probable conjecture," and estimated the length of time required for the excavation of the whole Niagara ravine at 35,000 years.[161] A commission recently appointed to survey the falls and to ascertain the rate of recession has reported (1890) that since 1742, when the first survey was made, the total mean recession of the Horseshoe falls has been 104 feet 6 inches. The maximum recession at one point is 270 feet. The mean recession of the American falls is 30 feet 6 inches. The length of the crest has increased from 2260 to 3010 feet by the washing away of the embankment. The total area of recession of the American falls is 32,900 square feet, and that of the Horseshoe falls 275,400 feet.

A feature of interest in the future history of the Niagara river deserves to be noticed here. It is evident that if the structure of the gorge continued the same from the falls

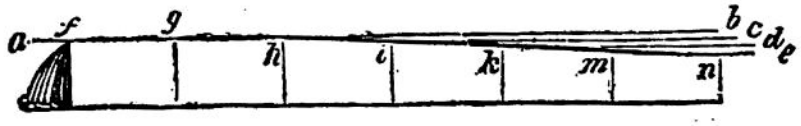

Fig. 120.—Section to illustrate the lowering of Lake Erie by the recession of Niagara Falls.

to Lake Erie, the recession of the falls would eventually tap the lake, and reduce its surface to the level of the bottom of the ravine. Successive stages in this retreat of the falls are shown in Fig. 120, by the letters *f* to *n*, and in the consequent lowering of the lake by the letters *a*, *b* to *e*. It is believed, however, that a slight inclination of the strata carries the soft underlying shale out of possible reach of the fall, which will retard indefinitely the lowering of the lake.

A waterfall may occasionally be observed to have been produced by the existence of a harder and more resisting band or barrier of rock crossing the course of the stream, as, for instance, where the rocks have been cut by an in-

[161] Lyell, "Travels in North America," i. p. 32; ii. p. 93. "Principles," i. p. 358. Compare Lesley's "Coal and its Topography," 1856, p. 169. On recent changes at the falls, see Marcou, Bull. Soc. Geol. France (2), xxii. p. 290. The Falls of St. Anthony on the Mississippi show, according to Winchell, a rate of recession varying from 3·49 to 6·73 feet per annum, the whole recession since the discovery of the falls in 1680 to the present time being 906 feet. Q. J. Geol. Soc. xxxiv. p. 899.