

by coal seams, are products of the alteration which would appear to be accelerated by terrestrial movements, such as those that compress and plicate rocks. During the process these gases escape, and the proportion of carbon progressively increases in the residue, till it reaches the most highly mineralized anthracite (p. 253), or may even pass into nearly pure carbon or graphite. In the coal-basins of Mons and Valenciennes, the same seams which are in the state of bituminous coal (*gras*) at the surface, gradually lose their volatile constituents as they are traced downward till they pass into anthracite. In the Pennsylvanian coal-field the coals become more anthracitic as they are followed into the eastern region, where the rocks have undergone great plication, and where, possibly during the subterranean movements, they were exposed to an elevation of temperature.⁶³ Daubr e has produced from wood, exposed to the action of superheated water, drop-like globules of anthracite which had evidently been melted in the transformation, and which presented a close resemblance to the anthracite of some mineral veins.⁶⁴

Production of new minerals.—Where metamorphism is well developed the chemical reactions which have been set up have given rise to more or less complete re-combination of the chemical constituents of the rock. New minerals have thus been formed either entirely out of the materials already comprising the rock, or with some addition or replacement of substance introduced from without, by aqueous solution or otherwise. Some of the commonest secondary minerals are micas; andalusite, chiastolite, and

⁶³ Daubr e, "Geologie Experimentale," p. 463. Part of the framework below a steam-hammer has been found after twenty years to be converted into lignite. F. Seeland, Verh. Geol. Reichs. 1883, p. 192.

⁶⁴ Op. cit. p. 177.