of 3000 fathoms of line in water was roughly 108 kilos. When heaving the lead the weight used was sometimes 150 and sometimes 200 kilos. During the whole of the voyage of the "Challenger" only two temperature lines with eight thermometers, and nine sounding-lines with thirteen thermometers, were lost; eleven thermometers collapsed under high pressure at great depths.

For dredging and trawling they employed hemp lines 2, $2\frac{1}{2}$, and 3 inches in circumference, with a breaking strain from 1600 to 2550 kilos, spliced together to form a length of 4000 fathoms, which was coiled on the forecastle (1, 2, and 3). An attempt was made to use swivels to keep the line from twisting, but this had to be abandoned owing to their being damaged in the blocks.

It is evident that in the arrangement and working of all the apparatus account had to be taken of these immense lengths of line. In the first place, they were extremely bulky, and required a large amount of deck space for coiling and handling, as the line had first to be led from the forecastle to the winch, and frequently from the end-drum on one side of the axle to its fellow on the other side, when the strain on the dredging rope was so great that the friction of the revolving drum was not sufficient to make it bite. This happened sometimes even when ten or twelve men were holding on abaft the winch. A second important consideration was the severe strain on the line every time the big heavy ship lurched, or when the lead or the dredge stuck fast on the bottom.

The weight of 3000 fathoms of sounding-line in water was, as already stated, over 100 kilos, and the weights amounted to 200 kilos, so that there was not much margin left for friction in the water and accidental jerks, when we remember that the breaking strain was only 700 kilos. Accordingly, when sounding or trawling great care had to be taken to provide against such contingencies, and large accumulators were used, consisting of rubber bands 3 feet long and $\frac{3}{4}$-inch thick, which could be extended to 17 feet, and thus counteracted sudden jerks on the line. For sounding, forty of these were employed, while for trawling there were as many as eighty, which together could support $2\frac{1}{2}$ tons, or the breaking strain of the line.

Fig. 2 shows the two accumulators, one for sounding and the other for trawling, attached to blocks high up on a yard, thus enabling them to expand and contract freely.

Before sounding all sail was taken in, and the ship was