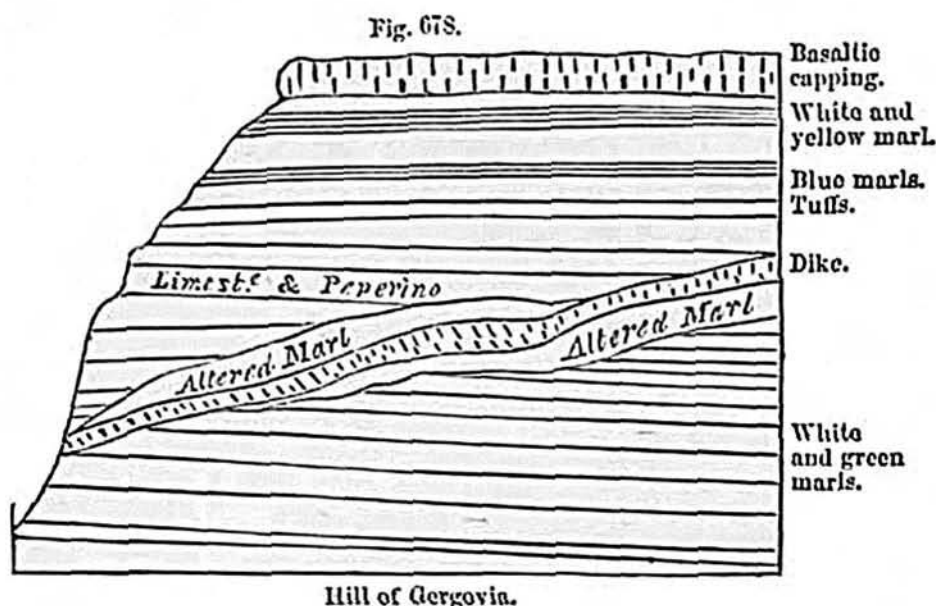


alternation here of a contemporaneous sheet of lava with freshwater strata in the manner supposed by some other observers;\* but the position and contents of some of the associated tuffs, prove them to have been derived from volcanic eruptions which occurred during the deposition of the lacustrine strata.

The bottom of the hill consists of slightly inclined beds of white and greenish marls, more than 300 feet in thickness, intersected by a dike of basalt, which may be studied in the ravine above the village of Mergogne. The dike here cuts through the marly strata at a considerable angle, producing, in general, great alteration and confusion in them for some distance from the point of contact. Above the white and green



marls, a series of beds of limestone and marl, containing fresh-water shells, are seen to alternate with volcanic tuff. In the lowest part of this division, beds of pure marl alternate with compact fissile tuff, resembling some of the subaqueous tuffs of Italy and Sicily called *peperinos*. Occasionally fragments of scoriæ are visible in this rock. Still higher is seen another group of some thickness, consisting exclusively of tuff, upon which lie other marly strata intermixed with volcanic matter. Among the species of fossil shells which I found in these strata were *Melania inquinata*, a *Unio*, and a *Melanopsis*, but they were not sufficient to enable me to determine with precision the age of the formation.

There are many points in Auvergne where igneous rocks have been forced by subsequent injection through clays and marly limestones, in such a manner that the whole has become blended in one confused and brecciated mass, between which and the basalt there is sometimes no very distinct line of demarcation. In the cavities of such mixed rocks we often find chalcedony, and crystals of mesotype, stilbite, and arragonite. To formations of this class may belong some of the breccias immediately adjoining the dike in the hill of Gergovia; but it cannot be contended that the volcanic sand and scoriæ interstratified with the marls

• See Scrope's Central France, p. 7.