

contains, we find that the coal-deposits can only be about seven-hundredths of the volume of the original wood and other vegetable materials from which they are formed. If we take into account, besides, the numerous voids necessarily arising from the loose packing of the materials forming the supposed raft, as compared with the compactness of coal, this may fairly be reduced to five-hundredths. A bed of coal, for instance, sixteen feet thick, would have required a raft 310 feet high for its formation. These accumulations of wood could never have arranged themselves with sufficient regularity to form those well-stratified coal-beds, maintaining a uniform thickness over many miles, and that are seen in most coal-fields to lie one above another in succession, separated by beds of sandstone or shale. And even admitting the possibility of a slow and gradual accumulation of vegetable debris, like that which reaches the mouth of a river, would not the plants in that case be buried in great quantities of mud and earth? Now, in most of our coal-beds the proportion of earthy matter does not exceed fifteen per cent. of the entire mass. If we bear in mind, finally, the remarkable parallelism existing in the stratification of the coal-formation, and the state of preservation in which the impressions of the most delicate vegetable forms are discovered, it will, we think, be proved to demonstration, that those coal-seams have been formed in perfect tranquillity. We are, then, forced to the conclusion that coal results from the mineralisation of plants which has taken place on the spot; that is to say, in the very place where the plants lived and died.

It was suggested long ago by Bakewell, from the occurrence of the same peculiar kind of fireclay under each bed of coal, that it was the soil proper for the production of those plants from which coal has been formed.*

It has, also, been pointed out by Sir William Logan, as the result of his observations in the South Wales coal-field, and afterwards by Sir Henry De la Beche, and subsequently confirmed by the observations of Sir Charles Lyell in America, that not only in this country, but in the coal-fields of Nova Scotia, the United States, &c., every layer of true coal is co-extensive with and invariably underlaid by a marked stratum of arenaceous clay of greater or less thickness, which, from its position relatively to the coal has been long known to coal-miners, among other terms, by the name of *under-clay*.

The clay-beds, "which vary in thickness from a few inches to more than ten feet, are penetrated in all directions by a confused and