems to be two sets of Productive Coal Measures, one being of sub-Carboniferous age, the other belonging to the Lower Carboniferous Measures. Of these the former are in many places deeply buried. Along the western edge of the **f** basin but two coal seams have been recognized. It will require further examinations on the part of the geological survey of the state to recognize and differentiate the different beds.

This concludes the coal-fields of the Alleghany area. We come next to—

III. THE ILLINOIS, INDIANA, AND WEST KENTUCKY AREA.—The coal-measures of this portion of the United States form but one area.

1. *The Indiana coal-field.*—The Carboniferous Measures occur in the counties of Posey, Vanderburgh, Warwick, Spencer, Perry, Crawford, Gibson, Pike, Dubois, Knox, Daviess, Martin, Sullivan, Greene, Clay, Owen, Vigo, Parke, Vermillion, Fountain, and Warren; or, in other words, in the southwestern part of the State. There are three beds of coking-coal in this field, varying from $4\frac{1}{2}$ to 10 feet in thickness, and three seams of open-burning or splint coals that range from $2\frac{1}{2}$ to 5 feet in thickness, the average thickness being 4 feet. One bed of cannel coal

occurs in Daviess county, about $4\frac{1}{2}$ feet thick. The principal coals mined with this exception are the block coals **a** from Clay county. The coal bears a high reputation for iron-smelting and steam purposes, is remarkably free from sulphur, and contains but a small amount of ash. As yet no consecutive report has been published by the geological survey of Indiana showing the exact relations of the different coal-beds. The coals all seem to belong to the coal-measures proper, with the exception of a sub-conglomerate bed which is mined in Martin county, where it is found 3 to 4 feet thick.

2. Passing south into *Kentucky* we find the area of the western coal-field to underlie the following counties in whole or in part, viz: Union, Crittenden, Caldwell, Hopkins, Christian, Webster, Henderson, Daviess, McLean, Muhlenberg, Butler, Ohio, Hancock, Grayson, Edmonson, and Hart. Twelve coal-beds have been recognized, but they vary in number in the different localities. Beginning with the top bed in the series included between the Anvil rock sandstone and the sub-Carboniferous conglomerate, the several coals may be briefly described as follows **b**

Coal A, more commonly known as No. 12, is present over a considerable extent of territory, but is seldom mined, as its position near the summit of the Carboniferous formation usually brings it near the hill-top, and it is thus rarely found in a suitable condition for working, the covering being insufficient, and the coal too soft or too untrustworthy in its linear extent. When found in a workable condition, however, this coal is comparatively free from all irregularities of bedding, and is easily mined. When well developed it varies from 3 to 6 feet in thickness. This coal is too full of bitumen to be used in a raw state for smelting iron. It was tried in a furnace on Green river, and the quality of iron made was poor. It makes, however, an excellent coke.

Coal B.—This bed is, taking the field through, quite untrustworthy. It thins and thickens in a remarkable manner, and it is seldom free from slips. It is, however, more persistent than coal A. When workable, the coal is of fair quality as a fuel for general purposes, though rather too soft to be kept long after mining. This bed is **c** worked at many points in the coal-field, and often lies above drainage. It is found in Henderson and Daviess counties toward the Ohio, in the western parts of Union and Webster, in Hopkins and Muhlenberg counties, at many points in the southern part of Ohio county, and in McLean county.

Coal C is a very erratic bed, but seldom present. It has been observed in but few localities, and is of no practical value.

Coal D varies in its general quality and physical features, but has a remarkable uniformity in the amount of sulphur it contains. It is an admirable heating fuel, and is of peculiar value as such, when properly screened. It is too full of bitumen and too sulphurous for blast-furnace use. Its thickness varies from 4 to 6 feet. It is worked at many points along the Louisville, Paducah and Southwestern railroad, along the Saint Louis and Southwestern railroad, along the Evansville, Owensborough and Nashville railroad, in the southwestern portion of Union county, **d** toward the Tradewater river in Webster county, generally in Hopkins and Muhlenberg counties, in the northern portion of Daviess county, and in the southwestern portion of Ohio county.

Coal E is one of the most remarkable coals in its variations in thickness to be found in the field. It is sometimes entirely absent, and when present varies from $\frac{1}{2}$ inch to $2\frac{1}{2}$ feet in thickness. It is believed to be of such a superior quality when fully developed that a thickness of 3 to $3\frac{1}{2}$ feet would be regarded as workable even in the region of thicker beds.

Coal F has not yet been found as a valuable bed in either an economic or a commercial point of view. But little is known in regard to it.

Coal G is a bed concerning which nothing is known beyond its existence.

Coal H has been seldom found. It is between 4 and 5 feet thick. **e**

Coal I is a bed of which little is definitely known. It has been found at a few points between 1 and 3 feet in thickness and apparently of good quality. It is above drainage in the southwestern quarter of Hopkins county, in Union county, the southern part of Ohio, and Muhlenberg counties.

Coal J varies from 2 to $3\frac{1}{2}$ feet in thickness, and has been but little mined. Owing to a high percentage of mineral charcoal and sulphur ***** stands exposure but poorly. This bed is found in the country eastward of Caseyville, in Union county; around Petersburg, in Christian county, and frequently along the disturbance which extends through Union, McLean, Webster, Ohio, and Grayson counties.

Coal K is a bed of which scarcely anything is known, and which seems to be very limited in its distribution.

Coal L is the poorest coal having great extent in the Kentucky field. It is found above drainage, or but little below it, around the eastern, southern, and western margins of the field. It varies from $3\frac{1}{2}$ to 5 feet in thickness, **1** and has been found in Hancock county, Union, Webster, McLean, and Ohio, into Grayson county. The coal has been mined at the Coaltown banks, in Christian county; in the vicinity of Tradewater station, in Hopkins and Caldwell counties; in the district around Caseyville, in Union and Crittenden counties; near Wrightsburg, in McLean county, and has been opened at a number of points in Edmonson, Grayson, and other counties.

All of these coals are of sub Carboniferous age, and therefore older than any of the coals mined in Pennsylvania and Ohio.

The Breckinridge cannel coal is the first coal above the sub-Carboniferous series. It is celebrated for its remarkable properties as an oil-producer and a gas-enricher. This coal is so rich in volatile bituminous matter that oil was distilled from it prior to the discovery of petroleum, and it was at one time shipped to New York as an

a enricher in the gas works. This bed seems to be confined to Breckinridge and Hancock counties. The seam is 22 to 38 inches thick. The coal is remarkably dense and tenacious. More oil can be obtained from it than from the famous Scotch Bog-Head cannel, which yields 72 gallons of oil and 12 pounds of paraffine, while the Breckinridge cannel yields 92 gallons of marketable oils to the ton. Its chief use at present is as a gas-enricher.

As yet the coals of this western Kentucky field have been but little exploited, and there does not seem to be any probability of the majority of the seams being extensively opened for many years, since there is but little market for these coals, except for domestic use, so long as the Pennsylvania, Ohio, and West Virginia coals can be floated down the Ohio river very cheaply.

3. The western portion of this coal area is occupied by the *Illinois coal-field*. The coals of this field are generally highly charged with sulphur, often contain a high percentage of water, and disintegrate on exposure to the b atmosphere. As a result the exploitation has been almost entirely confined to such coals as are needed for steam-raising and domestic use. The coal-measures cover the lower two-thirds of the state, and according to official reports there appear to be sixteen seams, but they all appear to be of about the quality above mentioned, with the exception of that mined in Jackson county. The coal mined here, known as "Big Muddy" coal, breaks into cubes and somewhat resembles the block coals of Ohio. It contains less sulphur, and is a harder and firmer coal than any mined elsewhere in the state. It has been used in blast-furnaces around Saint Louis.

The heaviest deposits of coal to be found in the northern portion of the coal-field are in Schuyler and Fulton counties, but owing to their distance from any large centers of consumption, the coal-beds of other portions of the state have been much more extensively opened. We pass next to another portion of the country, and come to—

IV. THE MICHIGAN COAL-AREA.—The coals of this district are very inferior in quality, and have been so little c developed that but little is known concerning them. The only coal mined is in Jackson and Ingham counties, and that only for local use.

V. THE IOWA, MISSOURI, KANSAS, ARKANSAS, AND TEXAS AREA.

1. *The Iowa coal-field*.—Its boundaries correspond nearly with the east line of Van Buren and Jefferson counties, curving a little eastward into Lee. From the northeast corner of Jefferson county the line pursues a little northwest course, passing near the northwest corner of Keokuk and the northeast corner of Mahaska county to the middle of the south line of Marshall county; running thence to Hardin county it passes westward to Hamilton and Dodge counties, beyond which its boundary is uncertain.

The center of the coal-field of southern Iowa lies in the triangle between the cities of Ottumwa, Albia, and Oskaloosa. Taking Eddyville as a center, and describing a circle of 20 miles' radius, it would embrace the territory d that produced two-thirds of the entire coal product of the state. Within this circle there are three coal-beds. The upper one is 15 to 30 inches thick in the eastern borders of Lucas and Warren counties, and 23 inches thick in the western edges of Jefferson and Keokuk counties, and is everywhere mined by drifts in the hillsides. In the central parts of the district this coal is sometimes deeper, and is worked by shafts 40 to 50 feet deep, the seam being at times thicker, 3 to 4½ feet. The lower seam of coal has only been worked in the shafts of the Whitebreast Company, the Albia Coal Company, and one or two other points.

In Mahaska county the lower coal is worked, presenting a thickness of 5 to 8 feet.

In the neighborhood of Des Moines mines have been opened in the valley of the Des Moines river, where three coal-beds, each too thin to be economically worked, come so close together that they are all mined together.

Near Fort Dodge coal is taken from a seam 5 to 6 feet thick, and this promises to be one of the important e fields of the future.

The coals of this field are all bituminous. The coals are inferior in quality, as regards the amount both of moisture and sulphur, which they contain, and can only be used for domestic and steam-raising purposes.

Passing south from Iowa, we come next to—

2. *The Missouri coal-field*.—This occupies the northern and northwestern part of the state, as well as the so-called "Osage" coal district. The best coals occur near the base of the formation. The use of the coals is entirely local, as they are of very inferior quality. The coals of the Osage district consist of a number of local deposits of limited extent, but of great thickness. They do not present the usual appearance of coal-seams, and are associated with the rocks which it is supposed would accompany them, but they occur in ravines in the older rocks below the level of the regular coal-seams. These local deposits furnish some of the best coal in the state. f They occur near the mouth of the Osage river, in Cooper, Moniteau, Cole, Morgan, and Callaway counties. In appearance these coals are between cannel coal and asphaltum, but they contain 31 per cent. less volatile matter than pure bitumen, and 5 to 10 per cent. more than the ordinary bituminous coals of the west.

3. *The Kansas coal-field* occupies the southeastern portion of the state. The Upper Coal Measures contain no coal-beds of any value, but the Middle Coal Measures produce a bituminous coal of fair value. There are three principal beds, viz, the Osage, the Cherokee, and the Fort Scott. The Osage bed is found in Osage county. It is 15 to 30 inches thick. It is mined partly at the surface, partly by shafts 20 to 30 feet deep. The Fort Scott coal appears at and near the surface in various parts of Bourbon and Linn counties. The thickest and best coal-seam is the Cherokee bed, found in Cherokee, Crawford, and Labette counties. Like all the other strata, it dips northwest. It is 15 to 54 inches thick, and is freer from impurities than any other coal found in Kansas.

4. *The Arkansas coal-field.*—The coals of this state all seem to belong to the sub-Carboniferous conglomerate. The coal-field covers the counties of Washington, Crawford, Sebastian, Franklin, Scott, Johnson, Yell, Pope, Perry, Conway, White, and Pulaski. Only two beds of coal have been found, of which only the lowest one is of sufficient thickness to work. This coal is in places semi-bituminous, in places semi-anthracitic in character, and in the future may be worked to advantage in developing the iron ores of the state. At present the mining is confined to what is needed for local use.

In reviewing the different coal areas of the United States it will be noticed that they diminish in value in passing from east to west. The anthracite districts of Pennsylvania are the most valuable, the coals of the western states the least. While of similar age, the coals of the east have been far more disturbed since their deposition than those of the west, and it would seem as if the greater the disturbance so much the greater became the value of the coals. While in the northern portion of each coal-area the upper coals appear to be the most valuable and the sub-Carboniferous to be valueless, this law becomes reversed on going south, where the sub-Carboniferous coals become of great value and the upper coals either disappear or become valueless.

Details for the census were not available in the Indian Territory. Valuable beds of coal are worked in the Choctaw Nation, supplying the railroads of the region and of a part of Texas, and furnishing coal, especially to gas companies, for the cities of Kansas and of Texas. The Choctaw Nation derives a considerable revenue from the royalty paid for the coal mined.—*Superintendent of Census.*

CHARACTERISTICS OF OHIO COALS.

BY EDWARD ORTON.

The coal-lands of Ohio are a section of the most important of the North American coal-fields, viz, that which is known as the Appalachian or Alleghany field, but which might more appropriately be termed, as has recently been suggested, the Ohio Valley coal-field, almost its entire drainage being directed to the Ohio river. Of this field the Ohio section constitutes the northwestern portion—thirty-one counties, in whole or in part, lying in the eastern and southeastern portion of the state, are occupied by rocks of Carboniferous age. The entire area of this formation in Ohio is nearly or quite 12,000 square miles, and coal-seams are due in all of it, but the geological surveys of the state so far made have not been on a minute enough scale to furnish a proper basis for estimating the actual amount of coal included within these limits. There are at least 1,200 feet of stratified deposits in the general section of the field, and inclosed within these 1,200 feet there are not less than 23 distinct coal-seams, from 18 or 19 of which coal is mined to a greater or less extent. Several of these seams occupy wide areas and are exceptionally steady and regular, but more of them are inconstant in their development, and a few are confined to very small areas, as far, at least, as workable thickness is concerned.

All of the Ohio coals belong to the bituminous division, but there are among them several well-marked varieties, the most important of which are the following, viz, (1) open-burning or dry-burning coals, (2) cementing or coking coals, (3) cannel coals. **d**

The last-named of these varieties has but a limited development in the state. It is at present nowhere mined by itself for the general market, but local deposits that are met in the working of ordinary seams, are brought out and sold separate from the common product. The only technical use of Ohio cannel coals is the enriching of gas. For this purpose the small volume of cannel reached in the mines of northeastern Ohio is in good demand, at remunerative rates. There are a number of cannel-coal fields proper in the state, which have not yet been worked, except in a small way. Their products are, in several instances, highly esteemed for household use in the neighborhoods in which they occur.

The first and second of the varieties named above constitute, in reality, all of the Ohio coals that reach the general market. Both of them are turned to large account for domestic fuel and for the production of steam; but in addition to these common and general uses, each variety has its special adaptations and technical characteristics. **e**

1. OPEN BURNING COALS.

Of the open-burning coals there are many subordinate varieties and great differences in quality. The eight lowermost seams of the state are open-burning; the ninth, Coal No. VI, of Newberry, which is the most valuable of the Ohio series, is a typical open-burning coal throughout the western half of its extent, and an excellent coking coal throughout much of its eastern area. Several of the remaining coal-seams belong to the open-burning variety, but the most of them are coking coals. It can therefore be said, in the large way, that the lower seams of the Ohio series are open-burning, and the upper seams cementing coals.

There are three of the lower coals that are well adapted, in the raw state, to the manufacture of iron, in one or more localities. These seams are (1) the Mahoning valley block-coal, the Massillon coal, and the Jackson court-house shaft coal, which are counted geological equivalents, all of them belonging to coal No. I of Newberry's classification; (2) the Wellston or Jackson Hill coal, which is No. II of Newberry, and (3) the western half of the Nelsonville coal, which is No. VI of Newberry. Each of these coals is largely used, and well approved for furnace use. The points that commend them, in addition to their open-burning quality, which is of fundamental importance, are the following, viz, a high percentage of fixed carbon, a comparatively low percentage of ash and also of sulphur. The Mahoning Valley coal, the Youngstown coal, the Brier Hill coal, the Sharon coal—for by all these names and more the seam is known—has been for many years the basis of a large production of iron, including Bessemer, pig, and car-wheel iron in northeastern Ohio and in adjacent parts of Pennsylvania. It has often been used as the sole fuel in the furnaces of the district, but of late years one-half or two-thirds of the fuel used is Connelsville coke. The Mahoning Valley coal is the type of furnace coals. It mines large; is unusually firm and

a strong, and is low in ash and sulphur. The analyses that are at hand were made from selected samples and, as is well known, but little value generally attaches to the results of such analyses, from the fact that there are but very few seams of coal from which excellent specimens cannot be taken. But in this case the results of furnace use on the large scale agree with the laboratory analyses in indicating unusual excellence in the seam. In addition to this, the number of analyses is now very large, and all agree essentially in character. It can, therefore, be asserted with all confidence that we have in this seam one of the purest coals of the country. A single analysis of the Brier Hill coal is appended, which shows the coal at its best. The analysis was made for the Ohio Geological Survey, by Professor T. G. Wormley, the chemist of the survey.

b

Analysis of Brier Hill coal.

	Per cent.
Specific gravity	1.20
Moisture	2.47
Ash	1.45
Volatile matter	31.83
Fixed carbon	64.25
Total	100.00
Sulphur.....	0.56

c

If the seam should be sampled from top to bottom, and all that goes into the furnace should be duly represented in the analysis, it is certain that the proportions of ash and of sulphur would be increased beyond the figures given above, but they would still be moderate—the former would not probably exceed 4 per cent., and the latter would fall within 1 per cent. An ultimate analysis of the coal reported by Dr. Newberry gives but a trace of phosphorus.

The Massillon coal of Stark county belongs to the same horizon and exhibits the same general characteristics as the Mahoning Valley coal, and needs no further description here. The Jackson shaft coal of southern Ohio, which has been named as another probable geological equivalent of the Mahoning Valley coal, is also the basis of an extensive manufacture of pig-iron. The coal differs, however, in several respects from the seam, as already d described. It is a tender coal and does not bear shipping well, and it is richer in mineral charcoal than the northern coal, but, like the latter, it is very pure and has high calorific power. An analysis of the seam made by Dr. Robert Peter, of Kentucky—not from selected samples, but from the whole seam as it occurs in the mines—gives the following results:

	Per cent.
Specific gravity.....	1.361
Water	4.54
Volatile combustible matter	20.68
Fixed carbon	57.06
Ash.....	8.72
Sulphur.....	0.758

e

This analysis agrees well with the analysis of selected samples as reported in the volumes of the Ohio Geological Survey, except in the proportion of ash, which is more than double the average of the figures there reported. It is altogether probable that these results are nearer the facts for the seam at large than the smaller amounts.

The coal is used in the furnace without any admixture of coke, and the ores are also exclusively native ores. The grades of pig-metal produced are not as high as those already described from northeastern Ohio, but still Jackson court-house is the seat of a thoroughly-established and thoroughly-successful iron manufacture. The iron is somewhat deficient in strength, but is well adapted to foundry purposes, and, in short, answers almost every f purpose for which "Scotch pig" can be used.

There are, then, three centers of iron production in Ohio for which the lowest of our coal-seams furnishes, in whole or in part, the fuel.

Coal No. II of Newberry is a very uncertain seam. There is, in fact, but one small basin in the state in which the seam reaches any considerable value. That basin is in Jackson county, and includes the Jackson Hill or Wellston coal, the two names being applied to the same seam. Four furnaces are working on this seam, relying upon it exclusively for fuel. The Wellston coal is somewhat tender and friable, and does not bear shipping very well, but it is a fuel of high quality. The percentage of sulphur rises above that reported for the Jackson Shaft coal, but the proportion of ash is smaller. It is about equal in calorific power to the last-named seam.

The only remaining seam in the state that is used in the raw condition in iron furnaces is the ninth seam in ascending order, or coal No. VI of Newberry. This seam is a coking coal for the eastern half of its extent and an

open-burning coal from Perry county southward. It is the basis of the last-developed but most promising center a of iron production of the state, that, namely, of the Hocking valley. In steadiness and volume the Hocking Valley coal far surpasses any of the fields thus far named. In purity it does not attain quite as high rank as that of the Mahoning Valley coals, but the whole seam in its best development scarcely rises above 1 per cent. in sulphur. The proportion of ash according to most of the published analyses is less than 3 per cent., but the portions of the seam that yield less than 6 per cent. for the whole product that goes into the furnaces are probably very rare. The fixed carbon averages more than 55 per cent., ranging from 52 per cent. to 61 per cent. Sixteen furnace-stacks have been built to run upon this seam, in whole or in part, in the Hocking valley and in regions directly dependent on its coal. The products of several of these furnaces are noted for unusual strength and excellence, the mill-iron produced competing in market with charcoal iron, a result which obviously attests the high character of the fuel used, although the native ore that is worked comes in for a share of the credit. **b**

A few analyses of picked samples of the Hocking Valley coals are here appended, and three averages, somewhat more reliable, are added:

No. 1 is from the mines of W. B. Brooks, Nelsonville. No. 2 is from the mines of Peter Hayden, Haydenville. No. 3 is from the McGinniss mines, Straitsville. No. 4 is average of seven analyses of whole seam, Sunday creek. No. 5 is average of twenty-seven analyses of coal from Sunday creek. No. 6 is average of whole seam, Nelsonville.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
	<i>Per cent.</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Specific gravity.....	1.259	1.271	1.247	1.30	.....	1.32
Water.....	6.80	6.45	6.00	6.42	5.34	3.47
Volatile matter.....	33.27	32.74	32.15	33.87	31.40	35.05
Fixed carbon.....	57.46	58.56	59.41	54.17	58.17	55.12
Ash.....	2.47	2.25	2.44	5.54	5.00	0.02
Total.....	100.00	100.00	100.00	100.00	100.00	99.66
Sulphur.....	0.74	1.19	0.50	0.88	0.88	1.73

Washington furnace, Jackson county, must be named as another separate center of iron manufacture dependent on this same coal-seam. Raw coal is used exclusively in the furnace, and all of the ores are mined on the furnace lands. A high degree of success at present attends the handling of these materials, but it was attained only after **d** several years of experiment and comparative failure.

The same seam retains its character as a furnace-fuel on the south side of the Ohio river. It is known as Coal No. 7, of the Kentucky survey, and has been successfully used in blast-furnaces for a number of years at Ashland, Kentucky, and also at Ironton, Ohio.

The Hocking Valley coal in some of its phases is well esteemed as a gas-coal, the main drawback being in the inferior quality of the coke produced. It is also used successfully in several iron-mills, but this branch of its applications has been but little developed as yet.

2. CEMENTING COALS.

The cementing coals of Ohio are used, beside their general application, for the following purposes, viz: For the production of coke, for the manufacture of gas, and for fuel in puddling-furnaces and iron-mills. The line of division between them and the coals of the first group is partially geological and partly geographical. As has been already stated, they are confined to the upper half of the seams of the state, no coal below the 9th seam in ascending order (No. VI of Newberry) being known to yield an approved coke. It is now to be added that the cementing coals are more fully developed on the eastern side of the coal-field of Ohio than on the western side. There is but a single point to the south and west of Zanesville where coke is now manufactured in the state, and the coke-production of this one point, viz, Nelsonville, is insignificant, as is that also of Zanesville. At Uhrichsville, in Tuscarawas county, a small production has been maintained for a number of years, but the largest center of production is Steubenville and vicinity. An exceptionally pure and strong coke is manufactured at Washingtonville **f** and at Leetonia in Columbiana county; but all that is produced at these points is used in the local furnaces.

This last-named coke is derived from the eastward extension of the Hocking Valley coal-seam, as are also the Zanesville and Uhrichsville cokes. The Nelsonville coke is made from the coal of the 11th seam in ascending order, viz, No. VII of the Ohio Geological Survey. To this horizon is also referred the Steubenville coking coal. The coal of neither of these seams has as yet obtained any unusual reputation as gas-making coal, though coal from each is fairly well adapted to gas-making in the phases here noted.

For the manufacture of gas a decided preference is given to the main seam of our upper series, viz, coal No. VIII, of Newberry. This is known as the Pittsburgh coal, the Wheeling coal, the Pomeroy coal, etc. Its best conditions for these technical uses are found outside of the boundaries of the state; but within these boundaries there is a large amount of coal well adapted to these purposes.

a This seam is largely used in puddling-furnaces, rail-mills, and nail-works, in all of which it does excellent service. In the vicinity of Bellaire the largest nail production of the country is located, and coal of this seam is exclusively used.

Coal of the same seam at Pomeroy is very extensively used in salt manufacture; but for this purpose an accessible fuel at low price is the only desideratum. The Pomeroy coal has an excellent reputation for every one of the purposes named above, but it is not largely coked.

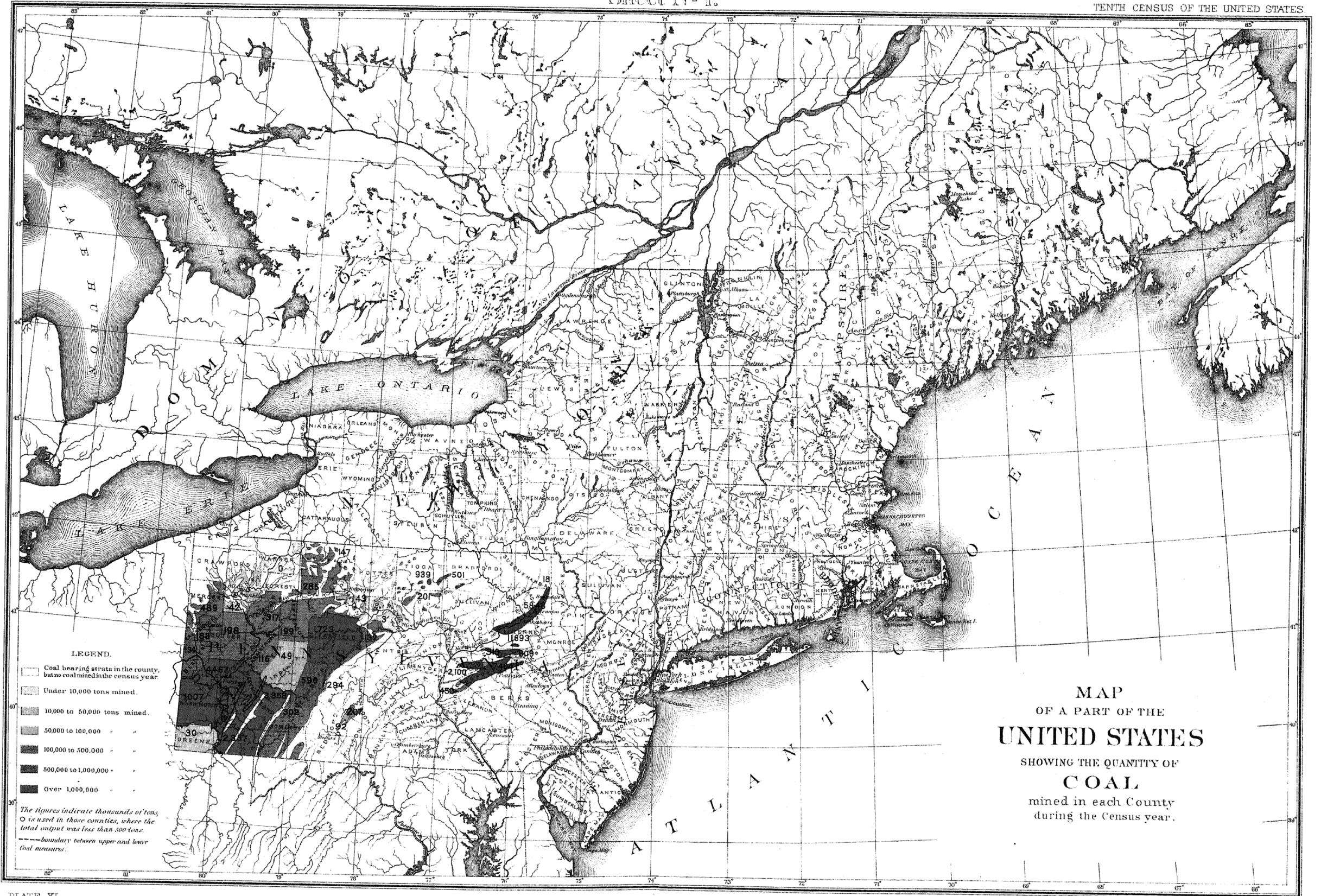
From this brief review it will be seen that three seams of Ohio coal make the chief contributions to the metallurgical work carried on within the state. These seams are, respectively: Coal No. I, of Newberry, open-burning. Coal No. VI, of Newberry, cementing in eastern Ohio, open-burning in southern Ohio. Coal No. VIII, **b** of Newberry, cementing.

These seams are reinforced in different sections of the state by two other seams, viz: Coal No. II, open-burning. Coal No. VIb, moderately cementing.

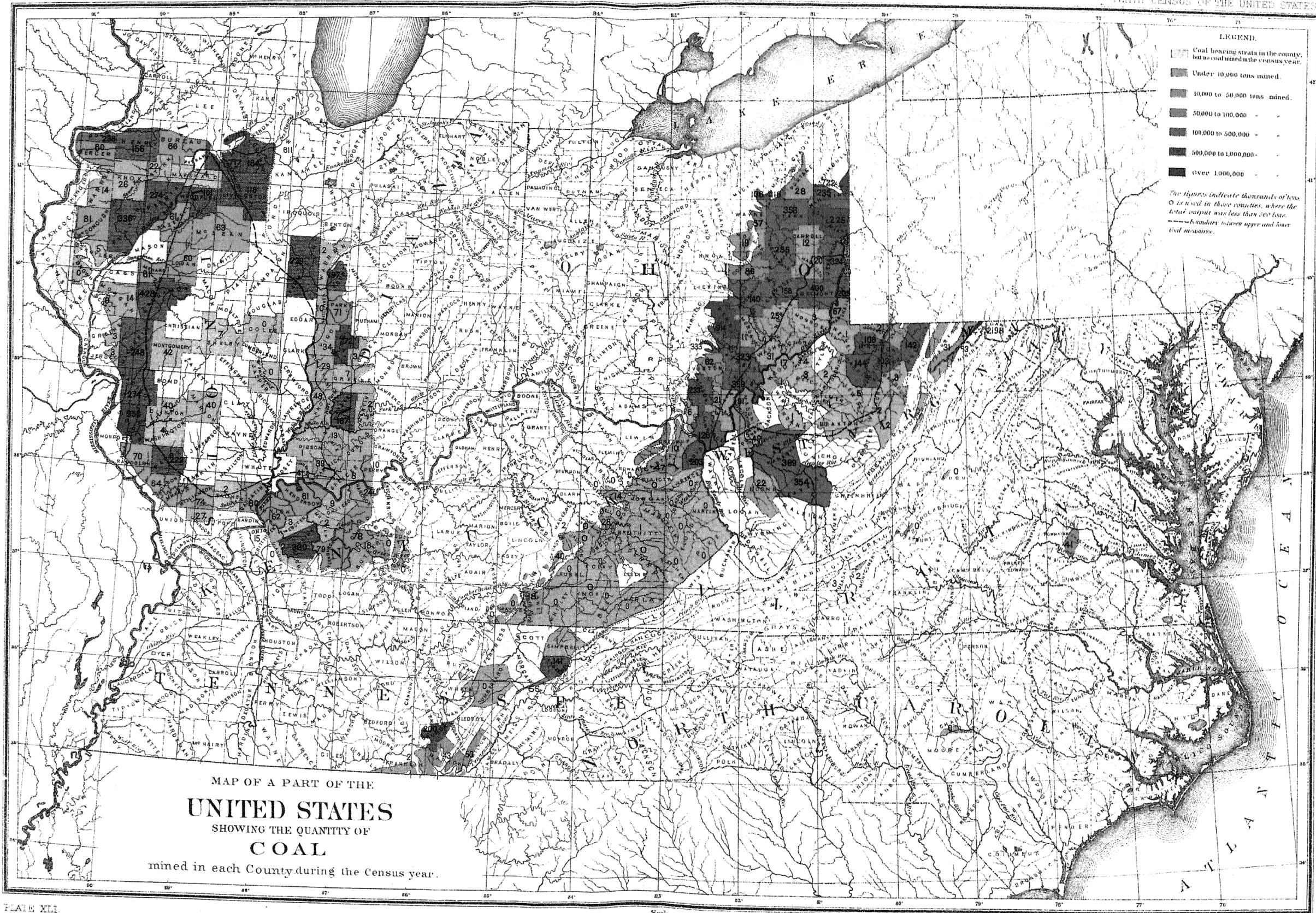
In regard to the numbering and identification of the coals above referred to, it must be acknowledged that the geologists of the state are not entirely agreed; and as to several points, nothing more can be claimed than an individual but positive opinion.

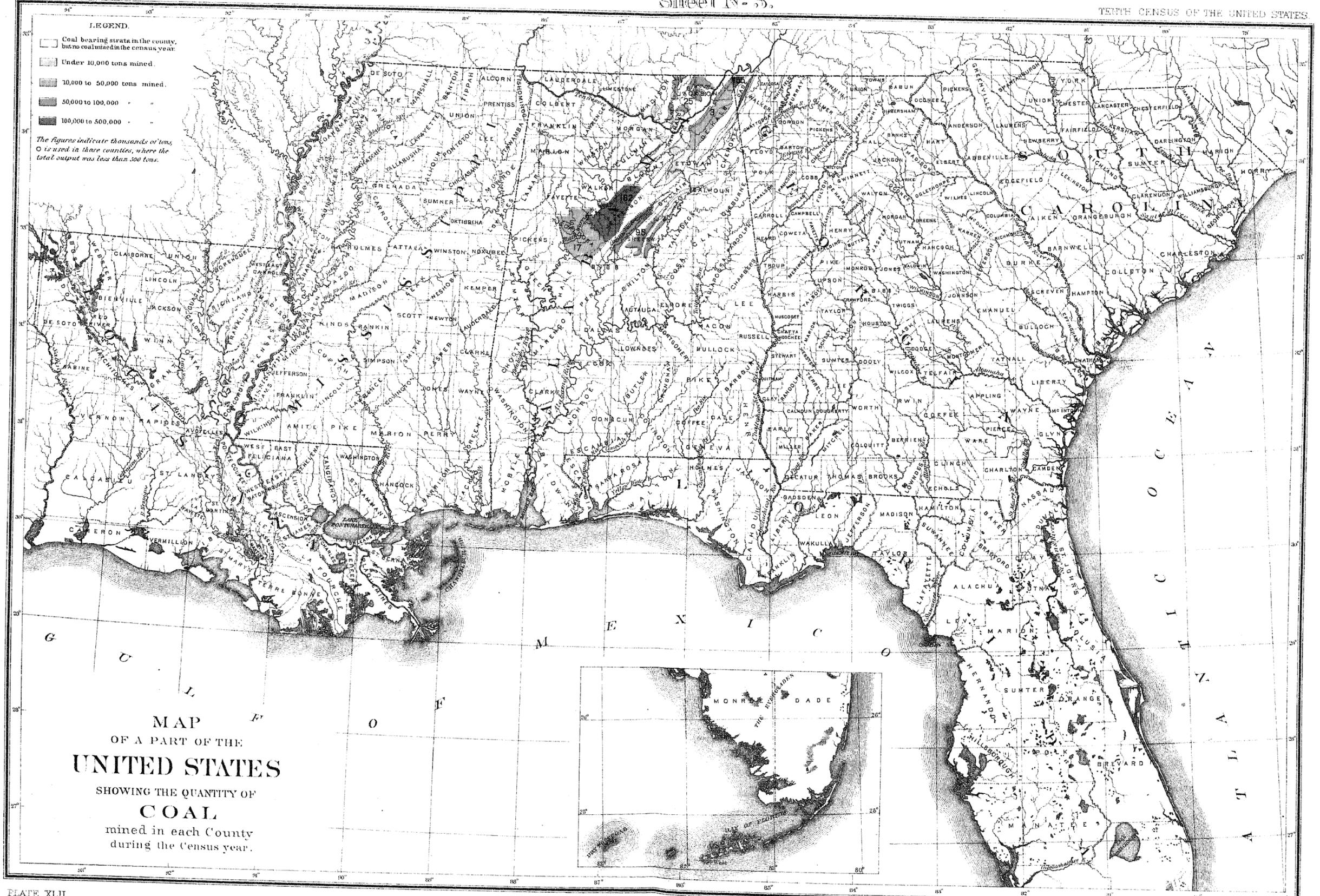
STATISTICS
OF THE
PRODUCTION OF ANTHRACITE COAL IN THE CENSUS YEAR.

023.



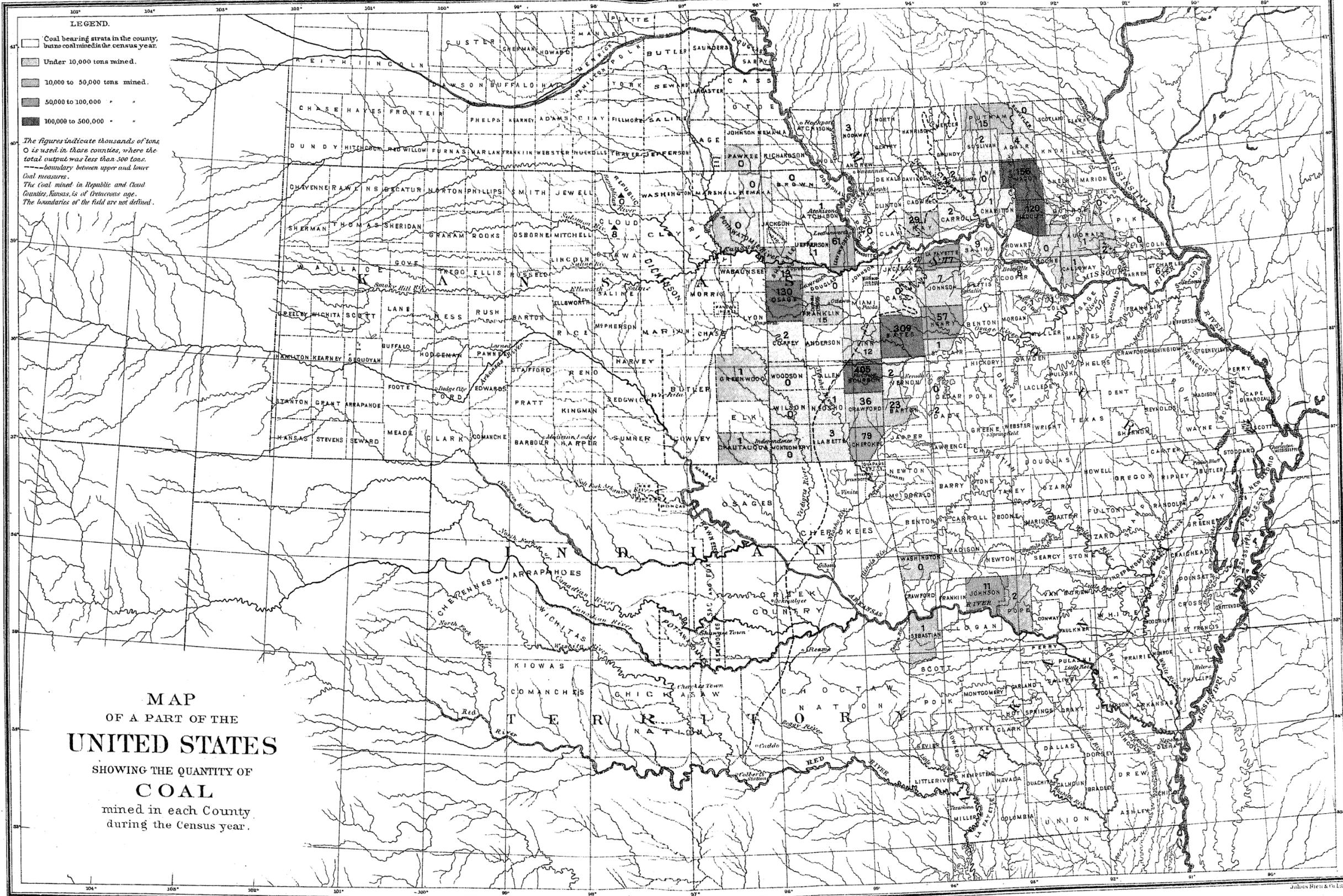
MAP
 OF A PART OF THE
UNITED STATES
 SHOWING THE QUANTITY OF
COAL
 mined in each County
 during the Census year.





MAP
OF A PART OF THE
UNITED STATES
SHOWING THE QUANTITY OF
COAL
mined in each County
during the Census year.

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MAP OF A PART OF THE
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 SHOWING THE QUANTITY OF
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 during the Census year

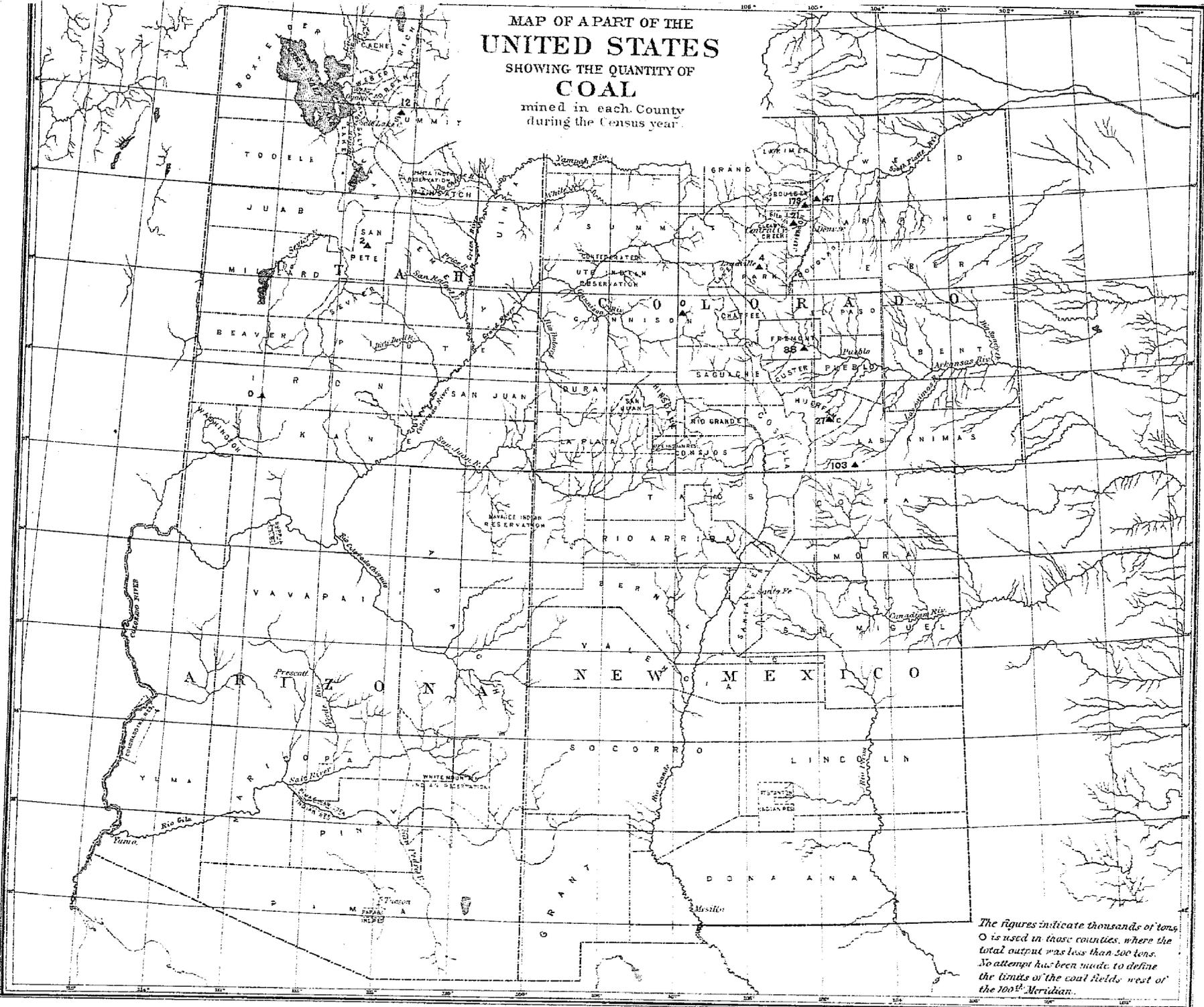
LEGEND.

- Coal bearing strata in the county, but no coal mined in the census year.
- Under 10,000 tons mined.

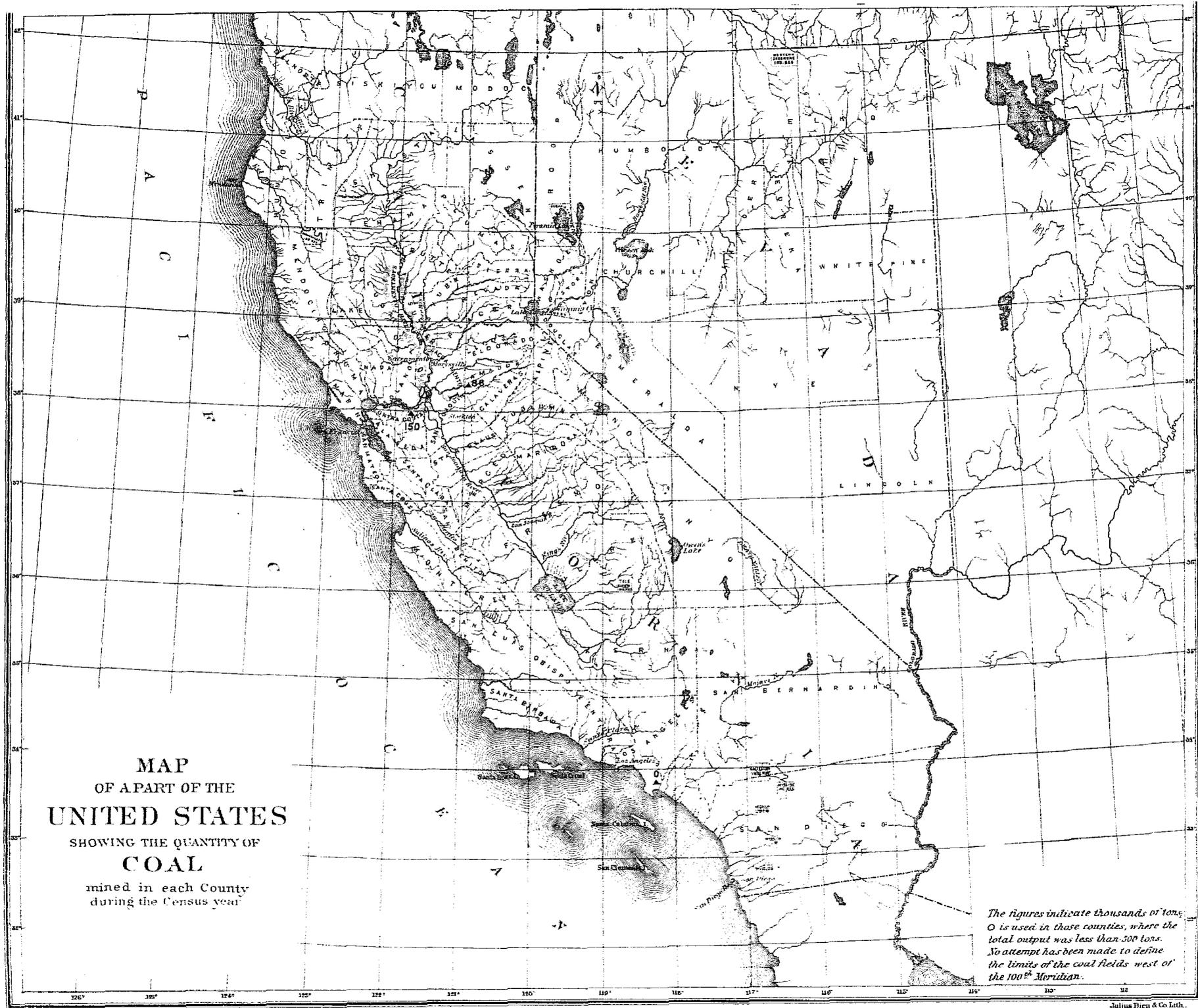


The figures indicate thousands of tons.
 O is used in those counties, where the
 total output was less than 500 tons.
 No attempt has been made to define
 the limits of the coal fields west of
 the 100th Meridian.

MAP OF A PART OF THE
UNITED STATES
 SHOWING THE QUANTITY OF
COAL
 mined in each County
 during the Census year.



The figures indicate thousands of tons.
 O is used in those counties, where the
 total output was less than 500 tons.
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MAP
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Scale
 1:100,000

Julius Bien & Co Lith.



The figures indicate thousands of tons; \circ is used in those counties, where the total output was less than 500 tons. No attempt has been made to define the limits of the coal fields west of the 100th Meridian.

MAP
OF A PART OF THE
UNITED STATES
SHOWING THE QUANTITY OF
COAL
mined in each County
during the Census year.

TABLE 27.—Production of anthracite coal, by states and counties.

[NOTE.—With the exceptions of columns 5 and 6, in which the regular and irregular products are combined, all the questions in columns 1 to 53, both inclusive, relate to regular establishments only.]

PENNSYLVANIA.

Counties.	Number of mines.	Maximum yearly capacity.	Acres of coal lands worked.	Acres of coal lands to be worked.	Acres of coal lands not specified.	Product of establishments, census year.	Value of product of establishments at mines.	Total product, census year, i. e., product of establishments and irregular product together.	Value of total product.
	1	2	3	4	5	6	7	8	9
The State	275	Tons. 42,406,897	14,450	89,850	64,101	Tons. 23,012,595	\$42,110,500	Tons. 23,040,819	\$42,172,048
1 Carbon	7	1,013,000	1,572	5,292	20	808,373	1,305,485	808,597	1,305,033
2 Columbia	7	551,300	20	854	002	318,573	459,095	318,573	459,095
3 Dauphin	2	634,892	.....	.....	0,004	450,345	723,760	450,345	723,700
4 Lackawanna	44	8,585,192	4,435	26,522	6,243	5,825,310	7,045,450	5,847,718	7,090,250
5 Luzerne	95	18,121,220	6,210	23,895	28,799	11,087,672	17,810,109	11,693,272	17,830,300
6 Northumberland	27	8,095,460	797	8,938	7,174	2,099,966	2,958,205	2,099,966	2,958,205
7 Schuylkill	92	10,360,433	1,410	24,784	15,130	7,404,177	11,118,130	7,404,177	11,118,130
8 Susquehanna	1	44,800	0	65	.....	18,173	27,260	18,173	27,260

RHODE ISLAND.

The State	1	10,000	.....	.....	100	0,176	15,440	0,176	15,440
1 Newport	1	10,000	.....	.....	100	0,176	15,440	0,176	15,440

VIRGINIA.

The State	1	70,000	.....	.....	1,280	2,000	7,800	2,817	8,290
1 Augusta .....	.....	.....	.....	.....	.....	.....	.....	112	250
2 Pulaski	1	70,000	.....	.....	1,280	2,000	7,800	2,705	8,040

TABLE 27.—Production of anthracite coal, by states and counties—Continued.

PENNSYLVANIA—Continued.

Counties.	EMPLOYEES.								Total wages paid.
	Men employed above ground.	Men employed below ground.	Boys employed above ground.	Boys employed below ground.	Total employes.	Miners.	Laborers.	Administrative force.	
	10	11	12	13	14	15	16	17	
The State.....	16,073	38,465	12,181	3,050	70,669	20,333	49,040	1,287	\$22,664,055
1 Carbon.....	557	1,305	530	78	2,560	647	1,879	34	717,055
2 Columbia.....	259	367	187	16	829	160	648	21	255,578
3 Dauphin.....	218	759	201	78	1,256	309	877	10	566,004
4 Lackawanna.....	2,152	7,757	2,626	1,287	13,822	3,803	9,870	149	4,361,153
5 Luzerne.....	6,210	14,474	4,309	1,709	26,702	6,770	19,460	473	8,888,996
6 Northumberland.....	1,370	3,926	998	100	5,890	2,208	3,508	114	1,741,181
7 Schuylkill.....	5,294	10,363	3,325	587	19,569	6,202	12,793	464	6,118,224
8 Susquehanna.....	7	24	5	5	41	15	24	2	14,874

RHODE ISLAND—Continued.

The State.....	9	22	1	.....	32	.....	.....	.....	10,300
1 Newport.....	9	22	1	.....	32	.....	.....	.....	10,300

VIRGINIA—Continued.

The State.....	18	20	.....	.....	47	.....	.....	.....	10,052
1 Augusta.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2 Pulaski.....	18	20	.....	.....	47	.....	.....	.....	10,052

TABLE 27.—Production of anthracite coal, by states and counties—Continued.

PENNSYLVANIA—Continued.

Counties.	Number of mining company's stores.	CAPITAL.				Value of all materials used.	Value of all machines.	Number of horses.	Value of horses.	Number of mules.	Value of mules.
		Real estate.	Plant.	Working capital.	Total.						
		19	20	21	22							23	24	25	26	27	28	29
The State.....	72	\$105,286,444	\$41,106,899	\$7,940,953	\$154,390,790	\$0,720,477	\$13,008,415	416	\$40,712	8,072	\$897,765
1 Carbon.....	3	5,007,858	1,805,790	260,500	7,074,154	280,808	498,088	7	1,050	200	95,737
2 Columbia.....	1	1,285,736	448,842	114,415	1,848,493	77,004	220,000	8	895	80	9,820
3 Dauphin.....	.....	3,066,246	1,076,549	80,000	4,222,795	114,580	234,310	7	760	246	84,825
4 Lackawanna.....	15	13,070,688	7,857,270	916,080	21,843,038	1,330,000	2,201,725	124	14,190	1,078	20,520
5 Luzerne.....	42	41,854,010	15,978,968	3,822,000	61,654,978	2,515,830	4,412,050	164	20,722	8,087	451,028
6 Northumberland.....	1	7,867,106	2,220,693	554,615	10,651,414	488,307	890,923	28	3,065	701	88,445
7 Schuylkill.....	10	33,084,800	11,793,781	2,104,423	47,043,004	1,066,388	5,502,313	83	9,600	1,086	247,316
8 Susquehanna.....	.....	50,000	0,000	5,000	61,000	3,000	.....	.....	.....	9	676

RHODE ISLAND—Continued.

The State.....	.....	.....	.....	.....	\$27,500	\$2,500	.....	.....	.....	.....	.....
1 Newport.....	.....	.....	.....	.....	27,500	2,500	.....	.....	.....	.....	.....

VIRGINIA—Continued.

The State.....	.....	.....	.....	.....	\$77,040	\$615	.....	.....	.....	1	50
1 Augusta.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2 Pulaski.....	.....	.....	.....	.....	77,040	615	.....	.....	.....	1	50

MINING INDUSTRIES OF THE UNITED STATES.

TABLE 27.—Production of anthracite coal, by states and counties—Continued.

PENNSYLVANIA—Continued.

Counties.	STEAM-POWER.						Amount of unsawed lumber (for purposes other than fuel).	Value of unsawed lumber.	Amount of sawed lumber.	Value of sawed lumber.	Value of explosives.	Number of hoisting-ma- chines.
	Number of steam-en- gines.	Value of steam-en- gines.	Horse-power of steam- engines.	Number of boilers.	Value of boilers.	Horse-power of boilers.						
	30	31	32	33	34	35							36	37	38	39	40	41
The State.....	1,605	\$3,817,806	105,752	4,111	\$2,380,740	80,418	<i>Lin. feet.</i> 23,303,541	\$800,334	<i>Feet B. M.</i> 30,525,547	\$645,500	\$1,622,378	606
1 Carbon	73	188,536	4,591	185	71,082	5,052	705,205	39,015	1,501,068	14,829	28,206	31
2 Columbia	31	55,100	1,819	36	43,500	1,296	410,514	12,279	438,425	6,358	11,318	6
3 Dauphin	30	88,020	1,175	94	20,700	1,880	604,700	21,276	976,315	13,560	10,917	7
4 Lackawanna	240	561,517	10,490	507	282,283	12,150	3,790,314	79,017	6,884,097	185,120	452,023	110
5 Luzerne	600	1,258,050	33,223	1,500	689,308	38,744	5,421,006	237,050	14,051,588	168,237	645,069	225
6 Northumberland	127	270,800	10,063	291	166,970	5,207	2,816,089	87,340	2,844,036	81,058	117,309	46
7 Schuylkill	555	1,389,843	39,391	1,388	1,100,097	25,089	12,473,885	413,408	12,723,518	175,801	355,326	175
8 Susquehanna							15,228	250	45,000	450	1,250	

RHODE ISLAND—Continued.

The State.....	2	55	5	75	4,000	\$70	\$800	1
1 Newport	2	55	5	75	4,000	70	800	1

VIRGINIA—Continued.

The State.....					5,500	\$325	\$100	
1 Augusta								
2 Pulaski					5,500	325	100	

TABLE 27.—Production of anthracite coal, by states and counties—Continued.

PENNSYLVANIA—Continued.

Counties.	Amount of coal or slack produced.	Amount subjected to washing.	ESTIMATED STATISTICS OF SMALL SURFACE MINES.								
			Number of mines.	Maximum yearly capacity.	Product, census year.	Value of product.	Number of employes.	Total wages paid.	Value of explosives.	Value of all other materials.	Total value of materials.
	54	55	56	57	58	59	60	61	62	63	64
The State.....	Tons. 7,060,447	Tons. 1,300,806	21	Tons. 50,500	Tons. 28,224	\$56,448	103	\$21,188	\$1,412	\$1,412	\$2,824
1 Carbon.....	306,914	28,185	1	500	224	448	6	108	12	12	24
2 Columbia.....	117,772	11,000									
3 Dauphin.....	177,255										
4 Lackawanna.....	1,568,790	7,840	16	40,000	22,400	44,800	80	16,800	1,120	1,120	2,240
5 Luzerne.....	2,415,822	1,036,882	4	10,000	5,800	11,200	20	4,200	280	280	560
6 Northumberland.....	539,595										
7 Schuylkill.....	1,871,490	312,830									
8 Susquehanna.....	2,800										

RHODE ISLAND—Continued.

The State.....											
1 Newport.....											

VIRGINIA—Continued.

The State.....			2		217	400	6	805			
1 Augusta.....			1		112	250	4	200			
2 Pulaski.....			1		105	240	2	105			

REMARKS ON THE STATISTICS OF PENNSYLVANIA ANTHRACITE.

a

Non-producing mines.—The statistics of these have been deducted from the totals, but in the case of the non-producing mines of the Philadelphia and Reading Coal and Iron Company the value of coal lands, plant, and machinery has been included in the total values of these items as returned for all the mines of that company in each county.

Tons.—All of 2,000 pounds.

Maximum capacity.—When not returned and when mine was not exhausted, has been estimated as equal to a full year's production at the rate of monthly production during the census year.

Acres.—When the answer is mixed, *i. e.*, includes both acres worked and unworked, the figures are placed in the column headed, "Number of acres not specified." None of the acres returned by the Philadelphia and Reading Coal and Iron Company as "worked" were entirely worked out, some seams still remaining untouched. In addition to the area of coal land returned as to be worked from present collieries, there are 43,485 acres of undeveloped coal land. Of these, 26,066 are in Dauphin county, 5,200 in Lebanon county, and the balance, 12,219 acres, is distributed in Columbia, Northumberland, and Schuylkill counties. The value of these lands may be estimated at from \$500 to \$750 per acre, or from \$21,742,500 to \$32,613,750.

There were also reported for Schuylkill county 9,900 acres of undeveloped coal lands, valued at \$400 per acre, equal to a total of \$3,960,000. The total acreage of undeveloped coal land reported equals 53,385 acres. In some cases it has not been possible to obtain the acreage owing to the highly inclined position of the strata or the undefined limits of the coal leases. In some cases the area of the seam has been taken instead of that of the *e* surface. See further under "acreage of large companies."

Employés.—In some cases the "maximum" instead of the "average" number of employés was returned. Wherever there was evidence of such an error, the number has been reduced, so as to correspond to the wages paid.

Wages.—It has been assumed that in all cases the amount of bills for supplies sold to miners was deducted from the gross wages by those who filled the schedules. In two or three cases where this had evidently not been done, the original figures have been replaced by estimates. "Wages," therefore, represent throughout *net* wages.

Capital in real estate refers to coal land exclusively. When not obtainable it has been estimated as equal to the number of acres of coal land yet to be worked from the mine in question, valued at \$500 to \$750 per acre. To the total value of coal land in this region should be added the sum of \$25,702,500 to \$36,573,750 for undeveloped *d* coal lands not connected with any colliery. For the particular distribution of these lands see above under "acres." When no data for an estimate of the coal land connected with a colliery were obtainable, the value of the real estate was estimated as equal to the royalty on five full years' production at the monthly rate of production during the census year.

Working capital, when not returned, has been estimated as equal to the value of one month's "wages" and "materials". Probably two months would be nearer the truth.

Materials include explosives, fuse, lumber for props or repairs to breaker or cars, iron rails, spikes and nails, tools, and shovels and other implements, oil for lighting and lubricating, besides feed for horses and mules. When not distinctly stated that all expenditure for feed was included in the return for materials, it has been assumed that *e* this item was *not* included. In all such cases to the original returns for materials has been added, for feed, \$9 per working month for each head (mule or horse), besides \$4.50 for each idle month per head when such idleness was not prior to the opening of the colliery nor subsequent to its permanent abandonment. In cases where the returns for materials were evidently inadequate, they have been replaced by estimates made up as follows: For lumber, 5 cents per ton of coal mined; for explosives, 5½ cents per ton of coal mined; for iron, tools, &c., 5 cents a ton of coal mined; for miner's oil, \$2 per working month for each miner, and to this has been added for feed as above. The coal consumed under ventilating furnaces or boilers has been excluded from materials, as the value of the labor in mining such coal, appearing under wages, already forms a part of the cost of the marketed product.

Machines include engines, boilers, hoisting, pumping, ventilating apparatus, and all the iron work of breakers.

Lumber, unsawed, returned, as a rule, in linear feet. When no lumber of any kind was returned it has been *f* estimated at 5 cents per ton of coal mined, and all considered as unsawed and valued from 4 to 5 cents a linear foot. When the sawed lumber has been returned but no unsawed, the latter has been estimated at 3 cents a ton of coal and valued per foot as above. When the number of feet and diameter has been given, but no value, the following scale has been used: Diameter 4 inches, value 1½ cents per linear foot; diameter 5 inches, 2 cents per linear foot; diameter 6 inches, 2½ cents per linear foot; diameter 7 inches, 3 cents per linear foot; diameter 8 inches, 4 cents per linear foot; diameter 9 inches, 5 cents per linear foot; diameter 10 inches, 6 cents per linear foot; diameter 11 inches, 7½ cents per linear foot; diameter 12 inches, 10 cents per linear foot. The diameter is always measured at the small end. The average diameter of unsawed lumber used in the Pennsylvania anthracite region may be taken as follows: Prop timber, 8 inches to 9 inches; sills or ties, 5 inches; laggings, 3 inches; sprags, 4 inches. In addition to the amounts returned on the tables the following amounts of lumber were tabulated under "remarks",

a and not included in the totals, except of "value of unsawed lumber" and of "materials": 10,861 laggings, 1,610 cords, 204,251 mine-ties, and 2,357,381 feet board measure. (Laggings, 3 inches diameter; ties, 5 inches diameter and 6 feet in length.) All these items are estimated equal to 5,245,869 feet linear.

Lumber, sawed, returned in feet, board measure. When no value, or value without quantity, returned, has been estimated to average \$20 per 1,000 feet, all kinds taken together. To the "total feet" in the column should be added 15,000 cubic feet = 180,000 feet board measure. The value of total remaining unchanged.

Explosives, when not returned, estimated at 5½ cents per ton of coal mined.

Ventilating apparatus, value.—This includes in very many cases not only the fan but the fan inclosure.

b *Horse-power of fan*, when not returned estimated at 20 per fan.

Horse-power of pumps.—When not returned has been estimated at 100 per colliery.

Breaking machinery.—The value of a breaking-machine includes all the iron-work of the breaker, except the engine and boiler, that is, it includes the following: Breaker rolls, breaker screens, chute linings, iron-work and tracks, shafting, pulleys, etc. (leaving out the bare structure and the engine and boilers). In the majority of cases either the value of the entire breaker, building and contents, or else of the breaker rolls alone, was returned. In all such cases the value of the breaker has been arrived at by subtraction or addition, and the use of the following table (prepared by J. H. Bowden, engineer of the Susquehanna Coal Company), which purports to give close approximations to the relative cost of breakers recently built:

Daily capacity.	Cost of building.	Chute linings and iron-work.	Breaker rolls.	Breaker screens.	Engines, machinery, and tracks.	Total cost.
Tons.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.	Dollars.
500	8,000	4,000	1,200	1,800	5,000	20,000
750	12,500	5,500	1,600	2,400	8,000	30,000
1,000	17,000	7,000	2,000	3,000	11,000	40,000
1,250	21,000	8,300	2,200	3,500	15,000	50,000
1,500	25,500	9,500	2,500	4,000	18,500	60,000
1,750	30,000	10,800	2,700	4,500	22,000	70,000
2,000	35,000	12,000	3,000	5,000	25,000	80,000
2,500	45,000	14,500	3,500	6,000	31,000	100,000

d *Number of collieries*.—The following definitions of a colliery have been adopted as a guide in determining the number of collieries: A colliery comprises "all the underground workings whose product is mingled in the preparation before delivery for transportation". "A colliery consists of the entire plant necessary for the mining and preparing of anthracite for market, namely, the breaker, and all mine openings, roads, etc., for supplying it." A complete breaker supplied from one or more shafts or slopes, etc., is a colliery. "One opening without a breaker is not counted a colliery." The following returns of small mines or openings which have no breakers of their own, and the product of which is probably largely broken by hand and consumed by local trade, are therefore omitted as far as they relate to the number of collieries; and their production should be deducted from the total regular product and added to that of the small surface mines in order to arrive at the exact average production of a colliery **e** in the proper sense:

County.	Number of openings.	Product, census year.	Value of same.
		Tons.	
Schuylkill	1	4,000	\$8,061
Do	1	1,800	1,771
Do	1	134	200
Do	1	67	90
Do	1	684	901
Do	1	1,844	1,800
Do	1	383	763
Do	1	4,032	5,400
Do	1	840	1,800
Do	1	224	367
Do	30	5,824	9,551
Do	1	305	500
Columbia	1	2,240	2,800
Total	42	21,327	34,100

Of course the twenty-one mines or concerns producing 28,224 tons in Lackawanna, Luzerne, and Carbon counties, which amount is classified as irregular product (surface mines), are not to be considered as collieries.

Culm.—The amount, 7,060,447 tons, was returned by collieries which produced during the same time 20,295,529 tons of salable coal, that is, the culm was equal to 34.2 per cent. of the salable product. If the remaining collieries had furnished returns of culm, the total culm would, estimated at that rate, have amounted to 9,904,884 tons.

Philadelphia and Reading Coal and Iron Company.—The returns for capital in real estate and plant of this a concern were given in gross by counties, and cover the coal lands and the plants of such of their collieries as were not in operation during the census year. This affects somewhat the accuracy of these two columns.

Acreage of large companies.—The following shows the aggregate acreage of all classes returned by the large companies:

Name of company.	Producing mines.	Non-producing mines.
	<i>Acrea.</i>	<i>Acrea.</i>
Lehigh Valley Coal Company	2,170	.....
Lehigh and Wilkes-Barre.....	5,073	.....
Delaware and Hudson Canal Company	38,848	1,130
Delaware, Lackawanna and Western Railroad Company	3,783	642
Pennsylvania Coal Company	3,200	.....
Philadelphia and Reading Coal and Iron Company	39,050	1,753
Girard estate	1,607	.....
All other concerns and individuals	74,039	2,847
Total	168,460	6,981

b

These figures do not include the undeveloped coal lands of the Philadelphia and Reading Coal and Iron Company or of the Broad Mountain Land Company, amounting together to 53,385 acres.

c

RÉSUMÉ.

Undeveloped	Acrea.
Producing mines	53,385
Non-producing mines	168,460
	6,381
Total.....	228,226

Deficiencies.—D. Vaughan & Co., Ashland. According to Pennsylvania mine-inspector's report for 1880, their "Pioneer" colliery produced 2,373 long tons and their "Vaughan" colliery, 2,373 long tons. These returns, however, d only include the "Pioneer" with a production of 2,520 short tons for census year. The concern has failed to reply to letters and telegrams on the subject. According to the same report, the Big Run Gap mine (James Fennel) produced in 1879 2,703 and in 1880 2,568 long tons. No census returns were obtained from this mine.

T. NELSON DALE,

Special Agent to assist in the collection of Mining Statistics.

TABLE 28.—Production of anthracite coal, by states—Continued.

States.	STEAM-POWER.						Amount of unsawed lumber (for purposes other than fuel).	Value of unsawed lumber.	Amount of sawed lumber.	Value of sawed lumber.	Value of explosives.
	Number of steam-engines.	Value of steam-engines.	Horse-power of steam-engines.	Number of boilers.	Value of boilers.	Horse-power of boilers.					
	28	29	30	31	32	33	34	35	36	37	38
Total	1,007	\$3,817,800	105,807	4,116	\$2,380,740	89,403	<i>In. feet.</i> 20,376,041	\$890,720	<i>Feet B. M.</i> 30,525,547	\$645,500	\$1,024,000
Pennsylvania:											
Regular establishments.....	1,005	3,817,800	105,752	4,111	2,380,740	89,418	20,300,541	890,834	30,525,547	645,500	1,022,378
Estimated statistics of small surface mines.....											a1,412
Rhode Island	2		55	5		75	4,000	70			b800
Virginia:											
Regular establishments.....							5,500	325			c100
Farmers' diggings.....											

States.	Number of hoisting-machines.	Number of mine locomotives.	Value of mine locomotives.	Number of pit-cars.	Value of pit-cars.	Miles of underground track.	Miles of outside track.
Total	607	88	\$251,758	81,207	\$1,001,242	1,085	258
Pennsylvania:							
Regular establishments.....	606	88	251,758	81,207	1,001,242	1,085	258
Estimated statistics of small surface mines.....							
Rhode Island	d1						
Virginia:							
Regular establishments.....							
Farmers' diggings.....							

States.	Value of ventilating machinery.	Horse-power of ventilating machinery.	Number of drainage-pumps.	Horse-power of drainage-pumps.	Value of breaking-machines.	Horse-power of breaking-machines.	Amount of culm or slack produced.	Amount subjected to washing.
Total	\$875,586	7,214	636	40,807	\$4,820,807	11,106	<i>Tons.</i> 7,000,447	<i>Tons.</i> 1,396,806
Pennsylvania:								
Regular establishments.....	875,586	7,214	635	40,807	4,820,807	11,106	7,000,447	1,390,800
Estimated statistics of small surface mines.....								
Rhode Island			1					
Virginia:								
Regular establishments.....								
Farmers' diggings.....								

a Value of other materials, \$1,412.
 b Value of other materials, \$1,700.

c Value of other materials, \$515.
 d Also 1 breaking-machine.

GENERAL ANALYSIS OF THE ANTHRACITE STATISTICS OF PENNSYLVANIA (a).

By C. F. JOHNSON, JR.

The following exhibit shows the number of establishments, capacity, product, capital, number of employes, and various details under the above head of the "anthracite industry" during the census year beginning June 1, 1879, and ending May 31, 1880.

The net ton of 2,000 pounds is invariably used in this Bulletin.

ESTABLISHMENTS.		
Number of counties reporting	number..	8
Total number of separate establishments or collieries.....	do....	275
Average yearly capacity of production (per colliery)	tons..	154,171
Average actual product in census year (per colliery)	do....	104,046
Per cent. of maximum capacity attained (per colliery)	per cent..	67.47
Average capital, leased, employed, and invested (per colliery)	dollars..	561,455
Average number of hands employed (per colliery).....	number..	256
Average amount of wages paid yearly (per colliery)	dollars..	82,415
Average value of materials used yearly (per colliery)	do....	24,471
Ratio of value of yearly product to total capital	per cent..	27.28
Number of company stores.....	number..	72

Two new counties appear as anthracite producers in the present census, viz, Lackawanna, which was set off **d** from Luzerne, and Susquehanna, in the southern border of which one small colliery was opened.

The number of working collieries has increased during the past ten years from 225 to 275, or 22 per cent. The average horse-power used has, however, increased from 216 to 384, or 77 per cent. The average number of hands has increased from 235 to 257, or only 9.3 per cent., while the average product per colliery has increased from 69,320 tons to 104,046 tons, a gain of 50 per cent.

The "capacity of production" referred to means the probable output, with present force and appliances, under a steady demand. The correctness of the figure is presumable from the fact that it bears about the same relation to the actual output that the time run does to the whole year.

PRODUCTION.		
Merchantable product for year ending June 30, 1880.....	tons..	28,612,595
Value of product delivered for transportation	dollars..	42,116,500
Average value of same per ton delivered for transportation	do....	1.47
Amount of coal washed	tons..	1,396,906
Tons raised yearly per man	do....	457
Tons raised daily per man	do....	2.15
Maximum yearly capacity of all collieries reported.....	do....	42,406,897

The value of the product is taken at the point where the labor we consider ceases to act on it.

A comparison of the census returns of 1880 and 1870 shows that the output has increased from 15,596,257 tons to 28,612,595 tons, or 13,016,338 tons, a gain of 84 per cent., while the gross value has increased only 10 per cent. But the value of the product of 1870 was reckoned in paper dollars. The apparent fall of the average price per ton is from \$2.49 to \$1.47, or \$1.02, about 41 per cent., considerably more than the change of standard would account for.

The number of tons raised yearly per man—laborers, miners, and administrative force being considered together, and two boys being reckoned the equivalent of one man for this purpose—has, however, risen from 320.5 tons to 457, a gain of 42 per cent. A portion of this increased output per man is due to more steady labor, a portion to the increased use of steam-power, and a small portion, doubtless, to the increased efficiency of the individual when unharassed by declining prices.

(a) Prepared for Census Bulletin No. 223. The figures have been corrected where necessary to make them accord with the final result.

a In addition to the merchantable product given above, 83 collieries, with a production of 20,245,529 tons, report the production of 7,060,447 tons of impure coal and dust, under the head of "culm". This would be 34.2 per cent. of their product, and would indicate a total production of 9,904,884 tons of unmerchantable coal during census year, to which no value is assigned. The best procurable estimate would show that 908,250 tons of this was used in making steam at the mines. A small unascertained portion is used in locomotives on the coal roads, and another unascertained portion is sold, for use under boilers, at the cost of transportation. A slight increase in the price of coal, or improvements in the manner of using it, may give this product a commercial value hereafter. At present it is ignored, in accordance with the usage of the trade.

EMPLOYÉES, WAGES, AND TIME.

b	Number of men above ground	number..	16, 073
	Number of men below ground	do....	38, 465
	Number of boys above ground, under 16 years of age.....	do....	12, 181
	Number of boys below ground, under 16 years of age.....	do....	3, 950
	Total employés	do....	70, 669
	Of whom miners number		20, 333
	Of whom laborers number		49, 049
	Of whom administrative force number		1, 287
	Giving the same total.....		70, 669
	Per cent. of total force, miners.....	per cent..	28. 77
	Per cent. of total force, boys	do....	22. 82
c	Per cent. of total force, administrative force.....	do....	1. 82
	Total wages paid	dollars..	22, 664, 055
	Average yearly income of man	do....	362 04
	Average monthly income of man (full time)	do....	39 10
	Per cent. of year worked	per cent..	70. 69
	Per cent. of year lost by stoppages, etc.	do....	28. 60
	Per cent. of year lost in strikes.....	do....	0. 72

As compared with the force reported in the census year of 1870, the total number has increased from 52,882 to 70,669, or 34 per cent. A large proportion of this increase, however, consists of boys who are employed as slate-pickers in the breaker buildings, the number of boys employed in the mine proper remaining almost stationary. The number of adult employés has increased 24 per cent. only, and the total number of boys, 78 per cent.

d The term "administrative" force includes foremen, mine superintendents, engineers, clerks, etc., employed about the collieries.

The total amount returned as wages is \$234,094 less than in the census year of 1870, a decrease of 1 per cent.

Wages, however, in the present returns, are of course reckoned on a specie basis, but, further, they signify net wages, *i. e.*, the pay-roll, less the sum the miner is obliged to expend for powder, oil, etc.

The average yearly income of adult employés has contracted only 23 per cent., which is less than its purchasing power has increased during the same interval, without taking into account the allowance necessary to reduce the wages of 1870 to net wages.

The average monthly income is found by dividing the total sum paid for wages by the total number of months **e** worked by one man. The sum thus arrived at is slightly too high, since miners who work by the ton can find employment during part of the time the colliery is idle. For the same reason the per cent. of the year lost by enforced idleness is slightly too high, and represents in reality the time shipments were suspended.

The small proportion of the time lost in strikes, less than 1 per cent., and the short average duration of the strikes reported, show that the relations between managers and miners are more harmonious than they were ten years ago.

The per cent. of the value of the product paid for labor is now 53.81 against 59.75 ten years ago. This loss of advantage to labor is, however, apparent, not real, and is caused by the reduction of gross wages to net wages referred to above. For the same reason the cost of supplies or material consumed, measured in unit of the product, is increased from 9.34 per cent. to 15.96 per cent. The proportion of the value of the product retained for royalty, **f** interest, taxes, profits, etc., is now 30.29 per cent., and was 30.91 per cent. in 1870.

CONSUMPTION OF MATERIAL.

Linear feet of unsawed lumber.....	feet..	26, 366, 541
Value of same.....	dollars..	890, 334
Feet sawed lumber (board measure).....	feet..	39, 525, 547
Value of same.....	dollars..	645, 509
Value of explosives.....	do....	1, 622, 378
Total value of all materials consumed.....	do....	6, 729, 477
Cost of explosives per ton merchantable product	cents..	5. 7
Cost of all material per ton merchantable product	do....	23. 5

The materials used embrace explosives, oil, candles, lumber and timber, rails, repairs of all kinds, horse and a mule feed, etc., but not fuel, to which no value is given. A considerable portion of the material is paid for by the miners, on the sale of which the companies controlling the 69 supply stores referred to doubtless make a profit. The capital invested in these stores is, however, not included, the mining industry alone being considered.

CAPITAL.

Number of coal lands reported.....	acres..	168,461	
Mineral value of same, whether owned or leased.....	dollars..	105,286,444	
Average value per acre.....	do....	624 39	
Number of tons on which royalty reported.....	number..	14,056,931	
Amount paid on above for royalty.....	dollars..	3,256,308	
Average amount paid per ton for royalty.....	do....	23 17	
Number of horses.....	number..	416	b
Value of horses.....	dollars..	49,712	
Number of mules.....	number..	8,072	
Value of mules.....	dollars..	897,765	
Number of steam-engines.....	number..	1,665	
Value of engines.....	dollars..	3,817,866	
Horse-power of engines.....		105,752	
Number of boilers.....	number..	4,111	
Value of boilers.....	dollars..	2,380,740	
Horse-power of boilers.....		89,418	
Number of mine locomotives.....	number..	83	
Value.....	dollars..	251,758	
Number of pit-cars.....	number..	31,267	c
Value.....	dollars..	1,691,242	
Miles of railroad track underground.....	miles..	1,085	
Miles of railroad track outside.....	do....	258	
Total value of machinery, including engines and boilers.....	dollars..	13,908,415	
Value of plant.....	\$41,166,399		
Value of working capital.....	7,946,953		
Value of real estate.....	105,286,444		
Total capital, real and personal.....		154,399,796	
Ratio of real estate to total capital.....	per cent..	68.34	
Ratio of plant to total capital.....	do....	26.51	
Ratio of working capital to total capital.....	do....	5.15	d
Ratio of value of annual product to total capital.....	do....	26.86	

The very large increase in capital reported (\$154,399,796) over that returned in 1870 (\$50,807,285) would seem to call for some explanation and justification, the more so that the capital in 1870 was reckoned in paper dollars.

The "plant" covers machinery, tracks, cars, buildings, animals, shafts, and dead work, and is the sum of the several items, and has been kept rather under than above its true value.

The largest part of the increase of capital is due to the fact that we have included in our returns the coal lands not owned by the mining companies, but worked on a royalty. Mineral lands are clearly a part of the capital of the mining industry, whether owned or leased or mortgaged. It has been our aim, however, to include only those coal lands which are in immediate connection with a working colliery, and either producing, or, in view of the increasing demand for this fuel, about to produce. The area reported would make a block only 16.12 miles square, e which the 1,085 miles of underground track would pierce with 67 parallel gangways from side to side, less than one-quarter of a mile apart; 53,385 acres of non-producing coal lands, valued at \$25,702,500, held in reserve by the great companies, were thrown out altogether as not an element of productive wealth at present. Of the 164,852 acres retained, 13,852 were returned as worked over. As all but a very small portion of this still contains the lower seams, it has all been considered as producing coal lands. The total amount so retained constitutes about 56.68 per cent. of the entire area of anthracite lands, estimated at 290,791 acres.

The average value per acre, \$624 39, is much less than the ordinary market value of such lands, so far as such property—valuable only in blocks—can be said to have a market value. The price has usually been fixed by the owners.

Again, taking the average royalty of 23.17 cents per ton, which is reported as paid on 51½ per cent. of the f product returned, and extending it to the entire output, the anthracite real estate would receive a yearly income of \$6,356,302. We are justified in this extension, since the lands owned are returned as equally valuable with those worked on a royalty.

Assuming the careful estimate of the total yield of the entire field made by Mr. Joseph B. Harris, based on the very conservative view that only 27 per cent. of the total content could be mined and marketed, the production of anthracite after 1880 would reach 4,009,640,000 net tons before exhaustion. This would indicate that the output of the census year could be maintained for 146 years.

a As the lands which we have assumed as a necessary part of the industrial capital to be reported constitute 56.68 per cent. of the entire area, they could continue to earn their present income for 83 years.

If we assume that one-tenth of the income would be absorbed in taxes and expenses, the present value of the above income for 83 years would be, with interest at 5 per cent., in round numbers, \$112,420,000, and with interest at 5½ per cent., \$102,790,000.

The above valuations would be materially increased if we took into account the probable anticipations of the payments of the income of the later years of the term, owing to the increasing demand and the probable reduction of taxes as the estate approached exhaustion.

Finally, the term "working capital" means the sum of money necessarily advanced for wages and supplies during the interval between production and the receipt of returns from sales. It is represented in actual property **b** by the unsold product on hand and in transit. The estimate of this amount was made in nearly all of the collieries by the operators. As the sum is equal to but little more than the value of the product for sixty days, it is evidently not exaggerated.

On the whole, therefore, the actual value of the anthracite property, as an element of productive wealth, is underestimated, notwithstanding the great apparent rise since 1870.

These considerations will apply also to our forthcoming reports on the other mineral industries, in all of which the production has nearly doubled, while the capital has increased in a much greater ratio.

Counties.	PRODUCTION.				Relative production—per cent. of total output, 1880.
	1880.	1870.	Gain.	Loss.	
	<i>Tons.</i>	<i>Tons.</i>	<i>Per cent.</i>	<i>Per cent.</i>	
Luzerne 11,687,672 } Lackawanna..... 5,825,316 }	17,512,988	9,519,298	84.0	.....	{ 25.878 40.847
Schuylkill	7,404,177	3,860,144	91.8	.....	20.850
Northumberland.....	2,099,966	1,001,200	109.8	.....	7.339
Carbon	808,373	403,984	100.4	.....	2.825
Dauphin.....	450,345	411,355	9.5	.....	1.574
Columbia.....	318,573	400,870	.....	20.53	1.119
Susquehanna	18,173	.....	.....	.....	0.064
Total	28,012,595	15,506,257	83.6	.....	.....

d Careful estimates prove that about 50,000 tons, in addition to the above, is raised in a small way for local consumption. As this does not enter into the merchantable product, nor affect the relations of the industry in any way, it has been omitted in the above computations.

The anthracite producers are entitled to the acknowledgments of the department for the pains they have taken in filling the census schedules, a task which, in case of the larger companies, involved a great deal of labor.

The census report of 1870 covered some coal from other fields now classed as semi-anthracite. This amount was deducted before the general comparisons were made.

STATISTICS
OF THE
PRODUCTION OF BITUMINOUS COAL AND LIGNITES IN THE CENSUS YEAR.

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VOL XV—41

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties.

GENERAL REMARKS ON THE STATISTICS OF BITUMINOUS COAL.—The following remarks apply to all the statistics of bituminous coal collected by special agents, statistics for each state will be found in their proper place. *Tons*: All of 2,000 pounds. *Maximum capacity*, when not returned, has been estimated as equal in real estate, plant, and working capital. Real estate was considered as including mineral lands only. When the working capital was not returned, it original figures have been replaced by estimates. *Wages* represent the net earnings of employes, their contributions to the mining supplies having been by operators or miners. Coal needed for fuel about the mines has not been included in "materials"; as the cost of mining it appears under "wages".

[NOTE.—With the exceptions of columns 5 and 6, in which the regular and irregular product are

ALABAMA.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital real and personal, invested.
	1	2	3	4	5	6	7
The State.....	10	Tons. 451,022	Tons. 322,034	\$475,550	Tons. 323,972	\$470,911	\$772,858
1 De Kalb	1	3,000	3,000	5,000	3,000	5,000	3,000
2 Jackson	1	25,000	25,000	50,000	25,000	50,000	60,000
3 Jefferson	5	254,800	182,394	256,432	182,394	256,432	580,808
4 Madison	3	2,250	1,200	2,800	1,200	2,800	1,100
5 Shelby	3	109,072	95,450	133,687	95,450	133,687	107,000
6 Tuscaloosa	0	57,500	15,890	27,040	16,928	28,992	14,950

ARKANSAS.

The State.....	14	57,440	14,778	\$33,535	14,778	\$33,535	\$15,400
1 Johnson	0	47,240	11,233	22,525	11,233	22,525	13,500
2 Pope	2	3,700	1,880	6,000	1,880	6,000	100
3 Sebastian	4	6,200	1,425	2,850	1,425	2,850	1,400
4 Washington	2	240	240	1,500	240	1,500	600

GEORGIA.

The State.....	2	105,000	154,644	\$231,605	154,644	\$231,605	\$441,745
1 Dade	2	105,000	154,644	231,605	154,644	231,605	441,745

ILLINOIS.

The State.....	500	13,808,709	6,089,514	\$8,739,755	6,115,377	\$8,779,832	\$10,654,261
1 Brown	1	800	400	800	400	800	200
2 Bureau	20	169,000	65,720	115,441	65,890	115,781	123,730
3 Clinton	1	60,000	40,000	60,000	40,000	60,000	78,000
4 Coles	1	8,000	320	550	320	550	150
5 Fulton	58	586,646	331,449	413,333	336,171	419,265	380,874
6 Gallatin	3	184,400	80,400	101,150	80,400	101,150	235,300
7 Greene	2	9,000	2,200	3,150	3,260	4,770	8,787
8 Grundy	20	322,070	183,212	280,455	183,812	281,355	357,650
9 Henry	35	590,510	154,595	249,683	155,695	251,693	556,770
10 Jackson	11	339,500	64,412	100,443	64,412	100,443	268,763
11 Jasper					24	60	
12 Jersey	2	1,700	1,100	1,925	2,300	3,815	
13 Johnson	1	40,000	27,000	34,290	27,000	34,290	19,500
14 Kankakee	1	5,000	1,600	3,600	1,600	3,600	14,150
15 Knex	22	57,303	26,312	37,097	26,462	39,087	51,330
16 La Salle	30	1,507,600	714,787	1,064,123	716,487	1,067,384	1,888,162
17 Logan	1	90,000	60,000	79,000	60,000	79,000	188,500
18 Livingston	11	287,000	118,230	171,124	118,230	171,124	194,190
19 Macoupin	11	471,800	247,204	319,682	247,284	319,832	411,600
20 McDonough	21	102,550	80,514	159,110	82,304	102,606	59,600

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties.

excluding those for the states of Arkansas, Kansas, Michigan, Missouri, and Nebraska, which were collected by enumerators. More particular explanations of the to one full year's production at the rate of the monthly production during the census year. Capital: In collecting the statistics this was divided into investments has been estimated as equal to one month's "wages" and "materials". Employés: Wherever the maximum number was returned instead of the average, the deducted. Materials include iron, rails, feed, lumber, oil and candles, tools and cost of sharpening the same, and powder, whether these articles were purchased

combined, all the questions in columns 1 to 20, both inclusive, relate to regular establishments only.]

ALABAMA.

EMPLOYÉS.					Total wages paid.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STEAM-POWER.			
Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employés.						Number of engines.	Horse-power of engines.	Number of boilers.	Horse-power of boilers.
8	9	10	11	12	13	14	15	16	17	18	19	20	21
850	21	025	17	1,513	\$328,788	5	\$450	00	\$0,100	12	425	20	535
12	3			15	4,000								1
85	3	35	5	128	20,000								2
442	9	410	5	875	187,871	4	375	40	3,000	7	225	11	295
20		6	7	42	1,776								4
222	5	151		378	98,096	1	75	15	1,500	4	100	7	220
60	1	14		75	17,545			11	1,000	1	40	2	40

ARKANSAS.

98	2	22	8	130	\$20,850					3	35	1	
00		15	7	88	10,700					3	35	1	1
18	2	2		22	2,200								2
10		3	1	14	1,350								3
4		2		6	600								4

GEORGIA.

185		257		442	\$85,170			34	\$2,040			1	20
185		257		442	85,170			34	2,040			1	20

ILLINOIS.

13, 128	950	2,152	71	10,301	\$0,035,919	426	\$28,075	1,078	\$77,716	230	8,294	345	0,925
3				3	582								1
197	11	25	1	234	75,878	10	775	12	1,300	5	292	7	317
63	2	10		75	38,065	3	400	0	500	2	75	4	375
3		1		4	400								4
002	24	133	9	708	252,336	41	3,240	51	3,500	12	220	14	315
170	5	38		222	63,200	13	1,100	12	650	2	120	4	400
11		2		13	1,750					1	60	1	35
420	7	33	5	515	230,139	17	830	24	1,300	9	160	11	200
480	23	67	2	572	169,619	10	780	30	2,750	14	282	19	531
192	6	51		249	54,780	7	500	27	2,008	7	160	0	175
5				5	1,100								11
64	4	16		84	25,000	2	150	10	470			1	20
10		1		11	2,130	1	40					1	6
95	3	19		117	20,837	6	550			2	35	2	35
1,702	140	250	11	2,109	750,711	29	2,070	131	6,315	43	1,050	42	1,300
95	3	15		113	54,000			13	350	3	40	4	200
236	7	40		230	126,977	12	800	14	000	9	290	11	350
464	12	62		528	242,653	7	320	19	1,850	10	325	14	317
285	10	18		313	105,685	3	200			4	65	4	85

MINING INDUSTRIES OF THE UNITED STATES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

ALABAMA.

Counties.	Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
	22	23	24	25	26	27	28	29
The State.....	13	11	\$11,100	\$37,483	\$48,583	Cords. 212	Linear feet. 561,500	Feet, B. M.
1 De Kalb		1		240	240			
2 Jackson			1,000	1,000	2,000	200		
3 Jefferson	7	3	760	24,240	25,000		330,000	
4 Madison				96	96			
5 Shelby	4	5	9,340	10,180	10,520		228,000	
6 Tuscaloosa	2	2		1,727	1,727	12	3,500	

ARKANSAS.

The State.....	7	5	\$25	\$1,110	\$1,135	54		
1 Johnson	2	2		965	965	4		
2 Pope	1							
3 Sebastian				100	100	50		
4 Washington	4	3	25	45	70			

GEORGIA.

The State.....	1	1	\$3,775	\$5,725	\$9,500	658		
1 Dade	1	1	3,775	5,725	9,500	658		

ILLINOIS.

The State.....	303	175	\$267,780	\$528,419	\$790,149	2,430	15,293,053	484,000
1 Brown				80	80		8,000	
2 Bureau	13	6	3,487	8,301	11,878	6	61,500	
3 Clinton	1	1	875	10,000	10,875		107,500	20,000
4 Coles			10	240	250			
5 Fulton	18	9	25,057	19,862	44,919	10	488,750	
6 Gallatin	1	2	5,380	4,220	9,600		45,000	16,000
7 Greene	1			600	600			
8 Grundy	20	7	419	23,521	23,940	55	938,000	
9 Henry	16	25	6,619	11,882	18,501	50	231,000	
10 Jackson	8	5	173	8,523	8,696		78,500	
11 Jasper								
12 Jersey								
13 Johnson		1	1,080	1,000	2,080		27,000	
14 Kankakee	1	1		128	128			
15 Knox	9	3	1,579	2,082	3,661	4	70,000	
16 La Salle	32	13	14,306	82,448	96,844	20	1,381,750	220,000
17 Logan	1	2	4,400	4,900	9,300			
18 Livingston	13	4	3,255	10,430	13,685		533,500	
19 Macoupin	12	2	8,516	12,267	20,783	100	77,300	
20 McDonough	9	3		6,801	6,801		252,500	

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

ALABAMA.

FARMERS' DIGGINGS.					Remarks.
Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.	
30	31	32	33	34	
7	Tons. 1,038	\$1,352	20	\$925	Wages: Deductions made for miners' oil, at \$1 per month per miner. Materials: To total may be added \$214, for one-half feed of horses and mules during idle time of mines temporarily suspending work during census year.
7	1,038	1,352	20	925	

ARKANSAS.

GEORGIA.

ILLINOIS.

105	25,803	\$40,077	202	\$25,761	
2	170	340	3	300	The statistics for this state were taken by Professor W. B. Potter, of Saint Louis, and Mr. W. L. Fawcett, of Chicago. The following counties are in Professor Potter's district: Clinton, Coles, Gallatin, Greene, Jackson, Jasper, Jersey, Johnson, Marion, Macomb, Madison, Montgomery, Perry, Randolph, Saint Clair, Saline, Shelby, Washington, Williamson. All the rest are in Mr. Fawcett's.
39	4,722	5,932	41	4,240	Capital, real estate, when not returned, has been estimated as equal to the acreage multiplied by the average value of land for the county, as given by the special agent. In taking the acreage for this estimate, Mr. Fawcett appears to have generally taken the total acres, worked and unworked.
7	1,060	1,620	10	1,035	Materials: The amount returned as materials represents all the materials purchased by operator or miner, and includes, as far as was possible, feed for horses and mules.—(W. B. Potter). Whenever the amount so returned for materials was not large enough to include feed, the latter was added to it at the rate of \$4 per head per working month. In Mr. Fawcett's district feed was almost always omitted, and was therefore added at the above rate. To the total materials for the state may be added \$7,905 for half feed of horses and mules during idle time in the case of mines temporarily suspending operations during the census year.
2	600	900	6	480	Wages: "In the coal schedules the answer regarding wages means net wages, except where otherwise specified"—(W. B. Potter). The original answers have therefore been left unaltered in that district. "All figures of wages in schedules sent by me represent the gross total amount of wages paid by the mine operator; from this amount should be deducted the cost of oil and powder to arrive at net wages. The rule is without exception throughout Iowa and Illinois that the miners (and all other laborers below ground) buy their own oil and powder. The consumption of lighting-oil averages one gallon per month per man employed under ground, at an average cost of \$1 per gallon"—(W. L. Fawcett). Therefore the value of all the powder and oil, at \$1 per underground miner and laborer per month, has been deducted from the original returns for wages in Mr. Fawcett's district. Throughout Mr. Fawcett's district, and very probably, also, Mr. Potter's, no deduction has been made from wages for blacksmithing paid by miners.
5	1,100	1,650	10	880	Un-sawn lumber: The returns were generally made in "props" instead of feet linear. The number of props has been multiplied by five when the thickness of the seam was 5 feet or less, and when over by the exact thickness of the seam, in order to arrive at the linear feet of un-sawn lumber used. When the lumber was returned without value, or vice versa, it has been estimated at one cent a foot. When lumber was used, but not returned in any shape, it has been estimated at 2 feet linear per ton of coal mined. To total un-sawn lumber for the state add 34 cords without changing the value.
1	24	60	1	30	
8	1,200	1,800	13	1,200	
5	1,150	1,900	14	1,460	
15	1,700	3,261	24	2,105	
1	80	150	1	120	
11	1,790	3,580	16	2,250	

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

ILLINOIS—Continued.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
		Tons.	Tons.		Tons.		
21 McLean	1	150,000	63,000	113,400	63,000	113,400	94,873
22 Madison	35	684,150	272,927	413,062	273,807	415,282	301,727
23 Maun	2	54,480	30,943	45,497	30,943	45,497	93,553
24 Marshall	3	12,200	2,700	4,275	5,450	9,536	1,450
25 Menard	7	111,250	61,120	78,930	61,120	78,930	103,630
26 Mercer	12	112,900	78,741	130,149	70,531	131,180	118,810
27 Montgomery	1	100,000	42,400	74,200	42,400	74,200	62,000
28 Morgan	2	42,250	13,500	19,065	13,500	19,065	53,900
29 Peoria	40	677,610	273,540	492,234	273,640	402,384	307,725
30 Perry	12	451,900	222,186	227,343	222,186	227,343	230,200
31 Randolph	10	350,200	69,958	81,572	69,958	81,572	100,202
32 Rock Island	27	453,042	236,652	474,117	237,589	470,016	308,400
33 Saline	1	24,000	2,000	3,000	2,320	3,460	9,500
34 Sangamon	9	1,070,000	427,619	575,700	427,619	575,700	537,295
35 Schuyler	4	13,350	4,065	6,274	5,115	7,840	4,550
36 Scott	2	9,550	5,700	9,975	5,700	9,975	11,000
37 Shelby	7	20,200	6,504	13,150	6,504	13,150	9,695
38 Stark	13	54,150	21,103	27,568	22,143	28,868	30,639
39 Saint Clair	73	2,951,700	950,265	1,186,000	950,265	1,186,000	1,575,214
40 Tazewell	14	151,744	61,348	91,922	61,348	91,922	125,925
41 Vermilion	36	358,480	225,950	301,908	228,850	305,400	301,000
42 Warren	19	56,750	13,967	23,782	15,467	26,032	24,175
43 Washington	1	12,000	4,000	6,000	4,000	6,000	13,000
44 Will	5	773,250	611,311	684,008	611,311	684,908	610,782
45 Williamson	2	118,000	73,500	73,500	73,500	73,500	94,000
46 Woodford	1	150,000	101,060	175,000	101,060	175,000	175,000

INDIANA.

	The State	216	3,110,983	1,449,460	\$2,143,003	1,454,327	\$2,150,268	\$2,304,720
1	Clay	41	1,414,085	772,423	1,220,020	772,423	1,220,620	1,260,560
2	Daviess	14	318,350	167,225	232,535	167,225	232,535	248,665
3	Dubois	8	21,520	619	1,343	619	1,343	224
4	Fountain	4	205,200	106,618	234,977	106,618	234,977	80,205
5	Gibson	1	3,500	600	900	600	900	610
6	Greene	26	56,698	7,286	12,250	7,286	12,250	3,125
7	Knox	3	80,560	48,270	65,731	48,270	65,731	26,775
8	Martin	6	24,000	1,857	3,931	1,857	3,931	4,693
9	Owen	20	50,865	3,248	4,047	3,248	4,047	3,535
10	Park	6	157,000	70,693	94,750	71,693	94,750	184,658
11	Perry	3	44,358	9,393	10,555	10,257	18,107	67,150
12	Pike	25	84,585	12,831	18,242	12,831	18,242	24,380
13	Spencer	7	18,635	6,541	7,433	8,093	9,008	21,445
14	Sullivan	10	194,184	29,078	41,900	29,078	41,900	40,695
15	Vanderburg	2	111,232	40,607	67,016	40,607	67,016	136,500
16	Vernon	2	40,000	9,725	10,514	9,725	10,514	10,600
17	Vigo	13	99,217	33,818	50,389	33,818	50,389	51,303
18	Warriek	8	187,404	36,174	44,712	38,659	48,150	106,424
19	Warren	8	18,050	2,490	5,330	2,490	5,330	11,565

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

ILLINOIS—Continued.

EMPLOYÉS.					Total wages paid.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STREAM-POWER.				
Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employes.						Number of engines.	Horse-power of engines.	Number of boilers.	Horse-power of boilers.	
8	9	10	11	12	13	14	15	16	17	18	19	20	21	
160		26		186	85,330	1	75	6	450	2	80	4	150	21
654	62	61	1	808	262,108	60	2,910	33	2,985	12	430	15	343	22
68	1	12		81	31,685			7	393	5	95	3	155	23
11				11	2,856									24
99	1	24		124	50,000	4	100	12	450	4	72	5	72	25
159	10	39	2	210	75,832	5	225	13	750	3	77	3	112	26
123	15	18	1	157	65,193			17	600	2	140	4	81	27
21	6	8		35	12,693	2	100	1	100	1	30	1	40	28
514	16	84	4	618	239,167	19	1,150	99	5,560	3	65	6	105	29
396	21	87	3	507	165,998	3	210	76	5,270	10	255	17	249	30
114	1	21		136	49,318	9	200	8	545	2	70	3	64	31
623	29	129	4	785	265,040	17	1,225	46	2,900	12	353	17	593	32
19		4	1	24	2,000			4	200					33
610	57	119	5	791	382,232	10	1,460	68	4,435	20	625	16	762	34
10		3		13	3,512	2	100							35
18		4		22	7,920					1	20	1	20	36
37	2	5		44	8,710	8	400							37
65	1	11	1	78	18,642	3	90			1	15	1	15	38
1,994	165	294	9	2,312	867,291	41	2,465	148	10,865	67	1,971	60	1,572	39
161	3	32		199	64,949	15	1,225	13	975	3	100	4	140	40
463	45	101		609	268,631	37	2,495	30	2,095	3	110	2	145	41
67	2	5		74	14,667	4	125					1	10	42
6		2		8	3,500						25	1	15	43
1,214	220	247	12	1,693	749,726	14	1,500	121	7,700	18	408	20	423	44
138		22		160	56,004	3	375	12	1,440	2	50	3	90	45
275		27		302	121,075	2	400	39	5,500	2	120	4	160	46

INDIANA.

3,748	171	570	7	4,496	\$1,405,164	67	\$3,655	341	\$18,502	65	1,717	78	2,729	
2,061	160	230	1	2,442	785,451	24	1,395	144	7,350	38	1,104	49	1,716	1
455	20	44		519	162,113	11	700	54	3,327	8	187	7	312	2
10				10	428									3
299	6	20		334	176,195	1	75	23	1,900	3	40	4	82	4
3				3	635	1	10							5
68		6		74	6,186									6
101	5	18		119	51,395			18	540			1	8	7
20		2		22	1,008									8
37		4		41	3,384									9
142	17	28		187	51,545	1	50	22	1,025			2	22	10
24	4	18	2	48	9,226			12	600					11
48		25	1	74	10,158	2	125	1	10	1	5	1	10	12
20		3	1	24	5,061	1	50							13
168	4	25		197	25,361	9	399	8	175	4	76	2	130	14
90	6	17		113	40,302	1	60	18	710	3	130	3	170	15
85		7	1	93	6,679			7	500					16
97	1	27	1	126	37,260	6	235	7	320	3	70	4	174	17
109	6	37		152	29,291	7	425	32	1,545	4	98	4	98	18
21	9	5		28	2,260	3	140			1	7	1	7	19

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

ILLINOIS—Continued.

Counties.	Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
	22	23	24	25	26	27	28	29
						Cords.	Linear feet.	Feet, B. M.
21 McLean	2	1	\$750	\$5,036	\$5,786		480,000	
22 Moulson	35	5	9,920	14,033	24,562	56	148,200	
23 Marion	3		2,573	2,180	4,753		135,800	
24 Marshall			135	120	255		4,500	
25 Menard	6	1	5,471	8,120	13,591		70,100	
26 Mercer	9	7	9,468	7,802	17,358		295,000	
27 Montgomery	2	3	3,000	6,700	10,300		252,000	
28 Morgan	2	1		1,137	1,137		84,000	
29 Peoria	7	8	32,128	21,281	53,409		685,750	
30 Perry	10	5	8,741	13,843	22,584		340,300	
31 Randolph	9		5,010	1,418	6,428		93,300	
32 Rock Island	10	11	18,444	33,071	51,515		1,384,000	24,000
33 Saline			720	648	1,368		25,000	
34 Sangamon	13	8	41,742	26,085	68,427		623,400	
35 Schuyler		2	595	317	912		6,600	
36 Scott	1			285	285		25,000	
37 Shelby		4		957	957		12,500	
38 Stark	6		1,752	2,040	3,801	81	59,750	
39 Saint Clair	73	9	31,891	45,711	77,602	45	2,255,000	185,000
40 Tazewell	11	4	7,222	4,753	11,975		120,500	
41 Vermilion	15	4	9,035	10,653	25,688		506,150	
42 Warren	3	2	245	810	1,055	6	8,000	
43 Washington	1		385	115	500			
44 Will	7	15	650	94,130	94,780	1,006	3,255,904	10,000
45 Williamson	2	1	2,000	2,500	4,500		100,000	
46 Woodford	2			10,000	10,000	1,000		

INDIANA.

The State	73	79	\$56,151	\$102,453	\$158,004	155	2,736,749	1,200,683
1 Clay	31	46	27,505	52,082	79,677		1,030,440	886,533
2 Daviess	8	7	3,933	14,006	17,939	1	303,534	223,600
3 Dubois			20	41	61			
4 Fountain	2	2	7,811	9,004	17,505		217,150	13,600
5 Gibson			50	42	92			
6 Groene	5	2	132	502	634	52		
7 Knox			8	2,624	2,632		108,000	20,000
8 Martin			7	240	247	7		
9 Owen		1	70	280	350	13		
10 Parke		2	4,059	7,823	11,882		194,350	12,000
11 Perry			72	672	744		12,375	
12 Pike	3	3	624	1,233	1,857	20	5,600	
13 Spencer		1	90	385	475	2	7,300	
14 Sullivan	6	5	1,066	1,868	2,451	7	40,500	14,000
15 Vanderburg	2	2	4,975	4,596	9,571		36,300	62,000
16 Vermillion		1	610	1,975	2,585		7,000	5,000
17 Vigo	5	5	2,141	1,922	4,063	1	81,900	27,750
18 Warrick	7	2	2,848	2,613	5,461		52,500	26,200
19 Warren	4		40	335	375	52		

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

ILLINOIS—Continued.

FARMERS' DIGGINGS.					Remarks.
Number of diggings.	Product census year.	Value of product.	Number of persons employed.	Wages paid.	
30	31	32	33	34	
	<i>Tons.</i>				
4	880	\$1,320	8	\$880	
20	2,750	5,261	24	3,520	
4	700	1,031	8	550	
1	100	160	1	07	
7	937	1,890	10	763	
1	320	480	4	230	
4	1,050	1,575	8	1,050	
7	1,040	1,300	10	1,080	
12	2,000	3,432	23	2,357	
9	1,500	2,250	12	1,200	

INDIANA.

	4,831	\$7,165	47	\$3,850	
					<i>Capital, real estate</i> , when not returned, has been estimated on the basis of the value of unworked coal lands connected with each mine. The following valuation per acre has been used: Clay county, \$175; Fountain, Daviess, Parke, Vanderburg, and all counties where coal is shipped by rail, \$150; all counties not accessible to railroads, \$50 per acre.
					<i>Wages</i> : When the data for rectifying the returns have not been returned, the following deductions have been made from gross wages: 3 cents per ton of coal mined (1 cent for oil and 2 cents for blacksmithing) and 80 per cent. of the weight of powder returned, taken at 14 cents a pound, the price paid for it by the miners.
					<i>Materials</i> : To arrive at these, there have been added to powder and lumber 1 cent per ton of coal for miner's oil, and \$4 per working month for each mule or horse. To the total "materials" for the state may be added \$2,476 for one-half feed of mules and horses during idle months.
					<i>Lumber</i> : In addition to the 155 cords returned for fuel, 100 cords for various uses were reported, making the total 255 cords. Of the amount of unsawed lumber reported, it is estimated that 1,512,569 linear feet averaged 6 inches in diameter, and 1,224,180 linear feet averaged 9 inches in diameter. This is based on the fact that for seams 4 feet and less in thickness 6-inch props are generally used, while for those of greater thickness 8-inch and 10-inch props are commonly employed.
	864	1,552	8	650	
	1,652	2,175	15	1,250	
	2,415	3,498	24	1,050	

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

IOWA.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments.	Value of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	227	3,896,895	1,442,333	\$2,473,155	1,461,116	\$2,507,453	\$2,778,937
1 Adams.....	9	19,000	8,187	21,070	8,167	21,070	14,000
2 Appanoose.....	15	186,495	69,100	88,020	59,700	88,020	168,711
3 Boone.....	1	366,966	136,500	260,100	140,000	270,100	246,309
4 Dallas.....	10	40,000	8,000	31,500	13,200	42,100	92,000
5 Davis.....	2	6,700	5,500	8,250	5,500	8,250	5,800
6 Greene.....	3	40,000	8,550	15,618	8,559	15,618	102,400
7 Hamilton.....	1	4,500	3,000	6,000	3,000	6,000	2,500
8 Hardin.....	4	8,000	3,135	8,547	3,135	8,547	5,850
9 Jasper.....	21	185,750	74,462	126,912	74,462	126,912	193,615
10 Jefferson.....	12	76,210	46,150	76,550	46,150	76,550	92,880
11 Keokuk.....	12	281,300	48,850	83,190	49,950	84,199	128,778
12 Leo.....	1	1,600	500	800	500	800	1,950
13 Lucas.....	4	201,980	126,013	200,584	126,498	202,039	133,136
14 Mahaska.....	27	824,950	283,836	308,275	283,061	398,450	695,107
15 Marion.....	18	207,700	67,857	100,542	72,559	106,720	80,870
16 Monroe.....	10	306,500	181,288	291,961	181,288	291,961	155,941
17 Pogo.....	3	10,800	5,200	15,225	5,200	15,225	9,920
18 Polk.....	10	302,500	129,062	258,015	131,362	292,615	292,225
19 Scott.....	5	32,400	14,500	25,375	14,500	25,375	58,800
20 Taylor.....	3	3,000	2,400	6,110	2,400	6,140	1,440
21 Van Buren.....	3	19,800	13,800	22,833	13,800	22,833	29,987
22 Wapello.....	18	232,250	67,475	102,777	67,535	102,917	80,255
23 Warren.....	14	62,810	17,957	33,904	17,957	33,904	35,200
24 Wayne.....	2	16,000	6,000	12,000	6,000	12,000	7,490
25 Webster.....	10	459,450	124,012	260,049	126,712	272,160	264,650

KANSAS.

The State.....	180	1,140,518	763,597	\$1,498,168	771,442	\$1,517,444	\$707,994
1 Atchison.....					900	1,800	
2 Bourbon.....	51	434,430	463,519	618,570	405,410	622,093	68,025
3 Brown.....	1	400	400	1,800	400	1,800	2,000
4 Chautauque.....	4	1,400	700	2,375	700	2,375	1,400
5 Cherokee.....	15	113,100	77,320	193,880	78,920	197,080	10,825
6 Cloud.....	8	8,400	8,500	20,800	8,500	20,800	6,750
7 Coffey.....	4	23,888	2,163	4,320	2,163	4,326	1,000
8 Crawford.....	19	97,880	36,450	64,915	36,450	64,915	40,200
9 Douglas.....	1	240	240	900	240	900	150
10 Franklin.....	13	20,360	14,300	38,725	15,200	40,800	11,250
11 Greenwood.....	1	1,200	600	3,600	600	3,600	1,800
12 Jefferson.....					575	2,150	
13 Labette.....	9	6,340	3,200	6,445	3,200	6,445	1,150
14 Leavenworth.....	2	122,000	69,588	121,176	69,588	121,176	309,500
15 Linn.....	8	13,700	11,740	18,550	11,740	18,550	3,433
16 Montgomery.....	1	450	375	800	481	1,488	1,200
17 Nemaha.....					270	1,125	
18 Neosho.....	2	1,000	700	1,750	700	1,750	3,000
19 Osage.....	38	345,460	129,492	354,191	129,832	365,821	291,730
20 Pottawatomie.....					120	300	
21 Republic.....	1	900	400	1,050	440	1,143	1,000
22 Shawnee.....	9	9,380	12,400	42,825	12,490	42,825	22,400
23 Wilson.....					540	1,275	
24 Woodson.....	2	840	300	1,400	911	2,897	120

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

IOWA.

Counties.	Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
	22	23	24	25	26	27	28	29
The State.....	141	56	\$116,970	\$132,850	\$249,820	Cords.	Linear feet.	Feet, B. M.
1 Adams.....	9			1,180	1,180		27,000	
2 Appanoose.....	12	2	12	4,725	4,737		197,000	
3 Boone.....	10	3	6,877	13,210	20,087		501,000	
4 Dallas.....	1		1,500	1,600	3,100		20,000	
5 Davis.....			504	280	700		40,000	
6 Greene.....	3	3	400	650	1,050		28,500	
7 Hamilton.....				250	250		0,000	
8 Hardin.....	2	3	235	688	923		33,250	
9 Jasper.....	11	10	2,066	10,333	13,304		413,550	
10 Jefferson.....	10	2	2,010	3,890	6,812		103,500	
11 Keokuk.....	11	2	2,007	4,436	7,343		111,000	
12 Lee.....				150	150			
13 Lucas.....	2	1	16,200	17,775	33,975		443,500	
14 Mahaska.....	20	14	27,540	14,929	42,478		472,650	19,250
15 Marion.....		4	6,520	4,570	11,168		96,500	
16 Monroe.....	12		21,731	21,315	43,076		236,500	
17 Page.....	4			678	678		45,000	
18 Polk.....	8	7	13,100	10,314	23,423		306,500	
19 Scott.....	5	2		1,663	1,663		82,600	
20 Taylor.....	1			318	318		25,000	
21 Van Buren.....	3		2,272	433	2,705		33,750	
22 Wapello.....	8		6,246	8,235	14,481		253,650	
23 Warren.....	6		1,554	2,316	3,870		96,500	
24 Wayne.....			853	360	1,224			
25 Webster.....	3	3	2,575	8,511	11,086		173,150	

KANSAS.

The State.....	50	26	\$12,125	\$35,360	\$17,485	947		
1 Atchison.....								
2 Bourbon.....				15,041	15,041			
3 Brown.....			70	300	370			
4 Chautauqua.....			68	142	210			
5 Cherokee.....	4	4	5,985	1,617	7,622	80		
6 Cloud.....	8	0		964	964	63		
7 Coffey.....				415	415			
8 Crawford.....			3,975	1,799	5,774			
9 Douglas.....	1			10	10			
10 Franklin.....	3		280	1,055	1,335	50		
11 Greenwood.....			100	100	200	10		
12 Jefferson.....								
13 Labette.....		4	60	330	390			
14 Leavenworth.....	2							
15 Linn.....	2	2	33	250	283			
16 Montgomery.....				0	0			
17 Nemaha.....								
18 Neosho.....				18	18			
19 Osage.....	25		1,409	11,932	12,741	657		
20 Pottawatomie.....								
21 Republic.....			10	115	125	13		
22 Shawnee.....	14	10	135	1,792	1,927	72		
23 Wilson.....								
24 Woodson.....				54	54			

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

KENTUCKY.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	65	2,435,776	935,857	\$1,123,046	946,288	\$1,134,900	\$1,008,537
1 Bath.....					63	63	
2 Bell.....					272	272	
3 Boyd.....	1	400,000	202,091	252,613	202,516	252,076	231,500
4 Breathitt.....	1	1,000	500	500	608	608	850
5 Butler.....	3	19,452	17,488	22,500	17,615	22,627	22,200
6 Caldwell.....					80	80	
7 Carter.....	1	125,000	45,126	40,638	46,811	51,800	145,000
8 Clay.....					154	154	
9 Clinton.....					102	102	
10 Crittenden.....	3	23,000	15,000	15,500	15,100	15,600	25,200
11 Daviess.....	2	20,000	8,370	10,355	8,650	10,935	57,500
12 Edmonson.....					50	50	
13 Elliott.....					82	82	
14 Estill.....					198	198	
15 Floyd.....					122	122	
16 Grayson.....					126	126	
17 Greenup.....	1	100,000	10,000	10,000	10,340	10,340	122,000
18 Hancock.....	2	37,000	23,680	43,134	23,782	43,236	68,500
19 Harlan.....					63	63	
20 Henderson.....	4	110,000	61,123	67,483	61,323	67,683	67,750
21 Hopkins.....	4	513,200	230,182	230,777	230,357	230,952	483,700
22 Jackson.....					100	100	
23 Johnson.....					160	160	
24 Knox.....					257	257	
25 Laurel.....					120	120	
26 Lawrence.....					199	199	
27 Lee.....	9	360,256	26,973	41,505	27,970	43,240	46,612
28 Lotcher.....					99	99	
29 Madison.....	2	4,930	1,930	3,700	1,930	3,700	7,700
30 Magoffin.....					143	143	
31 Martin.....					50	50	
32 McLean.....	2	4,220	1,155	1,630	2,063	2,377	3,300
33 Menifee.....	2	160,000	14,150	24,950	14,254	25,054	13,000
34 Montgomery.....					226	226	
35 Morgan.....	1	380	380	600	541	857	6,400
36 Muhlenburgh.....	6	129,468	73,638	80,630	73,778	80,170	165,350
37 Ohio.....	5	179,700	78,681	89,425	73,317	89,661	121,470
38 Owsley.....					71	71	
39 Perry.....					138	138	
40 Pike.....					116	116	
41 Powell.....					83	83	
42 Pulaski.....	3	63,100	17,450	22,260	17,744	22,554	75,800
43 Rockcastle.....	4	62,864	39,600	62,400	39,715	62,515	89,110
44 Rowan.....					73	73	
45 Union.....	7	107,700	61,398	37,241	61,578	37,421	205,495
46 Wayne.....					190	190	
47 Webster.....	2	5,500	2,642	6,700	2,672	6,330	10,100
48 Whitley.....					184	184	
49 Wolfe.....					79	79	

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

KENTUCKY.

EMPLOYÉS.					Total wages paid.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STEAM-POWER.			
Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employes.						Number of engines.	Horse-power of engines.	Number of boilers.	Horse-power of boilers.
8	9	10	11	12	13	14	15	16	17	18	19	20	21
1,058	122	679	67	2,826	\$687,474	28	\$2,010	348	\$23,807	18	522	23	738
205	15	48	2	300	94,818			40	8,000	1	50	4	120
2		2		4	345			1	50				
54	4	14		72	18,045			0	575				
91		10	1	102	33,000			12	1,080				
26	4	9	2	41	10,005			10	500				
19	1	10	2	41	5,450			0	300	1	8	1	8
60		12		72	8,500			8	300				
64	14	19	1	98	26,103			24	1,500				
105	10	38	1	154	53,770	5	300	23	1,480	5	120	3	135
370	16	125	21	532	162,722	5	475	80	0,800	2	44	3	110
80		20		100	0,283	10	750	2	300				
15				15	1,800								
4				4	552								
31	9	13	18	71	14,069	2	50						
2				2	102								
108	7	54	4	223	42,619	3	100	25	2,012	3	05	4	120
196	14	40	1	251	00,681	1	45	25	1,020	3	135	3	155
99	1	24	6	130	14,632			10	2,225				
98	12	100	7	220	53,028	2	200	10	825				
160	14	121	1	305	60,674			44	2,130	3	70	5	90
10	1	2		13	2,003			0	300				

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 20.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

KENTUCKY.

FARMERS' DIGGINGS.					Remarks.	
Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.		
30	31	32	33	34		
73	Tons. 10,491	\$11,914	93	\$8,080	<p>Wages, when not returned as "net" and when not very low, have been reduced to "net" by deducting as follows: For oil, \$1 per miner per month, and for powder (when used and not given), one keg at \$3 75 per miner per month.</p> <p>Materials: To the total "materials" may be added \$4,433 for half-feed of horses and mules during idle time and for feed of 10 oxen during working time. Feed of horses and mules has been estimated at \$6 per head per working month, and for oxen at \$8 per head per working month.</p> <p>Lumber: In addition to the amount of unsawed lumber given, 130,000 feet (board measure) of "unsawed" lumber were returned.</p>	
1	63	63	1	45		1
1	272	272	1	204		2
2	425	368	3	310		3
1	108	108	1	81		4
1	127	127	1	65		5
1	80	80	1	60		6
13	1,085	2,172	24	1,527		7
1	154	154	1	115		8
1	102	102	1	77		9
1	100	100	1	75		10
1	280	280	1	210		11
1	50	50	1	37		12
1	82	82	1	62		13
1	198	198	1	148		14
1	122	122	1	92		15
1	126	126	1	94		16
2	340	340	7	265		17
1	102	102	1	77		18
1	63	63	1	45		19
1	200	200	1	150		20
1	175	175	1	131		21
1	100	100	1	75		22
1	169	169	1	127		23
1	257	257	1	198		24
1	129	129	1	97	25	
1	199	199	1	149	26	
6	997	1,795	6	858	27	
1	99	99	1	75	28	
1	143	143	1	107	29	
1	56	56	1	42	30	
5	908	1,238	8	660	31	
1	104	104	1	78	32	
1	226	226	1	169	33	
1	161	161	1	121	34	
1	140	140	1	105	35	
1	236	236	1	177	36	
1	71	71	1	53	37	
3	138	128	3	93	38	
1	116	116	1	87	39	
1	83	83	1	62	40	
1	294	294	1	135	41	
1	115	115	1	86	42	
1	73	73	1	55	43	
1	180	180	1	135	44	
1	190	190	1	143	45	
1	180	180	1	97	46	
1	184	184	1	138	47	
1	79	79	1	59	48	
1	79	79	1	59	49	
1	79	79	1	59	50	

MINING INDUSTRIES OF THE UNITED STATES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

MARYLAND.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Values of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	32	Tons. 4, 532, 822	Tons. 2, 227, 844	\$2, 584, 455	Tons. 2, 228, 017	\$2, 585, 537	\$13, 165, 557
1 Alleghany.....	27	4, 240, 222	2, 198, 073	2, 557, 517	2, 198, 325	2, 557, 742	12, 026, 457
2 Garrett.....	5	292, 600	20, 771	26, 938	30, 592	27, 795	230, 100

MICHIGAN.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Values of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	6	141, 800	100, 800	\$224, 500	100, 800	\$224, 500	\$66, 800
1 Jackson.....	5	126, 800	85, 800	182, 500	85, 800	182, 500	40, 800
2 Shiawassee.....	1	15, 000	15, 000	42, 000	15, 000	42, 000	20, 000

MISSOURI.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Values of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	144	1, 120, 112	543, 090	\$1, 037, 100	844, 304	\$1, 464, 425	\$389, 315
1 Adair.....	8	4, 404	4, 404	9, 220	4, 464	9, 220	7, 000
2 Andrain.....	1	2, 000	1, 174	2, 348	1, 174	2, 348	.....
3 Barton.....	6	42, 915	22, 114	25, 670	23, 501	27, 763	9, 400
4 Bates.....	18	53, 000	19, 385	20, 380	808, 545	425, 215	26, 300
5 Boone.....	1	2, 400	400	1, 000	400	1, 000	25
6 Callaway.....	2	10, 000	800	1, 600	951	1, 826	.....
7 Carroll.....	1	1, 600	1, 600	4, 000	2, 030	5, 060	200
8 Cass.....	.....	.....	.....	.....	388	582	.....
9 Cedar.....	.....	.....	.....	.....	140	337	.....
10 Chariton.....	4	2, 300	590	2, 360	606	2, 410	.....
11 Cole.....	2	1, 700	910	2, 800	910	2, 800	1, 500
12 Cooper.....	4	11, 250	8, 000	17, 500	8, 852	18, 204	7, 500
13 Dade.....	1	560	560	1, 125	1, 685	8, 235	600
14 Henry.....	8	102, 258	56, 833	102, 728	56, 004	104, 319	18, 400
15 Johnson.....	5	8, 400	6, 910	18, 300	6, 910	18, 300	9, 870
16 La Fayette.....	16	196, 825	75, 816	129, 215	77, 326	132, 235	82, 250
17 Lincoln.....	.....	.....	.....	.....	285	626	.....
18 Linn.....	2	650	325	975	325	975	.....
19 Livingston.....	3	1, 800	1, 800	5, 650	2, 060	6, 380	1, 350
20 Macon.....	15	242, 400	165, 520	302, 522	155, 520	302, 522	15, 730
21 Moniteau.....	.....	.....	.....	.....	990	1, 778	.....
22 Monroe.....	.....	.....	.....	.....	1, 175	2, 350	.....
23 Montgomery.....	3	3, 550	2, 300	4, 725	2, 300	4, 725	3, 200
24 Nodaway.....	8	5, 565	2, 342	6, 630	2, 660	7, 754	6, 500
25 Platte.....	.....	.....	.....	.....	20	40	.....
26 Putnam.....	3	16, 300	15, 100	19, 775	15, 100	19, 775	3, 200
27 Ralls.....	1	500	200	800	200	800	50
28 Randolph.....	13	266, 735	119, 745	232, 070	120, 078	233, 362	147, 530
29 Ray.....	10	110, 800	29, 480	79, 225	29, 480	79, 225	40, 675
30 Saline.....	10	17, 940	8, 442	18, 604	8, 727	19, 174	1, 625
31 Schuyler.....	.....	.....	.....	.....	30	45	.....
32 Saint Charles.....	3	5, 900	5, 900	19, 100	5, 900	19, 100	4, 100
33 Saint Clair.....	2	3, 500	1, 359	2, 708	1, 375	2, 759	500
34 Sullivan.....	2	2, 200	1, 600	3, 750	1, 600	3, 750	650
35 Vernon.....	2	1, 700	830	1, 720	2, 193	4, 441	1, 100

MINING INDUSTRIES OF THE UNITED STATES.

TABLE 20.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

MARYLAND.

Counties.	Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
	22	23	24	25	26	27	28	29
The State.....	17	5	\$40	\$194, 002	\$194, 942	<i>Cords.</i>	<i>Linear feet.</i>	<i>Feet, B. M.</i>
1 Alleghany.....	14	5	.....	180, 108	180, 108	.....	1, 370, 444	.....
2 Garrett.....	3	.....	40	5, 790	5, 830	.....	.....	.....

MICHIGAN.

The State.....	6	7	\$4, 700	\$3, 050	\$7, 750	375	.....	.....
1 Jackson.....	5	5	700	3, 050	3, 750	375	.....	.....
2 Shiawassee.....	1	2	4, 000	.....	4, 000	.....	.....	.....

MISSOURI.

The State.....	45	17	\$3, 282	\$52, 474	\$55, 750	0, 511	.....	.....
1 Adair.....	2	.....	15	010	025	8	.....	.....
2 Audrain.....	.....	.....	.....	.....	.....	.....	.....	.....
3 Barton.....	.....	.....	.....	.....	.....	.....	.....	.....
4 Bates.....	2	2	405	976	1, 381	9	.....	.....
5 Boone.....	.....	.....	.....	45	45	10	.....	.....
6 Callaway.....	.....	.....	.....	85	85	.....	.....	.....
7 Carroll.....	1	1	.....	.....	.....	.....	.....	.....
8 Cass.....	.....	.....	.....	.....	.....	.....	.....	.....
9 Cedar.....	.....	.....	.....	.....	.....	.....	.....	.....
10 Chariton.....	.....	.....	.....	211	211	85	.....	.....
11 Cole.....	2	1	50	225	275	.....	.....	.....
12 Cooper.....	1	4	350	500	850	.....	.....	.....
13 Dade.....	.....	.....	.....	.....	.....	.....	.....	.....
14 Henry.....	5	3	.....	776	776	27	.....	.....
15 Johnson.....	.....	.....	.....	500	500	10	.....	.....
16 La Fayette.....	3	1	.....	3, 530	3, 530	.....	.....	.....
17 Lincoln.....	.....	.....	.....	.....	.....	.....	.....	.....
18 Linn.....	.....	.....	.....	48	48	4	.....	.....
19 Livingston.....	1	.....	.....	205	205	10	.....	.....
20 Macon.....	7	1	19	30, 045	30, 064	8, 810	.....	.....
21 Monticau.....	.....	.....	.....	.....	.....	.....	.....	.....
22 Monroe.....	.....	.....	.....	.....	.....	.....	.....	.....
23 Montgomery.....	2	2	20	350	370	185	.....	.....
24 Nodaway.....	.....	.....	.....	270	270	.....	.....	.....
25 Platte.....	.....	.....	.....	.....	.....	.....	.....	.....
26 Putnam.....	1	.....	.....	600	600	.....	.....	.....
27 Ralls.....	.....	.....	.....	30	30	10	.....	.....
28 Randolph.....	10	2	2, 033	10, 815	12, 848	285	.....	.....
29 Ray.....	8	.....	.....	1, 050	1, 050	35	.....	.....
30 Saline.....	.....	.....	.....	100	100	.....	.....	.....
31 Schuyler.....	.....	.....	.....	.....	.....	.....	.....	.....
32 Saint Charles.....	.....	.....	300	650	950	23	.....	.....
33 Saint Clair.....	.....	.....	85	.....	85	.....	.....	.....
34 Sullivan.....	.....	.....	.....	7	7	.....	.....	.....
35 Vernon.....	.....	.....	5	197	202	.....	.....	.....

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

MARYLAND.

FARMERS' DIGGINGS.					Remarks.
Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.	
30	31	32	33	34	
	<i>Tons.</i>				
15	1,073	\$1,082	17	\$532	<p>Wages have been reduced to "net" by deducting 40 cents per miner per working month for blacksmithing and 80 cents per underground employe per working month for lighting-oil. Materials: Feed, when not included in original returns, has been estimated at \$0 per head per month. Oil and blacksmithing as deducted from wages were added to materials in every case. In one concern feed was taken at \$18 per head per month, according to its instructions. To total materials for the state may be added for half-feed for idle time of horses and mules in mines temporarily suspending operations during census year, \$4,939. Lumber (unsawed): When used but not returned has been estimated at 2 cents per ton of coal mined, and valued at 5 cents per linear foot. To the total lumber should be added 15,000 ties and 28,000 props, but the value of these is already included in the column of value of lumber. Hoisting machinery includes inclined planes, drums, etc., for lowering coal.</p>
2	262	225	2	115	
13	821	867	15	417	

MICHIGAN.

.....	<p>These statistics were taken from enumerators' returns entirely.</p>
.....	
.....	

MISSOURI.

00	300,814	\$427,325	3,125	\$155,149	<p>These statistics were collected entirely by enumerators. Whenever the product amounted to less than \$500 the data, were transferred to farmers' diggings blanks. Tons supposed to be of 2,000 pounds. Returns which were evidently erroneous have been replaced by estimates. Many of them were grossly erroneous. In a number of cases the production was not returned, nor wages, nor employes, and yet there was no indication that the mine was idle. In such cases these items have all been estimated, taking as the basis the average production of mines in Missouri producing less than 1,000 tons. Acres: In some counties there are no returns of acreage. Capital: In some counties there are no returns of capital. It has not seemed advisable to attempt to supply these omissions by estimates.</p>
10	1,887	2,093	17	734	
	289,160	404,835	2,887	144,680	
1	151	226	3	75	
2	430	1,060	7	328	
1	388	582	7	104	
2	140	337	6	115	
1	16	50	3	20	
2	352	704	6	450	
8	1,125	2,100	33	964	
9	571	1,591	10	571	
7	1,510	3,020	14	1,510	
2	285	620	5	285	
2	260	730	4	260	
4	980	1,778	9	1,106	
5	1,175	2,350	10	1,175	
6	318	1,124	23	527	
1	20	40	1	20	
4	333	602	11	334	
6	285	570	14	285	
1	30	45	3	30	
2	25	51	2	25	
14	1,863	2,721	41	1,566	

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

NEBRASKA.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	1	Tons. 400	Tons. 200	\$750	Tons. 200	\$750	\$500
1 Pawnee.....	1	400	200	750	200	750	500

NORTH CAROLINA.

The State.....	1	700	350	\$400	350	\$400	\$40,170
1 Chatham.....	1	700	350	400	350	400	40,170

OHIO.

The State.....	618	12,093,880	5,932,853	\$7,029,488	6,008,595	\$7,719,667	\$13,052,484
1 Athens.....	16	778,600	310,750	320,543	323,050	334,068	819,835
2 Belmont.....	49	797,790	309,747	399,203	399,747	399,203	404,082
3 Carroll.....	14	104,880	11,477	15,068	12,557	10,413	99,968
4 Columbiana.....	58	837,835	515,002	584,095	524,712	596,643	613,955
5 Coshocton.....	20	177,006	82,216	96,617	85,531	101,501	115,640
6 Gallia.....	7	56,608	13,379	15,174	21,032	22,071	27,035
7 Guernsey.....	9	216,300	157,650	171,800	157,650	171,800	186,800
8 Harrison.....	9	20,400	20,400	25,945	20,400	25,945	15,310
9 Hocking.....	7	599,109	331,170	338,039	332,822	340,514	514,300
10 Holmes.....	7	56,240	12,963	18,450	10,060	25,696	71,200
11 Jackson.....	38	712,446	229,068	290,781	233,024	294,737	569,770
12 Jefferson.....	16	597,194	324,070	282,681	324,070	282,681	485,880
13 Lawrence.....	30	161,365	125,579	157,035	125,579	157,035	301,565
14 Mahoning.....	12	338,100	235,305	438,727	235,305	438,727	476,058
15 Medina.....	2	106,000	106,000	170,000	106,000	170,000	234,000
16 Meigs.....	29	527,400	359,225	428,723	359,225	428,723	776,421
17 Monroe.....	6	3,370	3,310	3,819	3,310	3,819	3,450
18 Morgan.....	5	235,450	3,080	4,313	11,231	13,714	10,100
19 Muskingum.....	48	453,750	135,737	142,562	140,279	148,015	226,296
20 Noble.....	21	64,937	24,760	27,060	24,760	27,060	27,850
21 Perry.....	24	2,006,481	913,974	913,392	913,974	913,392	4,286,520
22 Portage.....	3	100,000	27,780	60,625	27,780	60,625	46,000
23 Scioto.....	4	5,800	3,305	7,210	6,048	9,222	5,415
24 Stark.....	69	1,174,930	347,820	512,103	357,610	525,780	1,107,623
25 Summit.....	9	198,400	115,404	201,893	115,824	202,343	330,500
26 Trumbull.....	25	844,159	722,265	1,442,628	722,265	1,442,628	967,323
27 Tuscarawas.....	51	550,780	255,495	311,361	255,495	311,361	451,700
28 Vinton.....	5	169,300	57,200	78,176	62,108	82,474	197,000
29 Washington.....	11	31,449	31,449	33,511	33,511	33,511	20,750
30 Wayne.....	19	129,710	55,953	87,249	56,898	88,646	200,080

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

NEBRASKA.

EMPLOYÉS.					Total wages paid.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STEAM-POWER.			
Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employes.						Number of engines.	Horse-power of engines.	Number of boilers.	Horse-power of boilers.
8	9	10	11	12	13	14	15	16	17	18	19	20	21
5				5	\$200								
5				5	200								

NORTH CAROLINA.

2	1	1	4	\$300	1	\$50							
2	1	1	4	800	1	50							1

OHIO.

13,020	755	1,852	98	16,381	\$5,100,587	310	\$27,000	1,228	\$91,165	181	8,885	227	5,206	
775	62	102	13	952	279,457	40	4,005	61	5,520	0	140	5	148	1
604	13	103	3	723	257,884	12	1,000	55	4,010	0	180	7	165	2
61		10		71	18,366			4	985					3
1,080	70	118	12	1,280	444,402			110	8,920	10	180	11	175	4
234	4	27		265	67,615	2	180	31	2,260					5
87		6		43	8,998			4	325					6
288	3	34	12	337	114,142	4	380	41	2,370	1	18	8	55	7
63		10		73	18,150									8
526	12	112	2	652	266,081	52	4,025	35	2,875	2	80	2	80	9
33		3		36	10,143	1	50	2	200					10
635	20	77	2	743	205,056	2	125	58	4,095	9	239	10	209	11
406	43	136	1	676	195,205	19	1,150	75	5,395	8	381	14	620	12
200	42	51	3	386	113,145	2	150	38	8,235	1	50	1	35	13
730	35	76	4	845	309,592	3	230	62	4,670	18	414	24	605	14
282	10	20		312	74,680			26	2,200	2	64	8	64	15
828	54	156	13	1,051	166,365	29	1,925	102	9,900	4	140	9	200	16
21		1		22	2,482					1	13	1	25	17
17				17	2,288					1	17	2	20	18
342	5	38	2	387	100,689	2	100	11	1,000					19
75	5	4		84	15,785			2	200					20
1,505	64	189	5	1,703	708,369	82	7,139	71	6,935	7	178	14	310	21
120	2	14		136	33,360			5	500	2	60	3	75	22
18		1		19	5,809									23
1,381	78	182	1	1,637	347,023	43	4,080	92	6,005	15	440	37	701	24
355	11	40	2	417	114,555	1	100	19	1,700	7	179	11	192	25
1,810	140	105	15	2,175	880,688	10	920	171	12,085	26	1,013	62	1,408	26
601	32	82	2	717	198,999	3	270	50	3,305	4	45	4	65	27
146	17	35	4	202	65,227	12	800	12	700					28
63	3	2		63	20,069					1	20	1	25	29
201	20	19	2	242	57,542			25	2,175	5	112	3	105	30

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

NEBRASKA.

Counties.	Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
	22	23	24	25	26	27	28	29
The State.....			\$5	\$5	\$10	<i>Cords.</i>	<i>Linear feet.</i>	<i>Feet. B. M.</i>
1 Pawnee.....			5	5	10			

NORTH CAROLINA.

The State.....	1		\$50	\$50			
1 Chatham.....	1		50	50			

OHIO.

The State.....	120	131	\$210,453	\$720,845	\$931,298	2,397	4,195,378	378,697
1 Athens.....	0	3	10,637	26,073	37,610	10	180,000	
2 Belmont.....	0	0	10,633	29,858	40,541	79	240,049	
3 Carroll.....			1,491	3,938	5,429	50	20,000	
4 Columbiana.....	8	6	12,410	47,022	60,441	150	633,832	
5 Coshocton.....			924	9,110	10,034	15	151,070	
6 Gallia.....			551	866	1,417			
7 Guernsey.....	1	3	6,179	17,156	23,335		234,000	
8 Harrison.....		2	726	72	798	53		
9 Hecking.....	1		9,087	33,550	42,637		126,250	20,000
10 Holmes.....	1		594	1,222	1,816	53		
11 Jackson.....	9	13	13,381	16,946	30,327	317	1,600	
12 Jefferson.....	7	9	10,612	21,453	32,065		176,550	
13 Lawrence.....	1	1	3,038	11,450	15,088	110	60,401	129,037
14 Mahoning.....	11	13	5,062	26,231	31,293		252,961	27,000
15 Medina.....	2	2	5,650	9,760	15,410	250	40,000	
16 Meigs.....	4	2	13,796	161,533	175,329		4,771	
17 Monroe.....	1	1	118	256	374			
18 Morgan.....	1	1	131	57	188			
19 Muskingum.....			2,784	8,127	10,911		43,760	
20 Noble.....	7		935	1,718	2,653	12	3,600	
21 Perry.....	5	8	31,184	74,020	105,204	113	334,030	
21 Portage.....	2	2	172	4,947	5,119		64,300	
22 Scioto.....			113	945	1,058	8		
24 Stark.....	17	22	27,518	47,501	75,019	371	336,667	
25 Summit.....	0	9	5,911	21,091	27,002	580	90,000	
26 Trumbull.....	18	25	23,251	102,329	125,580		914,397	208,060
27 Tuscarawas.....	3	1	6,453	29,917	36,370	36	170,910	
28 Vinton.....			951	7,902	8,853			
29 Washington.....	1	1	1,120	1,494	2,614	50		
30 Wayne.....	2	1	4,382	3,401	7,783	138		

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

NEBRASKA.

FARMERS' DIGGINGS.					Remarks.
Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.	
30	31	32	33	34	
	Tons.				
					These statistics were collected by enumerators.

NORTH CAROLINA.

Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.	Remarks.

OHIO.

Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.	Remarks.
601	75,742	\$90,170	252	\$56,840	<p><i>Capital in real estate:</i> Whenever it has not been possible to obtain a return of this, the result has been reached by multiplying the number of acres unworked by the estimated mineral value of land per acre. The following scale has been used: Columbiana county, near railroad, \$100; off railroad, \$60; Belmont county, \$75; Jackson county, \$50; Hocking county, \$100; Mahoning county, \$200; Muskingum county, \$75; Portage county, \$200; Perry county, \$100; Scioto county, \$55; Stark county (Massillon district, western third of county), \$140; balance, \$100; Trumbull county, \$200; Tuscarawas county, \$45; Vinton county, \$40.</p> <p><i>Wages and materials:</i> In the returns these were generally confounded. In order to correct them a circular was issued, and the following rules were framed and applied after obtaining totals and averages from 24 mines. The totals were: Product, 680,218 tons; gross wages, \$530,337; materials for miners, \$40,180; net wages \$49,218; operators' materials, \$36,244; total materials, \$76,424. When gross wages are given and powder used, deduct 7.4 per cent. from wages; when gross wages are given but no powder used, deduct 3 per cent. from wages. When materials are not given, estimate them at 11 cents per ton, + \$5 per horse or mule per working month, + \$2.50 per head per idle month. When not given and powder not used, estimate at 4 1/2 cents per ton, + 3 per cent. of gross wages, + as above for horses and mules. When operators' materials are alone given and powder used, estimate by adding 5 1/2 cents per ton, + as above for horses and mules. When operators' materials are alone given but no powder used, estimate by adding 3 per cent. of gross wages, + as above for horses and mules.</p> <p><i>Powder:</i> Estimated as follows: By miners, 3 1/2 cents per ton, divided by 15, to arrive at pounds; by operators, 7 cents per ton, divided by 12, to arrive at pounds.</p> <p><i>Lumber:</i> Basis for estimates: Length of prop and cap=thickness of seam; ties, 5 feet long; props and caps, 1 1/2 cents per ton of coal mined; tracking, 1 1/2 cents for ditto; total, 2 1/2 cents; value of cord-wood, \$2.75 per cord.</p> <p><i>Farmers' diggings:</i> In these and all the smallest mines when wages have not been given, they have been estimated at 75 cents a ton. The average amount produced by one man during the census year in such mines has been estimated at 500 tons. Since the footings were made the following enumerators' returns have been received: Capital, \$800; 1 acre of coal land; 1 man employed under ground; wages, \$325; materials, \$25; product, 710 tons; value, \$710. Capital, \$1,500; 8 acres of coal land; 6 men employed under ground, 4 men above ground, 1 boy under ground; wages, \$800; materials, \$200 product, 1,320 tons; value, \$1,500.</p>
40	12,300	14,125	41	9,225	
10	1,080	1,350	3	810	
67	9,110	12,548	31	6,832	
35	3,315	4,944	11	2,450	
120	7,053	7,407	26	5,740	
15	1,652	1,825	6	1,230	
35	6,007	7,246	21	4,008	
63	3,956	3,056	12	2,907	
125	7,551	9,401	25	5,663	
37	4,542	5,458	15	3,406	
10	2,683	2,012	9	2,012	
51	0,700	13,077	34	7,342	
2	360	450	1	270	
54	4,903	4,208	16	3,681	
0	745	1,397	2	559	

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

PENNSYLVANIA.

Counties.	Number of establishments.	Maximum yearly capacity production.	Product of establishments, census year.	Values of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State	666	Tons. 26,229,031	Tons. 18,004,988	\$18,167,161	Tons. 18,425,163	\$18,567,129	\$38,700,344
1 Allegheny	105	0,722,832	4,426,871	4,732,070	4,467,227	4,775,126	0,780,757
2 Armstrong	22	130,021	74,850	70,147	116,423	100,099	160,560
3 Beaver	40	169,216	126,717	171,321	143,022	100,837	293,640
4 Bedford	3	130,000	92,106	82,130	92,106	82,130	90,833
5 Blair	8	307,065	208,834	278,377	294,384	278,097	300,682
6 Bradford	2	614,748	500,065	802,773	500,065	862,773	653,148
7 Butler	40	190,945	156,417	160,162	197,675	213,535	221,810
8 Cameron	1	43,000	43,000	51,000	43,000	51,000	132,000
9 Cambria	26	840,570	590,075	561,256	590,075	561,256	1,749,188
10 Centre	2	294,800	131,571	95,417	131,571	95,417	382,422
11 Clarion	33	487,062	286,846	286,713	217,297	322,500	791,290
12 Clearfield	29	2,865,800	1,722,711	1,470,747	1,722,711	1,470,747	3,193,175
13 Clinton	3	52,200	2,828	2,878	2,828	2,878	512,000
14 Elk	5	595,000	281,151	312,875	285,453	317,934	1,328,305
15 Fayette	68	2,700,912	2,318,728	1,318,912	2,356,983	1,349,657	3,868,070
16 Greene	4	8,052	6,781	6,754	30,158	26,011	2,050
17 Huntingdon	6	356,000	297,205	188,250	297,205	188,250	313,357
18 Indiana	21	154,945	46,445	34,762	58,881	45,050	135,400
19 Jefferson	13	327,276	180,515	144,981	199,074	164,298	173,614
20 Lawrence	24	285,234	165,528	200,807	183,273	231,075	418,459
21 Lycoming	1	275,000	200,023	287,432	200,023	287,432	250,000
22 McKean	2	160,000	147,378	173,294	147,378	173,294	680,571
23 Mercer	44	678,205	485,276	856,252	488,913	800,047	813,682
24 Somerset	23	749,688	286,456	234,402	302,293	240,552	1,163,699
25 Tioga	6	1,252,000	938,517	1,562,815	938,517	1,562,815	2,053,615
26 Venango	8	51,190	25,793	35,674	41,808	52,633	92,485
27 Warren					278	500	
28 Washington	50	1,384,485	968,042	950,180	1,006,529	985,155	1,506,420
29 Westmoreland	73	4,342,185	3,297,399	3,066,170	3,357,558	3,114,321	7,074,461

TENNESSEE.

The State	20	746,050	494,401	\$628,054	495,181	\$629,724	\$1,708,068
1 Anderson	6	277,500	140,813	146,376	140,813	146,376	182,700
2 Campbell	1	9,300	1,200	2,100	1,460	2,480	5,088
3 Cumberland	1	400	24	60	24	60	150
4 Franklin	3	1,450	1,325	3,330	1,705	3,710	8,172
5 Grundy	1	240,000	200,000	250,000	200,000	250,000	1,025,000
6 Hamilton	1	100,000	50,000	67,500	50,000	67,500	188,000
7 Marion	5	51,400	43,124	110,088	43,124	110,088	183,908
8 Roane	1	60,000	50,000	42,000	56,000	42,000	113,000
9 White	1	6,000	2,000	7,500	2,000	7,500	2,000

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

PENNSYLVANIA.

Counties.		Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
		22	23	24	25	26	27	28	29
The State.....		96	170	\$103,506	\$1,561,096	\$1,764,602	Cords. 557	Linear feet. 32,246,463	Feet, B. M. 6,574,651
1	Allegheny.....	8	10	34,100	444,440	478,600	.....	10,303,080	1,382,763
2	Armstrong.....	.....	2	1,770	6,708	8,478	10	227,041	.....
3	Beaver.....	1	3	3,633	14,419	18,052	.....	121,044	120,000
4	Bedford.....	1	1	351	9,200	9,551	.....	71,100	.....
5	Blair.....	3	2	829	22,425	23,254	375	124,986	51,000
6	Bradford.....	1	2	9,325	33,248	42,573	50	570,000	.....
7	Butler.....	7	8	1,906	12,685	14,591	.....	296,414	55,000
8	Cameron.....	.....	.....	30	4,470	4,500	.....	200,000	100,000
9	Cambria.....	.....	1	9,745	42,964	52,709	60	1,193,806	40,000
10	Centre.....	.....	.....	105	11,168	11,273	.....	531,304	.....
11	Clarion.....	3	3	6,265	22,182	28,447	.....	761,057	53,400
12	Clearfield.....	1	1	9,571	102,525	112,096	25	1,894,074	.....
13	Clinton.....	.....	.....	12	100	112	.....	.....	.....
14	Elk.....	2	.....	2,765	31,616	34,381	.....	796,375	94,000
15	Fayette.....	24	61	51,804	146,013	197,817	.....	3,238,806	109,400
16	Greene.....	.....	.....	61	289	350	.....	1,500	.....
17	Huntingdon.....	1	1	2,793	18,257	21,050	.....	247,887	.....
18	Indiana.....	.....	.....	920	2,112	3,032	29	15,000	.....
19	Jefferson.....	3	.....	4,030	10,988	15,018	.....	42,000	68,000
20	Lawrence.....	4	.....	2,418	23,473	25,891	5	322,793	61,000
21	Lycoming.....	2	.....	4,550	21,450	26,000	3	420,000	.....
22	McKean.....	.....	3	650	13,733	14,433	.....	50,000	375,000
23	Mercer.....	20	27	10,281	64,793	75,074	.....	1,181,463	268,250
24	Somerset.....	1	.....	348	18,051	18,399	.....	335,151	101,237
25	Tioga.....	1	1	12,828	148,974	161,802	.....	3,398,070	1,876,000
26	Venango.....	.....	.....	305	5,231	5,536	.....	274,085	1,584
27	Warren.....	.....	.....	.....	.....	.....	.....	.....	.....
28	Washington.....	3	9	3,386	79,006	87,392	.....	1,204,445	431,900
29	Westmoreland.....	10	35	13,065	250,526	264,191	.....	3,763,692	1,886,127

TENNESSEE.

The State.....		8	\$11,062	\$36,261	\$47,323	.....	412,200	796,000
1	Anderson.....	3	77	10,674	10,751	.....	171,000	.....
2	Campbell.....	.....	.....	150	150	.....	.....	.....
3	Cumberland.....	.....	2	3	5	.....	.....	.....
4	Franklin.....	.....	20	255	275	.....	.....	.....
5	Grundy.....	5	5,400	15,050	20,450	.....	180,000	370,000
6	Hamilton.....	.....	1,575	1,625	3,200	.....	.....	.....
7	Marion.....	.....	368	5,922	6,850	.....	25,200	426,000
8	Roane.....	.....	3,120	2,512	5,632	.....	36,000	.....
9	White.....	.....	.....	10	10	.....	.....	.....

MINING INDUSTRIES OF THE UNITED STATES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

VIRGINIA.

Counties	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments, census year.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.
	1	2	3	4	5	6	7
The State.....	4	Tons. 105,740	Tons. 40,520	\$92,837	Tons. 43,070	\$99,802	\$320,000
1 Botetourt.....					62	300	
2 Chesterfield.....	4	105,740	40,520	92,837	40,520	92,837	320,000
3 Montgomery.....					2,497	6,065	

WEST VIRGINIA.

The State.....	120	4,116,485	1,782,509	\$1,971,847	1,820,844	\$2,013,671	\$5,750,674
1 Barbour.....	1	1,400	950	750	3,361	2,705	7,000
2 Boone.....	1	83,000	22,400	30,000	22,400	30,000	93,000
3 Braxton.....					1,812	1,181	
4 Brooke.....	10	54,340	86,499	44,420	36,499	44,420	50,000
5 Doddridge.....	1	1,140	760	1,000	1,714	2,200	5,000
6 Fayette.....	18	916,410	343,677	296,491	343,701	296,515	727,980
7 Gilmer.....					1,082	895	
8 Grant.....	2	1,225	770	1,100	1,361	1,874	4,500
9 Hancock.....	7	25,400	19,950	21,750	19,950	21,750	11,500
10 Harrison.....	9	625,500	192,201	85,676	143,580	94,791	311,475
11 Kanawha.....	15	831,540	368,901	581,116	369,200	581,389	2,317,700
12 Lewis.....	3	2,275	1,680	1,920	4,991	5,469	16,500
13 Marion.....	16	221,865	103,874	83,518	107,630	86,008	192,900
14 Marshall.....	6	120,500	67,103	69,162	67,103	69,162	106,825
15 Mason.....	4	186,000	90,748	148,064	90,748	148,064	374,500
16 Mineral.....	3	114,800	62,731	70,080	63,171	70,511	27,250
17 Monongahela.....	7	16,275	12,559	10,425	20,796	17,047	61,500
18 Ohio.....	14	302,400	206,039	241,313	205,039	241,313	312,500
19 Pleasant.....	1	5,700	3,800	6,000	3,800	6,000	2,500
20 Preston.....	4	223,200	136,550	111,645	142,327	117,744	242,500
21 Putnam.....	1	300,000	49,000	67,375	49,000	67,375	663,000
22 Randolph.....	2	1,750	1,330	1,820	1,766	2,411	8,500
23 Ritchie.....	1	3,500	2,025	3,000	3,184	3,642	12,000
24 Roane.....					798	1,140	
25 Taylor.....	4	293,475	102,959	76,603	105,062	78,799	165,544
26 Upshur.....					1,892	1,349	
27 Wetzell.....	2	1,330	700	1,200	760	1,200	1,500
28 Wood.....	2	22,800	15,694	16,520	16,723	17,696	35,000

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

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TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

VIRGINIA.

EMPLOYÉS.					Total wages paid.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STEAM-POWER.			
Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employes.						Number of engines.	Horse-power of engines.	Number of boilers.	Horse-power of boilers.
8	9	10	11	12	13	14	15	16	17	18	19	20	21
112	1	124	24	261	\$71,447	7	\$650	31	\$3,250	15	763	32	1,313
112	1	124	24	261	71,447	7	650	31	3,250	15	763	32	1,313

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WEST VIRGINIA.

3,370	172	924	31	4,497	\$1,208,316	73	\$7,840	463	\$30,140	19	404	20	466
3				3	375								
60	10	30		100	53,000	1	100	12	900	2	43	2	43
74				74	22,310								
2				2	500								
506	17	237	4	854	259,500	5	650	57	6,200				
4				4	440								
37				37	12,350								
182	18	34	7	241	50,781	6	875	37	2,800	1	40	1	40
974	47	317	9	1,347	361,321	18	1,950	163	18,600	10	206	11	226
4				4	980								
116	4	28		148	46,821	3	240	17	1,400				
112		7	3	122	41,550								
206	17	55	1	279	91,232	7	625	64	5,050	4	95	3	105
96		3		99	36,780	6	750						
24				24	5,021								
339		27		366	184,087	20	1,000	34	3,300				
7				7	3,000								
107	85	48		240	78,086	1	25	34	2,200	1	6	2	20
190	10	100		300	50,000	3	200	23	1,000				
7				7	760								
4				4	1,500								
145	14	38	7	204	38,482	3	325	22	2,000	1	14	1	32
4				4	000								
17				17	3,200								

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MINING INDUSTRIES OF THE UNITED STATES.

TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

VIRGINIA.

Counties.	Number of hoisting-machines.	Number of drainage-machines.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.
	22	23	24	25	26	27	28	29
The State.....	13	3	\$1,336	\$10,278	\$11,614	<i>Cords.</i>	<i>Linear feet.</i> 110,540	<i>Fect. B. M.</i>
1 Botetourt.....								
2 Chesterfield.....	13	3	1,336	10,278	11,614		110,540	
3 Montgomery.....								

WEST VIRGINIA.

The State.....	41	15	\$30,035	\$221,011	\$251,046		1,819,453	720,181
1 Barbour.....			10	47	57			
2 Boone.....	1	1		6,574	6,574		15,000	100,000
3 Braxton.....								
4 Brooke.....			367	1,825	2,192			
5 Doddridge.....			8	38	46			
6 Fayette.....	1		5,514	45,347	50,861		992,600	158,000
7 Gilmer.....								
8 Grant.....			8	38	46			
9 Hancock.....			200	997	1,197			
10 Harrison.....	2		3,294	11,672	14,966		32,050	
11 Kanawha.....	10	11	9,283	65,031	75,214		251,443	462,181
12 Lewis.....			16	83	99			
13 Marion.....			1,432	8,314	9,746		65,000	
14 Marshall.....	23		296	12,600	12,896		98,400	
15 Mason.....	3	1	2,510	10,018	12,528		109,150	
16 Mineral.....			14	5,901	6,005		30,700	
17 Monongahela.....			126	623	754			
18 Ohio.....			990	27,757	28,747		120,500	
19 Pleasant.....			38	190	228			
20 Preston.....	1	1	4,022	10,276	14,298		55,550	
21 Putnam.....			1,687	3,513	5,200		49,000	
22 Randolph.....			13	66	79			
23 Ritchie.....			26	131	157			
24 Roane.....								
25 Taylor.....		1	17	8,003	8,110			
26 Upshur.....								
27 Wetzel.....			8	38	46			
28 Wood.....			156	784	940			

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

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TABLE 29.—Production of bituminous coal east of the 100th meridian, by states and counties—Continued.

VIRGINIA.

FARMERS' DIGGINGS.					Remarks.
Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.	
30	31	32	33	34	
13	<i>Tons.</i> 2,550	\$6,065	50	\$4,305	The remarks for West Virginia apply here, except that the amount to be added to "Materials" for half feed of horses and mules during idle time is \$391, and the amount to be deducted from "wages" is \$120.
1	62	300	3	150	
12	2,497	6,665	47	4,155	

WEST VIRGINIA.

774	47,275	\$41,824	828	\$19,830	<p><i>Aeres</i> are not always given.</p> <p><i>Materials:</i> To the original returns has been added throughout for feed \$6 per working-month per head; also for miners' oil, and sharpening and repairing tools, 4½ cents per ton. To the aggregate materials for the State may be added for half feed of horses and mules during idle time, \$4,817.</p> <p><i>Wages:</i> Original returns unaltered. It is probable however that they generally represent gross earnings; if so, the following amounts should be deducted for miners' powder, oil, and for sharpening and repairing tools: Boone county, \$1,608; Fayette county, \$15,345; Harrison county, \$7,302; Kanawha county, \$10,100; Marion county, \$4,077; Marshall county, \$2,676; Mason county, \$6,496; Mineral county, \$2,762; Ohio county, \$9,267; Preston county, \$9,362; Putnam county, \$2,205; Taylor county, \$4,553; making in all, \$85,122, and leaving total wages for the state, \$1,213,194.</p> <p><i>Powder:</i> Wherever used but not returned has been estimated at 2½ cents a ton and added to materials.</p> <p><i>Capital—Real Estate:</i> When not returned and acreage omitted has been estimated as equal to the royalty on six full years' production.</p>
59	2,411	2,045	00	303	
39	1,312	1,131	39	1,563	
40	954	1,290	40	537	
1	24	24	1	15	
33	1,082	895	34	443	
19	691	774	19	347	
153	11,388	9,115	173	4,424	
4	308	279	4	156	
70	3,311	3,540	76	1,702	
33	3,762	2,490	39	1,231	
9	440	431	11	215	
45	8,237	6,022	53	3,370	
86	5,768	6,099	94	2,941	
13	406	591	13	283	
20	659	642	20	329	
42	798	1,140	42	507	
33	3,663	2,191	36	1,069	
49	1,892	1,349	49	687	
17	1,020	1,170	17	588	

TABLE 30.—Production of bituminous coal, east of the 100th meridian, by states.

A summary of Table 29.

NOTE.—With the exception of columns 5 and 6, in which the regular and irregular product are combined, all the statistics in columns 1 to 29, both inclusive, relate to regular establishments only.

States.	Number of counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments.	Total product, census year.	Value of total product.	Total capital, real and personal, invested.	EMPLOYÉS.					Total wages paid.
									Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employees.	
									8	9	10	11	12	
0	1	2	3	4	5	6	7	8	9	10	11	12	13	
Total	314	2,043	74,153,963	40,301,758	\$40,045,308	41,218,327	\$50,137,603	\$93,517,464	70,512	5,366	13,842	755	96,475	\$80,707,009
1 Alabama	6	10	451,022	322,934	475,559	323,072	476,011	772,858	850	21	025	17	1,513	323,788
2 Arkansas	4	14	57,440	14,778	33,535	14,778	33,535	15,000	98	2	22	8	130	20,850
3 Georgia	1	2	165,000	154,644	231,605	154,644	231,605	441,745	185		257		442	85,170
4 Illinois	46	590	13,808,709	6,080,514	8,730,755	6,115,377	8,770,892	10,654,261	13,128	950	2,152	71	16,801	6,035,919
5 Indiana	19	216	3,110,983	1,440,490	2,143,003	1,454,327	2,150,288	2,304,720	3,748	171	570	7	4,400	1,405,164
6 Iowa	25	227	3,806,895	1,442,333	2,473,155	1,461,116	2,507,453	2,778,937	3,994	210	808	12	5,024	1,554,606
7 Kansas	24	180	1,140,518	763,597	1,498,168	771,442	1,517,444	787,994	3,142	181	288	0	3,017	758,980
8 Kentucky	49	65	2,435,770	935,857	1,123,046	946,288	1,134,900	1,968,597	1,058	122	679	67	2,820	687,474
9 Maryland	2	33	4,532,822	2,227,844	2,584,455	2,228,017	2,585,537	13,165,557	2,000	475	505	37	3,677	1,370,670
10 Michigan	2	6	141,800	100,800	224,500	100,800	224,500	66,800	295	65	51	1	412	146,000
11 Missouri	35	144	1,120,112	543,990	1,037,100	844,304	1,404,425	380,315	2,006	238	253	12	2,500	642,772
12 Nebraska	1	1	400	300	750	200	750	500	5				5	200
13 North Carolina	1	1	700	350	400	350	400	40,170	2		1	1	4	300
14 Ohio	30	618	12,003,880	5,932,858	7,629,488	6,008,595	7,719,667	13,652,484	13,626	755	1,852	98	16,331	5,100,587
15 Pennsylvania	29	606	26,229,031	18,004,988	18,157,151	18,425,163	18,567,129	38,769,344	26,550	1,941	4,480	268	33,248	10,861,583
16 Tennessee	0	20	746,050	404,401	628,954	495,131	629,724	1,708,968	693	62	242	65	1,002	336,765
17 Virginia	3	4	105,740	40,520	92,837	43,079	99,802	329,000	112	1	124	24	201	71,447
18 West Virginia	28	120	4,116,485	1,782,560	1,971,847	1,820,844	2,013,671	5,750,674	3,370	172	924	31	4,497	1,298,316

States.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STEAM-POWER.				Number of hoisting-machines.	Number of drainage-machines.
					Number of engines.	Horse-power of engines.	Number of boilers.	Horse-power of boilers.		
					14	15	16	17			18	19	20	21	22	23
Total	1,892	\$173,179	7,116	\$649,213	812	24,696	1,178	33,024	1,040	720
1 Alabama	5	450	66	6,100	12	425	20	555	13	11
2 Arkansas					3	35	1		7	5
3 Georgia			34	2,040			1	20	1	1
4 Illinois	426	28,675	1,078	77,716	280	8,294	345	9,925	393	175
5 Indiana	67	3,653	341	18,502	65	1,717	78	2,729	73	79
6 Iowa	170	10,025	338	23,723	57	1,445	54	1,032	141	56
7 Kansas					4	120	5		50	26
8 Kentucky	28	2,010	348	23,897	18	522	23	738	14	11
9 Maryland	301	37,664	31	3,130	7	860	17	850	17	5
10 Michigan					6	235	14		0	7
11 Missouri					13	518	14		45	17
12 Nebraska										
13 North Carolina	1	50							1	
14 Ohio	310	27,090	1,228	91,165	131	3,835	227	5,296	120	131
15 Pennsylvania	484	55,040	3,010	345,625	170	5,391	321	9,048	96	179
16 Tennessee	2	200	139	14,025	6	132	6	152		
17 Virginia	7	650	31	3,250	15	763	32	1,313	13	3
18 West Virginia	73	7,340	463	30,140	19	404	20	466	41	15

Indian territory was not canvassed by the census agents, and no returns of the coal production from that region were received. There were produced there in the census year, however, as has since been learned, 2,943,015 bushels of coal and 48,400 bushels of coke. (The coke was made from slack, and is not included in the previous figures.)

Estimating the yield of coke at 60 per cent., and the weight of a bushel of coal at 80 pounds, this would equal 120,947 net tons.

No other data in reference to this production were obtainable.

TABLE 30.—Production of bituminous coal, east of the 100th meridian, by states—Continued.

States.	Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of wood used for fuel.	Amount of unsawed lumber.	Amount of sawed lumber.	FARMERS' DIGGINGS.				
							Number of diggings.	Product, census year.	Value of product.	Number of persons employed.	Wages paid.
							24	25	26	27	28	29	30	31	32	33	34
Total	\$063, 913	\$3, 698, 349	\$4, 061, 662	Cords. 17, 305	Linear feet. 63, 918, 006	Feet, B. M. 10, 372, 462	5, 140	Tons. 916, 560	\$1, 092, 205	8, 922	\$370, 040
1 Alabama	11, 100	37, 483	48, 583	212	561, 500	.....	7	1, 038	1, 352	20	925
2 Arkansas	25	1, 110	1, 135	54	.....	.....	.....	.....	.....	.....	.....
3 Georgia	3, 775	5, 725	9, 500	658	.....	.....	.....	.....	.....	.....	.....
4 Illinois	267, 730	528, 419	796, 149	2, 430	15, 200, 053	484, 000	165	25, 866	40, 077	262	25, 761
5 Indiana	56, 151	102, 453	158, 604	155	2, 730, 749	1, 290, 683	.....	4, 831	7, 165	47	3, 850
6 Iowa	116, 970	192, 850	249, 820	.....	3, 743, 100	19, 250	68	18, 783	34, 298	148	25, 143
7 Kansas	12, 125	35, 300	47, 485	947	.....	.....	81	7, 845	10, 270	241	9, 247
8 Kentucky	41, 018	54, 977	95, 995	.....	875, 116	109, 000	73	10, 431	11, 914	93	8, 080
9 Maryland	40	194, 902	194, 942	.....	1, 379, 444	.....	15	1, 073	1, 082	17	532
10 Michigan	4, 700	3, 050	7, 750	375	.....	.....	.....	.....	.....	.....	.....
11 Missouri	3, 282	52, 474	55, 756	9, 511	.....	.....	90	360, 314	427, 325	3, 125	153, 149
12 Nebraska	5	5	10	.....	.....	.....	.....	.....	.....	.....	.....
13 North Carolina .....	.....	50	50	.....	.....	.....	.....	.....	.....	.....	.....
14 Ohio	210, 453	720, 845	931, 298	2, 307	4, 135, 378	378, 097	691	75, 742	90, 179	252	56, 840
15 Pennsylvania	193, 506	1, 561, 096	1, 754, 602	557	32, 246, 403	6, 574, 651	3, 169	420, 175	400, 978	3, 922	239, 795
16 Tennessee	11, 062	36, 261	47, 323	.....	412, 200	706, 000	3	610	770	7	575
17 Virginia	1, 336	10, 278	11, 614	.....	110, 540	.....	13	2, 550	6, 965	50	4, 305
18 West Virginia	30, 035	221, 011	251, 046	.....	1, 819, 453	720, 181	774	47, 275	41, 824	828	19, 836

TABLE 31.—Production of semi-anthracite coal.

PENNSYLVANIA.

Counties.	Number of establishments.	Maximum yearly capacity of production.	Product of establishments, census year.	Value of product of establishments.	Total product, census year.	Value of total product.	Total capital real and personal invested.	EMPLOYÉS.				
								Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total number of employees.
								8	9	10	11	12
The State	1	Tons. 112, 000	Tons. 70, 560	\$110, 000	Tons. 70, 560	\$110, 000	\$1, 112, 770	10	130	20	40	200
Sullivan	1	112, 000	70, 560	110, 000	70, 560	110, 000	1, 112, 770	10	130	20	40	200

Counties.	Total wages paid.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	STEAM-POWER.				Value of explosives.	Value of all other materials.	Total value of all materials.	Amount of unsawed lumber.
						Number of engines.	Horse-power of engines.	Number of rollers.	Horse-power of rollers.				
						13	14	15	16					17	18	19	20	21	22	23	24	25
The State	\$60, 000	4	\$300	34	\$3, 000	1	25	1	40	\$2, 201	\$7, 199	9, 400	Lin. feet. 70, 560
Sullivan	60, 000	4	300	34	3, 000	1	25	1	40	2, 201	7, 199	9, 400	70, 560

TABLE 32.—Production of bituminous coal and lignite west of the 100th meridian, by states and counties.

CALIFORNIA.

Counties.	Number of establishments.	Number of acres of coal lands.	Maximum yearly capacity of production.	Total product, census year.	Value of total product.	EMPLOYÉS								Total wages paid.
						Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total employes.	Miners.	Laborers.	Administrative force.	
						6	7	8	9	10	11	12	13	
The State.....	6	2,060	Tons. 230,927	Tons. 236,950	\$663,013	650	8	93	.....	751	478	255	18	\$321,950
1 Amador.....	2	1,400	85,080	85,080	153,000	50	.....	10	.....	60	50	7	3	28,000
2 Contra Costa.....	3	1,500	151,247	150,486	507,213	592	8	81	.....	681	420	247	14	293,200
3 Los Angeles.....	1	.....	3,000	784	2,800	8	.....	2	.....	10	8	1	1	741

COLORADO.

The State.....	25	23,592	638,233	462,747	\$1,041,350	1,133	.....	301	.....	1,434	1,133	227	74	\$714,714
1 Boulder.....	3	3,302	183,090	172,740	441,745	314	.....	80	.....	400	314	62	24	363,000
2 Fremont.....	1	3,309	88,323	88,323	220,800	200	.....	26	.....	226	200	20	6	111,600
3 Gunnison.....	1	320	10,800	200	1,000	2	.....	.....	.....	2	2	.....	.....	400
4 Jefferson.....	5	.....	130,500	20,650	63,025	74	.....	44	.....	118	74	35	9	25,375
5 Huerfano.....	2	2,810	55,000	20,630	52,000	120	.....	25	.....	145	120	20	5	30,675
6 Las Animas.....	5	0,000	105,312	103,032	132,280	203	.....	46	.....	240	203	29	17	137,760
7 Park.....	1	480	16,128	4,032	16,200	150	.....	57	.....	207	150	50	7	46,200
8 Weld.....	2	4,480	49,280	46,840	113,400	70	.....	17	.....	87	70	11	6	54,364

MONTANA TERRITORY.

The Territory.....	1	.....	1,344	224	\$800	3	.....	.....	.....	3	3	.....	.....	\$400
1 Gallatin.....	1	.....	1,344	224	800	3	.....	.....	.....	3	3	.....	.....	400

OREGON.

The State.....	2	2,649	43,205	43,205	\$97,810	63	.....	13	.....	76	62	21	3	\$68,017
1 Coos.....	2	2,649	43,205	43,205	97,810	63	.....	13	.....	76	62	21	3	68,017

UTAH TERRITORY.

The Territory.....	6	4,440	31,544	14,748	\$33,645	79	.....	12	.....	91	70	21	.....	\$25,675
1 Summit.....	3	200	27,844	12,048	15,845	68	.....	12	.....	80	59	21	.....	20,700
2 San Peto.....	2	4,080	3,400	2,400	7,200	8	.....	.....	.....	8	8	.....	.....	3,175
3 Iron.....	1	160	300	300	600	3	.....	.....	.....	3	3	.....	.....	1,800

Irregular product, 500 tons; value, \$1,125 (Iron county?).

WASHINGTON TERRITORY.

The Territory.....	5	2,600	161,708	145,015	\$280,046	163	.....	65	.....	168	103	44	21	\$143,754
1 King.....	3	2,120	158,796	112,103	380,541	93	.....	50	.....	143	93	34	16	135,868
2 Pierce.....	1	.....	261	231	1,401	3	.....	5	.....	8	3	5	.....	1,026
3 Thurston.....	1	480	2,651	2,651	7,101	7	.....	10	.....	17	7	5	5	5,060

WYOMING TERRITORY.

The Territory.....	6	1,200	917,280	589,385	\$1,080,451	.....	.....	149	.....	1,000	830	150	20	\$570,569
1 Carbon.....	1	.....	96,820	95,054	171,846	75	.....	12	.....	87	75	8	4	100,451
2 Crook.....	1	.....	.....	22	60	3	.....	.....	.....	3	3	.....	.....	750
3 Sweetwater.....	1	.....	336,000	240,642	445,790	385	.....	41	.....	426	353	65	6	220,192
4 Uintah.....	3	1,200	484,960	243,677	463,255	337	.....	96	.....	436	337	86	10	240,173

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 32.—Production of bituminous coal and lignite west of the 100th meridian, by states and counties—Continued.

CALIFORNIA.

Counties.	CAPITAL.				Value of explosives.	Value of all materials.	Number of hoisting-machines.	Number of drainage-machines.	STEAM-POWER.						Value of all machinery.
	Real estate.	Plant.	Working capital.	Total capital.					Number of engines.	Value of engines.	Horse-power of engines.	Number of boilers.	Value of boilers.	Horse-power of boilers.	
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
The State.....	\$500,000	\$535,500	\$107,031	\$1,230,431	\$2,367	\$44,013	10	12	8	\$10,000	295	32	\$45,000	850	\$77,500
1 Amador.....	180,000	9,000	2,450	191,450	.....	500	2	1	2	4,000	60	2	2,000	100	7,500
2 Contra Costa.....	411,000	524,000	104,956	1,039,956	1,655	42,502	8	11	0	15,000	235	30	43,000	750	70,000
3 Los Angeles.....	5,000	2,600	525	8,025	712	921	.....	.....	.....	.....	.....	.....	.....	.....	.....

COLORADO.

The State.....	\$5,448,100	\$328,000	\$102,550	\$5,030,250	\$11,673	\$114,576	23	10	20	\$44,000	749	25	\$33,750	1,140	\$100,650
1 Boulder.....	588,700	70,500	70,550	741,750	7,418	50,702	8	5	4	13,500	210	4	7,000	250	26,950
2 Fremont.....	3,360,000	10,000	10,000	3,400,000	800	8,373	1	.....	1	3,000	50	1	2,000	40	6,000
3 Gunnison.....	9,600	100	100	10,000	4	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
4 Jefferson.....	35,100	20,700	0,700	71,500	1,318	7,029	4	2	4	11,000	244	6	6,250	300	19,500
5 Huerfano.....	140,500	20,100	4,600	165,200	490	5,870	1	2	1	2,000	20	3	4,500	120	10,000
6 Las Animas.....	808,000	106,500	34,000	1,038,500	75	9,033	.....	1	1	2,000	20	1	1,500	40	5,500
7 Park.....	48,000	02,000	24,000	134,000	40	12,490	4	6	4	8,000	110	6	9,000	240	23,000
8 Weld.....	353,000	23,700	0,600	383,300	1,528	29,374	5	3	5	4,500	95	4	3,500	150	9,700

MONTANA TERRITORY.

The Territory.....	\$7,200	\$5,100	\$250	\$12,550	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1 Gallatin.....	7,200	5,100	250	12,550	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

OREGON.

The State.....	\$105,000	\$115,023	\$0,500	\$220,523	\$1,028	\$8,507	.....	.....	1	\$5,000	60	1	\$1,000	60	\$13,000
1 Coos.....	105,000	115,023	0,500	220,523	1,028	8,507	.....	.....	1	5,000	60	1	1,000	60	13,000

UTAH TERRITORY.

The Territory.....	.....	\$23,000	\$11,514	.....	.....	\$2,582	.....	.....	4	\$12,000	48	5	\$6,000	200	\$21,500
1 Summit.....	.....	17,000	10,114	.....	.....	.....	.....	.....	3	9,000	39	4	4,500	150	16,700
2 San Pete.....	.....	5,500	1,000	.....	.....	.....	.....	.....	1	3,000	9	1	1,500	50	5,000
3 Iron.....	.....	500	400	.....	.....	2,582	.....	.....	.....	.....	.....	.....	.....	.....	.....

WASHINGTON TERRITORY.

The Territory.....	\$32,000	\$87,721	\$15,700	\$335,421	\$10,698	\$21,203	2	2	4	\$6,000	115	4	\$4,500	140	\$15,500
1 King.....	212,000	81,721	14,500	308,221	10,650	18,644	1	2	3	5,000	85	3	4,000	100	13,000
2 Pierce.....	.....	3,000	200	3,200	20	889	1	.....	1	1,000	30	1	500	40	2,500
3 Thurston.....	20,000	3,000	1,000	24,000	28	1,670	.....	.....	.....	.....	.....	.....	.....	.....	.....

WYOMING TERRITORY.

The Territory.....	\$470,000	\$170,398	\$77,000	\$726,398	\$50	\$1,072	9	8	9	\$18,000	228	19	\$25,000	475	\$50,000
1 Carbon.....	75,000	9,000	8,500	92,500	.....	885	1	2	1	2,000	25	4	4,000	100	8,000
2 Crook.....	.....	1,127	1,000	2,127	36	187	.....	.....	.....	.....	.....	.....	.....	.....	.....
3 Sweetwater.....	150,000	35,000	25,500	210,500	.....	.....	5	2	5	10,000	125	10	15,000	250	32,000
4 Uintah.....	245,000	134,271	42,000	421,271	.....	.....	3	4	3	6,000	78	5	6,000	125	19,000

MINING INDUSTRIES OF THE UNITED STATES.

TABLE 32.—Production of bituminous coal and lignite west of the 100th meridian, by states and counties—Continued

CALIFORNIA.

Counties.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	Amount of wood used for fuel.	Value of cord wood.	Amount of unsawed lumber (other than for fuel).	Value of unsawed lumber.
	30	31	32	33	34	35	36	37
					Cords.		Linear feet.	
The State.....	23	\$2,200	22	\$2,200	.....	.....	1,879,500	\$18,907
1 Amador.....	.....	.....	.....	.....	.....	.....	2,000	132
2 Contra Costa.....	22	2,200	22	2,200	.....	.....	1,808,800	18,688
3 Los Angeles.....	.....	.....	.....	.....	.....	.....	8,700	87

COLORADO.

The State.....	.....	.....	66	\$9,600	.....	.....	1,100,305	\$33,837
1 Boulder.....	.....	.....	20	2,900	.....	.....	319,680	11,594
2 Fremont.....	.....	.....	30	3,090	.....	.....	100,000	2,300
3 Gunnison.....	.....	.....	.....	.....	.....	.....	.....	.....
4 Jefferson.....	.....	.....	.....	.....	.....	.....	51,025	1,023
5 Huerfano.....	.....	.....	10	1,000	.....	.....	68,000	1,220
6 Las Animas.....	.....	.....	17	1,700	.....	.....	101,000	3,000
7 Park.....	.....	.....	.....	.....	.....	.....	300,000	12,000
8 Weld.....	.....	.....	10	1,000	.....	.....	100,000	2,100

MONTANA TERRITORY.

The Territory.....	.....	.....	.....	.....	.....	.....	.....	.....
1 Gallatin.....	.....	.....	.....	.....	.....	.....	.....	.....

OREGON.

The State.....	.....	.....	14	\$1,400	.....	.....	.....	.....
1 Coos.....	.....	.....	14	1,400	.....	.....	.....	.....

UTAH TERRITORY.

The Territory.....	3	\$150	.....	.....	.....	.....	243,050	\$731
1 Summit.....	2	100	.....	.....	.....	.....	200,750	602
2 San Pete.....	1	50	.....	.....	.....	.....	38,400	115
3 Iron.....	.....	.....	.....	.....	.....	.....	4,800	14

WASHINGTON TERRITORY.

The Territory.....	.....	.....	20	\$2,000	800	\$875	30,000	\$902
1 King.....	.....	.....	20	2,000	800	875	4,750	121
2 Pierce.....	.....	.....	.....	.....	.....	.....	2,700	69
3 Thurston.....	.....	.....	.....	.....	.....	.....	22,610	712

WYOMING TERRITORY.

The Territory.....	.....	.....	42	\$4,200	.....	.....	7,000	\$140
1 Carbon.....	.....	.....	10	1,000	.....	.....	.....	.....
2 Crook.....	.....	.....	.....	.....	.....	.....	7,000	140
3 Sweetwater.....	.....	.....	10	1,000	.....	.....	.....	.....
4 Uintah.....	.....	.....	22	2,200	.....	.....	.....	.....

PRODUCTION OF BITUMINOUS COAL AND LIGNITES.

TABLE 33.—Production of bituminous coal and lignite west of the 100th meridian, by states.

[A summary of Table 32.]

States and territories.	Number of counties.	Number of establishments.	Number of acres of coal lands.	Maximum yearly capacity of production.	Total product, census year.	Value of total product.	EMPLOYEES.							Total wages paid.	
							Men employed below ground.	Boys employed below ground.	Men employed above ground.	Boys employed above ground.	Total employes.	Miners.	Laborees.		Administrative force.
							6	7	8	9	10	11	12		13
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Total	23	51	37,441	Tons. 2,003,241	Tons. 1,402,484	\$3,306,115	2,801	8	933	.....	3,532	2,669	727	136	\$1,854,076
1 California.....	3	0	2,000	239,927	230,050	603,013	050	8	03	.....	751	478	255	18	321,950
2 Colorado.....	8	25	23,592	698,233	403,747	1,041,350	1,133	.....	301	.....	1,434	1,133	227	74	714,714
3 Montana territory.....	1	1	.....	1,344	224	800	8	.....	.....	.....	3	8	.....	.....	409
4 Oregon.....	1	2	2,049	43,205	43,205	97,810	03	.....	13	.....	76	52	21	3	68,017
5 Utah territory.....	3	0	4,440	31,544	14,748	33,645	70	.....	12	.....	91	70	21	.....	25,075
6 Washington territory...	3	5	2,000	161,708	145,015	380,046	103	.....	65	.....	168	103	44	21	143,754
7 Wyoming territory.....	4	0	1,200	917,280	589,595	1,080,451	800	.....	140	.....	1,009	830	150	20	579,566

States and territories.	CAPITAL.				Value of explosives.	Total value of all materials.	Number of hoisting-machines.	Number of drainage-machines.	STEAM-POWER.					Value of all machinery.	
	Real estate.	Plant.	Working capital.	Total capital.					Number of engines.	Value of engines.	Horse-power of engines.	Number of boilers.	Value of boilers.		Horse-power of boilers.
	15	16	17	18					19	20	21	22	23		24	25	26	27	28	29
Total	\$4,858,300	\$1,274,342	\$381,445	\$8,479,573	\$26,702	\$192,013	44	41	46	\$104,000	1,405	86	\$115,250	2,865	\$287,160
1 California.....	596,000	535,500	107,931	1,239,431	2,307	44,013	10	12	8	10,000	295	32	45,000	850	77,500
2 Colorado.....	5,448,100	323,000	102,550	5,930,250	11,673	114,576	23	10	20	44,000	749	25	83,750	1,140	100,050
3 Montana territory.....	7,200	5,100	250	12,550	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4 Oregon.....	105,000	115,023	6,500	226,523	1,028	8,507	.....	.....	1	5,000	60	1	1,000	60	13,000
5 Utah territory.....	.....	23,000	11,514	.....	.....	2,582	.....	.....	4	12,000	48	5	6,000	200	21,560
6 Washington territory...	232,000	87,721	15,700	335,421	10,698	21,203	2	2	4	0,000	115	4	4,500	140	15,500
7 Wyoming territory.....	470,000	179,398	77,000	726,398	36	1,072	0	8	9	18,000	223	19	25,000	475	50,000

States and territories.	Number of horses.	Value of horses.	Number of mules.	Value of mules.	Amount of wood used for fuel.	Value of cord-wood.	Amount of unsawed lumber (other than for fuel).	Value of unsawed lumber.								
									30	31	32	33	34	35	36	37
									Cords.	Linear feet.
Total	25	\$2,350	194	\$19,400	300	\$675	3,200,815	\$54,517								
1 California.....	22	2,200	22	2,200	.....	.....	1,879,500	18,907						
2 Colorado.....	.....	.....	96	9,600	.....	.....	1,100,305	93,837				
3 Montana territory.....	.....	.....	.....	.....	.....	.....	.....	.....
4 Oregon.....	.....	.....	14	1,400	.....	.....	.....	.....				
5 Utah territory.....	3	150	.....	.....	.....	.....	243,050	731				
6 Washington territory...	.....	.....	20	2,000	300	675	30,060	999						
7 Wyoming territory.....	.....	.....	42	4,200	.....	.....	7,000	140				

GENERAL ANALYSIS OF THE BITUMINOUS COAL STATISTICS. (a)

By CHARLES F. JOHNSON, Jr.

TABLE No. 34.—*Production of bituminous coal by states east of the 100th meridian.*

Name of state.	Number of coun- ties.	Number of estab- lishments.	Maximum ca- pacity of year- ly production, tons.	Product of estab- lishments cen- sus year, tons.	Value of product at mines.	Irregular pro- duct, tons.	Total product census year, tons.	Value of total product at mines.	Value of mate- rials used in mines cen- sus year.	Wares paid to all classes of labor.
	1	2	3	4	5	6	7	8	9	10
Total.....	314	2,943	74,153,903	40,301,758	\$49,045,308	910,500	41,228,328	\$50,137,003	\$4,061,662	\$30,707,000
1 Alabama.....	6	10	451,622	322,934	475,559	1,038	323,972	470,911	48,583	328,788
2 Arkansas.....	4	14	57,440	14,776	33,535	.....	14,778	33,535	1,135	20,850
3 Georgia.....	1	2	105,000	154,644	231,605	.....	154,644	231,605	0,560	85,179
4 Illinois.....	46	500	13,808,709	0,080,514	8,730,755	25,863	6,115,377	5,770,832	706,149	6,035,919
5 Indiana.....	19	216	3,110,989	1,440,490	2,143,693	4,831	1,454,327	2,150,258	158,004	1,405,310
6 Iowa.....	25	227	3,890,805	1,442,333	2,473,155	18,783	1,461,116	2,507,453	249,820	1,554,696
7 Kansas.....	24	180	1,140,518	703,597	1,408,108	7,845	771,442	1,517,444	47,485	758,080
8 Kentucky.....	40	65	2,435,776	935,857	1,123,046	10,431	940,288	1,134,000	65,005	1,134,000
9 Maryland.....	2	32	4,532,822	2,227,844	2,584,455	1,073	2,228,917	2,585,537	104,042	1,370,079
10 Michigan.....	2	6	141,800	100,800	224,500	.....	100,800	224,500	7,750	140,600
11 Missouri.....	35	144	1,120,112	543,000	1,037,100	300,314	844,304	1,404,425	55,750	642,772
12 Nebraska.....	1	1	400	200	750	.....	200	750	10	200
13 North Carolina.....	1	1	700	350	400	.....	350	400	50	300
14 Ohio.....	30	618	12,003,880	5,932,853	7,020,488	75,742	6,008,505	7,710,007	931,208	5,100,547
15 Pennsylvania.....	20	606	20,229,031	18,004,088	18,157,151	420,175	18,425,163	18,567,120	1,754,002	10,868,583
16 Tennessee.....	0	20	746,050	404,491	628,054	640	405,181	620,724	47,323	336,735
17 Virginia.....	3	4	105,740	40,520	92,897	2,550	43,079	90,803	11,014	71,447
18 West Virginia.....	28	120	4,116,485	1,782,560	1,971,847	47,275	1,820,844	2,013,071	251,040	1,298,316

Name of state.	Men employed above ground.	Men employed below ground.	Boys under 16 em- ployed above ground.	Boys under 16 employed be- low ground.	Total employes.	Number of steam engines.	Horse-power of steam engines.	Value of all ma- chinery includ- ing engines.	Value of explo- sives used cen- sus year.	Amount em- ployed as work- ing capital.
	11	12	13	14	15	16	17	18	19	20
Total.....	13,842	70,512	755	5,306	90,475	812	24,000	\$2,403,211	\$063,313	\$8,191,960
1 Alabama.....	625	850	17	21	1,513	12	425	46,400	11,100	111,500
2 Arkansas.....	22	98	8	2	130	3	35	.....	25	.....
3 Georgia.....	257	185	.....	.....	442	.....	.....	.....	3,775	30,745
4 Illinois.....	2,152	13,128	71	650	16,301	286	8,204	597,184	267,730	1,162,635
5 Indiana.....	570	3,748	7	171	4,406	65	1,717	146,908	56,151	348,665
6 Iowa.....	808	3,094	12	210	5,024	57	1,445	126,218	116,070	273,350
7 Kansas.....	288	3,142	6	181	3,617	4	120	.....	12,125	.....
8 Kentucky.....	670	1,958	67	122	2,820	18	522	51,150	41,018	276,000
9 Maryland.....	505	2,600	37	475	3,677	7	800	129,050	40	901,360
10 Michigan.....	51	295	1	65	412	6	235	.....	4,700	.....
11 Missouri.....	259	2,006	12	238	2,509	13	518	.....	3,282	.....
12 Nebraska.....	.....	5	.....	.....	5	.....	.....	.....	5	.....
13 North Carolina.....	1	2	1	.....	4	.....	.....	.....	25	70
14 Ohio.....	1,852	13,020	98	755	16,301	181	3,835	385,004	210,453	1,177,328
15 Pennsylvania.....	4,480	20,550	208	1,941	33,248	170	5,301	720,180	193,506	3,460,807
16 Tennessee.....	242	693	95	62	1,062	6	132	70,750	11,062	65,750
17 Virginia.....	124	112	24	1	261	15	763	75,100	1,333	20,500
18 West Virginia.....	924	3,370	31	172	4,407	19	404	113,333	30,035	357,250

(a) Prepared for Census Bulletin No. 273. The figures have been corrected where necessary to make them agree with the final results.

TABLE No. 34.—Production of bituminous coal by states east of the 100th meridian—Continued.

Name of state.	Value of plant.	Value of real estate.	Total capital employed and classified in establishments. (a)	Tons paying royalty.	Amount paid as royalty.	Acres coal land worked out.	Acres coal land unworked, attached to working collieries.	Acres coal land unspecified.	Grand total of capital, classified and unclassified, invested in regular establishments. (a)	Acres available coal lands attached to working establishments.
	21	22	23	24	25	26	27	28	29	30
Total.....	\$19,453,107	\$62,854,034	\$89,990,101	13,089,804	\$1,964,076	56,101	206,151	204,401	\$93,517,464	410,642
1 Alabama.....	270,893	323,475	705,808	86,494	14,227	155	2,555	2,440	772,858	4,905
2 Arkansas.....								81	15,600	81
3 Georgia.....	311,000	100,000	441,745	15,000	1,875	62	16,028		441,745	16,028
4 Illinois.....	3,153,457	6,100,460	10,410,552	2,763,857	238,258	19,143	25,502	29,549	10,654,261	55,051
5 Indiana.....	773,445	1,146,850	2,268,969	899,356	137,311	2,884	8,000	2,407	2,304,720	10,407
6 Iowa.....	860,072	1,644,915	2,778,937	684,754	160,157	504	3,502	10,626	2,778,937	20,128
7 Kansas.....								1,600	767,994	1,600
8 Kentucky.....	733,252	939,385	1,947,637	213,490	29,017	1,235	30,748	3,887	1,008,537	34,035
9 Maryland.....	853,057	11,887,000	13,142,257	412,341	40,658	3,262	14,249	803	13,105,557	15,112
10 Michigan.....								107	66,800	107
11 Missouri.....								3,715	389,315	3,715
12 Nebraska.....								1	500	1
13 North Carolina.....	100	40,000	40,170					1,200	40,170	1,200
14 Ohio.....	3,258,581	8,529,931	12,965,840	2,630,108	458,468	9,984	32,088	24,651	13,652,484	58,039
15 Pennsylvania.....	7,242,524	27,162,403	37,855,794	5,009,817	728,735	17,730	60,814	57,497	38,799,344	118,311
16 Tennessee.....	415,371	1,222,847	1,708,968	141,818	35,300			23,743	1,708,968	23,743
17 Virginia.....	193,000	169,500	329,000	17,878	2,272			230	349,000	230
18 West Virginia.....	1,447,915	3,507,250	5,402,424	724,951	111,708	1,052	10,765	35,894	5,750,674	46,659

(a) The capital of all the mines in the states canvassed only by the regular census enumerators (*i. e.*, Arkansas, Kansas, Michigan, Missouri, and Nebraska), and of some of the small mines in the states canvassed from my office, was not classified into *value of plant, value of real estate*, etc., but was returned only under the heading *total capital, real and personal, invested*. In column 23 is given for each state the total of the classified capital, and to this is added, in column 29, the "unclassified capital" above referred to. Column 29 gives then the total capital invested in regular establishments. It will be seen that out of a total capital of \$93 million dollars reported, the capital representing nearly 90 million dollars was classified.—R. PUMPHREY.

Column No. 2 gives the number of separate individual "establishments" from which schedules have been received. As a rule, each schedule received represents what is ordinarily called "a mine", but in some cases one schedule necessarily contains all the data of a company which works one or more shafts not connected underground, and keeps no separate record of the product or labor of each of their mine-openings. Such cases—though from the point of view of a mine engineer they might represent two or more mines—we have been obliged to consider as one "industrial establishment". In the anthracite field this question as to what should constitute the industrial unit in the census report cannot arise, since the word "colliery" has a definite signification, *i. e.*, all the mine openings whose product goes to a single breaker building and is there mixed before delivery. No such absolute distinguishing criterion exists in the iron-ore and bituminous-coal industry, but the term "industrial establishment" must be taken to mean an organization, the managers of which keep a record in such a manner that the data required for the census can be obtained for it separately. There are, however, not more than five or six cases where any doubt on this point can arise.

Column 3, headed "Maximum capacity", represents the number of tons which the operators claim could be raised yearly from the present openings with the present facilities, if the market would take it. It is unexpectedly large, and possibly in some cases based on too sanguine estimates of capacity. As will be noticed, the average time run was only nine months of the year, which would indicate that the capacity of the mines was at least one-third more than the product.

Column 4 gives the production of mines supplying the general market, in tons of 2,000 pounds. It also is larger than was anticipated, but there is no reason to suppose it exaggerated. For instance, the production of Pennsylvania is given in the *Mine Inspector's Report* (see *Annual Report of the Secretary of Internal Affairs* for 1879-'80, pages 289, 362, and 410) at 18,837,962 tons. This summation is based largely on estimates, and covers the year ending December 1, 1880, thus embracing a period marked by a more active demand for coal and coke than the census year ending June 1, 1880. Our total is 18,004,988, a difference of 4.4 per cent., which is less than the natural increase between the two periods.

The 6th column is headed "Irregular product". Under this has been gathered the output of all the small operations where coal is mined in small quantities for local consumption. In many cases, in some of the bituminous fields, a farmer digs coal from the outcrop on his own farm and supplies his own, and perhaps one or two neighboring

families. This industry is analogous to the cutting of wood for domestic fuel, and has no bearing on the mining industry of the country. The whole amount so produced is only 916,569 tons, and it might as well be disregarded hereafter. The iron ore mined in a small way eventually reaches the general market, but the coal does not. No labor is hired and no machinery is used, and the work is carried on when there is nothing else to do on the farm. Strictly speaking, no capital is employed. There were over 5,000 of these small operations or "farmers' diggings" reported, and the labor of gathering the statistics from them is entirely disproportioned to the value of the results. They average less than 125 tons yearly.

All the other columns, except the 7th, and the 8th, apply to the regular mines or "establishments" only.

In column 5 the value is taken at the "mine's mouth," or rather at the point where the product is delivered for transportation to market.

Column 9, "Value of materials," covers mine supplies consumed, including powder, fuse, iron, steel, timber, lumber, wire, rope, etc., whether bought by the miners or by the operators.

Column 10 covers wages paid to all classes of labor during the census year, and represents the amount received by the men, less the amount paid by them for material, as powder, fuse, etc., which in many cases are charged to the miners and deducted at the end of the month from their gross wages. The necessity of making this deduction, when not already made on the return, has involved a great deal of extra labor which could not well be avoided, since the average net annual income of the miner available to the support of himself and his family is clearly one of the important items which the census should seek to ascertain with accuracy.

The meaning of the columns relating to capital has been sufficiently explained in the former bulletins on c anthracite coal, iron ore, and copper, and need not be repeated here.

An endeavor was made to ascertain the number of acres of coal lands that were worked out. This has not been altogether successful, as in many cases it was impossible to answer the question with approximate accuracy. In other cases the upper seam only was worked out over a certain area, leaving one or more below untouched. The sum of the three columns of acres is *but a very small fraction of the total available coal land*. The sum in question, 466,743 acres, represents the land attached to working collieries, and averages \$133 an acre. The fields are so extensive that only those lands which have special advantages of position, ease of mining, or quality of product, have any present industrial value as mineral lands.

TABLE No. 35.—General average—bituminous coal.

Name of state.	Average price per ton of product of regular mines, at mine.	Average cost of labor per ton.	Average cost of material per ton.	Average amount left for royalty, profit, etc., per ton.	Per cent. of capital used for working capital.	Per cent. of capital in plant.	Per cent. of capital in real estate.	Average royalty paid per ton, cents.	Average yearly earnings of man, net.	Average per cent. of year worked.	Average per cent. of year idle, except from strikes.	Average per cent. of year lost in strikes.	Tons raised per man per day.	Tons raised yearly per man.	Per cent. ratio of product to maximum capacity.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Total	\$1.29	\$0.70	\$0.72	\$0.34	0.10	21.01	00.28	0.14	\$28.72	75.70	17.02	0.08	1.00	431.43	54.24
1 Alabama.....	1.47	1.02	0.15	0.90	15.80	08.37	45.83	0.10	229.07	01.54	2.78	5.08	0.71	216.15	71.60
2 Arkansas.....	2.27	1.41	0.08	0.78					100.80					118.22	25.73
3 Georgia.....	1.50	0.55	0.06	0.80	0.06	70.40	22.04	0.125	102.71	100.00	0.00	0.00	1.17	349.87	63.67
4 Illinois.....	1.44	0.09	0.13	0.32	11.10	30.27	58.57	0.00	382.25	78.15	17.32	4.53	1.05	385.04	44.10
5 Indiana.....	1.48	0.07	0.11	0.40	15.37	04.00	50.54	0.15	318.85	74.34	21.36	4.30	1.47	328.91	46.60
6 Iowa.....	1.71	1.68	0.17	0.46	0.34	30.07	50.10	0.23	310.45	00.52	24.14	6.34	1.41	203.57	37.01
7 Kansas.....	1.03	0.90	0.06	0.91					215.41					216.63	60.03
8 Kentucky.....	1.20	0.73	0.10	0.37	14.17	37.60	48.23	0.14	201.08	02.00	23.60	4.40	1.84	342.61	38.42
9 Maryland.....	1.16	0.01	0.09	0.46	6.85	6.50	86.04	0.11	400.49	00.03	17.60	12.47	3.10	051.23	49.15
10 Michigan.....	2.23	1.45	0.08	0.70					085.22					205.00	71.09
11 Missouri.....	1.01	1.18	0.10	0.63					250.81					210.88	48.57
12 Nebraska.....	3.75	1.50	0.05	2.20											
13 North Carolina.....	1.14	0.57	0.14	0.43											
14 Ohio.....	1.29	0.86	0.10	0.27	0.08	25.13	05.70	0.17	320.09	77.00	13.55	8.55	1.00	373.03	49.00
15 Pennsylvania.....	1.01	0.60	0.10	0.31	0.14	10.13	71.73	0.14	337.97	75.73	17.28	0.99	2.47	500.14	68.65
16 Tennessee.....	1.27	0.68	0.10	0.40	3.86	24.38	71.76	0.25	332.28	91.15	8.79	0.06	1.78	487.90	66.28
17 Virginia.....	2.29	1.76	0.29	0.24	8.05	40.43	51.52	0.13	287.31	61.06	38.94	0.00	0.89	163.05	38.32
18 West Virginia.....	1.10	0.72	0.14	0.24	6.61	26.80	66.50	0.15	295.87	69.65	23.57	7.38	1.97	405.59	43.33

a Table No. 35 contains the averages drawn from the data in Table No. 34. In estimating the day's work, yearly earnings, etc., two boys were considered the equivalent, in producing and earning capacity, of one man. The year is taken to consist of twelve months of twenty-five working days each. A very considerable amount of time has been lost in strikes—about twenty days each for every man employed. Although it is not our province to discuss the question of strikes, it may not be out of place to call attention to some of the concomitant facts. First, in the bituminous coal industry there has been an *absolute fall* in the value per ton of the product, whereas iron ore and anthracite coal have not fallen in price since the last census more than gold has, or rather after falling they recovered, which bituminous coal did not. Second, in spite of the time lost in strikes, the average yearly earnings of a man engaged in mining bituminous coal are very nearly the same as those of the iron-ore miner, being in the one \$328 72 and in the other \$316 08, for the country at large. Third, that in the bituminous industry the percentage **b** of the value of the product obtained by labor has increased nearly 1 per cent., labor obtaining in 1880 62.3 per cent. of the selling price of the product, against 61.6 per cent. in 1870. In other words, the cost of labor per ton has not fallen in quite so large a ratio as the value per ton, though both have fallen more than gold did in the same interval (see Table No. 36). This very small difference represents a gain in favor of labor of one third of a million of dollars annually, and is the more striking from the fact that wages in the Census of 1880 represent net wages, whereas it is possible that the return in the Census of 1870, which is used as a basis of comparison, may include a part of what was necessarily expended by the men for mine supplies.

TABLE 36.—*Production of bituminous coal during the census year ending May 31, 1880, compared with the one ending May 31, 1870, for mines east of the 100th meridian.*

	Per cent.
c 1. Gain in number of mines.....	122.0
2. Gain in yearly tonnage.....	135.0
3. Gain in value of yearly product.....	44.0
4. Gain in value of material used.....	133.0
5. Gain in amount paid as wages.....	46.0
6. Gain in total number of employes.....	133.0
7. Gain in total capital.....	54.0
8. Decrease in value per ton.....	39.0
9. Gain in tons raised per man per year.....	3.0
10. Decrease in yearly earnings.....	36.0
d 11. Decrease in cost of labor per ton.....	38.0
12. Decrease in cost of material per ton.....	1.0
13. Gain in per cent. of value of the product paid for labor.....	0.7
14. Gain in per cent. of value of the product paid for materials.....	3.9
15. Decrease in per cent. of value of the product left for royalty, interest, profits, etc.....	4.6
16. Gain in number of counties reporting.....	68.0

NOTE.—The above table illustrates the fact that the fall in price per ton of bituminous coal during the last decade has borne less heavily on labor than on capital. Compare 3, 6, 8, 11, and 13.

As between the bituminous coal industry and the iron-ore mining industry, the former takes from the earth a product worth 140 per cent. more, employs 205 per cent. more hands, and 46 per cent. more capital, uses 161 per cent. more materials, and pays 222 per cent. more wages. These figures are based on the returns from regular **e** mines, and would be slightly less if the "irregular product"—more important in the case of coal than in that of iron—were taken into consideration.

The increase in the tonnage of the iron ore mined during the census year is 136 per cent., and in that of bituminous coal 135 per cent., as compared with the census year of 1870, showing that these two great divisions of mineral production keep pace with each other, and are advancing nearly twice as fast as the production of anthracite. The reason of this is the obvious one, that in the former cases new fields are laid under contribution, from time to time, as railways are extended, whereas anthracite is restricted to its original area.

Iron is mined in 135 counties, and bituminous coal in 314 counties east of the 100th meridian.

TABLE No. 37.—*List of counties of the first class east of the 100th meridian, i. e., producing over 500,000 tons per annum.*

	County.	State.	Tons.		County.	State.	Tons.
	Total.....		22,167,009	8	Tioga.....	Pennsylvania.....	638,517
				9	Perry.....	Ohio.....	913,974
1	Allegheny.....	Pennsylvania.....	4,426,871	10	Clay.....	Indiana.....	772,423
2	Westmoreland.....	do.....	3,297,390	11	Trumbull.....	Ohio.....	722,265
3	Fayette.....	do.....	2,318,728	12	La Salle.....	Illinois.....	714,787
4	Alleghany.....	Maryland.....	2,198,073	13	Will.....	do.....	611,311
5	Clearfield.....	Pennsylvania.....	1,722,711	14	Cambria.....	Pennsylvania.....	590,075
6	Washington.....	do.....	968,042	15	Columbiana.....	Ohio.....	515,662
7	Saint Clair.....	Illinois.....	956,265	16	Bradford.....	Pennsylvania.....	500,965

TABLE No. 38.—List of counties of the second class east of the 100th meridian, i. e., producing over 250,000 tons per annum.

County.			State.	Tons.	County.			State.	Tons.
Total				6,677,366	10	Hocking	Ohio	331,170	
1	Mercer	Pennsylvania		485,276	11	Jefferson	do	324,070	
2	Sangamon	Illinois		427,610	12	Athens	do	310,750	
3	Bourbon	Kansas		403,519	13	Blair	Pennsylvania	293,824	
4	Belmont	Ohio		399,747	14	Clarion	do	286,846	
5	Kanawha	West Virginia		368,901	15	Somerset	do	280,470	
6	Wicks	Ohio		350,225	16	Mahaska	Iowa	283,836	
7	Fayette	West Virginia		353,678	17	Elk	Pennsylvania	261,151	
8	Stark	Ohio		347,820	18	Peoria	Illinois	273,540	
9	Fulton	Illinois		331,440	19	Madison	do	272,927	
					20	Tuscarawas	Ohio	255,495	

The sixteen counties of the first class furnish 54.9 per cent., and the twenty counties of the second class 16.6 per cent. of the entire product, leaving 28.5 per cent. to be spread over the remaining two hundred and seventy-eight counties. Allegheny county, Pennsylvania, produces over one-tenth, and the three leading counties of Pennsylvania nearly one-quarter of the entire product.

TABLE No. 39.—Rank of the states east of the 100th meridian producing bituminous coal in the census year ending June 1, 1880.

Name of state.			Product of regular mines, tons of 2,000 pounds.	Percentage of total product.	Name of state.			Product of regular mines, tons of 2,000 pounds.	Percentage of total product.
Total			40,391,758	100.00	9	Kansas	763,597	1.895	
1	Pennsylvania		18,004,988	44.675	10	Missouri	543,990	1.349	
2	Illinois		6,089,514	15.111	11	Tennessee	494,491	1.227	
3	Ohio		5,932,853	14.722	12	Alabama	322,934	0.801	
4	Maryland		2,227,844	5.528	13	Georgia	154,644	0.383	
5	West Virginia		1,782,569	4.423	14	Michigan	100,868	0.250	
6	Indiana		1,449,490	3.597	15	Virginia	40,520	0.100	
7	Iowa		1,442,333	3.579	16	Arkansas	14,778	0.036	
8	Kentucky		935,857	2.323	17	Nebraska	260		
					18	North Carolina	250		

The three leading states, Pennsylvania, Illinois, and Ohio, produce nearly three-fourths, and the eight leading states nearly nineteen-twentieths of the entire product.

TABLE No. 40.—The rank of states east of the 100th meridian, as producers of bituminous coal, according to the census of 1870, was as follows:

	Per cent. gain in 1880.
1. Pennsylvania	131
2. Illinois	132
3. Ohio	135
4. Maryland	22
5. Missouri	13*
6. West Virginia	104
7. Indiana	231
8. Iowa	447
9. Kentucky	521
10. Tennessee	270
11. Virginia	34*
12. Kansas	2217
13. Michigan	258
14. Alabama	2836

* Loss.

The United States, exclusive of the territories, has gained 134.4 per cent. in weight of product. The average price per ton has fallen from \$1 99 to \$1 22 during the past decade, the price for 1870 being, of course, reckoned in paper dollars.

TABLE No. 41.—Production of bituminous coal and lignite west of the 100th meridian.

Name of state and territory.	Number of counties.	Number of establishments.	Maximum capacity of yearly production, tons.	Total product census year, tons.	Value of total product.	Value of materials used, census year.	Wages paid to all classes.	Men employed above ground.	Men employed below ground.	Boys employed above ground.	Boys employed below ground.	Total employes.
	1	2	3	4	5	6	7	8	9	10	11	12
Total	23	51	2,033,241	1,402,484	\$3,306,115	\$102,013	\$1,854,076	633	2,891	.....	8	3,592
California.....	3	6	239,927	286,950	663,013	44,013	221,950	93	650	.....	8	751
Colorado.....	8	25	638,233	462,747	1,041,350	114,576	714,714	361	1,133	.....	.....	1,434
Montana territory.....	1	1	1,344	224	800	.....	400	.....	3	.....	.....	3
Oregon.....	1	2	43,205	43,205	97,810	8,567	68,017	13	63	.....	.....	76
Washington.....	3	5	101,708	145,015	389,046	21,203	143,754	65	103	.....	.....	168
Wyoming territory.....	4	6	617,280	529,595	1,072,451	1,072	579,569	140	860	.....	.....	1,009
Utah.....	3	6	31,544	14,748	33,645	2,582	25,675	12	79	.....	.....	91

Name of state and territory.	Number of miners.	Number of laborers.	Administrative force.	Number of steam engines.	Horse-power of engines.	Value of all machinery.	Value of explosives used census year.	Amount employed as working capital.	Value of plant.	Value of real estate.	Total capital employed and invested.	Acres of coal land.
	13	14	15	16	17	18	19	20	21	22	23	24
Total	2,669	727	136	46	1,405	\$287,150	\$26,702	\$981,445	\$1,274,342	\$6,858,300	\$8,473,573	37,441
California.....	473	255	18	8	295	77,560	2,367	107,921	535,500	596,600	1,239,431	2,969
Colorado.....	1,133	227	74	20	740	100,050	11,673	162,550	328,600	5,448,100	5,939,250	23,592
Montana territory.....	3	.....	.....	.....	.....	.....	.....	250	5,100	7,200	12,550	.....
Oregon.....	52	21	3	1	60	13,000	1,928	6,500	115,023	105,000	226,523	2,649
Washington territory.....	103	44	21	4	115	15,500	10,696	15,700	87,721	232,000	335,421	2,660
Wyoming territory.....	830	159	20	9	228	59,000	36	77,000	179,398	470,000	726,398	1,200
Utah.....	70	21	.....	4	48	21,500	.....	11,514	23,660	.....	.....	4,440

TABLE No. 42.—Production of coal in the United States for the year ending June 30, 1880, by coal-fields (tons of 2,000 pounds).

Bituminous:	
Appalachian field.....	29,842,240
Western field (Illinois, Indiana, etc.).....	8,150,019
Michigan field.....	100,800
Triassic field (Virginia and North Carolina).....	46,246
Iowa and Kansas field.....	3,091,540
All fields west of the 100th meridian.....	1,492,484
Total bituminous.....	42,723,329
Anthracite:	
Pennsylvania.....	28,640,819
Rhode Island.....	6,176
Total anthracite.....	28,646,995
Grand total coal production of the United States for the year ending June 30, 1880 (a).....	71,370,324
Grand total of hands employed in coal mining.....	170,676

a 2,817 tons of coal returned from Virginia as anthracite included in above as bituminous.

The production of coal in England was, in 1855, 64,661,401 tons, and in 1877 it was 136,179,968 tons, and in 1880 it was 146,818,122 tons. The English ton, however, is 2,240 pounds. The number of collieries in 1880 was— in England, 3,880, and in the United States, 3,264.

TABLE No. 43.—187 Ohio coal mines classified on basis of power used.

- Class 1. Mines using no power to supplement manual labor.
 Class 2. Mines using the power of animals only.
 Class 3. Mines using boiler-power not exceeding 100 horse-power.
 Class 4. Mines using boiler-power exceeding 100 horse-power.

Class.	Number of mines in class.	Aggregate maximum yearly capacity, net tons.	Product census year, net tons.	Value of census year's product at mines.	Average yearly product, net tons per mine.	Average value per ton at mine.	Average cost of labor per ton mined.	Average number of days worked by each man.	Average earnings per man, census year.	Average per diem wages earned.	Average product per man per day worked, net tons.	Average horse-power to mine.	Tons mined per horse-power yearly.	Per cent. of value of product paid for labor.	Per cent. of value of product paid for materials.	Per cent. of value of product for profits, including interest, repairs, and royalty.	Average number of hands to mine, all classes of labor, including superintendence.
Total....	187	7,775,040	4,793,201	\$6,062,258	25,145	\$1 30	\$0 88	220.4	\$330 70	\$1 44	1.63	26.4	953	68.45	12.53	18.97	67.1
1.....	12	231,805	90,875	157,218	832	1 57	03	216.4	267 00	1 23	1.33	.....	.....	59.1	7.47	33.43	20.0
2.....	88	3,890,000	2,068,000	2,337,000	23,500	1 13	77	267.5	339 00	1 27	1.04	7.2	3,264	68.42	16.57	15.01	53.6
3.....	78	3,091,000	2,129,421	2,939,025	27,300	1 38	90	223.6	318 00	1 42	1.49	38.2	715	69.94	10.86	19.80	52.2
4.....	9	682,175	404,908	628,415	44,990	1 55	1 03	228.0	388 00	1 70	1.66	146.0	3,082	66.13	10.95	22.92	119.0

TABLE No. 44.—100 Indiana coal mines classified on the basis of the power used.

- Class 1. Mines using no power to supplement manual labor.
 Class 2. Mines using the power of animals only.
 Class 3. Mines using boiler-power not exceeding 100 horse-power.
 Class 4. Mines using boiler-power exceeding 100 horse-power.

Class.	Number of mines in class.	Aggregate maximum yearly capacity, net tons.	Product census year, net tons.	Value of census year's product at mines, in dollars.	Average yearly product, net tons per mine.	Average value per ton at mine.	Average cost of labor per ton mined.	Average number of days worked by each man.	Average earnings per man, census year.	Average per diem wages earned.	Average product per man per day worked, net tons.	Average horse-power to mine.	Tons mined per horse-power yearly.	Per cent. of value of product paid for labor.	Per cent. of value of product paid for materials.	Per cent. of value of product for profits, including interest, repairs, and royalty.	Average number of hands to mine, all classes of labor, including superintendence.
Total.....	100	2,787,710	1,420,324	\$2,120,035	14,263	\$1 49	\$0 97	222	\$337 00	\$1 52	1.56	22.1	565	65	7.8	27.2	40.9
1.....	12	42,808	9,807	13,291	817	1 35	87	162	202 00	1 25	1.44	.....	.....	64	5.0	31.0	3.5
2.....	36	430,682	143,657	214,924	3,991	1 50	84	155	244 00	1 57	1.88	2.4	1,663	56	14.6	29.4	13.7
3.....	48	2,000,000	1,144,243	1,765,166	23,839	1 49	97	230	340 00	1 50	1.55	44.0	592	65	7.0	28.0	67.0
4.....	4	314,870	122,617	186,704	30,634	1 52	1 11	246	404 00	1 64	1.48	153.0	200	73	7.0	20.0	84.0

Tables 43 and 44 illustrate, in a general way, the proposition that large mining establishments which employ power and labor-saving machinery, can pay higher wages and give more steady employment to labor than smaller ones. The mines chosen in the two states were typical ones of their classes. The large amount spent for "materials" by Class 2 is, to a great extent, made up of feed, etc., for the animals used.

As a general rule, too, the mines employing capital most liberally can afford to yield to labor a larger share of the value of the product, since their profits depend upon the volume of their business. They also employ more skilled labor. It is believed that these features run through the entire mining industry.