

*Hurst Castle bank—progressive motion of sea beaches.*—Although the loose pebbles and grains of sand composing any given line of sea-beach are carried sometimes one way, sometimes another, they have, nevertheless, an ultimate motion in one particular direction.\* Their progress, for example, on the south coast of England is from west to east, which is owing partly to the action of the waves driven eastwards by the prevailing wind, and partly to the current, or the motion of the general body of water caused by the tides and winds. The force of the waves gives motion to pebbles which the velocity of the currents alone would be unable to carry forwards; but as the pebbles are finally reduced to sand or mud, by continual attrition, they are brought within the influence of a current; and this cause must determine the course which the main body of matter derived from wasting cliffs will eventually take.

It appears, from the observations of Mr. Palmer and others, that if a pier or groin be erected anywhere on our southern or south-eastern coast to stop the progress of the beach, a heap of shingle soon collects on the western side of such artificial barriers. The pebbles continue to accumulate till they rise as high as the pier or groin, after which they pour over in great numbers during heavy gales.†

The western entrance of the Channel, called the Solent, is crossed for more than two thirds of its width by the shingle-bank of Hurst Castle, which is about seventy yards broad and twelve feet high, presenting an inclined plane to the west. This singular bar consists of a bed of rounded chalk flints, resting on a submarine argillaceous base. The flints and a few other pebbles, intermixed, are exclusively derived from the waste of Hordwell, and other cliffs to the westward, where tertiary strata, capped with a covering of broken chalk flints, from five to fifty feet thick, are rapidly undermined. In the great storm of November, 1824, this bank of shingle was moved bodily forwards for forty yards towards the north-east; and certain piles, which served to mark the boundaries of two manors, were found after the storm on the opposite side of the bar. At the same time many acres of pasture land were covered by shingle, on the farm of Westover, near Lymington. But the bar was soon restored in its old position by pebbles drifted from the west.

Mr. Austen remarks that, as a general rule, it is only when high tides concur with a gale of wind that the sea reaches the base of cliffs so as to undermine them and throw down earth and stone. But the waves are perpetually employed in abrading and fashioning the materials already strewed over the beach. Much of the gravel and shingle is always travelling up and down, between high-water mark and a slight depth below the level of the lowest tides, and occasionally the materials are swept away and carried into deeper water. Owing to these movements every portion of our southern coast may be seen

\* See Palmer on Shingle Beaches, Phil. Trans. 1834, p. 568.

† Groins are formed of piles and wooden planks, or of faggots staked

down; and are used either to break the force of the waves, or to retain the beach.