

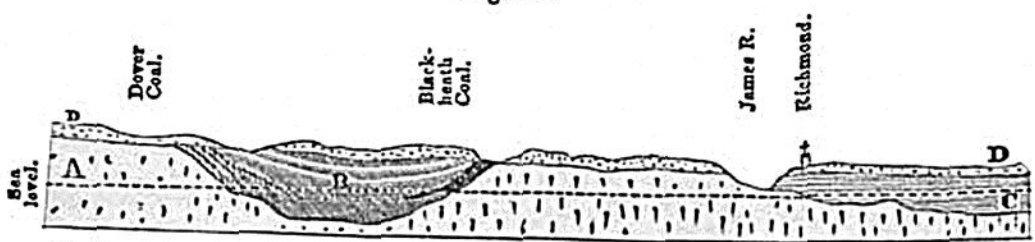
sea has grown shallower, or when the land, increasing in extent, whether by upheaval or by sediment filling up parts of the sea, has approached nearer to the spots first occupied by fine mud.

In order to account for another great formation, like the Oxford clay, again covering one of coral limestone, we must suppose a sinking down like that which is now taking place in some existing regions of coral between Australia and South America. The occurrence of subsidences, on so vast a scale, may have caused the bed of the ocean and the adjoining land, throughout great parts of the European area, to assume a shape favorable to the deposition of another set of clayey strata; and this change may have been succeeded by a series of events analogous to that already explained, and these again by a third series in similar order. Both the ascending and descending movements may have been extremely slow, like those now going on in the Pacific; and the growth of every stratum of coral, a few feet of thickness, may have required centuries for its completion, during which certain species of organic beings disappeared from the earth, and others were introduced in their place; so that, in each set of strata, from the Lias to the Upper Oolite, some peculiar and characteristic fossils were imbedded.

### *Oolite and Lias of the United States.*

There are large tracts on the globe, as in Russia and the United States, where all the members of the oolitic series are unrepresented. In the state of Virginia, however, at the distance of about 13 miles eastward of Richmond, the capital of that state, there is a regular coal-field occurring in a depression of the granite rocks (see section, fig. 421), which

Fig. 421.



Section showing the geological position of the James River, or East Virginian Coal-field.

A. Granite, gneiss, &c.  
C. Tertiary strata.

B. Coal-measures.  
D. Drift or ancient alluvium.

Professor W. B. Rogers first correctly referred to the age of the lower part of the Jurassic group. This opinion I was enabled to confirm after collecting a large number of fossil plants, fish, and shells, and examining the coal-field throughout its whole area. It extends 26 miles from north to south, and from 4 to 12, from east to west. The plants consist chiefly of zamites, calamites, and equisetums, and these last are very commonly met with in a vertical position more or less compressed perpendicularly. It is clear that they grew in the places where they are now buried in strata of hardened sand and mud. I found them maintaining their erect attitude, at points many miles distant from others, in beds both above