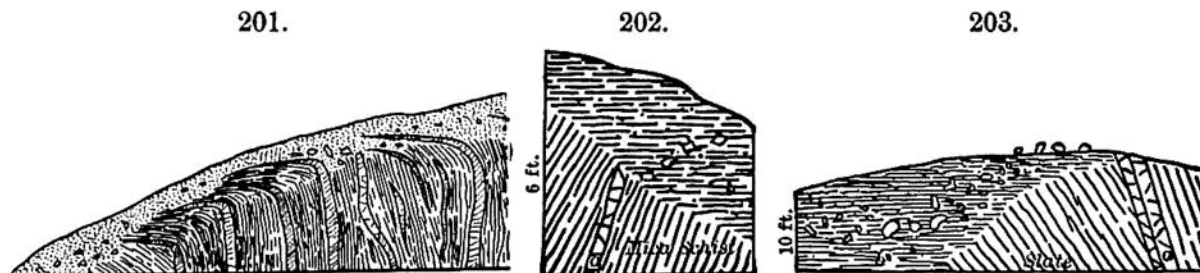


and thus carries on a process of displacement and destruction. It tears to pieces rifted, jointed, and laminated rocks, often separating large masses; and as most rocks absorb moisture at the surface, if not also through the mass, few escape disintegration by this means when exposed to icy weather. Hence rocky bluffs in cold latitudes have usually a talus of broken stone, while, in the tropics, this source of fragments fails. This kind of degradation has produced much of the earth and coarser loose material of the globe.

The divellent effect of freezing in fissures may be increased by an addition to the ice first formed in the fissure through water taken in between the ice and the rock. The same interstitial process often goes on beneath the stones of a pebbly soil, and ends in lifting them out of the ground, to a height of an inch or two, each on its own ice-column. The process serves to bring the stones to the surface, and thus has an assorting effect.

As a body of water 35 feet wide will make a volume of ice a foot thick and 36 feet wide, the freezing of the surface of small ponds brings pressure against the sides, or their rocks, and shoves loose stones up the shore, making a low *rampart*. It also causes fractures and ridges over the surface of the ice. Freezing usually begins about the shores, and in its expansion this littoral belt of ice slips over the water, and only the central portion, which becomes frozen later, is thrown into a strain.

2. *Downward creeping of soils through freezing.*—A displacement or creeping downward of the earth or loose material on inclined surfaces is a common effect of successive freezings and thawings, as well as of changing temperature and other causes. Interesting examples have been described from North Carolina by W. C. Kerr.



Displacement by the action of frost. Kerr, '81.

Fragments of quartz veins are here represented as traveling down the slope after becoming detached. In the first of the figures, the veins have received a bend downward through the decomposition of the rock, a mica schist, and the slipping movement also includes the soil. According to the experiments of C. Davison (1889), each freezing produces a slight upward movement, normal to the inclined surface, and the thawing, a vertical settling, and thereby a displacement downward. The deeper the freezing in any case, the greater would be the displacement.