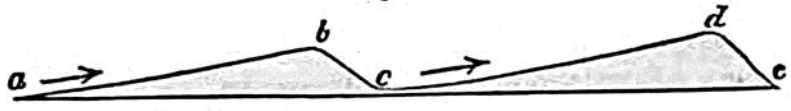
at low tide, seems to originate in the drifting of materials along the bottom of the water, in a manner very similar to that which may explain the inclined layers above described. This ripple is not entirely confined to the beach between high and low water mark, but is also produced on sands which are constantly covered by water. Similar undulating ridges and furrows may also be sometimes seen on the surface of drift snow and blown sand. The following is the manner in which I once observed the motion of the air to produce this effect on a large extent of level beach, exposed at low tide near Calais. Clouds of fine white sand were blown from the neighboring dunes, so as to cover the shore, and whiten a dark level surface of sandy mud, and this fresh covering of sand was beautifully rippled. On levelling all the small ridges and furrows of this ripple over an area of several yards square, I saw them perfectly restored in about ten minutes, the general direction of the ridges being always at right angles to that of the wind. The restoration began by the appearance here and there of small detached heaps of sand, which soon lengthened and joined together, so as to form long sinuous ridges with intervening furrows. Each ridge had one side slightly inclined, and the other steep; the lee-side being always steep, as *b*, *c*,—*d*, *e*; the windward-side a gentle slope, as *a*, *b*,—*c*, *d*, fig. 9. When a gust of wind blew

Fig. 9.



with sufficient force to drive along a cloud of sand, all the ridges were seen to be in motion at once, each encroaching on the furrow before it, and, in the course of a few minutes, filling the place which the furrows had occupied. The mode of advance was by the continual drifting of grains of sand up the slopes *a b* and *c d*, many of which grains, when they arrived at *b* and *d*, fell over the scarps *b c* and *d e*, and were under shelter from the wind; so that they remained stationary, resting, according to their shape and momentum, on different parts of the descent, and a few only rolling to the bottom. In this manner each ridge was distinctly seen to move slowly on as often as the force of the wind augmented. Occasionally part of a ridge, advancing more rapidly than the rest, overtook the ridge immediately before it, and became confounded with it, thus causing those bifurcations and branches which are so common, and two of which are seen in the slab, fig. 8. We may observe this configuration in sandstones of all ages, and in them also, as now on the sea-coast, we may often detect two systems of ripples interfering with each other; one more ancient and half-effaced, and a newer one, in which the grooves and ridges are more distinct, and in a different direction. This crossing of two sets of ripples arises from a change of wind, and the new direction in which the waves are thrown on the shore.

The ripple mark is usually an indication of a sea-beach, or of water from 6 to 10 feet deep, for the agitation caused by waves even during