

soft mud. I mention these soundings thus particularly because they are the first authentic instances of any quantity of the bottom having been brought up from such depths. The clamms were used with strong whale line made of the best hemp, $2\frac{1}{2}$ inches in circumference. The weight recommended by Sir John Ross for the sounding in the North Sea is fifty pounds.



FIG. 37.—The
'Cup lead.'

One of the earliest and certainly not the worst of these miniature dredges is a simple modification of the common deep-sea lead, the 'cup-lead' (Fig. 37). A rod of iron passes through the lead, and ends a few inches beneath it in a conical iron cup. A thick bend-leather washer slides freely on the rod between the end of the lead and the cup. The theory of this instrument is, that as the lead runs down, the current of water keeps up the washer, leaving the mouth of the cup free. On reaching the ground, the weight of the lead drives the cup into the mud or sand, and the lead falls to one side. When the lead is hauled up, a sample of the bottom goes into the cup, and is retained there by the washer, which is pressed down upon the top of the cup during its upward journey by the reversal of the current. The 'cup-lead' is very

useful for moderate depths. Twice out of three times it brings up a sample, but the cup is too open and the means of closing it are too crude, and the third time everything is washed out and the cup comes up perfectly clean. Deep soundings take too