

to be independent of the structure of the visible part of the crust through which they rise.

The materials filling up ancient volcanic orifices may be (a) some form of lava, as granophyre, felsite, gabbro, diabase, porphyrite, basalt; or (b) the fragmentary materials which fell back into the throat of the volcano and finally solidified there. In many instances, both kinds of rock occur in the same neck, the main mass consisting of agglomerate or tuff with a central pipe or numerous veins of lava. Among the Palæozoic volcanic districts of Britain, necks not infrequently are filled with some siliceous crystalline rock, such as a quartz-porphry or felsite, even where the surrounding lavas are basic. The great vent of the Braid Hills near Edinburgh, belonging to the time of the Lower Old Red Sandstone, is filled with felsite-tuff containing 70 per cent of silica, while the lavas which flowed from it are porphyrites and diabases with not more than 50 per cent of this acid. Again, at Largo in Fife, strings of quartz-felsite occur in one of the necks, though all the surrounding lavas are basalts.³⁵

In some necks composed of eruptive rock, the material appears arranged in successive spherical shells, which may be supposed to be due to the protrusion of successive portions of the pasty or viscous mass one within the other, the outer layers thinning away over the crown of the dome as they were attenuated by the ascent of fresh material from below.³⁶ Or we may suppose that the top of the plug some-

³⁵ Necks of agglomerate and fine tuff abound among the Carboniferous and Permian volcanic regions of Scotland, and are laid bare in so many admirable sections, that these regions may be regarded as typical for this kind of geological structure.

³⁶ Scrope, "Geology and Extinct Volcanoes of Central France," 2d edition, p. 68. See E. Reyer, *Jahrb. Geol. Reichsanst.* xxix. 1879, p. 463; and ante, p. 421; A. G., *Trans. Roy. Soc. Edin.* xxxv. 1888, p. 161.