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PLAN FOR PROTECTING SHIPS (AT ANCHOR), BLOCK-
ADING A PORT FROM ATTACKS BY OUTRIGGER
WHITEHEAD, OR HARVEY TORPEDOES.

By Lieutenant CHARLES LINDSAY, R.N.

THE mode of conducting naval warfare has undergone great changes in, so to speak, late years, through the introduction of torpedoes. This new weapon being unseen, and taking effect under water, is all the more difficult to guard against. Hidden enemies being always the most dreaded, the moral effect is very great; so much so that a fleet was kept off a port, in the late war, by a harbour protected by dummy torpedoes. When the torpedoes arrived, the burgomaster was afraid to charge them, but laid them out empty. And at the completion of the war, when the dummies were taken up, the burgomaster was congratulated by several consuls on the masterly way in which it had been performed, no loss of life having been caused in the task—really a most dangerous one, as we know that after the American war, at Charleston, where the same men who laid them down took up the mechanical torpedoes there was great loss of life.

Many attempts have been made to protect ships against this hidden foe, by increasing the number of compartments and by giving ships double bottoms.

But the subject I wish particularly to treat of, is guarding ships against offensive torpedoes, viz., the Whitehead, the Harvey, and the Outrigger.

In 1873, the "Monarch" was protected against the two latter descriptions, under the superintendence of the Naval Torpedo Committee, by her own spars and stores; but as the "Monarch" had been only temporarily commissioned for the visit of the Shah, and had not her stores on board, she was supplied by the dockyard with what were called her own stores. She used her topmasts, trysail masts, and longest spars; round these spars were hawsers, at various distances from the ship's side, of wire and rope, and from bow and quarter-spars were hung grapnels. This took about a week to get ready, but it was said that it could be done by a ship, with her own spars and stores, in twenty-four hours.

This protection will be seen at a glance was useless against the Whitehead, as we know that it can be set to go at a certain distance under water, therefore obstructions on the surface were of no avail.

The ship was partially protected against the Harvey by the grapnels,

Fig. 1.

STAYS STOWED AT SHIPS SIDE.
Scale $\frac{1}{8}$ " = One Foot.

Fig. 4.

Fig. 2.

Scale $\frac{1}{8}$ " = One Foot.

PLAN

PLAN OF STAY FOR KEEPING NETTING VERTICAL.
Scale $\frac{1}{8}$ " = One Foot.

SECTION OF OUTRIGGER. Scale, 1" = One Foot.

PLAN OF OUTRIGGER

Fig. 3.

for a gun-boat tried to strike the ship in passing, but once only the levers were pressed down. However, if the "Monarch" were to come up astern, to ram a ship with the Harvey placed astern or on the quarter, and hung like a life-buoy, as proposed, the object being to use it on the defensive, she (the "Monarch") would have no protection against this application of the Harvey.

The Outtrigger torpedo was tried in a steam pinnace. The ship had steam up, and slipped on a given signal. The pinnace came at her from some distance ahead, and was very nearly capsized by the hawsers, but was near enough to have exploded the torpedo in contact, or very near it.

The want of a protection of some sort for ships was evident in the last war, where a whole fleet was incapable of acting through fear of torpedoes. The French Fleet had to steam out to sea every night, to avoid outtrigger torpedo-boats, and when they came in next day, it was almost time to start again. What evidently was required, then, was a more perfect protection, which could be quickly got out and in, allowing the ship to keep under weigh, moving slowly, if necessary, as in blockading a port.

I forwarded a plan to the Lords Commissioners of the Admiralty for this purpose—a wire netting, equal in depth to the draught of water of the ship, completely surrounding her. This was hung from iron-jointed outriggers, three on each side and one astern, the jibboom answering that purpose ahead. There were four joints in each out-rigger, of flat iron, each joint ten feet. The Committee had made forty feet, a *sine qua non*. I endeavoured to find out the reason, but failed. I think that a less distance would do, especially as the "Oberon" experiments have clearly shown at what close proximity the charge must be to do any damage to the bottom of the vessel. These outriggers were supported by topping lifts and guys, and could be triced up or lowered, the mode of supporting them being merely a matter of seamanship; and, when not in use, they were fitted to fold up and stowed perpendicularly against the ship's side, and secured by lashings. The netting was rolled up and stowed in boom-boats amidships, so that it could be hoisted out with them and run round the ship, in an hour at most, the outriggers being got out and unfolded by another boat, as will be more fully described further on.

The Committee found fault with this plan on account of the non-rigidity of the outriggers and their insufficient number and strength (the two latter being merely a matter of detail), and they did not think it so good as a plan of their own, which they brought out about the same time. In their plan, which was tried on Her Majesty's ship "Glatton," the net was the same as above described, but hung by ship's spars, and was supposed to be got ready in twenty-four hours. The net flapped up under the bottom, with a tide about three or four knots, or moving ahead at that rate, when the net flapped up, the side was unprotected from the Whitehead, and the vessel was excessively unbandy, owing to the complicated arrangements. She was considered successfully protected against a boat, but not a gun-boat using an outtrigger, as gun-boats of the "Comet" class are to be fitted with.

I proceeded to remedy the faults in my former plan, and trust I have successfully done so in the annexed diagram.

Fig. I is an elevation, showing an iron-clad ship (Her Majesty's ship "Bellerophon") with the wire netting hung by three-jointed outriggers, one on each side, one astern, and by jibboom ahead.

Fig. II is a plan showing outriggers in four lengths of ten feet each, made of gas piping (gas piping being used on account of great strength, lightness, and cheapness), supported by topping lifts from yardarms, guys, &c. The netting is supported between the outriggers by a span from yardarms, which, with the topping lifts, would enable the netting to be triced up, to effectually prevent any attempt to override them by outrigger boats. A wire rope goes round the ship, about ten feet from the netting, and a hawser ten feet inside that; these are a further support to outriggers, also a further protection against outrigger boats.

Fig. III is a section of a length of outrigger, showing the joint, the ends being tapped to receive solid metal plugs, through which pins are placed that the tongue works on, and allows them to turn up when not in use. The tubing which goes over the joint keeps the outrigger rigid, and when the outrigger is not in use, the tubing is pushed back and the pin put in, to keep it in place, as shown in Fig. IV of outrigger stowed for sea.

Fig. V shows the stay for keeping the netting perpendicular. The rod B A is small and solid, and goes in and out of different meshes, as shown in Fig. I. A D is the same size as B A, and works as shown in Fig. IV. B C D is the ordinary outrigger of gas piping, but is shown small and same size as B A and A D, to show the idea more clearly.

This gets over the failure in Her Majesty's ship "Glatton," of the net flapping up under the bottom.

A Whitehead torpedo striking this netting will explode, and merely damage the net at that place. This has been found out by actual experiment.

When the ship is at sea and outriggers are not in use, they are folded up and lashed against the ship's side, as in Fig. III. They would not be in the way or unsightly.

The netting, which is the same depth as the draught of the ship (certainly not more than 28 or 29 feet), would be rolled up in lengths, as convenient. The netting for each side of the ship being in two lengths, would probably suit best for a large ship, the diameter of the roll for 50 yards being about 18 inches. These rolls I propose stowing two in each boom-boat amidships, the length of the roll being 12 to 15 feet less than the length of the boat, they could be stowed easily.

On arriving off an enemy's port, and wishing to remain under weigh for blockading or other purposes, the boom-boats would be hoisted out and netting run round the ship; another boat each side assisting to place the outriggers and secure the netting to them. The boats would then be hoisted in again, and the ship steam slowly (from three to four knots at least), as required. The anchor might be let go, if necessary, and guard-boats placed round the ship. It would be

advisable to have "service hand-charges" and other appliances suitable to the situation in them, which would effectually dispose of any of the enemy's boats that approached.

The ship ought also to have several 20-pound Armstrong's, loaded with case, and given extreme depression, so as to strike the water at about the end of outriggers; these guns should be kept loaded.

When required to go to sea, the boats will be hoisted out, the netting got in, and the outriggers secured, as already described. It would certainly not take more than one hour to rig and half-an-hour to unrig.

DELINEATIONS OF SOME MINUTE SEA-SURFACE ANIMALS.—From Coloured Drawings by Mrs. TOYNBEE.

PART III.

(Continued from page 379.)

For instructions regarding means of capture, examination, &c., see page 214.

PLATE V.

- Fig. 55. April 23rd, 1857. Lat., 23.29 S.; long., 3.33 E. Temperature of surface water, 67°. This larva crustacean was taken by the net from a very phosphorescent sea, but died before it could be examined.
- „ 56. March 6th, 1857. Lat., 0.57 S.; long., 82.49 E. Current, N., 30 E., 25 miles. Temperature of surface water, 81°. *Copilia mirabilis*. The striped claw on each horn was very distinct.
- „ 57. *Anomalocera*, *Crustacea*, *Copepoda*.—March 28th, 1857. Lat., 29.22 S.; long., 44.55 E. Current, S. 74 W., 5 miles. Temperature of surface water, 73.9°. The eyes appeared to be multiplex, and the circles on them moved regularly to and fro like a piece of machinery.
- „ 58. *Larva*?—No description.
- „ 59. *Crustacea*, *Amphipoda*.—Nov. 13th, 1856. Lat., 32.42 S.; long. 76.19 E. Temperature of surface water, 62°. Crustacean found in a jelly fish. It appeared to respire by a quick movement of the hind legs. In the legs there was a distinct circulation of a colourless fluid containing a few corpuscles, the fluid running down one side of the leg and up the other.
- „ 60. *Crustacea Amphipoda*.—April 17th, 1857. Lat., 31.13 S.; long., 13.18 E. Current, N. 65 W., 7 miles. Temperature of surface water, 63°. Pumped up this shrimp, as it may be called; it was probably brought by the northerly current into the deep sea.
- „ 61. *Larval Crustacean*.—Jan. 9th Lat., 16.18½ N.; long., 82.22 E. Temperature of surface water, 75.5°. This was caught in the bucket from about a depth of ten fathoms. It kept its legs in very rapid motion. Its eyes were multiple, it does not seem to belong to the deep sea.

PLATE VI.

- „ 62. *Larval Holothurioid*?—May 17th, 1858. Lat., 35.26 S.; long., 18.40 E. Current, N. 78 E., 2 miles. Temperature of surface water, 65.3°.

Caught two of these larvæ in the bucket; in both were detected wings as they flapped quickly through the water, though when placed under the microscope there was no sign of them; nothing was in motion save the active ciliæ and the incessant contraction and expansion of the flexible body, especially at the upper end.

- Fig. 63-4. April 9th, 1857. Lat., 31.59 S.; long., 19.55 E. Current, S. 64 W., 14 miles. Temperature of surface water, 61°. Caught this holothuria? in the net, besides numerous crustaceæ. Its first appearance was cup-shaped, as in Fig. 63, then changed its form by projecting its mouth as in Fig. 64; after working it actively for some time with a kind of sucking motion, it drew itself into a ball and died.
- „ 65. Oct. 6th, 1857. Lat., 12.06 N.; long., 26.49 W. Current, N. 49 W., 28 miles. Temperature of surface water, 80°. Nearly calm; caught two. The ciliæ and long feelers were kept in very active motion, and the sucker-like mouth contracted and expanded.
- „ 66. *Phyllozoa*?—Dec. 14th, 1857. Lat., 9.35 S.; long., 82.47 E. Current, S. 66 W., 24 miles. Temperature of surface water, 81°. The side paddles of this annelid all seemed to consist of two pieces as shown in enlarged drawing.
- „ 67. *Mcusomatotatus Worm*?—Nov. 23rd. Found this worm, which swam freely in the water, though when placed in a drop of water under the microscope it was very quiet.
- „ 68. *Annelida, new form*?—March 9th, 1857. Lat., 7.35 S.; long., 84.11 E. Current, N. 45 E., 17 miles. Temperature of surface water, 80.4°. This annelid moved through the water with a wriggling motion, moving its fins rapidly.
- „ 69. *Annelid Larva*.—April 9th, 1858. Lat., 12.48 S.; long., 74.30 E. Current, N. 24 W., 17 miles. Temperature of surface water, 81.2°. This larva was very active, darting about and working its ciliæ. When under the microscope there was no trace of internal formation, eyes or mouth, the whole looked one soft contractile, elastic mass.
- „ 70. No description.
- „ 71. Dec. 26th, 1857. Lat., 1.05 S.; long., 85.13 E. Current in two days, S. 73 E., 58 miles. Temperature of surface water, 81°. Caught this creature which moved about its large mouth, contracting and expanding its body, the dark mark on the body looked raised and hard.
- „ 72. Dec. 24th, 1857. Lat., 4.03 S.; long., 82.11 E. Current, S. 25 E., 19 miles. Temperature of surface water, 80.9°. Found this shell; it was very light, floating on the top of the water.
- „ 73. *Macgillivrayia, or Cheletropis*.—April 27th, 1858. Lat., 29.30½ S.; long., 45.32 E. Current, S. 42 E., 9 miles. Temperature of surface water, 76.7°.
- „ 74. April 22nd, 1858. Lat., 27.29 S.; long., 52.51 E. Current, N. 2 E., 22 miles. Temperature of surface water, 75.1°. This delicate little medusa worked its crown of ciliæ actively.