No. 741,298. PATENTED OCT. 13, 1903.

H. BINNEY.

APPARATUS FOR CLEANING AND TREATING SHIPS' HULLS, &c.

APPLICATION FILED AUG. 19, 1898.

NO MODEL.

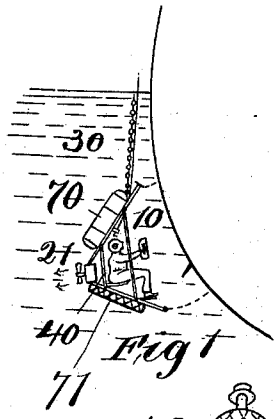


Fig 1

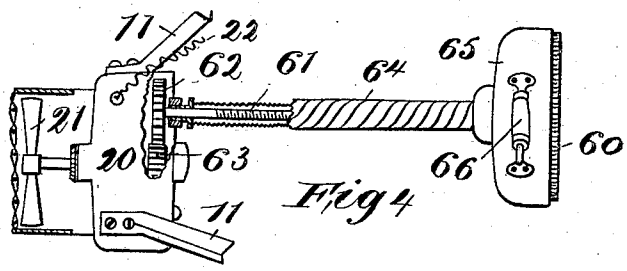


Fig 4

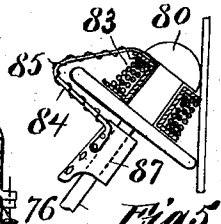


Fig 5.

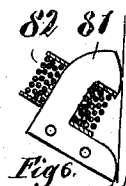


Fig 6.

Fig 2

Fig 3

Fig 8

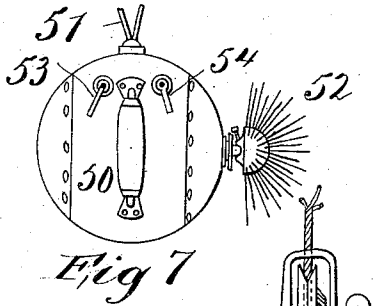


Fig 7

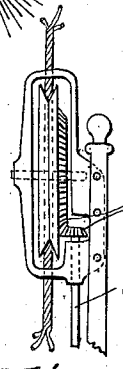


Fig 10

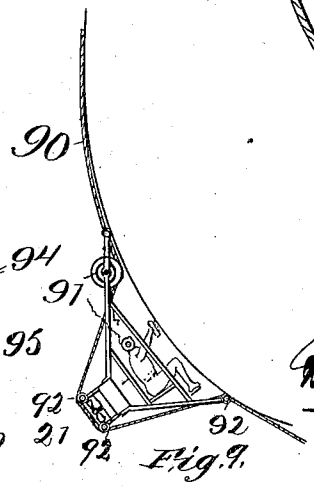


Fig 9.

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No. 741,298. Patented October 13, 1903.

UNITED STATES PATENT OFFICE.

HAROLD BINNEY, OF NEW YORK, N. Y.

APPARATUS FOR CLEANING AND TREATING SHIPS' HULLS, &c.

SPECIFICATION forming part of Letters Patent No. 741,298, dated October 13, 1903.

Application filed August 19, 1898. Serial No. 688,951. (No model.)

To all whom it may concern:

Be it known that I, HAROLD BINNEY, lawyer, of No. 31 Nassau street, in the city of New York, State of New York, have invented certain new and useful Improvements in Apparatus for Cleaning and Treating Ships' Hulls and other Objects, of which the following is a description, referring to the accompanying drawings, which form a part of this specification.

The invention is intended particularly for cleaning and repairing the submerged surface of ships' hulls, though it is applicable for cleaning other submerged surfaces, as will be readily understood.

The nature of the invention is such that its principles, operation, and objects may be fully understood from a description of certain preferred embodiments of it, which are shown in the accompanying drawings.

Figure 1 is a side elevation showing on a very small scale one form of the invention as applied to cleaning a ship. Fig. 2 is a rear elevation of part of the apparatus. Fig. 3 is an enlarged side elevation showing the apparatus in use. Figs. 4, 5, and 6 are details of construction of one form of the apparatus. Fig. 7 is a detail of construction of another form of part of the apparatus. Fig. 8 is a detailed view of a modified portion of the frame shown in Figs. 2 and 3. Fig. 9 is a side elevation of a modification of the apparatus, and Fig. 10 is a detail thereof.

Throughout the drawings like reference-numerals indicate like parts.

The invention includes means capable of several embodiments for supporting a diver while at work, means under the control of the diver for holding him while at work against the surface of the ship or other object being treated and resisting the pushing-away tendency which he exerts against the surface of such object, also means within his reach for controlling the whole apparatus, and means for moving it around either along the surface being treated or to and from such surface.

In the drawings, 10 indicates a frame, which is preferably formed of light angle-irons in a tripod shape. The three leg-pieces 11 are detachably braced together by the braces 12, making a very light structure. The whole frame takes to pieces and when detached occupies a very small space.

An electric motor 20, incased in a water-tight casing, actuates a propeller 21 against the object to be treated, as will be understood clearly from Fig. 1. The conductors to the motor extend from the frame upward and are of course supplied with suitable current. The frame itself is lowered into the water and raised by means of the chain 30. The diver sits in the seat 40, which is preferably pivotally secured and adjusted by means of the hand-wheel and screw 41. The diver is provided with power-actuated cleaning apparatus, such as shown in Figs. 3 and 7 or in Fig. 4.

In Fig. 7, 50 illustrates a water-tight electric-motor case, 51 leading-in cables or conductors, and 52 an electrically-actuated cleaning-brush. At 53 and 54 are shown switch-handles, by which the diver controls the cleaning apparatus and the propeller. The electrical circuits of the apparatus, which are of course a mere matter of electrical engineering, are preferably concealed in the channels of the angle-irons, so that they do not show in the drawings. In Fig. 4 the cleaning-brush 60 is operated by a flexible shaft 61, driven by spur-wheels 62 and 63 from the propeller-motor 20. I prefer, however, to have the cleaning-motor entirely separate from the propeller-motor, as shown in Figs. 3 and 7. When the flexible shaft is used for driving the cleaning-brush from the propeller-motor, I prefer to inclose the shaft in a protective tube or cover 64, which terminates in the cover 65, partially inclosing the brush and provided with handles 66 for manipulating it.

At 70 and 71 are shown inflatable air-bags, incased in wire-netting 72 and secured to the legs 11 of the frame. The lower bags 71 may be omitted, and in any case I prefer to make the upper bag 70 much larger, as their object is not only to buoy up the apparatus when in the water, but also to keep it right side up in the position shown in Fig. 1. These inflated bags are blown up under considerable pressure, preferably more than twenty pounds, so that in sinking thirty or forty feet under water they withstand the water-pressure and do not diminish in size and

buoyancy, for if the pressure of the air within the bags did not exceed the external hydrostatic pressure the bags would diminish in size and the weight of the apparatus increase rapidly as it sank. I prefer to have the apparatus, together with that of the diver, exert a sinking-force of about twenty-five to fifty pounds, so that it is easily manipulated under water, although the apparatus when above water will usually weigh two or three hundred pounds exclusive of the diver. At the rear of the apparatus and behind the propeller I place a rudder 25, which is controlled by link or rod 26, having an eye 27, which may be secured to any one of the several pins 28 on the diver's seat.

The operation of the apparatus as so far described is as follows: Upon being lowered over the side of the vessel into the water, as shown in Fig. 1, the apparatus takes a nearly upright position, even if no tension is exerted on the chain 30. Upon starting the propeller 21 the apparatus tends to move forward. If it is directed toward the side of the ship, it is therefore forced against it. If it is not directed against the side of the ship, the diver turns the rudder 25, and thereby the effect of the propeller is exerted sidewise, turning the apparatus around until it faces the vessel. Thereupon the diver sets the rudder amidships, and applying more power to the propeller, if necessary, he forces the frame of the apparatus up against the vessel. He is then ready to operate on the side of the vessel. As he presses the cleaning apparatus against the side of the vessel or otherwise exerts pressure the propeller 21 resists the tendency of the frame of the apparatus to be pushed away from the ship. In short the reaction of the water caused by the propeller resists the force exerted by the diver's arms in operating on the surface of the vessel. Owing to the position of the diver, as clearly seen in Fig. 3, he can use his feet to raise the lower legs of the tripod-frame clear of the side of the ship, and when so raised he may move or walk along the surface carrying the frame with him, the propeller pressing his feet against the surface of the vessel and enabling him to move not only along the vertical sides of the vessel, but over any portion, whether on the sides or in the neighborhood of the keel. He can also use his hands for the same object, thus raising the upper leg of the frame, so that he can crawl about on the surface of the vessel at will from place to place, carrying all the apparatus with him without difficulty. When he is beneath the vessel, it will be seen that the propeller 21 overcomes not only the force of the diver's arms in operating his tools, but also supports the tendency of the apparatus to sink away from the vessel. If the buoyancy of the inflated bags 70 and 71 be adjusted so that very little sinking tendency exists in the apparatus, no tension need be exerted on the chain 30, and the diver can crawl around and come to the surface with the apparatus without signaling to be drawn up. If he wants to be drawn up quickly at any time, he stops his propeller, allowing the apparatus to swing away from the ship and hang, as in Fig. 1, and he signals the operators to draw up the apparatus.

The buoyancy of the apparatus can be regulated to a fraction of a pound without difficulty by introducing more or less water with the air in the inflated bags.

There is yet another way in which the diver can come to the surface without assistance from above. It is the following: At 75 a confining-band surrounding the inflated bag is shown, provided with an adjusting-screw 76 within reach of the diver's hand. By unscrewing the adjusting-screw 76 some expansion of the bag 70 is permitted, thereby increasing the displacement of the apparatus and enabling the diver to adjust it at will. I illustrate this to indicate generically means for locally varying the displacement of the apparatus in accordance with the will of the diver.

It will be seen that the propeller 21 and motor 20 are constantly using up power during their operation. If desired, means for holding the apparatus against the side of the vessel by an attractive force to the side of the vessel may be provided. Such means is shown in the electromagnets 80 81. One such magnet 81 is secured to each of the lower legs of the apparatus and current supplied under control of the diver to the magnet-coil 82. This magnetically fastens the device firmly to the side of iron ships. The magnet 80 is rotary, though its coil 83 is fixed by means of the brace 84, along which the conductors 85 may be led. A rotary shaft 86, extending through bearings 87, by which the device is fastened to the end of the upper leg 11 of the apparatus, serves to turn the core of the magnet 80 by means of the crank and handle 88, within easy reach of the diver's hand. By means of this crank 88, therefore, the diver may give travel horizontally to the upper part of the apparatus, while with his feet he can move the lower part of the apparatus horizontally, or he may combine these two movements. I may use the rotary shaft, crank, and bearing on the end of the leg with or without magnetism, as it serves as an excellent means of moving the upper part of the apparatus along the ship, while the diver controls the position of the lower part by means of his feet, as already described.

In Figs. 9 and 10 I illustrate another means of holding the apparatus against the side of the ship, it being in this case a cable 90, running over the wheel 91 and rollers 92. As the force which holds the apparatus against the vessel is here controlled from the deck of the vessel and not by the diver, I consider this apparatus as decidedly inferior to the forms already illustrated and described, al-

though it saves the operation of the propeller 21. Furthermore, horizontal travel of the apparatus in this case necessitates the loosening of the rope 90. The wheel 91, however, may be turned by the diver by means of bevel-gears 94 and rotary shaft 95, enabling the diver to traverse the apparatus up and down along the side of the vessel, running along the rope 90. It will be seen that in this apparatus my principle of providing the apparatus with means for holding it against the side of the vessel and locally-controlled means for giving travel to the apparatus are present, but the travel is restricted in direction and in convenience. A simple and very effective form of the apparatus may be produced by employing with the inflatable bags and triangular frame the propeller for holding the apparatus against the side of the ship and the simple rubber feet 99, as shown in Fig. 8, on the ends of the three arms of the apparatus or on the two lower arms.

If the apparatus be not provided with means, such as band 75 and screw 76, for decreasing the buoyancy of the apparatus or increasing it, nevertheless the diver can always rise quickly to the surface by cutting the netting 72 on the upper inflated bag, whereupon the compressed air within the bag exceeding the pressure of the water will expand, increasing the displacement of the apparatus and causing it to rise quickly to the surface.

Having now set forth the essential principles of my invention, together with several embodiments thereof, in effective forms, I desire to claim as new, and secure by these Letters Patent, the following several essential features and combinations:

1. The combination for cleaning or treating ships' hulls, or other objects under water, of an open floating frame forming a seat or support for the diver, with power-actuated mechanism for bringing the frame in contact with said hull, and power-actuated mechanism for treating the said hull, and electrical connections from a suitably-distant source of current to the said mechanisms, substantially as set forth.

2. The combination for cleaning or treating ships' hulls, or other objects under water, of an open floating frame forming a seat or support for the diver, with power-actuated mechanism for bringing the frame in contact with said hull, and power-actuated mechanism for treating the said hull, electrical conductors leading to and from the said mechanisms for transmitting power thereto and local means for controlling the application of power, substantially as set forth.

3. The combination for cleaning or treating ships' hulls, or other objects under water, of an open floating frame forming a seat or support for the occupant or diver, and means controllable by the occupant of the frame for holding it against the hull, substantially as set forth.

4. The combination for cleaning or treating ships' hulls, or other objects under water, of an open floating seat or support for the occupant or diver, a frame carrying such seat or support and dynamic means for producing force to hold the said frame against the hull, substantially as set forth.

5. The combination for cleaning or treating ships' hulls, or other objects under water, of a frame having a seat or support for the occupant or diver, with means for exerting attraction between the frame and the hull, and means within reach of the occupant of the frame for controlling such attraction, substantially as set forth.

6. The combination for cleaning or treating ships' hulls, or other objects under water, of an open floating seat or support for the occupant or diver, with dynamic means reacting against the surrounding water, for pushing the seat or support toward the hull, substantially as set forth.

7. The combination for cleaning or treating ships' hulls, or other objects under water, of an open floating seat or support for the occupant or diver, power-actuated means reacting dynamically against the water for pushing the seat or support toward the hull, and controllable by the occupant or diver, substantially as set forth.

8. For cleaning or treating ships' hulls, or other objects under water, a seat or support for the occupant or diver provided with dirigible power-actuated mechanism for holding the seat or support toward the hull and with power-actuated mechanism for treating the said hull, substantially as set forth.

9. In apparatus for cleaning or treating ships' hulls or other objects under water, a seat or support for the diver having a plurality of points of contact with the hull and provided with buoyant devices which are normally insufficient to bring the apparatus when loaded, to the surface, substantially as set forth.

10. In combination with a submarine seat or support for a diver, electromagnets on one or more of the legs or bearings of the frame thereof and under control of said diver, substantially as set forth.

11. The combination of a frame, provided with a seat or support for a diver, electromagnets on one or more of the legs or bearings of the frame, a source of current therefor, and a controller secured to said frame for controlling the current in said electromagnets, substantially as set forth.

12. The combination of an open floating frame provided with a seat or support for a diver, a propeller mounted on or in the said frame, and a rudder therefor, substantially as set forth.

13. The combination of an open floating

frame provided with a seat or support for a diver, a propeller, power-actuating driving connections for the propeller, and a controlling device therefor within reach of said diver, substantially as set forth.

14. A seat or support for a diver, having an open framework of detachable members and provided with power-actuated mechanism for submarine operations, and with a chain or tension device for raising and lowering the said seat, occupant, and mechanism, substantially as set forth.

15. A frame provided with a seat or support for a diver, said frame having a plurality of adjustable legs or rests which bear upon the object to be treated, power-actuated mechanism for submarine operations, means for holding the frame against the object to be treated, devices for giving travel to the frame, and local means for controlling said devices, substantially as set forth.

16. A frame provided with a seat or support for a diver, power-actuated mechanism for submarine operations, rotary frictional devices for giving travel to the frame, and means controlled by the diver for actuating said devices, substantially as set forth.

17. A frame provided with a seat or support for holding a diver, and legs or rests which bear against the hull or other object, and means tending to hold the frame movably against such hull or object, the frame and legs or rests being so proportioned that the legs of the occupant can reach and exert separating force between the frame and such hull or object, substantially as set forth, whereby the occupant can travel over such object at will with the said frame.

18. A submarine apparatus for cleaning or treating surfaces under water, provided with means under control of its occupant for propelling and directing it and means for treating the surface to be cleaned, substantially as set forth.

19. An open floating submarine apparatus for cleaning or treating surfaces under water, provided with means under control of its occupant for propelling it and for operating the cleaning and other mechanisms.

20. An open floating submarine apparatus for cleaning or treating surfaces under water, provided with means under control of its occupant for varying its specific gravity, substantially as set forth.

21. An open floating submarine apparatus for cleaning or treating surfaces under water, provided with means under control of its occupant for varying its specific gravity and for propelling it horizontally and also provided with a plurality of legs or rests which bear upon the surface of the submerged object to be treated, substantially as set forth.

22. In a submarine apparatus, the combination of a tripod-frame consisting of three or more detachable parts and propelling means secured in the vicinity of the common center of the three legs, substantially as set forth.

23. In a submarine apparatus, the combination of a tripod-frame consisting of three or more detachable parts secured in the form of a triangular pyramid and provided with a propeller mechanism at its apex, for the purposes set forth.

Signed this 13th day of July, 1898, at New York.

HAROLD BINNEY.

Witnesses:
FREDERICK H. DAVIS,
WENDELL FRANCIS BECKER.