BULLETIN 9 OF TENNESSEE GEOLOGICAL SURVEY SERIES; PRELIMINARY REPORT OF THE COAL RESOURCES OF THE PIKEVILLE SPECAIL QUADRANGLE OF EASTEN TENNESSEE

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W. C. PHALEN

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Trieste

STATE OF TENNESSEE
STATE GEOLOGICAL SURVEY
GEO. H. ASHLEY,
STATE GEOLOGIST

U. S. DEPT. OF THE INTERIOR
U. S. GEOLOGICAL SURVEY
GEORGE OTIS SMITH,
DIRECTOR

BULLETIN 9
(of Tennessee Geological Survey Series)

Preliminary Report of the Coal Resources of the Pikeville Special Quadrangle of Eastern Tennessee,

By W. C. PHALEN,
Assistant Geologist, U. S. Geological Survey.

WITH AN INTRODUCTION
BY GEO. H. ASHLEY.

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1911

State Geological Commission.

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State Geologist.

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LETTER OF TRANSMITTAL.

UNITED STATES GEOLOGICAL SURVEY.

WASHINGTON, D. C., May 27, 1911.

Dr. Geo. H. Ashley, State Geologist,
Nashville, Tenn.

DEAR SIR: Herewith I transmit to you the manuscript and drawings for a "Preliminary Report on the Coal Resources of the Pikeville Special Quadrangle in Eastern Tennessee," by W. C. Phalen, Assistant Geologist.

This report is based upon the examination made during the last field season in the Pikeville Special Quadrangle, and is transmitted for publication by the Geological Survey of Tennessee, in accordance with the terms of the co-operative agreement.

Very respectfully,

(Signed) GEORGE OTIS SMITH,
Director.

Introductory Statement

ON

THE RELATION OF THE PIKEVILLE SPECIAL QUADRANGLE TO THE COAL FIELD OF TENNESSEE AS A WHOLE.*

BY GEORGE H. ASHLEY.

In view of the fact that Mr. Phalen's paper does not describe the relations of the Pikeville Special quadrangle to the coal field of Tennessee as a whole, and in view of the fact that the present Survey has not published any description of the coal field in the State as a whole, it seems wise to preface Mr. Phalen's paper with a brief description of the coals of the State, and a map showing the position of the special area studied by him.

The coal field of Tennessee is a part of the great Appalachian field, extending from northern Pennsylvania to central Alabama. In the northern part of the State are found the same beds as in Kentucky, and in the southern part the same beds as in Alabama and Georgia. The coals have the same general character as those of eastern Kentucky, western West Virginia and Pennsylvania, though not the qualities of Pocahontas coal of Virginia and West Virginia, nor of the Clearfield coal of Pennsylvania.

The coal field of Tennessee is coincident with the Cumberland Plateau, lying in a northeast and southwest direction across the State, a little east of the center. The field has an average width of from 35 to 50 miles. It covers practically all of Morgan, Scott, Cumberland, Sequatchie, Bledsoe and Marion counties; the western part of Claiborne, Campbell, Anderson, Roane, Rhea and Hamilton counties; nearly all of Fentress, Van Buren and Grundy counties, and a part of the eastern side of Pickett, Overton, Putnam, White, Warren, Coffee and Franklin counties.

The Cumberland Plateau, which contains the coal field of Tennessee, is a broad upland, standing about 2,000 feet above the sea level. While many of the streams flowing out to the east and west or to the south have cut ravines into this upland, still, as a rule, the ravines occupy but a narrow part of the area in contrast with the broad upland, which, in many places is nearly flat, and in many others only slightly rolling. As a result of this condition, the coals have been rendered accessible at a large number of points, at the same time, they have been broadly protected, so that in many cases almost as large an area of beds remain as though they were entirely below drainage. In the northeastern part of the coal field are

*This introductory paper is published as part of Bulletin 9, of the regular series, and as a separate paper in Vol. 1, No. 5, of the monthly magazine, "The Resources of Tennessee."

many hills and mountains that rise from several hundred to a thousand feet or more above the general level of the plateau. These hills retain the higher coals that have been entirely removed from the rest of the field. They are remnants of the lands which were reduced to the general level at the time that the level of the plateau was established. But while containing these higher coals, as a rule, these higher mountains are often narrow topped, divides or ridges, so that the areas of coal they contain are relatively not as broad as of those under the plateau proper. Fortunately massive sandstones at various elevations tend to make the mountains broad shouldered, as it were, protecting larger areas of the high coals than in the corresponding mountains farther northeast where the sandstones of that part of the section are less massive and resistant and the mountain divides are much narrower. As a rule, the level surface of the plateau has been maintained through the existence at these elevations of massive beds of sandstone, Lest it be thought that the sandstone has alone been responsible for the general flatness of the plateau, it may be noted that the plateau level bevels a number of massive sandstones, as well as the intermediate beds of less resistant shales and shaly sandstones. This is well seen in Walden Ridge, where the sandstone that protects the eastern edge of the plateau is stratigraphically 500 to 700 feet higher than the sandstone, which protects the western edge overlooking the Sequatchie Valley. At the eastern edge of the plateau there is a fairly even escarpment with a precipitous drop of about 1,000 feet. At the western edge, overlooking the basin of Middle Tennessee, there is a nearly similar drop, but the edge of the escarpment is not regular, but almost dentritic in shape, extending out in numerous headlands, that inclose deep coves, and in a few cases the ends of these headlands have been cut off and stand out as isolated outlyers.

The Age of the Coal-Bearing Rocks.

All of the coal-bearing rocks of the Appalachian field are of Carboniferous age. The Carboniferous in turn is subdivided into Pennsylvanian or upper Carboniferous and Mississippian or Lower Carboniferous. The upper beds of the Lower Carboniferous are slightly coal-bearing in Virginia, and to a less extent in Tennessee. The main coal-bearing rocks of the Appalachian field are all of the Pennsylvanian age. Again, the Pennsylvanian may be divided into Pottsville or lower Pennsylvanian, and post-Pottsville or upper Pennsylvanian. In Pennsylvania, the latter includes the Allegheny, Conemaugh and Monongahela, the first containing the Freeport and Kittanning coals and the latter the famous Pittsburg coal. No rocks of this age have yet been found in Ten-

nessee, though it is more than probable that rocks of at least the lower part of the upper Pennsylvania existed in this State, though long since carried away by erosion, unless the rocks at the extreme top of a few of the mountains are of that age. The coal measures of Tennessee then contained only the lower Pennsylvanian or Pottsville. The Pottsville has a thickness of 1,200 feet in the Anthracite field of Pennsylvania. In western Pennsylvania land conditions existed most of Pottsville time, and no deposits or coals were laid down until near the end of Pottsville time. Then the Sharon, Quakertown and Mercer coals, none of which are of any great importance in Pennsylvania, were laid down. Coming south and east from the southwest corner of Pennsylvania the Pottsville thickens until it is over 6,000 feet thick in the Coosa field of Alabama.

Stratigraphy.

The coal-bearing rocks of Tennessee consist of a series of sandstones, shales, coal beds and clay beds. The coal is known to have been deposited at over fifty horizons, in beds ranging from a few inches to 8 or 9 feet in thickness, or locally to 20 to 30 feet, or in one case, possibly due to squeezing, over 100 feet thick. As practically all of the coal beds are underlain by clay, at least locally, quite as many clay beds are found. The shales occur in beds often several score of feet thick. They are usually quite sandy and in places grade over into sandstones. The sandstones are the rocks commonly seen. While many of them are soft, and weather rapidly, many of the beds are hard and resistant and project out of the hill slopes as massive ledges or cliffs. Such sandstones are often 100 feet or more thick, and a few of them make prominent cliffs that can be traced long distances. These cliff-making sandstones serve as key-rocks, and the position of any coal bed is described as so many feet above or below the top or bottom of a certain sandstone.

Considering the rocks as a whole, these cliff-making, massive sandstones predominate in the lower third of the series. They occur in the upper two thirds, but are usually not so hard nor so close together. They are largely responsible for the flat top of the plateau in the western and southern parts of the coal field. In the northern part of the coal field this lower third of the series has been called the Lee conglomerate or the Lee formation. As only a small part of the rocks are actually conglomeratic, and as there are also coals, clays, shales and non-conglomeratic sandstones, the latter term may be considered the better. To the south the same group of rocks have been known as the Lookout sandstone, from Lookout Mountain, and the Walden sandstone, from Walden Ridge, the latter overlying the former. It was formerly thought that the Lookout sand-