

CHAPTER XXXIII.

CAUSES OF EARTHQUAKES AND VOLCANOS — *continued.*

Review of the proofs of internal heat—Theory of an unoxidated metallic nucleus — Decomposition of water a source of volcanic heat — Geysers of Iceland — Causes of earthquakes — Wavelike motion—Expansive power of liquid gases — Connection between the state of the atmosphere and earthquakes— Permanent upheaval and subsidence of land — Expansion of rocks by heat—The balance of dry land how preserved — Subsidence in excess — Conclusion.

WHEN we reflect that the largest mountains are but insignificant protuberances upon the surface of the earth, and that these mountains are nevertheless composed of different parts which have been formed in succession, we may well feel surprise that the central fluidity of the planet should have been called in to account for volcanic phenomena. To suppose the entire globe to be in a state of igneous fusion, with the exception of a solid shell, not more than from thirty to one hundred miles thick, and to imagine that the central heat of this fluid spheroid exceeds by more than two hundred times that of liquid lava, is to introduce a force altogether disproportionate to the effects which it is required to explain.

The ordinary repose of the surface implies, on the contrary, an inertness in the internal mass which is truly wonderful. When we consider the combustible nature of the elements of the earth, so far as they are known to us,—the facility with which their compounds may be decomposed and made to enter into new combinations,—the quantity of heat which they evolve during these processes; when we recollect the expansive power of steam, and that water itself is composed of two gases which, by their union, produce intense heat; when we call to mind the number of explosive and detonating compounds which have been already discovered, we may be allowed to share the astonishment of Pliny, that a single day should pass without a general conflagration:—“*Excedit profectò omnia miracula, ullum diem fuisse quo non cuncta conflagrarent.*”*

The signs of internal heat observable on the surface of the earth do not necessarily indicate the permanent existence of subterranean heated masses, whether fluid or solid, by any means so vast as our continents and seas; yet how insignificant would these appear if distributed through an external shell of the globe one or two hundred miles in depth! The principal facts in proof of the accumulation of heat below the surface may be summed up in a few words. Several volcanos are constantly in eruption, as Stromboli and Nicaragua; others are known to have been active for periods of 60, or even 150 years, as those of Sangay in Quito, Popocatepetl in Mexico, and the volcano of the Isle of Bourbon. Many craters emit hot vapours in the intervals between eruptions, and solfataras evolve incessantly the

* *Hist. Mundi*, lib. ii. c. 107.