

OBSERVATIONS ON  
MARINE  
CURRENTS.

which was almost the only navigation known to the ancients and up to the middle ages. As early as the fifteenth century the Portuguese discovered the Guinea current; Vasco da Gama must have noticed the Mozambique current. In 1513 Antonio d'Alemanos observed the current of the Gulf Stream near Florida, and Varenius, as far back as 1650, places the source of this current in the Caribbean Sea.<sup>1</sup> From Sir Richard Hawkins' observations it is evident that the Gulf Stream had already been observed in the northern parts of the Atlantic between Newfoundland and Europe. It is probable that, as early as 1497, Sebastian Cabot observed the Labrador current, while the first navigators who ventured into the Pacific had to grapple with the cold current of Peru, as shown by their log-books.

Leonardo da Vinci, in explaining the currents running from the equator to the poles, said they were produced by an elevation of temperature, which expands the water, and would make an equatorial swelling were the waters unable to flow away by the currents, and thus re-establish the equilibrium of the surface of the sea. The cold currents from the poles to the equator had been explained in the seventeenth century by the great evaporation of the water in the tropical zones, which had to be balanced by water brought from higher latitudes. We may add that, even at that period, the salinity of the tropical waters was attributed to the same cause, viz., evaporation. The current towards the west, which had already been observed by Columbus, was interpreted as being in accordance with the rotation of the earth, not, however, in the sense of Copernicus, but by supposing the liquid envelope of our planet to be drawn from east to west by the movement of the "primum mobile" of the Ptolemaic system of astronomy.

In 1665 Athanasius Kircher traced on a map all that was then known of marine currents. J. Vossius discussed this important question, and collected together all the information extant in his time. He points to a "motus perpetuus" in the torrid zone, which follows exactly the course of the sun, and becomes more pronounced between the coast of Peru and the Moluccas; he also mentions a second similar motion running in a southern direction, dependent on the sun's movement, but modified sensibly in its course by the configuration of the African coast; and, lastly, he speaks of a "motus tertius priori semper contrarius," of which the Gulf Stream forms part.<sup>2</sup> Fournier, in his great work on hydrography, had, it is true, twenty years before Vossius given a careful list of all the localities, to the number of twenty, where currents had been noticed,<sup>3</sup> but he had formed no theory to explain these phenomena. We know of no really important addition to this subject during the eighteenth century.

<sup>1</sup> "In sinum Mexicanum impetuose inter Cubam et Jucatan illabitur mare, affluitque inter Cubam et Floridam" (Varenius, *Geographia generalis*, Camb., 1672, p. 119).

<sup>2</sup> Vossius, *De motu marium et ventorum liber*, Hagæ Comitum, 1663, pp. 1, 4, 8.

<sup>3</sup> Fournier, *Hydrographie contenant la théorie et la pratique de toutes les parties de la navigation*, Paris, 1643, p. 478.