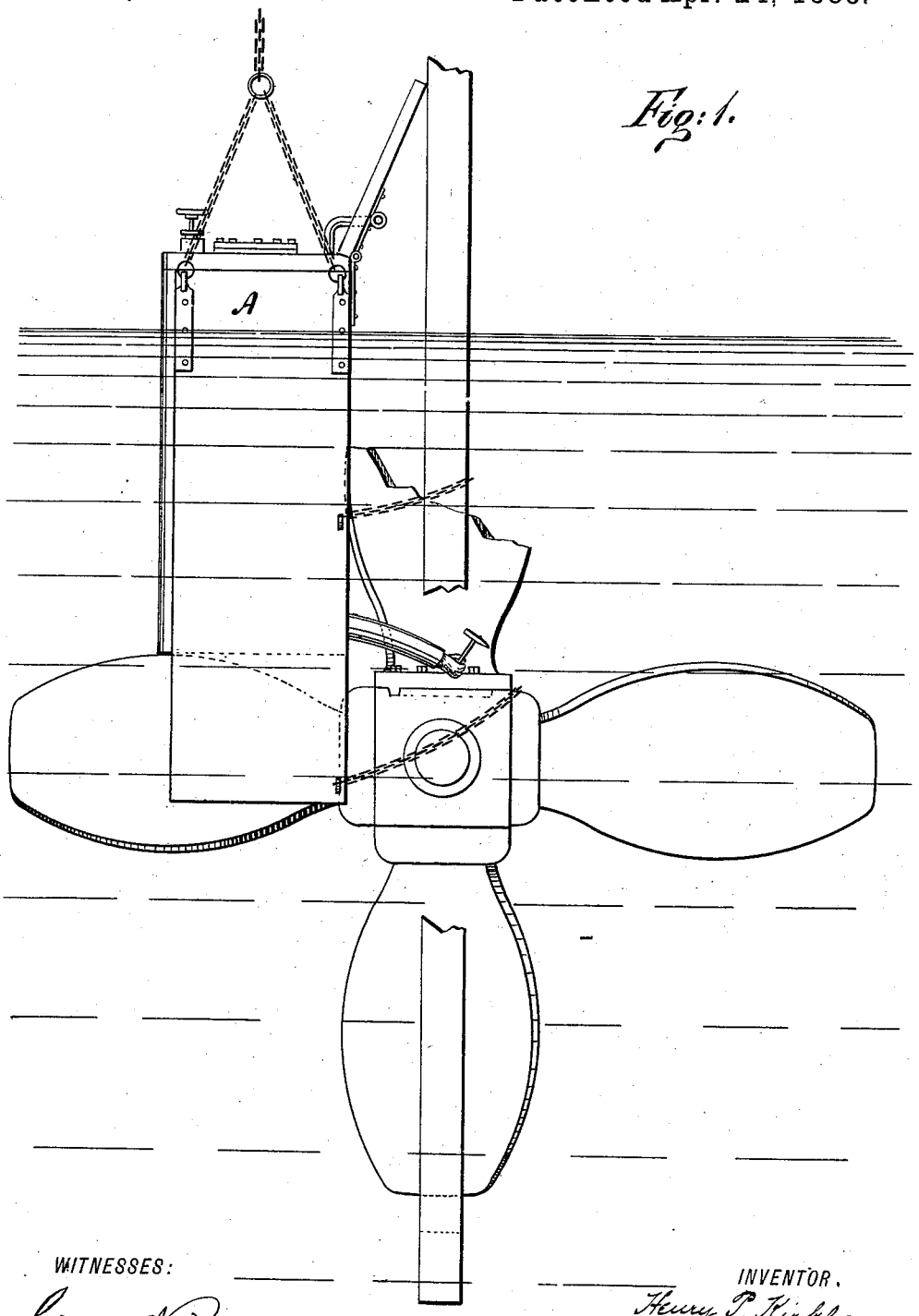
(No Model.) 2 Sheets—Sheet 1.

H. P. KIRKHAM.

PORTABLE CAISSON.

No. 381,797. Patented Apr. 24, 1888.

Fig: 1.



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(No Model.) 2 Sheets—Sheet 2.

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Fig: 2.

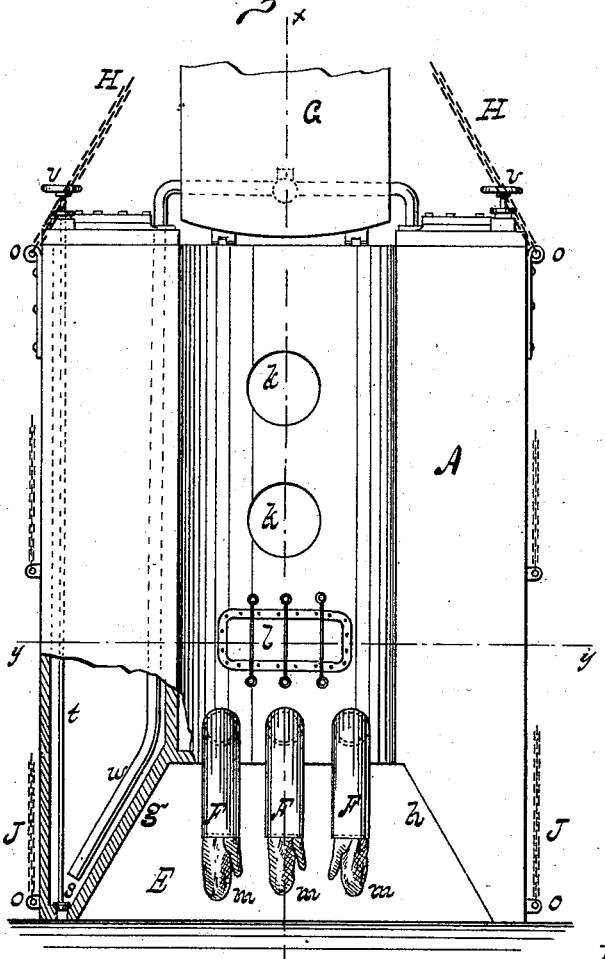


Fig: 3

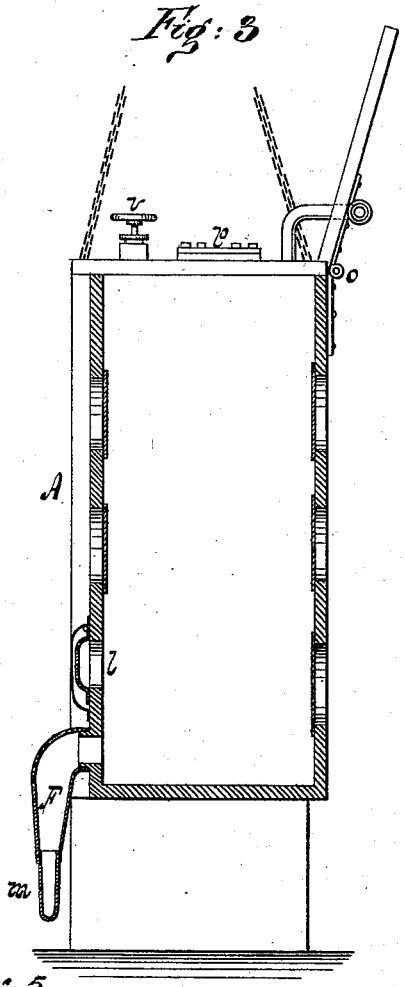


Fig: 4.

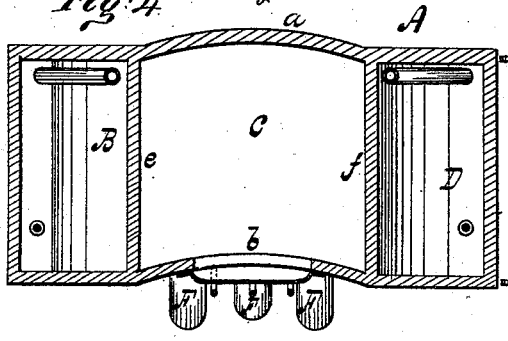
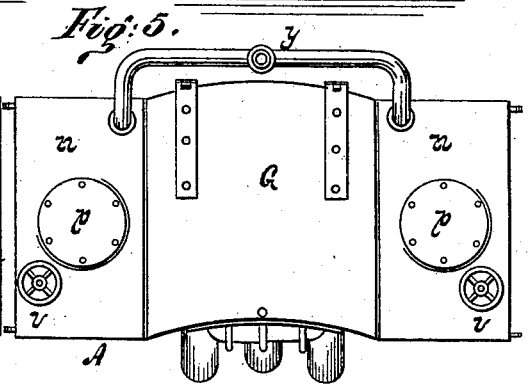


Fig: 5.



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UNITED STATES PATENT OFFICE.

HENRY P. KIRKHAM, OF BROOKLYN, NEW YORK.

PORTABLE CAISSON.

SPECIFICATION forming part of Letters Patent No. 381,797, dated April 24, 1888.

Application filed March 25, 1887. Serial No. 232,369. (No model.)

To all whom it may concern:

Be it known that I, HENRY P. KIRKHAM, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Portable Caissons, of which I declare the following to be a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention is in the nature of an improvement in portable caissons; and the invention consists of a portable caisson constructed in the manner hereinafter shown, described, and claimed.

In the accompanying sheets of drawings, Figure 1 represents the caisson submerged as in use; Fig. 2, a side view of caisson, partly in section; Fig. 3, a vertical section taken in the line *x x*, Fig. 2; Fig. 4, a cross-section in the line *y y*, Fig. 2; and Fig. 5, a plan or top view of caisson.

Similar letters of reference indicate like parts in the several figures.

The chief purpose of this invention is to enable the crew of a ship to make minor underwater repairs, and to avoid the delay and expense incident to putting the vessel on the dock for that purpose, besides permitting repairs of this character to be made during the voyage and permit the vessel to proceed with safety without material delay. Among these minor repairs may be mentioned the loss of a propeller-blade, which is so common an accident that ships propelled by such means invariably carry duplicate blades on board to replace the broken ones; but this replacing necessitates docking the ship, so that the duplicate blades are really not available until the vessel has reached port after a lengthened voyage, possibly made dangerous by the loss sustained. There are many other minor repairs—such as the starting of a plate in iron ships, &c., to repair which my invention will be found useful; but since the drawings show its application to the repair of a propeller-blade, I will confine my description of its application to that purpose.

Referring to the drawings, A represents the caisson, which may be of any convenient size and made of any suitable material consistent with the purpose for which it is designed. The form of this caisson is shown in the views Figs. 4 and 5. It is divided into three compartments, B, C, and D. The middle compartment, C, is convex on one side, as at *a*, and concave on the other, as at *b*, and this middle compartment is separated from the compartments on either side of it by water-tight partitions *e* and *f*. These partitions extend the entire length of the compartments, as is seen in Fig. 2; but the compartment C, as is also shown in that figure, is of less depth than the side compartments, B and D, these side compartments extending somewhat below the middle compartment, and thereby forming a space, E, between each of the lower projections, *g* and *h*, of the side compartments, which is unoccupied, excepting when the caisson is in use, as hereinafter mentioned.

The caisson is on all of its sides tightly closed and rendered water-proof, excepting at its top side, which may or may not be closed by a cover or other temporary means. In the convex side *b* or concave side *a* of the middle compartment, or in both sides, if desired, are inserted windows *k*, and in the concave side a window, *l*, the last-named window being near the bottom of the compartment, or in such a position as will enable a man, when kneeling or sitting within the compartment, to see out of it. Also, to the concave side *b* and below the window *l* are fixed flexible tubular sections F, terminating at their outer ends in mittens or gloves *m*, perforations being made through the caisson corresponding to the openings in these tubular sections, the perforations opening into said sections. If desired, the upper ends or tops of the side compartments, B and D, may be closed by plates *n*, and these plates having man-holes *p* to permit access within said compartments, the man-holes being provided with suitable covers in the ordinary way. The center compartment, C, may have fitted to it a cover, G, hinged thereto. At or near the bottom of the prolongations *g* and *h* of the side compartments, B and D, are fitted valves *s*, operated by valve-stems *p*, which extend through the compartments and terminate in hand-wheels *v*. Also, in the compartments B and D may be inserted pipes *w*, terminating at their upper ends in a yoke-pipe, *y*. The caisson may be provided with suitable eye-bolts, *o*, to which guys and hoisting-chains H and J may be attached.

Now, with the foregoing construction my caisson is in this way operated: Should it be desired to replace a broken propeller-blade, the caisson, with suitable tackle, is lowered over the ship's quarter, the valves *s* having been previously opened by operating the hand-wheels *v*, the water in this way being permitted to enter into the side compartments, B and D, and assist in sinking the caisson, and also serve as ballast to maintain it in a steady vertical position. The caisson descends with its concave side *b* forcing the edge of the broken propeller blade until the caisson rests on one of the blades which has been turned to a horizontal position for that purpose, the horizontal blade being received in the space E, as is shown in Fig. 1. Then, by means of suitable guys, the caisson is confined in that position, and the broken blade that is to be replaced is brought within the reach of a man within the caisson, the concave side *b* bringing the hub of the propeller-shaft, to which the blades are attached, within easy reach of the operator, since the swell of the blade can be received to some extent within the concavity of the side *b*, while the convex side *a* affords an increased space in the interior of the caisson for the operator to occupy.

The caisson now in position, the operator within it kneels or sits down, thrusts his arms into the tubular sections F and his hands into the mittens *m*, and grasps a hammer, wrench, or other tool that has been lowered to him from above, and proceeds to remove the remains of the broken blade and replace it with the new blade, which has also been lowered to him from above. The repairs being made, the caisson, by tackle, is hoisted up, the ballast-water within the compartments B and D finding exit through the open valves *s*, and the caisson is then stowed away and the ship proceeds.

On board ship the space that the caisson would occupy may be utilized by using the caisson for a water-tank or for stowing within it anything desired.

Under some circumstances, as when a vessel has reached port and requires some minor under-water repairs, but is without a caisson, by closing the man-holes *p* and the cover G and the valves *s*, the caisson may be towed to the vessel, sunk, as before described, and when the repairs are made a pump on board the tug may be attached to the yoke-pipe *y*, and by means of the pipes *w* empty the compartments B and D of the ballast-water, and the caisson be towed ashore.

Of course it must be understood in the foregoing description of the operation of my caisson that when in use it is not wholly submerged, its top projecting above the surface of the water and its cover G left open, so that the operator below may have both light and air, the windows *k* also admitting light.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A caisson consisting of three water-tight compartments separated by water-tight partitions, provided with windows, and tubular flexible arm-sections which terminate in mittens or gloves, whereby an operator may make repairs, as and for the purpose described.

2. In a subaqueous caisson, flexible tubular and gloved arm-sections fixed permanently to the caisson, combined with a window located and constructed to permit the operator to guide his arms in said tubular sections, as and for the purpose described.

3. In combination, in a subaqeous caisson, a middle compartment of less length than the compartments on each side of the same, whereby a space, E, without a bottom is formed, which enables the caisson to straddle a projecting object, as and for the purpose described.

4. In combination, a subaqueous caisson constructed with convex and concave sides, with the means hereinbefore described for operating said caisson, as and for the purpose described.

5. A subaqueous caisson constructed with a concave or recessed side to receive within it such projecting part or parts as need repairs and bring the same within reach of the operator in the caisson, substantially as and for the purpose described.

HENRY P. KIRKHAM.

In presence of—
D. A. CARPENTER,
T. G. EARL.