came when it last blew across the dune; though it is at the same time probable, that since that happened some breeze or other has passed over, which has been too weak to displace the individual particles of sand. If then, under these circumstances, a wind springs up, making with the wind that last blew an angle of, say 30°, the whole of the ribbings will have totally changed their position. The same patterns re-occur in principle, but it is on another slope.

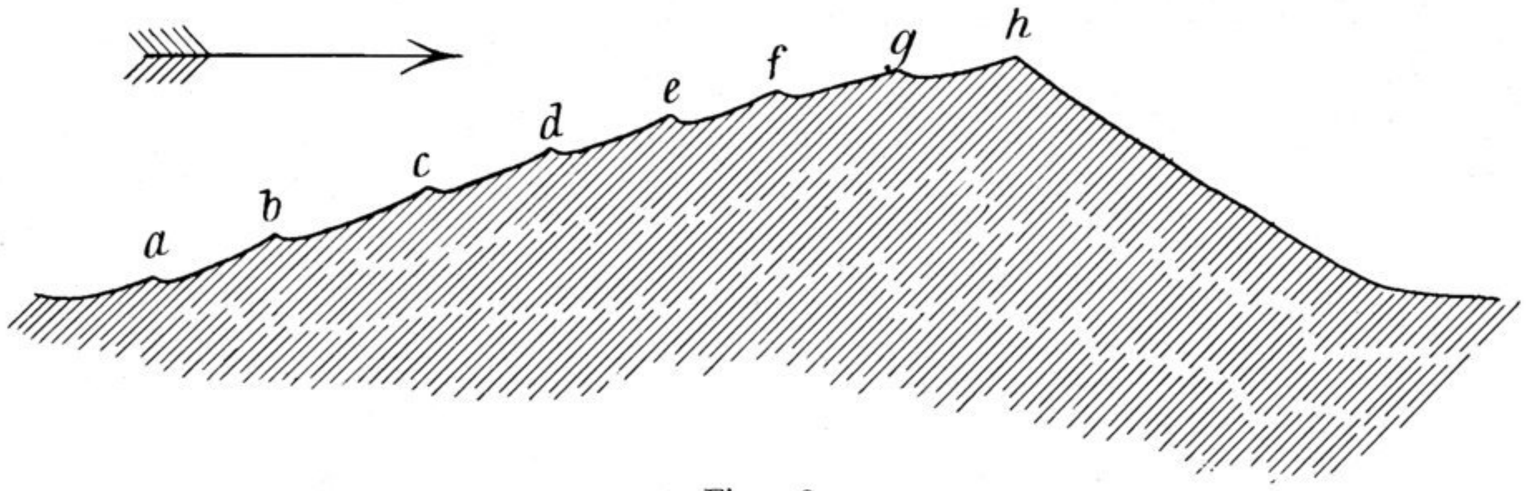

Fig. 189.

A dune will continue to increase so long as it is exposed to a constant wind, that carries with it a constant quantity of drift-sand. The fact that it is simultaneously progressive makes no difference, for the rate of progress is so small that it may be taken as negligeable when compared with the velocity of the wind. If then the dune grows and increases in size, it must from the beginning have been immeasurably small. Geological text-books tell us also, that the minutest obstacle is sufficient to give occasion for the origination of a dune. It would however be impossible to look for this earliest germ of the dune; for not only is the ground always so far uneven or full of minor irregularities that a tiny dune of this description never gets an opportunity to originate in a regular way, but a solitary ripple-mark would never, by reason of its lightness, remain *in situ* in the wind, but it would travel along the ground with almost the same velocity that the wind does, and the sand-particles would be dissipated. An embryonic dune is only able to maintain its position when its mass offers a sufficient amount of resistance to the wind. Its windward side is then so short that it affords no room except for a very few ripple-marks; but on a full-sized dune the ripple-marks may be counted by the hundred, all arranged in more or less parallel lines. In fig. 189 we see the profile of a dune, the

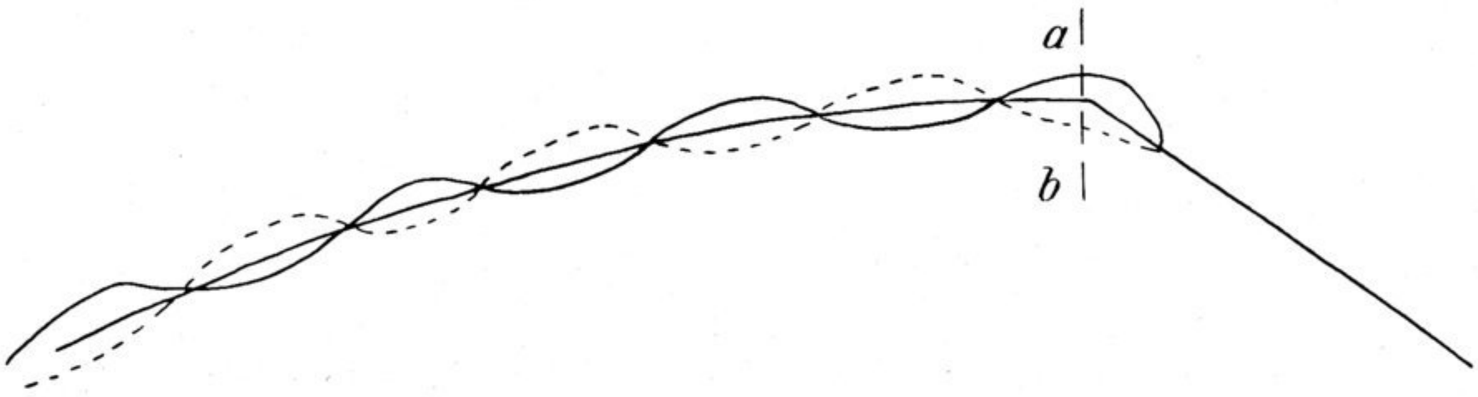

Fig. 190.