by their own erosions, and that previous agencies in great part prepared the valleys through which they run.

The general features of continents, and the larger valleys, are due to the position of the underlying strata. If these have the shape of a trough or basin, the depression is a natural valley; and as it is produced by the sinking of the strata, it is called a *valley of subsidence*, as in Fig. 83. Such valleys may be enlarged by erosion.

But often these depressions are actually excavated from strata inclined at various angles. These are *valleys of denudation.* There are two general varieties of them. First, when the crest of an anticlinal ridge has been worn away, constituting a *valley of elevation*, as in Fig. 84. Secondly, when a valley has been excavated out of vertical or inclined strata, as in Fig. 85. These are *valleys of erosion.* Ravines, gorges, and cañons (pronounced *canyōns*), are narrow valleys chiefly along the present beds of rivers, excavated by the streams alone without foreign assistance. In many instances one is surprised at the magnitude of the excavations.

Fig. 83.

Fig. 84.

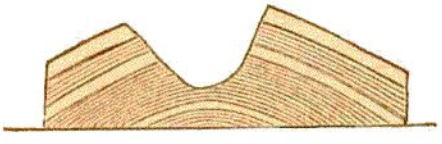
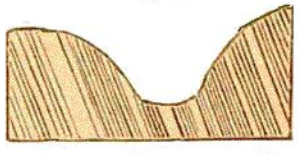


Fig. 85.



Out of a multitude of examples we select only a few to illustrate the first mode in which rivers produce geological changes.

1. The gulf, seven miles long and 150 feet deep, between Niagara Falls and Lake Ontario, has long excited the attention of geologists, and some of them have imagined other agencies beside the river to make the erosion. But we see a work now going on there from year to year, which needed only time enough to have excavated the whole gorge, and time is an element for which a multitude of geological facts make an almost unlimited demand. At Niagara Falls 670,000 tons of water are precipitated into the gulf every minute. The upper shelf of rock is quite hard, but the layers of strata beneath are worn out by the dripping water, and then the weight causes the hard crust to break off from time to time in large masses. The rate of retrocession has been loosely estimated to average from one foot to one yard per year. But this rate, if correct, would not be what it was when the fall was nearer Lake Ontario, nor what it will be as it approaches Lake Erie, because in both cases the rocks are different.

2. On Genesee river, in New York, we find very striking evidence of erosion. Between its mouth and Rochester, seven miles, are three cataracts,