

hooks, especially in the absence of reliable historic data. Distinct as they are from a developmental point of view it is convenient to treat them as true hooks—with which, indeed, they have otherwise much in common.

Coming now to the subject of *mobility*, which affects in varying degree all shingle beaches to which the sea has access, so long as the sea beats on a shingle bank so long will its component parts be liable to displacement, unless it be covered and protected by dunes, or—as very rarely happens in Nature—becomes so densely clothed and bound with a robust vegetation as to defy the violence of the elements. There are three principal ways, quite distinct from one another, in which shingle is kept mobile; though all are operative on nearly every bank, their relative importance will vary in different cases.

**A. Wave Impact.**—When a great wave plunges on the face of a shingle beach it rushes up the slope, carrying with it much of the surface shingle which it encounters. As it approaches the crest it will on account of its diminishing velocity drop some of its burden of shingle. If the crest be overtopped a portion of this will be carried over to the lee side, whilst the water as it runs off on this side under the influence of gravity will carry with it the surface layer of the shingle over which it runs. Whether the water reaches the foot of the slope or whether it drains off through the beach will depend on the amount of water in motion and on the porosity and inclination of the shingle. The chief points to be emphasized are:—

- (1) That the displacement of shingle by the waves is superficial;
- (2) That if much water is traversing the crest a large part of the displaced shingle will be carried to the lee foot of the bank, where it will be thrown as a talus or fan encroaching on the marshes beyond.

In this way the crest will be lowered—an effect that is cumulative, for the more the crest drops the greater is its accessibility to the waves. One may see a single gale lowering the crest of a beach two or three feet, at the same time transporting great volumes of shingle down the lee slope. The result is a definite