

settle on a steep slope, and may include shells and the remains of aquatic animals, which flourish in the intervals between eruptions. Lava under the pressure of water would be less porous; but, as Dr. Daubeny suggests, it may retain its fluidity longer than in the open air; for the rapidity with which heated bodies are cooled by being plunged into water arises chiefly from the conversion of the lower portions of water into steam, which steam absorbing much heat, immediately ascends, and is reconverted into water. But under the pressure of a deep ocean, the heat of the lava would be carried off more slowly, and only by the circulation of ascending and descending currents of water, those portions nearest the source of heat becoming specifically light, and consequently displacing the water above. This kind of circulation would take place with much less rapidity than in the atmosphere, inasmuch as the expansion of water by equal increments of heat is less considerable than that of air.*

We learn from the valuable observations made by Mr. Dana on the active volcanos of the Sandwich Islands, that large sheets of compact basaltic lava have been poured out of craters at the top or near the summits of flattened domes higher than Etna, as in the case of Mount Loa for example, where a copious stream two miles broad and twenty-five miles long proceeded from an opening 13,000 feet above the level of the sea. The usual slope of these sheets of lava is between 5° and 10° ; but Mr. Dana convinced himself that, owing to the suddenness with which they cool in the air, some lavas may occasionally form on slopes equalling 25° , and still preserve a considerable compactness of texture. It is even proved, he says, from what he saw in the great lateral crater of Kilauea, on the flanks of Mount Loa, that a mass of such melted rock may consolidate at an inclination of 50° or even 60° and be continuous for 300 or 400 feet. Such masses are narrow, he admits, "but if the source had been more generous, it is difficult to see that they would not have had a greater breadth, and by a succession of ejections overspreading each cooled layer, a considerable thickness might have been attained."† The same author has also shown, as before mentioned, that in the "cinder cones" of the Sandwich Islands, the strata have an original inclination of between 35° and 40° .‡

Mr. Scrope, writing in 1827, attributed the formation of a volcanic cone chiefly to matter ejected from a central orifice, but partly to the injection of lava into dikes, and "to that force of gaseous expansion, the intensity of which, in the central parts of the cone, is attested by local earthquakes, which so often accompany eruptions."§ It is the opinion of MM. Von Buch, De Beaumont, and Dufresnoy, that the sheets of lava on Somma are so uniform and compact, that their original inclination did not exceed four or five degrees, and that four-fifths, therefore, of their present slope is due to their having been subsequently tilted and upraised. Notwithstanding the light

* See Daubeny's *Volcanos*, p. 400.

† Ibid. p. 354.

‡ Dana, *Geol. of American Explor. Exped.* p. 359. note.

§ *Geol. Trans.*, 2d series. vol. ii. p. 341.