

the agencies of subterranean movements in ancient and modern periods.

*Ejections of Ashes and Stones.* — The distance to which these are transported after leaving the volcano, is a useful indication of the quantity ejected, and thereby of the general power of an eruption, but not a measure of its momentary violence. During the eruption of Vesuvius in 472—473, the ashes thrown out were transported by the winds even to Africa, Syria, and Egypt, and fell in Constantinople. In 1631, ships were covered with ashes 20 leagues from Vesuvius. In 1812, the eruption of the Souffrier Mountain, in St. Vincent's, gave forth ashes which were carried by the winds to Barbadoes. During the terrific eruption of Tomboro, in Sumbawa (1815), clouds of ashes obscured the sun, and fell, inches deep, on the streets and houses in Java, at a distance of 300 miles.

The *intensity* of the volcanic force can be better appreciated by the magnitude of the stones ejected from the crater, and the height and distances to which they are thrown, than by any other criterion. It appears that stones 8 lb. in weight were thrown from Vesuvius to Pompeii, a distance of 6 miles; and stones were observed by sir W. Hamilton to be thrown so high above the mountain top, that they occupied 11'' in falling, which gives a height of 2000 feet, and an initial velocity of above 350 feet in a second. In 1798, during a violent eruption in Teneriffe, the mountain Chahorra threw out stones to such a height that from 12 to 15 seconds were reckoned during their descent. The height was consequently from 2500 to 3600 feet, and the initial velocity from 380 to 480 feet per second. The pressure of a whole column of lava, which should overflow the crater of Teneriffe, would, according to Daubuisson, be equal to 1000 atmospheres, and might eject lava, *at the base*, with a velocity of nearly 850 feet per second. These forces are much inferior to those with which cannon balls are projected. The intermitting character of these "fits" of volcanic