

South Atlantic at a depth of 46,000 feet;¹ and Lieutenant Parker, of the U.S. frigate 'Congress,' ran out a line 50,000 feet without reaching the bottom.² In these cases, however, the chances of error were too numerous; and in the last chart of the North Atlantic, published on the authority of Rear-Admiral Richards in Nov. 1870, no soundings are entered beyond 4,000 fathoms, and very few beyond 3,000.

A great improvement in deep-sea sounding, first introduced in the United States navy, was the use of a heavy weight and a fine line. The weight, a 32 or 68 lb. shot, is rapidly run down from a boat; and when it is supposed to have reached the bottom, which is usually indicated with tolerable certainty by a sudden change in the rate of running out of the line, the line is cut at the surface, and the depth calculated by the length of line left on the reel.

As the great problems of physical geography, the strength and direction of currents, and the general conditions of the bottom of the sea began to acquire more general interest, the particles brought up on the 'arming' of the lead from great depths were eagerly sought for and scrutinized; it thus became important that a greater quantity should be procured, enough at all events for the purposes of chemical and microscopical examination. Many instruments have been contrived from time to time for this purpose, and a vast amount of information has been gained by their use. It has now been shown that dredging on a large scale is possible at all depths, but dredging can only be performed under specially favourable circumstances, and requires a vessel specially fitted at con-

¹ Loc. cit.

² Loc. cit.