

With the progress of the sun during a sunny day Bunker Hill Monument, a hollow obelisk, 221 feet high and 30 feet square at base (made of granite blocks), swings to one side and the other, a pendulum suspended from the center of the top describing an irregular ellipse nearly half an inch in its greatest diameter (Horsford). Such a cause, working day after day about rocky peaks and precipices, causing each day some displacement, must end in degradations of geological importance.

(b) Expansion works with special facility if *blocks rest on an inclined surface*, even when the inclination is very small. It extends the mass down the slope, — the direction of easiest movement, — and contraction pulls the mass to the expansion line for the same reason; and thus masses slide on till they fall over precipices, or off cliffs into the sea. Even the loose stones or blocks of a talus are kept on a downward move by the same means. The action of frost has already been mentioned (page 231) as another one of the causes of a slipping movement in rocks and soil.

(c) Expansion and contraction also cause grains and thin portions of the exterior of rocks to peel off or crack away from the part below. It hence may open fractures and so give access to air and moisture for other destructive work.

Further: terranes of granite, granitoid gneiss, syenite, and other massive rocks, as in the domes about the Yosemite in California, are often divided into parallel concentric or horizontal layers a foot to a yard and more thick; and vertical joints at irregular intervals also are made. J. D. Whitney states that the dome-like shapes of the Yosemite summits are thus made; for "the curves are arranged strictly with reference to the surface of the masses" (1865). These effects have been attributed to contraction attending the original cooling; but also to the climatal heat through daily and seasonal cooling.

On some of the Thimble Islands, off the shores of Stony Creek, Conn., the walls of granitoid gneiss facing the water are peeling off in laminæ a third to a half inch thick, without any apparent decomposition, or even a dimming of the luster of the feldspar or mica; and it may be owing to the heat of the day's sun, and the chilling by the waters when the tide is in. In the same region the slipping of great masses of rocks from the islands into the salt water is well exemplified.

Over the rocky surface of countries within the glacial latitudes of the Glacial period, the scratches left by the glacier are generally, when first uncovered, as fresh as when they were made. But, if the surface be open to the sun's heat and light, and to the rains and frosts, for a score of years, far the larger part of the markings disappear; and alternate heating and cooling is an important means of this obliteration.

(d) *By drying*, the sun's heat produces cracks, the lightest cases of which are mud-cracks (page 94). Such cracks in mud or earth, and therefore in rocks, are shallow, and by this means they may be distinguished from cracks or fissures made by other means.

3. *Effects of heat from interior sources.* — From Totten's experiments as data, Lyell has calculated that a mass of sandstone a mile thick, raised in