

repeated. The coal-beds are principally distinguished by the proportion of bitumen which they yield: three species may be ascertained. The first yielding about forty per cent. of bitumen, is known by the names of *slaty coal*, *binding or caking coal*, *crozzling coal*, *cherry coal*, &c. In ignition it swells, agglutinates, and emits much smoke, which inflames at a sufficient temperature: the second variety yields about 20 per cent. of bitumen, and has been termed *cannel coal and caking coal*; it inflames readily, but does not agglutinate: the third variety contains little or no bitumen; it has been called *culm*, *coarse coal*, *stone coal*, *Kilkenny coal*, &c.; in ignition it exhibits little or no flame, and does not agglutinate; this last variety forms the anthracite of mineralogists, when these characters are carried to their furthest point. It must be understood however, that much confusion has prevailed in the application of the above names; particularly in those of *slaty* and of *stone coal*.

The variable proportions of bitumen in all these species of coal were considered by Mr. Kirwan as united with charcoal, which constitutes the predominating ingredient; the residuum, besides these two substances, consisting only of between two or three per cent. of earthy ashes. Mr. Kirwan supposes that the bitumen exists in different states in these varieties, and when in the state of Asphaltum, communicates to some of them the property of caking. These coals are often much mixed with clay, and pass into bituminous shale.

The above are the views of the chemical composition of coal exhibited by the analyses of Kirwan.

Dr. Mac Culloch, however, has been led by subsequent experiments (see G. T. vol. 2.) to consider coal rather as itself forming a series of links connected with the bitumens, varying by the diminishing proportions which the hydrogen bears to the carbon in their composition; than as a mixture of bitumen and charcoal, as distinct principles. We cannot better explain his opinions than by subjoining the condensed statement of them which he has lately published in his *Classification of Rocks*.

All the bitumens, from naphtha to asphaltum, consist of compounds, apparently indefinite, of carbon and hydrogen principally; the small quantities of oxygen and azote which they contain, appearing to have little or no effect in modifying their mineral characters. In the most fluid, the hydrogen predominates, diminishing progressively according to the order of their relative tenacity or solidity. Where asphaltum ends this series, *cannel coal*, with some interruption in composition, and a considerable one in texture, commences that of the coals. From this variety, down to the most perfect anthracite, there is a