

in the same county, at Button Ness, which were built on a tract of blown sand, the sea having encroached for three quarters of a mile.

Force of Waves and Currents in Estuaries—The combined power which waves and currents can exert in *estuaries* (a term which I confine to bays entered both by rivers and the tides of the sea) was remarkably exhibited during the building of the Bell Rock Lighthouse, off the mouth of the Tay. The Bell Rock is a sunken reef, consisting of red sandstone, being from twelve to sixteen feet under the surface at high water, and about twelve miles from the mainland. At the distance of 100 yards, there is a depth, in all directions, of two or three fathoms at low water. In 1807, during the erection of the lighthouse, six large blocks of granite, which had been landed on the reef, were removed by the force of the sea, and thrown over a rising ledge to the distance of twelve or fifteen paces; and an anchor, weighing about 22 cwt., was thrown up upon the rock.* Mr. Stevenson informs us, moreover, that drift stones, measuring upwards of thirty cubic feet, or more than two tons' weight, have, during storms, been often thrown upon the rock from the deep water.†

Submarine Forests.—Among the proofs that the sea has encroached on the land bordering the estuary of the Tay, Dr. Fleming has mentioned a submarine forest which has been traced for several miles along the northern shore of the county of Fife.‡ But subsequent surveys seem to have shown that the bed of peat containing tree-roots, leaves, and branches, now occurring at a lower level than the Tay, must have come into its present position by a general sinking of the ground on which the forest grew. The peat bed alluded to is not confined, says Mr. Buist, to the present channel of the Tay, but extends far beyond it, and is covered by stratified clay from fifteen to twenty-five feet in thickness, in the midst of which, in some places, is a bed full of sea-shells.§ Recent discoveries having established the fact that upward and downward movements have affected our island since the general coast-line had nearly acquired its present shape, we must hesitate before we attribute any given change to a single cause, such as the local encroachment of the sea upon low land.

On the coast of Fife, at St. Andrew's, a tract of land, said to have intervened between the castle of Cardinal Beaton and the sea, has been entirely swept away, as were the last remains of the Priory of Crail, in the same county, in 1803. On both sides of the Frith of Forth, land has been consumed; at North Berwick in particular, and at Newhaven, where an arsenal and dock, built in the reign of James IV., in the fifteenth century, has been overflowed.

East Coast of England.—If we now proceed to the English coast, we find records of numerous lands having been destroyed in North-

* Account of the Erection of the Bell Rock Lighthouse, p. 163.

† Ed. Phil. Journ. vol. iii. p. 54. 1820.

‡ Quart. Journ. of Sci., &c., No. XIII. N. S. March, 1830.

§ Buist, Quart. Journ. of Agricult., No. XLV. p. 34. June, 1839.