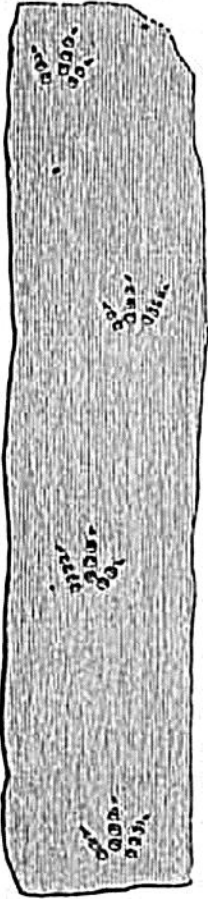


on the lower surfaces or planes of the strata. If we follow a single line of marks, we find them uniform in size, and nearly uniform in distance from each other, the toes of two successive footprints, turning alternately right and left (see fig. 443). Such single lines indicate a biped; and there is generally such a deviation from a straight line, in any three successive prints, as we remark in the tracks left by birds. There is also a striking relation between the distance separating two footprints in one series and the size of the impressions; in other words, an obvious proportion between the length of the stride and the dimension of the creature which walked over the mud. If the marks are small, they may be half an inch asunder; if gigantic, as, for example, where the toes are 20 inches long, they are occasionally 4 feet and a half apart. The bipedal impressions are for the most part trifold, and show the same number of joints as exist in the feet of living tridactylous birds. Now such birds have three phalangeal bones for the inner toe, four for the middle, and five for the outer one (see fig. 443); but the impression of the terminal joint is that of the nail only. The fossil footprints exhibit regularly, where the joints are seen, the same number; and we see in each continuous line of tracks the three-jointed and five-jointed toes placed alternately outwards, first on the one side and then on the other. In some specimens, besides impressions of the three toes in front, the rudiment is seen of the fourth toe behind. It is

Fig. 443.



Footprints of a bird. Turner's Falls, Valley of the Connecticut. (See Dr. Deane, Mem. of Amer. Acad. vol. IV. 1849.)

not often that the matrix has been fine enough to retain impressions of the integument or skin of the foot; but in one fine specimen found at Turner's Falls on the Connecticut, by Dr. Deane, these markings are well preserved, and have been recognized by Prof. Owen as resembling the skin of the ostrich, and not that of reptiles.* Much care is required to ascertain the precise layer of a laminated rock on which an animal has walked, because the impression usually extends downwards through several laminae; and if the upper layer originally trodden upon is wanting, the mark of one or more joints, or even in some cases an entire toe, which sank less deep into the soft ground, may disappear, and yet the remainder of the footprint be well defined.

The size of several of the fossil impressions of the Connecticut red sandstone so far exceeds that of any living ostrich, that naturalists at first were extremely adverse to the opinion of their having been made by birds, until the bones and almost entire skeleton of the *Dinornis* and of

* This specimen was in the late Dr. Mantell's museum, and indicated a bird of a size intermediate between the small and the largest of the Connecticut species.