

Kamschatka and the Aleutian Island, between a latitude of 50° and 66° they exist as numerously as in the Sunda isles, Galapagos and in Quito between 0° and 10° lat. But we find them especially frequent on the coasts of continents or rising out of the depth of the ocean, proving that there the conditions are especially present which are necessary to their development and activity. From all this we may conclude that the material cause of Vulcanism is present everywhere beneath the earth's crust, although it may only have been able to break out along certain lines and at certain points." By means of volcanoes and the subterranean canals connected with them, a communication is established between the molten zone beneath the earth's crust and the atmosphere. This communication is liable to be interrupted by various circumstances, and when this is permanently the case the volcano is extinct. But even the active volcanoes are far from being continually in a condition of violent eruption, their usual activity is rather of a very temperate character, and F. Hoffmann very correctly remarks that the energetic eruptions are more the exception than the rule. Volcanoes in a state of rest exhale steam and other gases and it is even the case, that a quiet effusion of lava can take place unaccompanied by any extraordinary phenomena. Generally however the ascent of the lava in the canal and crater of the volcano is the immediate cause of all the sublime effects and terrible devastations, which accompany and follow volcanic eruptions. It is still a matter of doubt among philosophers as to what is the real cause of the ascent of the lava from its home in the depths of the earth. The oldest hypothesis is that which attributes the force, which expels the lava to highly compressed steam, resulting from the access of water, and especially of sea water, to the regions filled with igneous fluid beneath the earth's crust. In later times this view has been adopted by very many philosophers such as Gay Lussac, Von Buch, Angelot, Bischof, and Petzholdt. On the other hand, Humboldt does not at all regard the problem as completely solved,* and Naumann does not consider it probable that the expansive force of the steam derived from sea-water is the cause of the ascent of the lava, although he considers it as quite certain, that sea and other water obtains access through the eruptive canals of volcanoes to very great depths, and on the ascent of the lava plays a very important part in the phenomena of volcanic eruptions. Naumann's view so far as re-

* *Cosmüs* I, 243.