it was almost impossible to determine exactly the moment when the float returned to the surface, and Hooke endeavoured to obviate this defect by a new apparatus, which he presented to the Royal Society in 1671. This improved "Explorator profunditatis, distantiæ, abyssi," had a sphere with a hole through the diameter, in the orifice of which he placed an axis with inclined blades. During the descent of the bathometer a hand connected with clockwork was set going by an endless screw, and acted as a marker. As soon as the weight was detached at the bottom, a spring closed the orifice with a valve and stopped the clockwork during the ascent. Lastly, a third improvement was introduced by Hooke. A vertical rod bore the wooden sphere intended to return to the surface, having on the upper part a float or buoy to show more distinctly the moment of emersion. The apparatus was provided, moreover, with two odometers—the one to register the descent, the other the ascent. The weight of the bathometer was held by a spring-hook; Bacciali replaced this by clutches, the arms of which held the sphere during the descent and opened to let it go on touching the ground.

These methods and bathymetrical apparatus increased but little the bathymetrical knowledge of the sea, and rendered insignificant services as regards soundings. The soundings taken during the period under consideration were made in the usual manner with lead and line, and were confined to spots near the coasts and in comparatively shallow waters. We have noted the fruitless efforts of Magellan to sound the Pacific; apart from this detail, which has only historical interest, there is little progress to record.

KIRCHER'S VIEWS AS TO THE DEPTH OF THE OCEAN.

Father Athanasius Kircher, in his encyclopædic work Mundus Subterraneus, devotes a chapter to oceanographical questions.[1] After having given the nomenclature of the oceans, and indicated the subterranean rivers supposed to feed the Caspian, so often mentioned by the ancients, he examines the opinions accepted in his time as to the depths of the sea. His doctrine that the deepest seas were to be found opposite the loftiest mountains was adopted by many. Kircher sums up his opinion on the subject thus:[2] "In the same manner as the highest mountains are grouped in the centre of the land, so also should the greatest depths be found in the middle of the largest oceans; near the coasts with slight elevations, the depth will gradually diminish towards the shore. I say coasts with slight elevations, for if the shores are surrounded by high rocks, then greater depths are there found; this is proved by experience on the shores of Norway, Iceland, and the Îles de Flandres." He imagines the bottom of the ocean, over its whole extent, to be very uneven. The marine plains must be found in those places not thronged with islands, where the declivities of the oceanic mountains are not pronounced. He brings forward scanty proofs in support of his theory, his experiments being mostly made on the sea-shore. He concludes by saying: "Ex his adductis patet, quam hallucinentur, qui putant, maris profunditatem ubique aut equalem esse, aut determinari posse certam ejus profunditatem; tam enim

[1] Kircher, Mundus Subterraneus, Amst., 1664, p. 85. [2] *Ibid.*, p. 97.