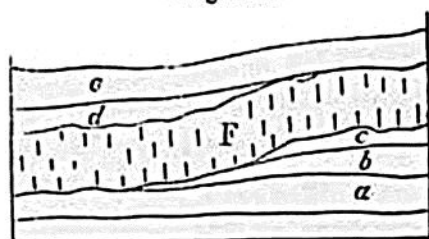


if newly thrown down, they thin out in certain places, thus allowing the lava to cross their edges. Besides, the heavy igneous fluid will often, as it moves along, cut a channel into beds of soft mud and sand. Suppose the submarine lava *F*, fig. 658, to have come in contact in this manner with the strata *a*, *b*, *c*, and that after its consolidation, the strata *d*, *e*, are thrown down in a nearly horizontal position, yet so as to lie unconformably to *F*, the appearance of subsequent intrusion will here be complete, although the trap is in fact contemporaneous. We must not, therefore, hastily infer that the rock *F* is intrusive, unless we find the strata *d*, *e*, or *c* to have been altered at their junction, as if by heat.

Fig. 658.



When trap dikes were described in the preceding chapter, they were shown to be more modern than all the strata which they traverse. A basaltic dike at Quarrington Hill, near Durham, passes through coal-measures, the strata of which are inclined, and shifted so that those on the north side of the dike are 24 feet above the level of the correspond-

Fig. 659.

Magnesian limestone.



Section at Quarrington Hill, east of Durham. (Sedgwick.)

a. Magnesian Limestone (Permian).

b. Lower New Red Sandstone.

c. Coal strata.

ing beds on the south side (see section, fig. 659). But the horizontal beds of overlying Red Sandstone and Magnesian Limestone are not cut through by the dike. Now here the coal-measures were not only deposited, but had subsequently been disturbed, fissured, and shifted, before the fluid trap now forming the dike was introduced into a rent. It is also clear that some of the upper edges of the coal strata, together with the upper part of the dike, had been subsequently removed by denudation before the lower New Red Sandstone and Magnesian Limestone were superimposed. Even in this case, however, although the date of the volcanic eruption is brought within narrow limits, it cannot be defined with precision; it may have happened either at the close of the Carboniferous period, or early in that of the Lower New Red Sandstone, or between these two periods, when the state of the animate creation and the physical geography of Europe were gradually changing from the type of the Carboniferous era to that of the Permian.