

dation, must have measured 900 miles in length, and in some places more than 200 miles in breadth. By again referring to the section (fig. 505, p. 390), it will be seen that the strata of coal are horizontal to the westward of the mountains in the region D E, and become more and more inclined and folded as we proceed eastward. Now it is invariably found, as Professor H. D. Rogers has shown by chemical analysis, that the coal is most bituminous towards its western limit, where it remains level and unbroken, and that it becomes progressively debituminized as we travel southeastward towards the more bent and distorted rocks. Thus, on the Ohio, the proportion of hydrogen, oxygen, and other volatile matters, ranges from forty to fifty per cent. Eastward of this line, on the Monongahela, it still approaches forty per cent., where the strata begin to experience some gentle flexures. On entering the Alleghany Mountains, where the distinct anticlinal axes begin to show themselves, but before the dislocations are considerable, the volatile matter is generally in the proportion of eighteen or twenty per cent. At length, when we arrive at some insulated coal-fields (5', fig. 505) associated with the boldest flexures of the Appalachian chain, where the strata have been actually turned over, as near Pottsville, we find the coal to contain only from six to twelve per cent. of bitumen, thus becoming a genuine anthracite.*

It appears from the researches of Liebig and other eminent chemists, that when wood and vegetable matter are buried in the earth, exposed to moisture, and partially or entirely excluded from the air, they decompose slowly and evolve carbonic acid gas, thus parting with a portion of their original oxygen. By this means, they become gradually converted into lignite or wood-coal, which contains a larger proportion of hydrogen than wood does. A continuance of decomposition changes this lignite into common or bituminous coal, chiefly by the discharge of carburetted hydrogen, or the gas by which we illuminate our streets and houses. According to Bischoff, the inflammable gases which are always escaping from mineral coal, and are so often the cause of fatal accidents in mines, always contain carbonic acid, carburetted hydrogen, nitrogen, and olifiant gas. The disengagement of all these gradually transforms ordinary or bituminous coal into anthracite, to which the various names of splint-coal, glance-coal, hard coal, culm, and many others, have been given.

We have seen that, in the Appalachian coal-field, there is an intimate connection between the extent to which the coal has parted with its gaseous contents, and the amount of disturbance which the strata have undergone. The coincidence of these phenomena may be attributed partly to the greater facility afforded for the escape of volatile matter, where the fracturing of the rocks had produced an infinite number of cracks and crevices, and also to the heat of the gases and water penetrating these cracks, when the great movements took place, which have rent and folded the Appalachian strata. It is well known that, at the

* Trans. of Assoc. of Amer. Geol. p. 470.