

It is not necessary, and it does not always happen, that any actual solid or liquid volcanic rock is erupted by explosions that shatter the rocks through which the funnel passes. Thus, among the cones of the extinct volcanic tract of the Eifel, some occur which consist entirely, or nearly so, of comminuted *débris* of the surrounding Devonian graywacke and slate through which the various volcanic vents have been opened (see pp. 341, 417, 970). Evidently, in such cases, only elastic vapors forced their way to the surface; and we see what probably often takes place in the early stages of a volcano's history, though the fragments of the underlying disrupted rocks are in most instances buried and lost under the far more abundant subsequent volcanic materials. Sections of small ancient volcanic "necks" or pipes sometimes afford an excellent opportunity of observing that these orifices were originally opened by the blowing out of the solid crust and not by the formation of fissures. Examples will be cited in later pages from Scottish volcanic areas of Old Red Sandstone, Carboniferous, and Permian age. The orifices are there filled with fragmentary materials, wherein portions of the surrounding and underlying rocks form a noticeable proportion.<sup>54</sup> (See Figs. 296-301.)

**Showers of Dust and Stones.**—A communication having been opened, either by fissuring or explosion, between the heated interior and the surface, fragmentary materials are commonly ejected from it, consisting at first mainly of the rocks through which the orifice has been opened, afterward of volcanic substances. In a great eruption, vast numbers of red-hot stones are shot up into the air, and fall back partly into the crater and partly on the outer slopes of the

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<sup>54</sup> Trans. Roy. Soc. Edin. xxix. p. 458; Quart. Journ. Geol. Soc. (1892), President's Address. pp. 86, 118, 135, 143, 153.