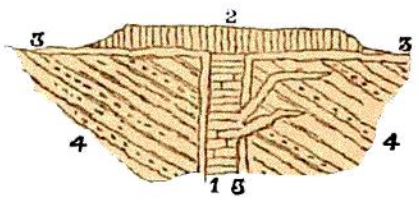
to be igneous by their crystalline, slaggy, scoriaceous, vesicular, or columnar structures, and also by the effects they have produced on the strata with which they are associated. Shales, sandstones, &c., are often hardened, bleached, and even vitrified at the points of junction with greenstone, basaltic, and felspathic dykes, or old lava beds (fig. 9), and the same kind of alteration takes place on a greater scale when large masses of igneous rocks have been intruded among the strata.

FIG. 9.



1. Dyke with veins.
2. Overflow of basaltic lava.
3. Altered strata at junction.
4. Unaltered sandstone and shale.

Then by comparing volcanic rocks of old date with those of modern origin, we are able to decide with perfect truth, that rocks which were melted long before the human race appeared upon the world are yet of truly igneous origin.

Changes of a more general character are especially marked in cases where granite, syenite, felspar and other porphyries and their allies, are associated with stratified deposits. Their igneous affinities are known by their crystalline structure, their modes of occurrence, and the effects they produce on the strata. Granite is composed of crystals of quartz, felspar, and mica; and syenite, according to old nomenclatures, of quartz, felspar, and hornblende. They often send veins or dykes into stratified rocks with which they are in contact, as in figs. 10 and 11, and frequently all along the line of junction, and often at great distances from it, alterations of the strata of an extreme character (metamorphism) are common. One marked distinction between granitic and volcanic and ordinary trap rocks is, that though injected veins of granite are common, granitic