

similarly indefinite range of composition; the hydrogen gradually diminishing as the coal becomes less inflammable, as it is less capable of being separated into bitumen and charcoal by distillation, and as it yields a smaller comparative proportion of the former. Thus the composition of the bitumens illustrates that of the several varieties of coal. The most perfect anthracite appears to yield no bitumen, yet it still contains hydrogen, perhaps in every case; as that element is present even in common charcoal, which is itself a compound substance. Where anthracite passes to plumbago, which may in fact be considered as the true end of this series, the hydrogen seems to have disappeared; and, if this substance be not mere carbon, as it probably is not, from the apparent combustion which it undergoes on exposure to air, when its base has been extricated from iron under water, it undoubtedly approaches nearer to that element than any of the preceding substances.

The paper of Dr. MacCulloch above referred to (G. T. vol. 2), contains some observations on the experiments which have been made with a view to illustrate the origin of coal, and its formation from vegetable matter, modified by the action of fire or water, or both, which are highly valuable, and strongly marked by the masterly precision which characterises all his researches.

1. He shews that the substances produced from wood by the action of fire, by Sir James Hall and others, and supposed to be true bitumens and coal, were forms of a peculiar compound, resembling indeed the bitumens in colour and inflammability, but essentially different in many of its properties, being insoluble in naphtha, &c.; containing oxygen and azote in proportions different from those in which the same substances exist in the bitumens, and in particular a considerable quantity of the former. He proposes that this peculiar substance should be distinguished by the name of *distre*, which is already applied to it in the arts; hence these experiments afford no countenance to the idea that fire has been employed to convert vegetable matters into bitumen.

2. By a series of experiments on peat and various lignites, the gradual progress of bituminization in these was ascertained; and it was found that in jet, the extreme term of the lignite series, no chemical difference from coal existed, excepting that a greater quantity of acid was given over in the process of its distillation. The general result of these experiments is thus stated.

‘ Examining therefore the alteration produced by water on common turf or submerged wood, we have all the evidence of demonstration, that its action is sufficient to convert them into substances capable of yielding bitumen on distillation.