

heat is supported, is derived first, from the occurrence of volcanic fires in almost every degree of latitude north or south : secondly, from submarine volcanoes : thirdly, from the occurrence of numerous thermal springs in countries remote from active volcanoes : lastly, from direct experiments made on the temperature of the earth, at various depths in mines, and by sinking and boring into the earth.

Whether there exist a mass of heated matter under the whole surface of the globe may be uncertain ; but that there is subterranean fire, under a considerable extent of the surface, can scarcely be doubted. The volcanoes that are thickly scattered over both the northern and southern hemisphere, the long period of their activity, and the connection that appears to subsist between the volcanoes in distant districts (see Chap. XVIII.), prove the depth and extent of the source of volcanic fire. The volcanoes that break out from under the sea, and overcome the vast pressure of the incumbent ocean, farther indicate, that the explosive force is situated at a great depth. Thermal waters, prove the extensive effects of subterranean heat ; for though many hot springs rise in volcanic districts, and are properly a part of volcanic phenomena, yet other thermal waters are far removed from any active volcanoes. Some hot springs have flowed, without any known diminution of temperature, for nearly two thousand years ; this is the case with the waters of Bath, which have no volcanoes nearer to them, than those in Iceland and the south of Italy. That thermal waters derive their temperature from a deep-seated internal source of heat, and not from any local cause, or from chemical changes near the surface, is rendered probable by various circumstances. In many of these waters there is scarcely any admixture of saline or mineral matter, which there would be, were the heat derived from chemical decomposition. Most warm springs are situated near to crystallized primary rocks, or to basaltic rocks or dykes, as I observed to be the case in the Alps. Hot springs often rise among the loftiest mountain ranges in Asia and America. The temperature of thermal waters in low situations, is frequently reduced by admixture with cool springs near the surface, and this I believe to be the principal cause why thermal waters so rarely rise in the upper secondary strata, as I have more fully stated in an account of the thermal waters of the Alps. (See *Appendix*.) It could scarcely have been expected, that an enquiry relating to the temperature of the central part of our planet, could be brought within the limits of human observation and experiment, as the depth to which we can explore by boring or by excavation, bears so inconsiderable a proportion to the diameter of the earth ; yet from numerous observations on the temperature of the earth in deep mines, and from experiments on the temperature of water at different depths, it would appear, that this temperature increases in a very remarkable degree, as we descend lower from the surface. In France, the subject has been recently investigated with considerable activity, and the prac-