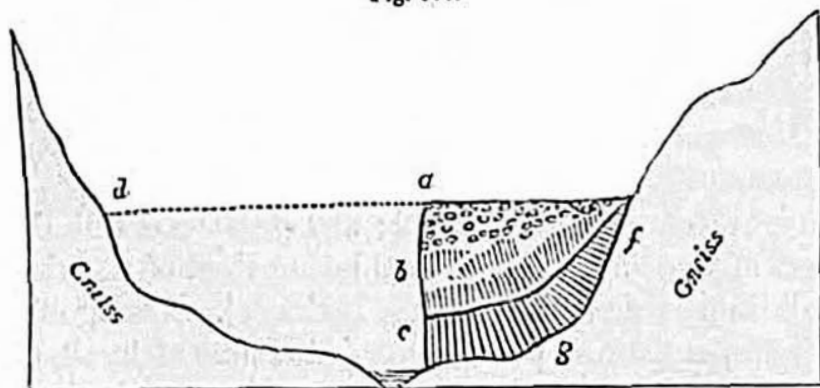


the sea. In fig. 634, a small portion of this dike is represented on a less reduced scale.*

It being assumed that columnar trap has consolidated from a fluid state, the prisms are said to be always at right angles to the *cooling surfaces*. If these surfaces, therefore, instead of being either perpendicular or horizontal, are curved, the columns ought to be inclined at every angle to the horizon; and there is a beautiful exemplification of this phenomenon in one of the valleys of the Vivarais, a mountainous district in the South of France, where, in the midst of a region of gneiss, a geologist encounters unexpectedly several volcanic cones of loose sand and scorïæ. From the crater of one of these cones, called La Coupe d'Ayzac, a stream of lava descends and occupies the bottom of a narrow valley, except at those points where the river Volant, or the torrents which join it, have cut away portions of the solid lava. The accompanying sketch (fig. 635) represents the remnant of the lava at one of

Fig. 635.



Lava of La Coupe d'Ayzac, near Antraigue, in the province of Ardèche.

the points where a lateral torrent joins the main valley of the Volant. It is clear that the lava once filled the whole valley up to the dotted line *d a*; but the river has gradually swept away all below that line, while the tributary torrent has laid open a transverse section; by which we perceive, in the first place, that the lava is composed, as usual in this country, of three parts: the uppermost, at *a*, being scoriaceous; the second, *b*, presenting irregular prisms; and the third, *c*, with regular columns, which are vertical on the banks of the Volant, where they rest on a horizontal base of gneiss, but which are inclined at an angle of 45° at *g*, and are horizontal at *f*, their position having been everywhere determined, according to the law before mentioned, by the concave form of the original valley.

In the annexed figure (636) a view is given of some of the inclined and curved columns which present themselves on the sides of the valleys in the hilly region north of Vicenza, in Italy, and at the foot of the higher Alps.† Unlike those of the Vivarais, last mentioned, the basalt of this country was evidently submarine, and the present valleys have since been hollowed out by denudation.

* Seale's Geognosy of St. Helena, plate 9.

† Fortis. Mém. sur l'Hist. Nat. de l'Italie, tom. i. p. 233, plate 7.