

over the rim of the basin. When the pressure is thus diminished, the steam in the upper part of the cavity A expands, until all the water D is driven into the pipe; and when this happens, the steam, being the lighter of the two fluids, rushes up through the water with great velocity. If the pipe be choked up artificially, even for a few minutes, a great increase of heat must take place; for it is prevented from escaping in a latent form in steam; so that the water is made to boil more violently, and this brings on an eruption.

Professor Bunsen of Marburg, who visited Iceland in 1846, made experiments on the water in the pipe of the Great Geyser, and found, by suspended thermometers, that the temperature at the bottom just before an eruption was 260° Fahr., or 48° above the boiling point, while it was only 212° Fahr. at the surface. After the column of water and steam had been expelled, it was much cooled. He inferred that the source of heat is not situated immediately beneath, but at a distance, and that the column of water must communicate with it by a long and winding channel. After the ejection of a large body of water and steam, the lower part of the liquid mass becomes colder, so that it condenses the steam, which arrives from the distant spot where it is formed. Continued accessions of hot steam at length transmit to it again such an increase of heat, that the water below begins to boil and expand so as to overcome the incumbent pressure, driving before it the column of water which had filled the pipe.

Previously to these observations of Bunsen and Descloizeaux in Iceland, it would scarcely have been supposed possible that the lower part of a free and open column of water could be raised so much in temperature without causing a circulation of ascending and descending currents, followed by an almost immediate equalization of heat. Such circulation is no doubt impeded greatly by the sides of the well not being vertical, and by numerous contractions of its diameter, but the phenomenon may be chiefly due to another cause. According to recent experiments on the cohesion of liquids by Mr. Donny of Ghent, it appears that when water is freed from all admixture of air, its temperature can be raised, even under ordinary atmospheric pressure, to 275° Fahr., so much does the cohesion of its molecules increase* when they are not separated by particles of air. As water long boiled becomes more and more deprived of air, it is probably very free from such intermixture at the bottom of the Geysers.

In speculating, therefore, on the mechanism of a volcanic eruption, we may suppose that large subterranean cavities exist at the depth of some miles below the surface of the earth, in which melted lava accumulates; and when water containing the usual mixture of air penetrates into these, the steam thus generated may press upon the lava and force it up the duct of a volcano, in the same manner as a column of water is driven up the pipe of a Geyser.

Causes of earthquakes — wave-like motion. — I shall now proceed to examine the manner in which the heat of the interior may give

* See Mr. Horner's Anniversary Address, Quart. Journ. Geol. Soc. 1847, liii.