are reduced to fragments, and carried down the stream. Thus the waterfall cuts its way backward up the stream, and as it advances it prolongs the excavation of the ravine into which it descends. The student will frequently observe, in the recession of waterfalls and consequent erosion of ravines, the important part taken by lines of joint in the rocks. These lines have often determined the direction of the ravine, and the vertical walls on either side depend for their precipitousness mainly upon these divisional planes in the rock.

The gorge of the Niagara affords a magnificent and remarkably simple illustration of these features of river-action. At its lower end, where it enters the wide plain that extends to Lake Ontario, there stretches away, on either side of the river, a line of cliff and steep wooded bank, formed by the escarpment of the massive Niagara limestone. Back from this line of cliff, through which it issues into the lacustrine plain, the gorge of the river extends for about 7 miles, with a width of from 200 to 400 yards, and a depth of from 200 to 300 feet. At the upper end lie the world-renowned falls. The whole of this great ravine has unquestionably been cut out by the recession of the falls. When the river first began to flow, it may have found the escarpment running across its course, and may then have begun the excavation of its gorge. More probably, however, the escarpment and waterfall began to arise simultaneously and from the same geological structure. As the former grew in height, it receded from its starting point. The river-ravine likewise crept backward, but at a more rapid rate, and the result has been that while at present the cliff, worn down by atmospheric disintegration, stands at Queenstown, the ravine dug by the river extends 7 miles further inland. The waterfall will continue to cut

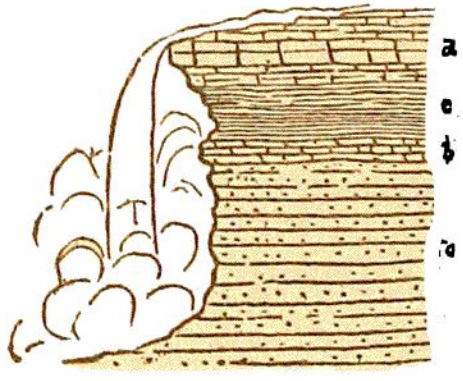

Fig. 118.—Section at the Horseshoe Falls, Niagara.

a, Medina Sandstone, 300 feet; *b*, Clinton Limestone and Shale, 30 feet; *c*, Niagara Shale, 80 feet; *d*, Niagara Limestone, 165 feet, of which 85 feet are visible at the fall.