M. A. WHITE.

DIVING BELL.

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1,364,337. **Patented Jan. 4, 1921.**

Fig. 1.

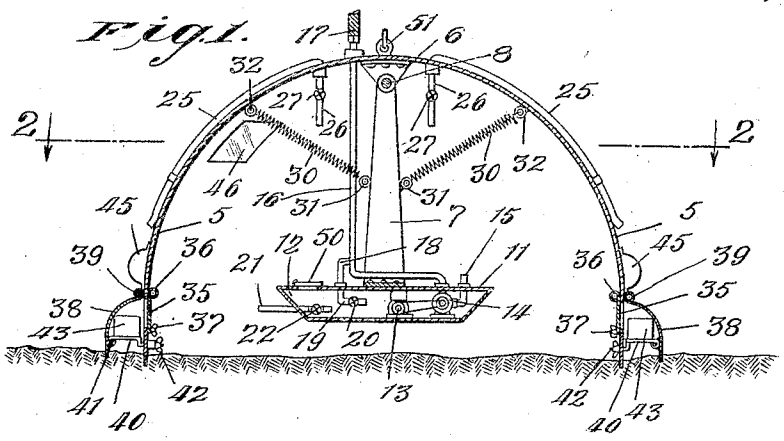


Fig. 2.

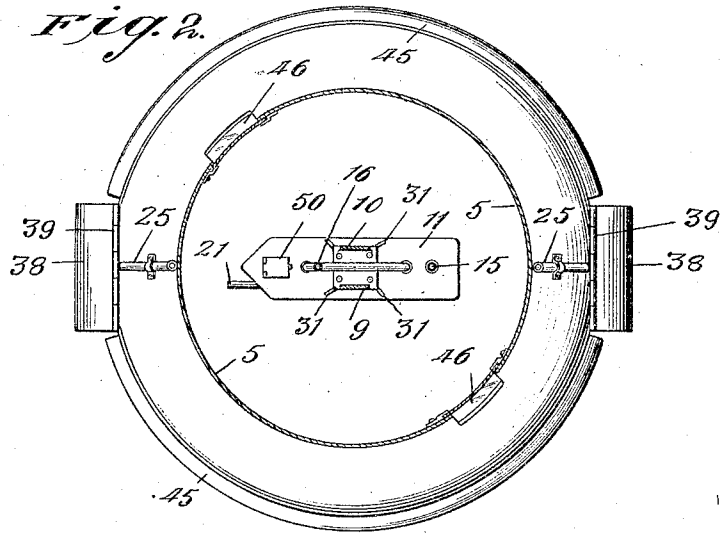
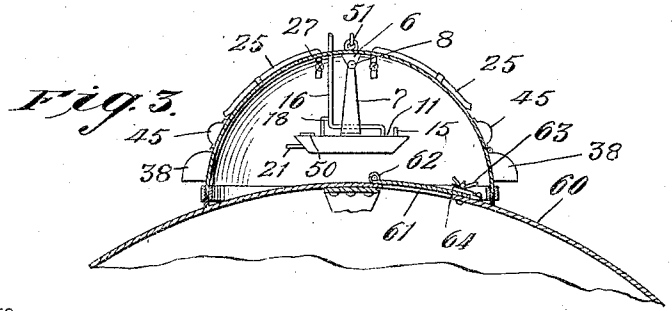


Fig. 3.



WITNESSES

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DIVING-BELL.

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To all whom it may concern:

Be it known that I, MANLEY A. WHITE, a citizen of the United States, and a resident of Beverly, in the county of Essex and State of Massachusetts, have invented new and Improved Diving-Bells, of which the following is a full, clear, and exact description.

This invention relates to new and useful improvements in hydraulic devices, and it pertains more particularly to means for facilitating submarine operations.

The primary object of the present invention is to provide a device which may be lowered beneath the surface of the water into contact with the bed of the water to permit of mechanical operations thereon.

A further object of the invention is to provide means for expelling the water from within the device after the same has been placed in its operative position.

A still further object of the invention is to provide means in connection with such a device whereby the air pressure within the same may be regulated at the will of the operator.

With the above and other objects in view, reference is had to the accompanying drawings in which—

Figure 1 is a vertical sectional view of the device showing the same placed in its operative position;

Fig. 2 is a horizontal sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a detail sectional view of a portion of a modified form of the invention.

Referring more particularly to the drawings, the device comprises a shell 5 in the form of an inverted member of substantially semi-spherical shape. Secured to the upper inner portion of the shell 5, is a bracket 6, and pivotally mounted in said bracket 6, is a depending arm or link 7, this arm being pivotally mounted as at 8. The arm 7 comprises two members 9 and 10, which are secured at their lower ends to the top wall 11 of a compartment 12, said compartment being substantially air tight. The compartment 12 is preferably in the form of a boat or barge, and on its interior side, said compartment is provided with a motor 13 and a pump 14, said pump 14 being of the air-compressor type. Leading from the pump 14 to the interior of the shell 5, is an air pipe 15, and leading from the exterior of the shell 5 into the compartment 12 and the pump 14, is an air-line 16, said air-line 16 being secured to a suitable flexible line 17 on the exterior of the shell, said flexible line 17 extending to the surface of the water in which the shell 5 is submerged.

Leading from the air-line 16, near its lower end, is a pipe 18, and said pipe extends into the interior of the compartment 12, as at 19, and is controlled by means of a valve 20. The reference character 21 designates a pipe leading from the interior of the compartment 12 to the interior of the shell 5, and said pipe is controlled by means of a valve 22.

From the foregoing, it will be apparent that as the motor 13 is operated, the pump 14 will likewise be operated to draw air into the compartment through the line 16. The air is then forced to the interior of the shell 5 through the pipe 15.

In order that the air pressure in the compartment 12 may be regulated, the valve 20 may be opened, in which case the interior of the compartment 12 is in direct communication with the atmosphere through the medium of the pipe 16 and the flexible pipe 17. If, however, greater air pressure within the compartment 12 is desired, the valve 22 may be opened to permit of the air entering the compartment 12 from the interior of the shell 5. It will be understood that the pressure in the shell 5 is greatly in excess of that in the compartment 12, since it is the air pressure in the shell 5 which is utilized to force the water from the said shell when the device is submerged.

Leading from the upper portion of the shell are pipes 25, and said pipes 25 have extensions 26, which lie within the shell. In the extensions 26 are valves 27, by means of which the passage of air from the interior of the shell to the exterior thereof for the purpose of ventilation, may be regulated.

As heretofore stated, the depending arm or link 7 is pivotally mounted as at 8, and in

order to maintain the same in a vertical position, resilient elements 30 are employed, said resilient elements being connected to eyes 31 and 32 in the depending arm 7 and the shell 5, respectively.

Arranged on the exterior of the shell 5, at diametrically opposite points are water-tight doors 35. These water-tight doors 35 are hingedly secured, as at 36, to the interior of the shell, and these doors are maintained in their closed position by means of dogs or the like 37.

Mounted at diametrically opposite points on the exterior of the shell 5 and adjacent the water-tight doors 35, are compartments 38. Each of these compartments 38 comprises a hinge member pivoted to the exterior of the shell as at 39, said members being adapted to swing upwardly when released.

For securing the compartments 38 in the position shown in Fig. 1, a bolt 40 is employed, and this bolt is pivotally secured as at 41, to the inner face of the compartment 38, and has its inner end passing through an opening in the wall of the shell and engaged by means of a nut 42. If desired, more than one bolt may be used to each compartment, to hold the same in its closed position.

Mounted in the compartments 38 are suitable receptacles 43, and these receptacles are adapted to carry material, tools and the like, in order that they may be accessible when the device is submerged. The reference character 45 designates suitable ballast, which in the present instance is shown in the form of iron cast integral with the exterior of the shell, but it is to be understood that ballast which is unattached to the shell may be employed if desired.

As shown at 46, the device may be provided with windows, by means of which light may be projected through the water for the purpose of exploring exterior of the shell, and while in the present instance but two windows are shown, it is to be understood that any number found desirable may be employed.

The operation of the device is as follows: The workmen having positioned themselves within the compartment 12, by means of the door 50, the device is submerged until it comes nearly into contact with the bed or bottom of the body of water in which the operation is to take place. It is, of course, understood that a certain amount of water will be within the bell 5, after the same has reached this position. To expel water the motor 13 and pump 14 are operated to force air through the pipe 15. After the water has been expelled, the door 50 is opened and the workmen proceed to the interior of the shell 5, where suitable operations may be carried out. It is evident that a suitable hoisting means may be attached to the shell as at 51, in order that the same may be raised and lowered as desired.

In the form of the invention shown in Fig. 6, the reference character 60 designates the upper portion of a shell similar to that above described, which, however, is of considerably larger dimensions, and in this form of the invention, the upper portion of the shell is provided with a trap door 61, which is pivoted as at 62, and is provided with a dog 63 of the ordinary construction, by means of which the trap door 6 is held closed.

In this form of the invention a small shell 5 is lowered until the same rests on the larger shell 60, as designated in Fig. 3, and after the water has been expelled from both shells, the trap door 61 is opened and access to the larger shell is obtained through the hatch opening 64.

Having thus described the invention, what is claimed as new is:

1. A device of the character described comprising an inverted shell of semi-spherical form, means for submerging said shell, a compartment pivotally suspended within said shell, and means carried by said compartment and operated to expel the water from the shell when the latter is in its operative position.

2. A device of the character described comprising a shell of inverted semi-spherical form, means for submerging said shell, a compartment pivotally supported and suspended within said shell, means carried by said compartment, for expelling water from said shell, and separate means for supplying air to said compartment.

3. A device of the character described comprising a shell of inverted semi-spherical form, a compartment suspended within the shell, an air-line leading to said compartment, means for forcing air from said air-line to the interior of the shell, means for conducting air from said air-line to the interior of the compartment, and separate means for conducting air from the interior of the shell to the interior of the compartment substantially as described.

4. A device of the character described comprising a shell of substantially inverted semi-spherical form, a compartment suspended within said shell, means for supplying air to said compartment, a plurality of compartments mounted exteriorly of the shell and carried thereby, water-tight doors establishing communication between the interior of said shell and said exterior compartments, and means for submerging said shell.

5. A device of the character described comprising an inverted shell of semi-spherical form, an air-tight compartment pivot-

ally mounted within the shell and suspended from the upper portion thereof, resilient means for maintaining said air-tight compartment in a substantially central position, means for submerging the shell, an air-line leading from the exterior to the interior of said compartment, a pump for drawing air into the compartment and delivering the same to the interior of the shell, means for delivering air to the interior of the compartment from said air-line, means for delivering air to the interior of the compartment from the interior of the shell, and means for controlling the flow of air through each of said delivering means, substantially as described.

MANLEY A. WHITE.