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Flexible Coffe-Dams for Cleaning and Repairing Ships Afloat

Captain H. F. M'Killop R.N.
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and the most perfect accuracy, orders from the captain to any part of the ship. What would have been the old sailor's astonishment? Fancy his look of mingled incredulity and wrath? And yet how calmly we look upon these improvements now, taking them as matters of course, and wondering why such things have not always been. In the next century, possibly, "our ancestors," as Paddy said, "will look back upon his posterity" in the same manner in which we look back upon the people of a past age. The wedge being introduced, and the ball of science set rolling, it will doubtless continue to roll, gathering daily every grain of science that the teeming brain of man conceives, and so keep on increasing in volume, and constructing of the diurnal atoms an offering to Him who endows us with reasoning power, until this world itself shall cease to roll its daily course. I have said before that all classes of society on shore *have* their electric telegraphs, and I therefore submit to *this Institution* that it is very hard that sailors should *not* have theirs; and I would also move that this Institution do consider the necessity of applying electricity to certain nautical purposes, believing that should we fit the apparati, sparks will not fly from the wires and set fire to the loose powder about the decks, as some officials to whom the subject was explained have feared, though we can, if we like, by frictional electricity discharge a ship's broadside as one gun.

FLEXIBLE COFFER-DAMS FOR CLEANING AND REPAIRING SHIPS AFLOAT.

By Captain H. F. McKILLOP, R.N.

THE very limited dock accommodation available for our large ships, either at home or abroad, has now become a serious consideration, both to the Government and mercantile naval authorities. The almost universal use of iron for ship-building, is only checked by the frequent necessity now existing for docking iron ships, to remove the incrustations, weed, &c., which so rapidly form on their bottoms; not large ships only feel this want of dock accommodation, "for in many parts of the world where our ships of war are frequently stationed for three or four years, and to which numbers of our merchant ships are constantly trading," no docks or other convenience for cleansing, painting, or repairing the bottoms of our ships, exist *at all*. Heaving down the long flat-floored ships of the present day would be a long and dangerous process, and in the case of a steamer almost impossible without removing her machinery. The helmet and diving dress, although most useful for examining the bottoms of ships afloat, and even for effecting trifling repairs, does not at all meet the necessity. Cofferdams have for many years been used for these purposes, but hitherto they have invariably been constructed of rigid material made

expressly, and after the accident had happened, to *fit any one particular part* of the hull, where repair was needed. This was the case with the "Great Eastern," after her accident off New York.

The great expense and delay necessary to fit such coffer-dams renders their use of rare occurrence, and I have only alluded to them, as the machine to which I wish to call your attention bears an affinity to them; but instead of being constructed of rigid material to fit one particular section of the ship, it is made of a flexible material, and capable of being applied to any part of the ship for which it may be made. I claim for this machine the advantage of being inexpensive and portable; when rolled up, not occupying more space than a rain awning or a topsail; the circular backed ladder which goes down inside the coffer-dam, takes to pieces and stows away in a case "*not so large as a midshipman's chest.*" The air pump (where one is needed) is quite a small affair. I say where one is needed, because all ships, having Gossege's or Hearn's pumps, such as are used in Her Majesty's service, need not have the air pump, as those pumps answer the purpose of inflating the cylinders or tubes by simply taking off the suction and drying the pump well out before using it. My triangular coffer-dam is simply a modification of the other, made to be used at the bow and stern, supported in one case by the bowsprit, and in the other by a spar placed there for the purpose. These machines, although not so portable as the *jacket*, are very important, inasmuch as they enable you to examine and repair your stem and stern post; or in screw steamers with non-lifting screws to do the same to them. As to the question of light to enable the men to see under the bottom, simply a globe-lamp or police light lowered down inside the ladder, answers all purposes, and is only required under the floor.

I now come to the cleaning process without using a coffer-dam; for iron ships up to the present time this has been a great necessity, for although numerous inventions have been announced (my own amongst others) *no one* has yet succeeded in producing a *composition*, the use of which would enable an iron ship to be kept three years on a station where she could not be docked; in fact it is very rare to find an iron ship kept perfectly clean even for a year.

Failing the means of *keeping* ships clean, it becomes necessary to have the means of cleaning them when they become foul. One side of the flexible machine I propose to use, as I have already done, for the purpose of quickly and thoroughly cleaning the bottom of a ship, not by the process of scrubbing or scraping, but by the use of unslaked lime introduced between the ship and the canvas lining, which lime being slightly wetted, soon in the process of slaking, destroys all animal and vegetable life, which may then be readily and thoroughly removed, by the machine being drawn along the bottom, some of the air having previously been allowed to escape from the cylinder, in order to ease the pressure of the machine from the ship's bottom.

In the machine made for the "Recruit" I have brushes introduced near to the cylinders on the off side, simply to remove the lime and any foul matter on which it has already acted. I do not believe in scrubbing iron ships. I have been told by many who have scrubbed their ships,

MACKILLOP'S SYSTEM OF CLEANING SHIPS BOTTOMS.

Fig. 1.

Half Transverse Section of Vessel

- A. A. Air Cylinders.
- B Topmast to keep the end of the Dock down.
- C Globe Lamp.
- c. c. Oringles.
- D. Air Cylinders.
- E. Cork Floats to fill the Garboard between the Cylinder and the Keel F.

Fig 2.

Front View

Fig. 3.

Fig. 4.

Triangular Dock or Coffer dam for Bow or Stern.

Fig. 5.

H.B.M. M.C.K.

particularly in tropical climates, that after one scrubbing, the growth is three times as quick and is much thicker than it was before. Indeed, I believe that the hogging process at sea only tends to irritate the grass, much as our brushing and sweeping our lawns on shore tends to stimulate the growth of the grass. Whether it is the same with the fish I do not know. The foul matter removed from the "Recruit" in my first attempt at acting upon it by lime, clearly proved that both animal and vegetable life were thoroughly destroyed by the action of the lime, and that life had to be renewed by a new formation. I do not say that in a short time a new formation would not exist, but by destroying it with lime you have this advantage over scrubbing, that you destroy the germ of the animalcule and the seed of the grass.

The evident utility of this machine for stopping a leak needs no comment, the simplicity of its application and the closeness of its fit to the hull, are easily seen. Another purpose for which it may be used is for a *float* or pontoon; by doubling the machine and lacing the parts together, a sort of boat is formed, so buoyant that for landing on a lee-shore through a surf, few boats, built expressly for the purpose, would answer better. In conclusion, I beg to point out, that I do not confine myself to one or two materials for the construction of the air tubes or lining of these machines—in some cases I would use india-rubber, or rather canvas prepared with india-rubber; and in other cases leather riveted as in our hoses; and I propose to try vulcanized rubber, with canvas coverings faced with farnought, and luted with beeswax and tallow, on the part of the cylinder which comes in contact with the ship's side and bottom.

In the meantime I have confined myself to leather and india-rubber, and have succeeded, as far as the principle is concerned. The thing is still in its infancy; I trust it may be further developed as a useful means of getting under water to examine ships without the use of diving dresses, and without the great expense of sending ships home from foreign stations to be docked.

I must apologise for the roughness of my models, but the half-pay of a sailor who has to develop the merits of an invention admits of no extravagance in that direction.

The flexible-jointed ladder shown in Figs 2 and 3, is used as a means of going down the ship's side, inside the canvas machine. Fig. 3 shows the arched back piece which prevents the man from being jammed up against the ship's side by the pressure of the water outside, and also gives him room to use a scraper, brush, or other tool, after the water has been pumped out of the coffer-dam thus formed.

Fig. 4 shows triangular dock or coffer-dam for bow or stern. Fig. 5 the same applied to the stern. This figure shows the stern higher out of the water than would be the case under ordinary circumstances.