

of the deck engines on the starboard side corresponding in diameter to the drum used on the port side, and from this it was finally taken and coiled. The strain was of course greatest at the yard-arm and the first leading-block, and by this arrangement it gradually diminished as the line passed round the series.

The Dredge-Rope.—For dredging and trawling we were supplied with rope of three different sizes—2 inches, $2\frac{1}{2}$ inches, and 3 inches in circumference respectively. This cordage was made of the best Italian hemp, tarred, well hackled and rubbed down, and laid up softly. The 2-inch rope weighed 95 lbs. per 100 fathoms, and its breaking strain was 1 ton 12 cwts.; the $2\frac{1}{2}$ weighed 158 lbs., with a breaking strain of 2 tons 6 cwts.; and the 3-inch, 220 lbs. per 100 fathoms, with a breaking strain of 2 tons 11 cwts. In proportion to its weight, therefore, the 2-inch was the strongest rope, and this or the $2\frac{1}{2}$ -inch was used for deep trawling or dredgings, the 3-inch rope being reserved for comparatively shallow water. The dredge-rope was “marked red” at every 100 fathoms.

When we left England we had 10,000 fathoms of 3-inch rope on board, 4200 fathoms of which were expended. Of $2\frac{1}{2}$ -inch rope we had 10,000 fathoms; we got out 21,000 fathoms during the voyage, and expended a total of 27,100 fathoms. Of 2-inch rope we started with 5000 fathoms, got 10,000 fathoms additional, and expended 10,860 fathoms.

The rope was spliced together so as to form an uninterrupted length of 4000 fathoms, and it was kept coiled away in racks on the forecastle, each size by itself. When we first used rope in such great lengths we spliced swivels in at each 500 fathoms to take the turns out; but if care be taken in splicing that all the lengths of rope are twisted in the same direction, this precaution is unnecessary, and as the swivels sometimes got jammed in the blocks they were shortly discarded.

The Deep-Sea Dredge.—The dredge in ordinary use in the CHALLENGER is represented in fig. 8. 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 short iron tongue 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 an iron bar which bears the hempen tangles. These rods keep the dredge-bag at 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; it is made of netting of soft line (something like marline), the meshes an inch to the side, and the lower third is lined with bread-bag stuff to prevent even the smallest animals washing out whilst the dredge is being hove in. 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. The canvas pads represented in