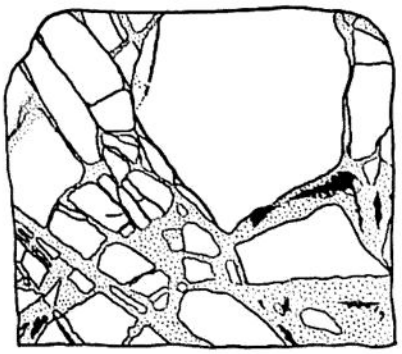
rents; moreover, the iron oxide spread either side, staining the rock, producing the appearance of very wide rifts. Along one rift there is an open space from the loss of grains, and in it a crust of newly formed quartz crystals. The process often results in pushing the pieces out of place.

139.

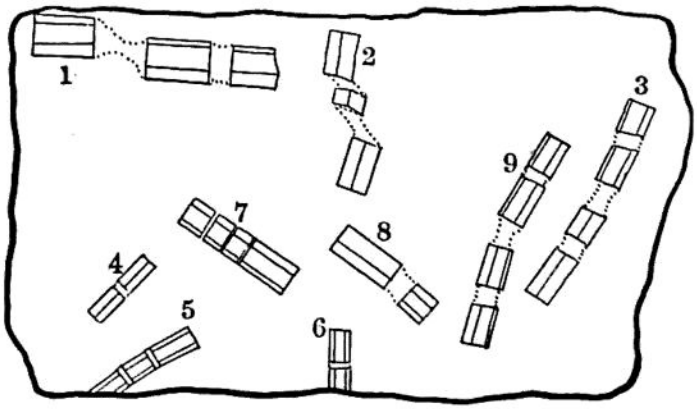


Quartzyte septaria. D. '84.

Where saline efflorescences — as alums, nitrates, alkaline carbonates, or chlorides — are produced in the pores of a sandstone, the surface grains are successively pried off. Much denudation is thus produced, especially in arid regions. The process often makes a series of excavations along the front of bluffs. The process goes on most actively in covered places and during the heat of the day. A shale often has its laminæ separated by layers of the salt or oxide, and fragments detached.

Displacement by intrusion of crystalline material is a common process. The following figure illustrates a case in which crystals of tourmaline in mica schist are pushed apart at planes of fracture by intruding quartz (the dotted portion) from a siliceous solution. After the first deposit of quartz within the fracture, the additions were made between this deposit and the adjoining part of the crystal, and so the wedging apart went on. A. H. Worthen has described Crinoids, from the Keokuk limestone, as split open and enlarged in this way, and one Barycrinus that was thus made a foot in diameter. The tubular stems are increased four to six diameters in the process. The siliceous solution supplying the quartz of the Keokuk limestone was probably not heated.

140.



Broken crystals of tourmaline displaced by intruded quartz, Lenox, Mass. D. '85.

The displacements may be great when large masses of a rock undergo change to a kind requiring additional space. In the change of a bed of anhydrite to gypsum the increase of bulk, due to the added water (page 128), is nearly 60 per cent. Dividing the atomic weight of anhydrite, which is 136, by the specific gravity, 2·95, gives 46·1 for the bulk; and that of gypsum, 172, by its specific gravity, 2·33, gives the bulk 73·8, making thus the gain in bulk from 46·1 to 73·8. The change is hence attended by a breaking and displacement of any overlying beds of rock. In the change of calcite to true dolomyte, $(\frac{1}{2}\mathrm{Ca}\,\frac{1}{2}\mathrm{Mg})\,\mathrm{CO_3}$, there is a diminution in bulk of one eighth per cent (or one tenth, if the composition is $(\frac{2}{3}\mathrm{Ca}\,\frac{1}{3}\mathrm{Mg})\,\mathrm{CO_3}$); which,