ously the expansive force exerted by vapors dissolved in the molten magma from which lavas proceed. Whether and to what extent these vapors are parts of the aboriginal constitution of the earth's interior, or are derived by descent from the surface, is still an unsolved problem. The abundant occlusion of hydrogen in meteorites, and the capacity of many terrestrial substances, notably melted metals, to absorb large quantities of gases and vapors without chemical combination, and to emit them on cooling with eruptive phenomena, not unlike those of volcanoes, have led some observers to conclude that the gaseous ejections at volcanic vents are portions of the original constitution of the magma of the globe, and that to their escape the activity of volcanic vents is due. Prof. Tschermak in particular has advocated this opinion, and it is meeting with increasing acceptance.[162]

On the other hand, since so large a proportion of the vapor of active volcanoes consists of steam, many geologists have urged that this steam has in great measure been supplied by the descent of water from above ground. The floor of the sea and the beds of rivers and lakes are all leaky. Moreover, during volcanic eruptions and earthquakes, fissures no doubt open under the sea, as they do on land, and allow the oceanic water to find access to the interior.[163] Again, rain sinking beneath the surface of the land, percolates down cracks and joints, and infil-

[162] He has suggested that if 190 cubic kilometres, of the constitution of cast-iron, be supposed to solidify annually, and to give off 50 times its volume of gases, it would suffice to maintain 20,000 active volcanoes. Sitz. Akad. Wissen. Wien, lxxv. (1877), p. 151. Reyer ("Beitrag zur Physik der Eruptionen," Vienna, 1877) advocates the same view.

[163] Prof. Moseley mentions that during a submarine eruption off Hawaii in 1877 "a fissure opened on the coast of that island, from a few inches to three feet broad, and in some places the water was seen pouring down the opening into the abyss below." "Notes by a Naturalist on the 'Challenger,'" p. 503.