

iron rod, which terminates above in an eye, and below in an

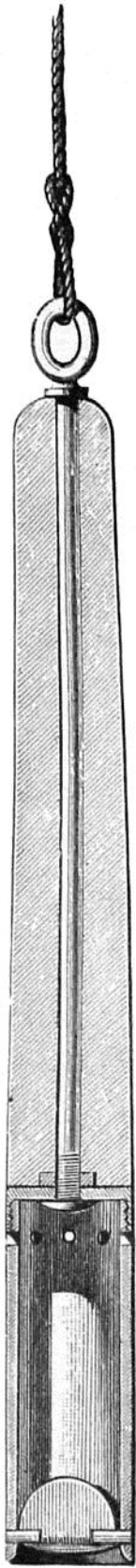


FIG. 15. — The  
"Valve"  
Sounding-  
lead (in Sec-  
tion).

iron disk, the diameter of the lead, with a short wide-threaded screw. On this is screwed a stout hollow cylinder of iron up to 13 inches or so in length, ending in a pair of butterfly-valves opening inward. "Valve-leads" on this plan are made of different sizes. The larger, which work easily down to 1000 fathoms with the No. 1 sounding-line, bring up a most satisfactory sample of the bottom. We still use "Ball's dredge;" and only some slight modifications have been the result of further experience. Fig. 16 represents the form of dredge which we find most suitable for work at all but the very greatest depths, when one of a smaller size is used. The dredge-frame of hammered iron is 4 feet 6 inches long, and 1 foot 3 inches broad. The scrapers are 3 inches wide, and are connected at the ends by bars of  $1\frac{1}{4}$  inch-round iron. The arms are of inch-round iron, and slightly curved; they are bolted together to a stout iron bar, which ends above in a swivel and ring. Two bars of square iron of some strength are attached by eyes to the round cross-bars at the ends of the dredge-frame, and have the other ends lashed to the iron bar which bears the hempen tangles. These rods keep the dredge-bag at its full length, and prevent it or the tangles from folding over the mouth of the dredge. The dredge-bag is 4 feet 6 inches in length; the lower half is of twine netting, so close as to retain every thing except the finest mud, which indeed only partially washes through; and the upper half is of twine netting, with the meshes an inch to the side. The bag is guarded by three loops of bolt-rope attached to the frame of the dredge, to the bottom of the bag, and finally to the tangle-bar.