

4. *Landslides*. — Subterranean waters sometimes produce disastrous results by adding their weight to loose or porous deposits and so occasioning landslides.

Landslides are of three kinds : —

(a) The mass of earth on a side-hill, having over its surface, it may be, a growth of forest trees, and, below, beds of gravel and stones, may become so weighted with the waters of a heavy rain, and so loosened below by the same means, as to slide down the slope by gravity.

A slide of this kind occurred, during a dark, stormy night, in August, 1826, in the White Mountains, back of the Willey House. It carried rocks, earth, and trees from the heights to the valley, and left a deluge of stones over the country. The frightened Willey family fled from the house, to their destruction. The house remains, as on an island in the rocky stream.

(b) A clayey layer, overlaid by other horizontal strata, sometimes becomes so softened by water from springs or rains, that the superincumbent mass, by its weight alone, presses it out laterally, provided its escape is possible, and, sinking down, takes its place.

Near Tivoli, on the Hudson River, a subsidence of this kind took place in April, 1862. The land sunk down perpendicularly, leaving a straight wall around the sunken area, 60 or 80 feet in height. An equal area of clay was forced out laterally underneath the shore of the river, forming a point about an eighth of a mile in circuit, projecting into the cove. Part of the surface remained as level as before, with the trees all standing. Three days afterward, the slide extended, partially breaking up the surface of the region which had previously subsided, and making it appear as if an earthquake had passed. The whole area measured 3 or 4 acres.

(c) When the rocks are tilted, and form the slope of a mountain, the softening of a clayey or other layer underneath, in the manner just explained, may lead to a slide of the superincumbent beds down the declivity.

In 1806, a destructive slide of this kind took place on the Rossberg, near Goldau, in Switzerland, which covered a region several square miles in area with masses of conglomerate, and overwhelmed a number of villages. The thick outer stratum of the mountain moved bodily downward, and finally broke up and covered the country with ruins, while other portions were buried in the half-liquid clay which had underlain it and was the cause of the catastrophe.

Similar subsidences of soil have taken place near Nice, on the Mediterranean. On one occasion, the village of Roccabruna, with its castle, sunk, or rather slid down, without destroying or even disturbing the buildings upon the surface.

Besides (a) the transfer of rocks and earth, landslides also cause (b) a scratching or planing of slopes, by the moving strata and stones; (c) the burial of animal and vegetable life; (d) the folding or crumpling of the clayey layer subjected to the pressure, where the effect does not go so far as to produce its extrusion and destruction; while the beds between which it lies are only slightly compacted or are unaltered; and (e) depressions of the surface which may become lake-basins. Fig. 188 is a reduced view of