

is not wanted to keep it in. In fact it not only offers resistance to the entrance of the mud, but as its diameter is necessarily somewhat smaller than that of the tube B, the mud cylinder is also of less diameter than B, and rests on the valve L, leaving a passage between the mud and B. This interferes with the action of the instrument as a mud-pipette, on which its efficiency as a water-bottle depends. The instruments are fitted with mud tubes of two sizes, namely, the smaller of 1 inch diameter, and the larger of $1\frac{3}{4}$ inches diameter. In the ordinary routine work of running a line of soundings the smaller size should be used and without the comb valve. It is screwed into A on the top of a thin leather washer to make the joint tight. At each sounding a sample of the mud and of the bottom water will be obtained. When the tube is brought on board the mud tube is unscrewed, any water that may be on the top of the mud cylinder is poured off, and the mud cylinder itself pushed out by a metal plunger which just fits the tube. The water is simply poured out of the bottle into any convenient vessel. If the gases dissolved in the water are to be examined, then it must be drawn off by a siphon passed through the upper valve and down to the bottom of the tube.

This sounding tube has been very successfully used on board the ships "Dacia" and "International," belonging to the India-rubber, Gutta-percha and Telegraph Works Company, while surveying the route for the cable from Cadiz to the Canary Islands. It has the advantage that on board such ships, where rapidity of work is of the greatest importance, good samples of mud and of bottom water are obtained in the course of the ordinary routine work, and without having to use any extra instruments. The weight of the sinkers used was 60 lbs., but 50 lbs. is quite heavy enough. When the sinker is to be recovered its weight should not exceed 30 lbs.

Method of Taking Temperatures.—The actual method adopted on board the Challenger for obtaining the temperature below the surface was as follows:—A temperature line, of No. 1 sounding rope, 1500 fathoms in length, was kept on a separate reel, and a set of accumulators, twenty in number, fitted with a patent block at their end for the line to reeve through, was attached to either the fore or main yardarm, generally the main, so as to prevent the rolling of the ship bringing an undue strain on the line, and to keep it well clear of the ship's side. The rope was marked at every 10 fathoms for the first 200 fathoms, at every 25 fathoms for the next 100, and at every 50 fathoms to 700 fathoms, after which it was only marked at the 100 fathoms. Fifty fathoms were allowed for stray line at the beginning. It was first rove through a leading block on the deck, for the convenience of bringing it to the drum of the engine, then through the block attached to the accumulators, and then through the thimble of a "lizard," after which a cup lead was attached to it, of from $\frac{1}{2}$ to $1\frac{1}{2}$ cwt. according to circumstances. The weight was then lowered into the water 50 fathoms, or until the first mark on the line was level with the hammock rail, when the bight of the line was hauled in to the rail by means of the lizard, and a thermometer "bent on"; the bight of the line was then carefully eased out by the lizard until it hung perpendicularly from the yardarm, when 100 fathoms were veered and another thermometer attached, and so on until eight had been "stopped on." Only that number of thermometers was used at a time, as there is always a risk of the sounding line parting and the instruments being lost. As a rule it was not deemed necessary to obtain temperatures at every 100 fathoms below 1500