

thickness is 3251 feet, and that of the 27 coal-beds, 154 feet, a ratio of 1:21. Of the 27 coal-beds, numbers 19 and 20 (counting from below), together 23 feet thick, but separated by 15 feet of shales—in all 47 feet—correspond in position to the “Mammoth” bed. The facts relating to the Anthracite region are given in detail, with magnificent maps in folio, by Ashburner, in his Report of the Pennsylvania Geological Survey.

The Coal-measures of western Pennsylvania continue to decrease in thickness as they spread northward.

Beyond Ohio, in Illinois and Indiana, a region wholly independent in its coal areas, as shown by the Ohio and Pennsylvania geologists, the Coal-measures are less than 1200 feet in thickness; and a considerable portion of the intervening beds consists of limestone.

The accompanying rocks may be of marine origin, brackish water or fresh; and limestones with their many fossils are usually marks of marine origin.

The coal-beds are not all coal. They have commonly layers of shale or shaly coal at intervals; and sometimes so many that the bed is worthless. A bed may change in the course of a few miles to a dirt-bed, or the carbonaceous material may wholly fail.

The Pittsburg, at Pittsburg, Pa., is 10 feet thick; but it is made up of one foot, at bottom, of coal with pyritiferous shale; 5 to 6 feet of good coal; and, above this, shale and coal, left as the roof for working, though sometimes including one or two feet of pure coal. It borders the Monongahela for a long distance, the black horizontal band being a conspicuous object in the high shores, and in some places contains seven or eight feet of good coal. It extends into West Virginia and Ohio, over an area at least 225 miles by 100. It varies in thickness, being 12 to 16 feet in the Cumberland basin; 6 feet at Wheeling; 5 to 8 feet in Morgan, Athens, and Meigs counties, Ohio; 5 to 6 feet at Pomeroy, where it is the “Pomeroy” bed; $6\frac{1}{2}$ to $9\frac{1}{2}$ feet in West Virginia, at Morgantown. But, according to I. C. White (1891), it fails nearly or wholly to the southwest of Pennsylvania, over part of West Virginia and Ohio, along a belt north-and-south in course, and 30 to 50 miles wide.

Layers of *clay-ironstone* are often in the series, as the sections show, making parts of beds of limestone, shale, or coal, or intervening between them; and a bed of *fire clay* generally underlies a coal-bed.

The coal chiefly of vegetable origin.—The clay-bed beneath the coal, often called the *underclay*, generally contains fossil plants, and especially the roots or under-water stems of *Lepidodendrids* and *Sigillarids*, called *Stigmaria*; it is often the old dirt-bed, or the bed of earth over which the plants grew that commenced to form the coal-bed. It was either this, or the clayey bottom of the plant-bearing marshes or lakes. In some cases, trunks of trees rise from it, penetrating the coal layer and rock above it. The Nova Scotia coal region abounds in erect trunks, standing on the old “dirt-beds,” as illustrated in Fig. 1028.

The rock capping a coal-bed may be of any kind, for the rocks are the