mountain-summits. The faulted region, because a region of fractures, is, in general, the course of a great valley.

Fissures also are faulted in the several ways mentioned, because they are in the terranes, and must share in the displacements. They may be faulted even at the time when they are first made, and faulted at various later periods.

Besides faults of up-and-down displacement, there are also (1) longitudinal faults, and sometimes without much change of level in the beds. More common than either vertical or longitudinal faults are (2) the oblique, since resistance and pressure would seldom be so equable as to prevent obliquity. (3) Horizontal displacement of strata also occur, and sometimes of marvelous extent. They are produced by a horizontal or oblique thrust shoving terranes over others. In a case reported from the Scottish Highlands, a mass of the oldest crystalline rocks, many miles in length from north to south, was thrust at least ten miles westward over younger rocks, part of the latter fossiliferous.

(4) Bed-plane faults are still another kind in which the plane of displacement is that between two layers or strata. They are produced by the pushing of one bed or stratum of a series over the surface of that below it. In the Triassic of East Haven, Conn. (on the borders of New Haven), the successive beds of the red granitic sandstone (which dip eastward 15° to 20°) have been shoved over one another upward along the plane of bedding, producing large and general displacements, and great slickensided surfaces; and these surfaces have generally a very thin and hard white coating, apparently due to the ground-up feldspar. In the same region, besides these shoves of layers over one another, there are also ordinary faults with slickensided walls; and in many places the rock is in fragments, and all the fragments, even those no larger than the hand, indicate participation in the movement by the slickensides which cover them.

(5) Pressure has sometimes produced a crushing of the rocks along fractures, either directly or aided by lateral movement, making what has been called in the latter case *shear-zones*.

(6) In the upturning and flexing there has also been slipping, by the inch and fractions of an inch, along planes of cleavage or bedding, making slip-faults, and producing also small flexings or crumplings of the beds.

Jointed structure, joints. — A jointed structure is a style of fracturing, usually on an extended scale, in which there is a degree of system in the arrangement of the fractures. The divisional planes are termed joints. They cut across the stratification, and may have great extent vertically and laterally. The planes of division are often very even, and not enough open to admit the thinnest paper. They may be in one, two, or more directions in the same rock, and extend, with nearly uniform courses, through regions that are many miles in length or breadth. The accompanying sketch represents the falling cliffs of Cayuga Lake, and the fortress-shapes and buttresses arising from the natural joints intersecting the rocks. The wear of the