

intermixture of green-earth, toadstone, and limestone, near the junction of toadstone with the limestone beds, certainly favors Mr. Whitehurst's original theory of protrusion; but this protrusion took place before the formation of metallic veins, and might be the cause of those fissures in which the veins were formed. It is not improbable that some of the more regular beds of toadstone may have flowed as lava. Professor Sedgwick justly observes, "that our reluctance to admit the theory of protrusion arises from the difficulty of conceiving any powers in nature adequate to produce such an effect. But all the phenomena of Geology show, that the great disturbing forces by which the crust of the globe has been modified, acted in former times with incomparably more energy than they do at present. Volcanic forces are now employed in lifting a column of melted lava to the lip of a crater. The same kind of forces, acting with more energy and through a wider region, may in the early history of the globe have been employed in lifting islands and even continents from the bottom of the ocean. During an operation like this, the elastic forces, acting from below, may often have driven masses of fluid lava among the superincumbent strata; and, in every case, the lava would naturally be propelled through those portions which were most easily penetrated—the lateral must, at every point, have been equal to the vertical pressure. The expansive forces may not at any point have been able to drive a column of lava through all the solid unbroken beds, but the lateral forces may have driven a portion of the fluid between the partings of two horizontal beds; and when a penetration of this kind was once effected, the lava like a wedge, would act, to mechanical advantage, and rush, in an horizontal stream, to a distance proportioned to the elastic forces which were in action."

The formation of basaltic dykes is sufficiently explained by what takes place in the vicinity of volcanoes. Before the confined vapour that afterwards issues through the crater, finds a vent there, the surface of the ground in the vicinity of the volcano is frequently upheaved; and fissures of great extent are made, into which melted lava is sometimes forced, which on cooling forms a wall or dyke, in every respect similar to a basaltic dyke. During an eruption of Vesuvius that took place in 1794, a rent of this kind was formed near the bottom of the mountain, 2375 feet in length and 237 feet in breadth, which became filled with compact lava. Rents or fissures of some miles in length have been opened on the sides of Etna. There is abundant evidence to prove, that most basaltic rocks were erupted under the pressure of the ocean, and it is probably owing to circumstances attending their refrigeration, that they have frequently a columnar structure.

The occurrence of thick beds of basalt, divided into regular pentagonal or hexagonal columns, and disposed in ranges of vast extent and height, could not fail to arrest the attention of the most careless observer, and give rise to speculations respecting their origin and for-