of vapor on rocks when suddenly developed along an opened crack (1890, 1891) are referred to on page 278, attributes the first opening of the conduit tube of a volcano to such action of vapors.

2. *Source of igneous fusion.* — It was formerly believed that the earth's liquid interior, or else a liquid layer beneath the crust, or isolated liquid areas in place of a liquid layer, supplied the liquid rock of volcanoes. Now it is generally held that the earth is solid within, but that below a thin exterior there is a temperature just below that of fusion, and that actual fusion results whenever subterranean pressures cause movements and thus develop heat. It is also urged that the removal of surface pressure might cause fusion, since lessening pressure lowers the melting-point. In this process fusion takes place without increase of heat; but in the preceding, there is augmented heat of dynamical origin.

Believing in the earth's igneous fluidity, Bunsen, in 1851, put forth the theory that within the crust the earth contains an acidic layer chiefly of orthoclase and quartz material and with a mean percentage of silica of 76·67; below this a heavier basic layer in which the mean percentage of silica is but 47·48; and that igneous rocks are from one or the other of these magmas, or from mixtures of the two. Richthofen in his "Natural System of Volcanic Rocks" (*California Acad. Sci.*, 1868), after a study of the rocks of the Pacific border of the United States, announced as the order of eruption in igneous regions: propylyte (since shown to be andesyte), andesyte, trachyte, rhyolyte (quartz-trachyte), basalt — basalt being the latest — when present with the others.

More recently, Iddings has concluded that the different kinds have arisen from local differentiation of a common magma; that the first that appears in a region is usually one having the mean composition of the series in that region, and that the last is a rock of one or both extremes, that is either rhyolyte (quartz-trachyte), or basalt, or both; also that in each case the portions of the magma that are latest to be extruded are the solvent for the other portions.

A. D. Hague has found, in the Leadville region, the succession in the ejected rocks to be (1) andesyte, (2) dacyte, (3) rhyolyte, (4) basalt; and he regards it as the prevailing order.

This order — which is near that of Richthofen — corresponds to a succession from (1) soda-lime semibasic lavas, to (2) potash-bearing or acidic lavas; to (3) basic lavas: also from (1) those of medium fusibility; to (2) those of difficult fusibility; to (3) those of easy fusibility or which melt at the lowest temperature: also from (1) those of medium specific gravity; to (2) those of least specific gravity; to (3) those of greatest specific gravity. No further physical or chemical explanation for the succession is yet given. If fusibility is the important principle in determining distributions, then basalt should generally be, as the facts make it, the last and the uppermost. Mount Loa shows that specific gravity has little or no importance; for the heaviest chrysolitic basalts occur not only below, but also at the summit, although it is nearly 14,000 feet above the sea level.