

ain, the Cambrian, Silurian, Devonian, Carboniferous, and Permian volcanoes successively appeared, and their lavas and tuffs were carried down and buried under thousands of feet of sedimentary deposits.⁸⁹

Torrents of Water and Mud.—We have seen that large quantities of water accompany many volcanic eruptions. In some cases, where ancient crater-lakes or internal reservoirs, shaken by repeated detonations, have been finally disrupted, the mud which has thereby been liberated has issued from the mountain. Such “mud-lava” (*lava d’acqua*), on account of its liquidity and swiftness of motion, is more dreaded for destructiveness than even the true melted lavas. On the other hand, rain or melted snow or ice, rushing down the cone and taking up loose volcanic dust, is converted into a kind of mud that grows more and more pasty as it descends. The mere sudden rush of such large bodies of water down the steep declivity of a volcanic cone cannot fail to effect much geological change. Deep trenches are cut out of the loose volcanic slopes, and sometimes large areas of woodland are swept away, the débris being strewn over the plains below.

One of these mud-lavas invaded Herculaneum during the great eruption of 79, and by quickly enveloping the houses and their contents, has preserved for us so many precious and perishable monuments of antiquity. In the same district, during the eruption of 1622, a torrent of this kind poured down upon the villages of Ottajano and Massa, overthrowing walls, filling up streets, and even burying houses with their inhabitants. During the great eruption of Cotopaxi, in June, 1877, enormous torrents of water and

⁸⁹ Presidential Addresses, Quart. Journ. Geol. Soc. xlvii. (1891), xlviii. (1892).