

new bay is of a somewhat circular form, and between *thirty* and *forty* miles in diameter. How much of this space may formerly have been occupied by Lake Flevo is unknown. (See map, plate 5.)

Destruction of Islands.—A series of islands stretching from the Texel to the mouths of the Weser and Elbe are probably the last relics of a tract once continuous. They have greatly diminished in size, and have lost about a third of their number, since the time of Pliny; for that naturalist counted twenty-three islands between the Texel and Eider, whereas there are now only sixteen, including Heligoland and Neuwerk.* The island of Heligoland, at the mouth of the Elbe, consists of a rock of red marl of the keuper formation (of the Germans), and is bounded by perpendicular red cliffs, above 200 feet high. Although, according to some accounts, it has been enormously reduced in size since the year 800, M. Wiebel assures us, that the ancient map by Meyer cannot be depended upon, and that the island, according to the description still extant by Adam of Bremen, was not much larger than now, in the time of Charlemagne. On comparing the map made in the year 1793 by the Danish engineer Wessel, the average encroachment of the sea on the cliffs, between that period and the year 1848 (or about half a century), did not amount to more than three feet.† On the other hand, some few islands have extended their bounds in one direction, or become connected with others, by the sanding-up of channels; but even these, like Juist, have generally given way as much on the north towards the sea as they have gained on the south, or land side.

The Dollart formed.—While the delta of the Rhine has suffered so materially from the movements of the ocean, it can hardly be supposed that minor rivers on the same coast should have been permitted to extend their deltas. It appears that in the time of the Romans there was an alluvial plain of great fertility, where the Ems entered the sea by three arms. This low country stretched between Groningen and Friesland, and sent out a peninsula to the north-east towards Emden. A flood in 1277 first destroyed part of the peninsula. Other inundations followed at different periods throughout the fifteenth century. In 1507, a part only of Torum, a considerable town, remained standing; and in spite of the erection of dams, the remainder of that place, together with market-towns, villages, and monasteries, to the number of fifty, were finally overwhelmed. The new gulf, which was called the Dollart, although small in comparison to the Zuyder Zee, occupied no less than six square miles at first; but part of this space was, in the course of the two following centuries, again redeemed from the sea. The small bay of Leybucht, farther north, was formed in a similar manner in the thirteenth century; and the bay of Harlbucht in the middle of the sixteenth. Both of these have since been partially reconverted into dry land. Another new estuary, called the Gulf of Jahde, near the mouth of the Weser,

* Von Hoff, vol. i. p. 364.

† Quart. Journ. Geol. Soc. vol. iv. p. 32.; Memoirs.