

to Daubrée, through beds of concrete, of lime, brick, and sandstone, these hot waters have percolated until they have originated calcareous spar, aragonite, and fluor spar, together with siliceous minerals, such as opal, which are found filling the interstices of the bricks and mortar. From these and other similar statements, "we are led," says Sir Charles Lyell,\* "to infer that when in the bowels of the earth there are large volumes of molten matter, containing heated water and various acids, under enormous pressure, these subterraneous fluid masses will gradually part with their heat by the escape of steam and various gases through fissures producing hot springs, or by the passage of the same through the pores of the overlying and injected rocks." "Although," he adds,† "we can only study the phenomena as exhibited at the surface, it is clear that the gaseous fluids must have made their way through the whole thickness of the porous or fissured rocks, which intervene between the subterraneous reservoirs of gas and the external air. The extent, therefore, of the earth's crust which the vapours have permeated, and are now permeating, may be thousands of fathoms in thickness, and their heating and modifying influence may be spread throughout the whole of this solid mass."

The fountains of boiling water, known under the name of *Geysers*, are another emanation connected with ancient craters. They are either continuous or intermittent. In Iceland we find great numbers of these gushing springs—in fact, the island is one entire mass of eruptive rock. Nearly all the volcanoes are situated upon a broad band of trachyte, which traverses the island from south-west to north-east. It is traversed by immense fissures, and covered with masses of lava, such as no other country presents. The volcanic action, in short, goes on with such energy that certain paroxysms of Mount Hecla have lasted for six years without interruption. But the Great Geyser, represented on the opposite page (PLATE V.), is, perhaps, even more an object of curiosity. This water-volcano projects a column of boiling water, eight yards in diameter, charged with silica, to the height, it has been said, of about 150 feet, depositing vast quantities of silica as it cools after reaching the earth.

The volcanoes in actual activity are, as we have said, very numerous, being more than 200 in number, scattered over the whole surface of the globe, but mostly occurring in tropical regions. The island of Java alone contains about fifty, which have been mapped

\* "Elements of Geology," p. 732.

† Ibid, p. 733.