CHAPTER XXIX.

VOLCANIC ROCKS-continued.

Trap dikes-sometimes project-sometimes leave fissures vacant by decomposition-Branches and veins of trap-Dikes more crystalline in the centre-Strata altered at or near the contact-Obliteration of organic remains-Conversion of chalk into marble-Trap interposed between strata-Columnar and globular structure-Relation of trappean rocks to the products of active volcances-Form, external structure, and origin of volcanic mountains-Craters and Calderas-Sandwich Islands-Lava flowing underground-Truncation of cones-Javanese calderas-Canary Islands-Structure and origin of the Caldera of Palma-Older and newer volcanic rocks in, unconformable-Aqueous conglomerate in Palma-Hypothesis of upheaval considered-Slope on which stony lavas may form-Extent and nature of aqueous erosion in Palma-Island of St. Paul in the Indian Ocean-Peak of Teneriffe, and ruins of older cone-Madeira-Its volcanic rocks, partly of marine, and partly of subaerial origin-Central axis of eruptions-Varying dip of solid lavas near the axis, and further from it-Leaf-bed, and fossil land-plants-Central valleys of Madeira not craters, or calderas.

HAVING in the last chapter spoken of the composition and mineral characters of volcanic rocks, I shall next describe the manner and position in which they occur in the earth's crust, and their external forms. The leading varieties both of the basaltic and trachytic rocks, as well as of greenstone and the rest, are found sometimes in dikes penetrating stratified and unstratified formations, sometimes in shapeless masses protruding through or overlying them, or in horizontal sheets intercalated between strata.

Volcanic or trap dikes.—Fissures have already been spoken of as occurring in all kinds of rocks, some a few feet, others many yards in width, and often filled up with earth or angular pieces of stone, or with sand and

pebbles. Instead of such materials, suppose a quantity of melted stone to be driven or injected into an open rent, and there consolidated, we have then a tabular mass resembling a wall, and called a trap dike. It is not uncommon to find such dikes passing through strata of soft materials, such as tuff, scoriæ, or shale, which, being more perishable than the trap, are often washed away by the sea, rivers, or rain, in which



Diko in valley, near Brazen Head, Madeira. (From a drawing of Capt. Basil Hall, R. N.)