

Mr. HAYTER, President, announced with sorrow that since the last meeting one of the Members of Council, Mr. Edward Alfred Cowper, had passed away. He had been a regular attendant at the Meetings, and had often taken part in the discussions, his remarks being always apt and to the point. Like his father, whom the President knew well, he was a born mechanic, and though he had never constructed any large public works, owing to the particular nature of his calling, he had done much useful work in his generation. His life had been governed by a high moral standard, which he had faithfully acted up to. The Council had at their meeting passed the following resolution:—

“That this Council desires to express great regret at the loss of its colleague, Mr. E. A. Cowper, and to convey sincere sympathy to his Widow and family in their sad bereavement.”

In that resolution he asked the members present to concur, in order that their acquiescence might be incorporated with the resolution, which would thus have additional value in the eyes of his family, his relatives, and his friends.

(*Paper No. 2691.*)

“Wreck-raising in the River Thames.”

By CHARLES JAMES MORE, M. Inst. C.E.

THE raising of sunken vessels is an important duty devolving on Conservancy Boards and other harbour authorities, and is one to which, in the case of the River Thames, considerable attention has been directed for many years past. The casualties in a comparatively narrow waterway, crowded with craft of every size and description, must necessarily be numerous. Soon after the control of the river passed into the hands of the Conservators, they became convinced of the necessity of providing and maintaining, in the most efficient state, the appliances required for speedily raising and removing out of the fairway sunken vessels of large tonnage.

The power to raise or remove wrecks and obstructions was conferred by Parliament on the Conservancy Board in 1857, but was then limited to cases where the owner neglected or refused to undertake the work, after receiving due notice requiring him to do so. In 1870 this power was extended, so as to enable the Conservators to proceed at once with the removal of wrecks without incurring the delay consequent on communications between

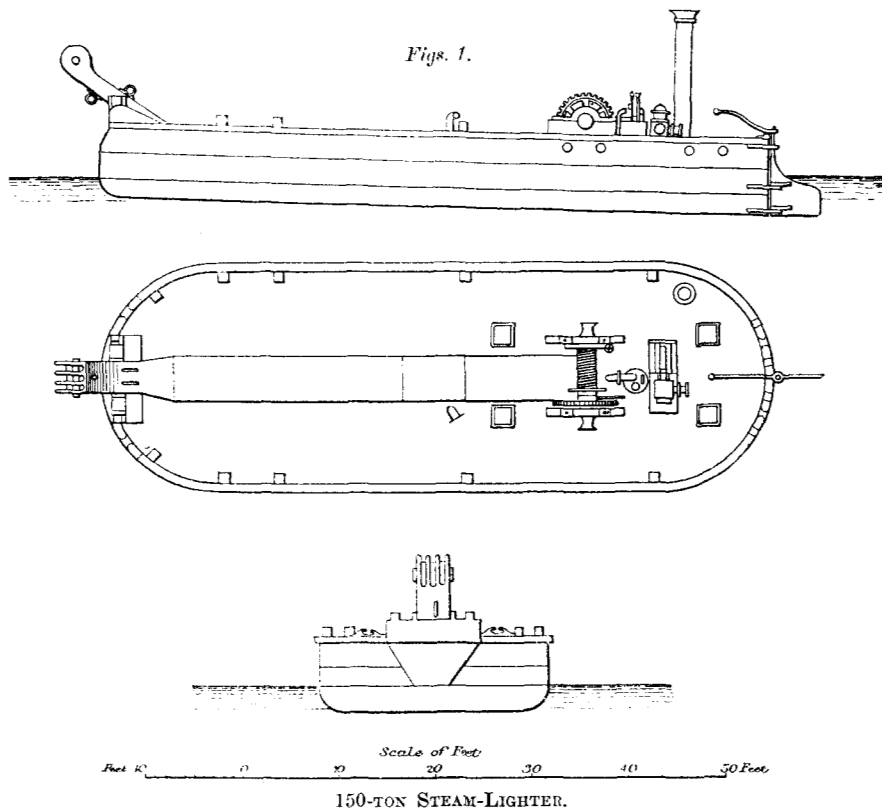
themselves and the owners. The Conservators are also empowered to recover from the owners the whole of the cost and charges incurred in raising sunken vessels, and in the event of non-payment they may sell the vessel and her cargo; and further, should the amount realized by the sale not be sufficient to satisfy their claim, they may sue the owner for the balance.

In organizing the wreck-service, advantage has been taken of the circumstance that the ship's moorings in the Port of London are under the control of the Conservators, and that the examination and repair of these moorings necessitate the continuous employment of a staff of skilled men. All the lighters required for the mooring-service are also adapted for wreck-raising, and the permanent staff of men, well trained to the work, is available at the shortest notice. In addition to the mooring-service lighters, special lighters have been constructed for the sole purpose of wreck-raising, and are kept in constant readiness for use at the Conservancy wharf at Millwall.

The craft available for wreck-raising consist of:—Five lighters, each 70 feet long by 24 feet beam, and having a lifting power of 150 tons; two lighters, each 90 feet long by 24 feet beam, with a lifting power of 300 tons; two lighters, each 108 feet long by 28 feet beam, with a lifting power of 400 tons; the total lifting capacity of these nine lighters is, therefore, 2,150 tons at their ordinary load-line, but by submerging them more deeply, as is frequently done, a much greater lifting power can be obtained. Besides the lighters, there are: A screw steam-tug, 60 feet long by 14 feet beam, with engines of 30 HP. (nominal); a wreck-vessel, stationed at Gravesend, to mark the position of sunken craft in the lower reaches of the river; whilst three wreck-boats are kept at different stations in the upper and less exposed reaches. In addition to these appliances the steam-tug employed in towing barges in attendance on the dredgers is fitted with a powerful centrifugal pump, with a delivery pipe 15 inches in diameter, which can be used at any time when extra pumping power is required. A large quantity of material is kept in stock at the wharf, such as wire-rope, chains, shackles, diving-apparatus, wreck-lanterns, and other gear.

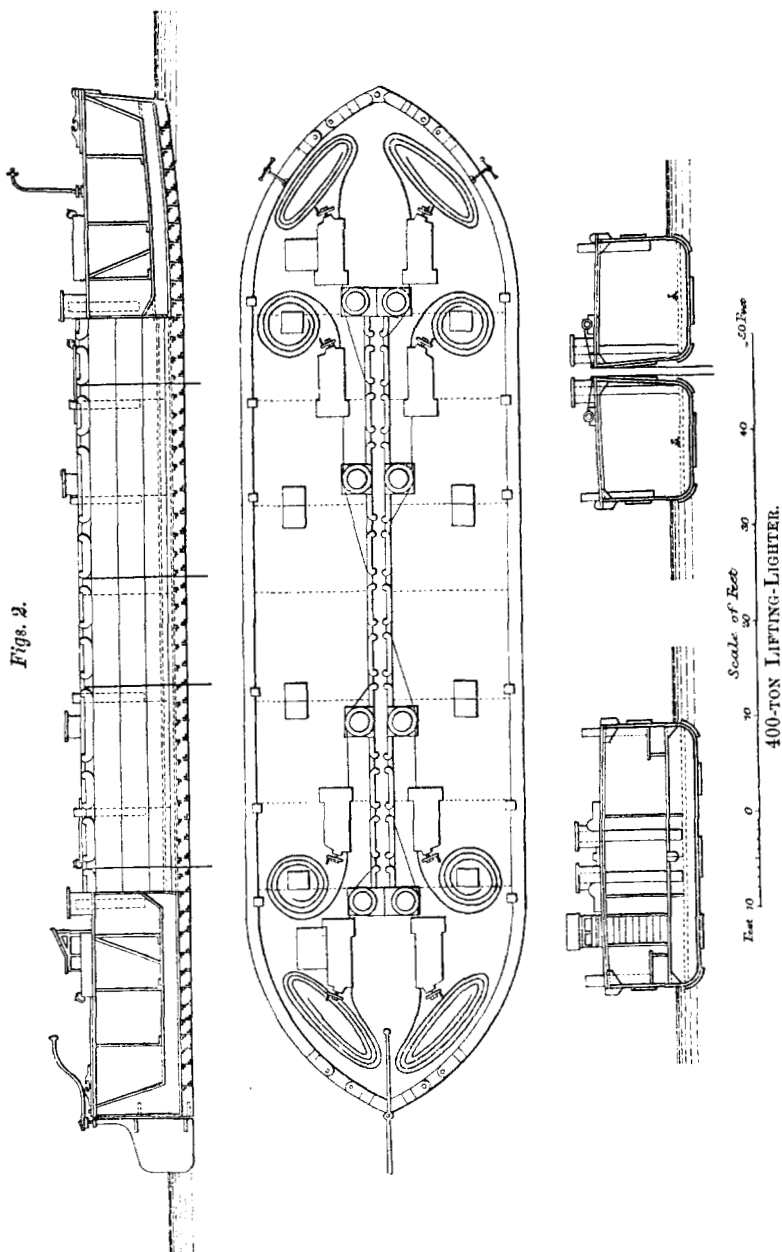
There is nothing special in the construction of the hulls of the 150-ton lighters; they are strongly built of iron, and have stout timber decks, with water-tight hatchways (*Figs. 1*). Three of them are fitted with powerful winches, operated by engines of 12 HP., and have davits 3 feet 6 inches broad, carrying three sheaves, overhanging the bows. Each lighter has also a 10-inch

centrifugal pump placed below the deck, worked by the winch-engines. A force-pump fitted on deck is used for charging the centrifugal pump, for scouring away mud or sand, to make a space for passing the wire-ropes under a wreck when necessary, and may be used as a fire-engine. Each lighter has a small smithy, and carries a quantity of stores and material required in wreck-raising. There is also accommodation on board for a foreman and six men.



The 300-ton lighters are built of iron, and are divided into six water-tight compartments. The decks are of timber and the hatchways are made perfectly water-tight, so that the lighters may be completely submerged without danger of sinking.

The 400-ton lighters, *Figs. 2*, are of special design, and require a more detailed description. They are 108 feet in length, 28 feet in width, and 9 feet 6 inches deep at the side. In the centre is an open space or well, 60 feet long by 18 inches wide at



the deck-level, and 2 feet at the bottom. The hull is of iron, with stiff cross bulk-heads at each end of the well, making the fore and aft parts perfectly water-tight. The sides of the hull are also connected with the sides of the well by iron plates, so that between the fore and aft holds there are six additional water-tight compartments on each side of the lighter. The deck is of crown Dantzic fir, 3 inches thick, and the gunwales and rubbing-pieces are of oak. The scantlings of the iron are as follows:—The keel-plate stem and stern, $\frac{7}{16}$ inch thick; the frames of iron angle-bars 3 inches by 3 inches by $\frac{3}{8}$ inch, spaced 2 feet apart; floors 12 inches by $\frac{3}{8}$ inch, one to each frame; reverse frames 3 inches by 3 inches by $\frac{3}{8}$ inch from gunwale to gunwale and from side to side alternately; keelsons on each side of well 2 feet by $\frac{3}{8}$ inch; with double angle-bars 3 inches by 3 inches by $\frac{3}{8}$ inch at top and bottom; beams of angle-bars 4 inches by 3 inches by $\frac{3}{8}$ inch, one to each frame; bulkheads of $\frac{3}{8}$ -inch plate, with angle-bars 3 inches by 3 inches by $\frac{3}{8}$ inch, spaced 2 feet 6 inches apart; keel and outside plating of bottom $\frac{7}{16}$ inch thick, inside plates of bottom and sides of well $\frac{3}{8}$ inch thick, top plate of well $\frac{1}{2}$ inch thick; side stringer plates of deck 2 feet 6 inches by $\frac{3}{8}$ inch, with angle-bars 4 inches by 4 inches by $\frac{1}{2}$ inch at gunwale; and stringer plates alongside of well $\frac{5}{8}$ inch thick. On each side of the well ten strong cast-iron fair-leads are securely bolted to the side plates and stringers, for the purpose of keeping the wire-ropes in their proper positions. To give the ropes a direct lead to the holding nippers, four large cast-iron bollards, 30 inches in diameter and 20 inches high, are provided on each side of the well. The nippers which hold the wire-ropes are eight in number, placed four at each end of the well. They are of the pattern known as "Bullivant's Patent Automatic Nippers," and are tested to hold a wire-rope 8 inches in circumference under a strain of 100 tons.

The 400-ton lighters were built by Messrs. J. and G. Rennie, of Greenwich, and cost, with their fittings, about £5,000 each, and the total value of the wreck-raising plant may be estimated at £30,000.

Steel-wire rope is now exclusively employed for lifting purposes. It has great advantages over the heavy chain formerly used, being safer under great strains, and so much lighter and more easily handled that the number of men required on the lighter is considerably reduced. The wire-rope is from 7 inches to 9 inches in circumference, and is kept in lengths of from 2 to 20 fathoms, each piece having a large steel eye at each end to take the lashing when the lengths are joined together. The rope

used in the nippers is in one length, without joints or eyes at the ends, so that there may be no obstruction in slacking it out or letting it run through the jaws of the nippers if necessary.

The permanent staff of the mooring service consists of a superintendent, two foremen, two assistant foremen, and forty-six men, whose ordinary duties are the laying down, overhauling and repairing the moorings in the Port of London; and the whole of this staff is available for immediate service in wreck-raising, the number of men being augmented, when necessary, by the temporary engagement of as many other hands as may be required for the work.

The following is a short description of the mode of dealing with a sunken vessel; it is the duty of the Harbour Master of the district in which a casualty occurs, to report it immediately by telegraph to the head office and to Lloyd's, and to send a watch-boat to take up a position as nearly as possible over the wreck. This boat flies a green flag with the word "Wreck" in white letters by day, and displays two bright lights placed horizontally by night. In the case of very long vessels, two watch-boats are provided, one moored at the head and the other at the stern. Notices are also issued stating the position of the wreck, for the information of pilots and of persons in charge of craft navigating the river. At the low-water following the sinking of the vessel, the lighters are brought down and preparations are commenced for slinging her. It is first of all necessary to cut away any of the masts or rigging which would be likely to interfere with the operations. The lighters are then laid alongside the wreck, and the wire-ropes are passed under and adjusted with the aid of the steam-winches and tugs. It is frequently necessary to employ divers to assist in this operation, and where the wreck is deeply embedded in mud or sand, a force-pump is used to wash out a hole at the place where it is desired to pass the rope. The adjustment of the ropes, which vary in number from eight to fourteen according to the weight of the vessel to be lifted, generally occupies from four to eight tides. The position of the lighters with regard to the wreck is governed by circumstances. When the depth of water is sufficient they can be placed directly over the vessel to be lifted; when the water is shallow they have to be placed at the sides. The operation of lifting the wreck is generally arranged to take place during spring tides, as the extra height to which the water then rises enables the wreck to be placed further in shore, and the lower level to which it ebbs facilitates the work of stopping any holes or openings which may have to be

closed up before the pumping out of the water can be accomplished. At low water of the tide preceding the flood chosen for the lift the slack of the ropes is hauled in, and the latter are securely fastened either in the nippers or by lashings through the eye-holes at the ends. Two or three tugs are then made fast to the lighters, and, as soon as the rising tide has lifted the wreck off the bottom, the lighters are gradually towed towards the shore until the time of high water, the wreck being just clear of the bottom.

As the rise of an ordinary spring tide in the Thames is about 20 feet, the wreck will then rest some 12 or 13 feet nearer the surface than at the previous tide, the 7 or 8 feet lost being due to the difference in draught of the lighters when weighted, and to a certain amount of give in the ropes when the full strain is brought upon them. As the tide falls, the ropes are relieved of the weight, and the lighters are towed clear of the wreck to avoid fouling. The same process has to be gone through two or three times, according to the depth from which the sunken vessel has to be raised. When the wreck has been brought so far in shore that her decks are clear at low water, the work of stopping all leaks and openings is proceeded with. If there be a hole in the plates, as is usually the case, this is closed by a shield, made either of timber or iron as may be the most convenient. This shield is bolted to the sound plates by divers, who also close any port-holes or hatchways under the water-level. The steam-pumps are then put to work, and, the water being pumped out, the vessel floats and is taken into dock. The time occupied in raising a large steamer varies under favourable circumstances from a week to a fortnight from the commencement of the operations.

The cost is regulated by a fixed scale of charges for the use of the lighters and other craft and materials employed, and the payment of the amount actually expended in labour.

During the past eleven years, seventy-four steamers of 55,758 tons register, fifty-four sailing vessels of 9,128 tons, and three hundred and one barges of 11,956 tons, being a total of 76,842 tons register of shipping, have been raised by the Conservancy lighters.

The Paper is accompanied by tracings from which the *Figs.* in the text have been prepared.
