

through Ohio, Kentucky, Indiana, and beyond; but is mostly a sandstone, where present, in the Mississippi basin. But even there, beach-like features are often observed. Like the coal-beds of the Coal-measures the formation was only approximately at a common level.

In part of western Pennsylvania the Pottsville conglomerate contains one or more *coal-beds*. Just above the Sharon conglomerate, the base of the Pottsville series in Mercer County, Pa., one coal-bed is two to four feet thick, and has long been worked. The same bed is mined also in Ohio. A bed of similar character occurs in the conglomerate of Kentucky, Tennessee, and Alabama, and that of Alabama affords excellent coal. These coal-beds, with their alternating beds of shale, prove that slow and varying changes of level were in progress, but that for prolonged intervals portions of the surface lay quiet until deep accumulations of vegetable debris had been made in the marshes. The fact of a general parallelism in the movements over Europe and America favors the view that the changes in level and in deposits were a consequence, in a general way, of oscillations in the sea level, that is, in the crust of the sea bottom; but at the same time there were other variations in level which were dependent on local conditions and movements over the continents.

THE COAL-MEASURES.

The Coal-measures in Pennsylvania are divided into (1) the LOWER PRODUCTIVE MEASURES, (2) the LOWER BARREN MEASURES, (3) the UPPER PRODUCTIVE MEASURES. Above the last there are the Upper Barren Measures, corresponding to the Permian.

Over the great Appalachian-Arkansas area, the three great Carboniferous or Coal-measure regions are, as shown on the map, page 412, (1) the *Appalachian*, extending from northern Pennsylvania to Alabama, and having the Anthracite region as a detached portion in eastern Pennsylvania; (2) the *Illinois-Indiana*, east of the Mississippi, extending south into Kentucky; and (3) the *Iowa-Texas*, west of the Mississippi.

The Appalachian area spreads west into Ohio, eastern Kentucky, eastern Tennessee, and northern Alabama. In Tennessee, the Cumberland *Tableland* has the Coal-measures for the top, and a substructure of Subcarboniferous rocks, 1000 feet or more thick, for the rest of its height. In Alabama, the western portion, constituting the large Warrior coal-fields, is a continuation of the Cumberland Measures, with an extension far westward nearly to the Mississippi line — Mississippi having only a small patch of Subcarboniferous beds.

It is probable that the Coal-measures of Tennessee, and those of Alabama, originally spread across what is now the Mississippi valley and joined the area of southern Missouri.

The Carboniferous areas are generally much broken, especially so in Pennsylvania and along the Appalachians to the southwest of this state. The following map, by Lesley, illustrates in a general way the condition in Pennsylvania. The Anthracite coal is in narrow isolated strips to the east-