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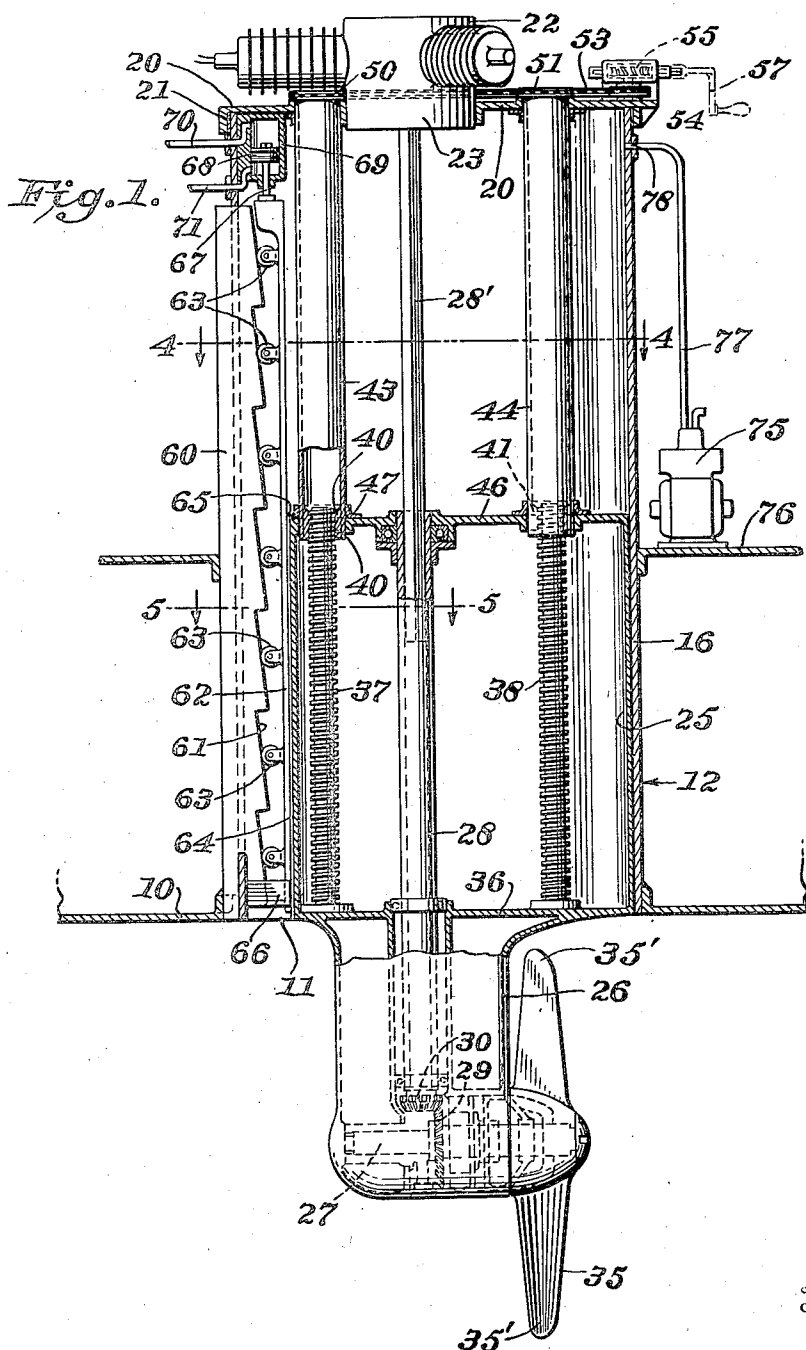
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SHIP PROPULSION MEANS

Filed Nov. 14, 1941

2 Sheets-Sheet 1



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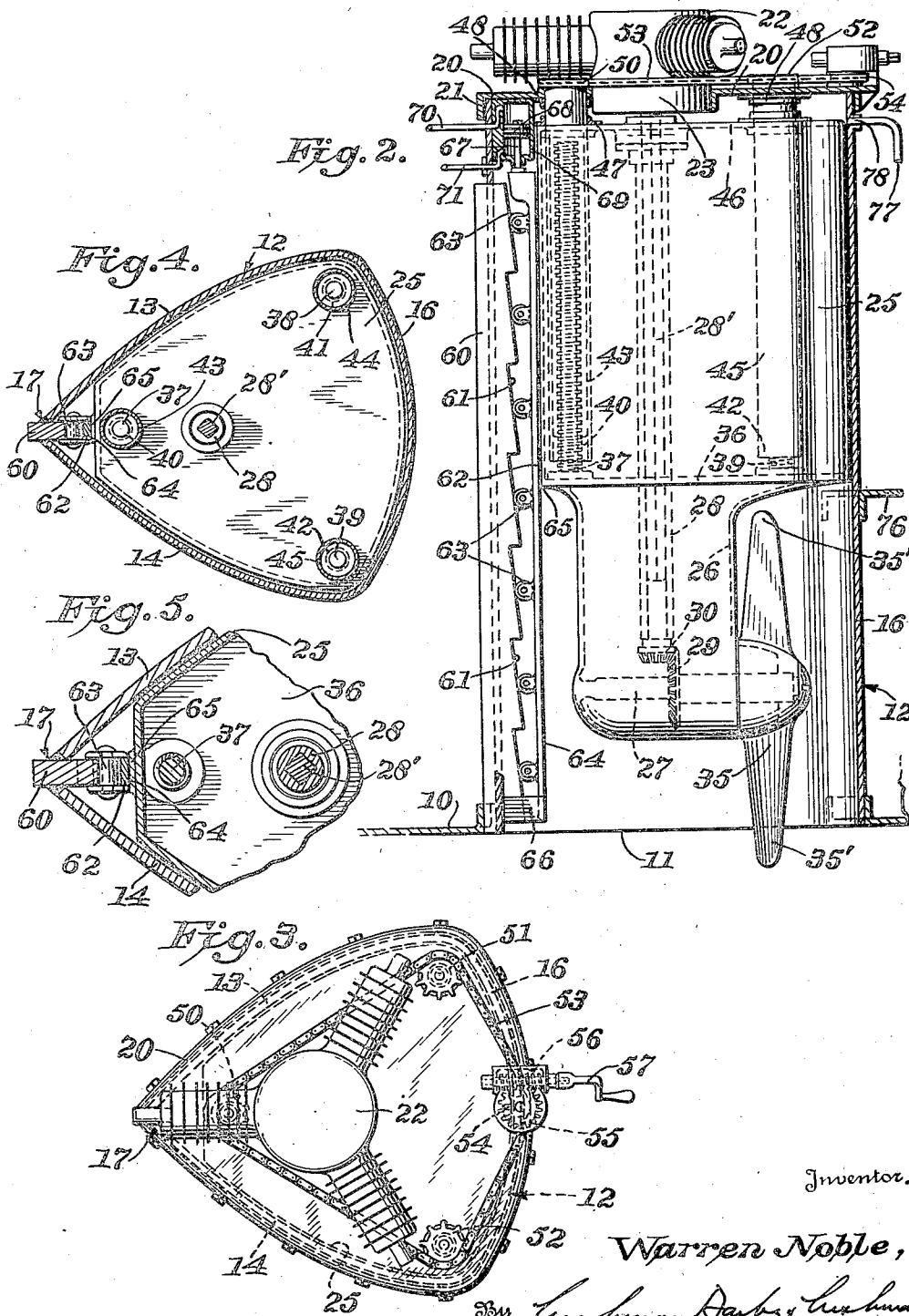
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UNITED STATES PATENT OFFICE

2,302,795

SHIP PROPULSION MEANS

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Application November 14, 1941, Serial No. 419,202

10 Claims. (Cl. 115—41)

In ships of a recently developed type, wherein propulsion assemblies or units are mounted in wells projecting upwardly from the ship's bottom, difficulties have arisen because of the relatively great draft of the ships, caused by the disposition of the propellers below their bottoms. With ships of the type shown in my prior application Serial No. 338,667, the propellers, positioned below the bottom of the ship, increase the draft thereof by an amount in excess of the diameters of the propellers, as compared with similar hulls having no propellers below their bottoms. In commercial ships of this type the propellers are often in excess of six feet in diameter. Positioning of the propellers below the ship's bottom is a highly desirable feature for normal operation of the ship at sea, where water of adequate depth is available, but when navigating in harbors and rivers, and particularly when docking, the excess draft created by the propellers is a distinct disadvantage and, in fact, makes it impossible to bring the ships into certain ports and to make them fast to certain docks.

The present invention aims to eliminate these difficulties and to enable the ship to navigate in shallow water.

The primary object of the invention, therefore, is to provide means, in a ship of the class described, for reducing the draft of the vessel whenever it is desired to maneuver in shallow water, yet without sacrificing the advantages inherent in the use of propellers mounted below the ship's bottom, as distinguished from propellers mounted above the keel line at the stern, in accordance with conventional practice.

A further object of the invention is to provide means for raising a propeller at least partially into a well projecting upwardly from the ship's bottom and to provide means making it possible to use the propeller in its raised position as a means for driving the ship.

A further object of the invention is to provide means for operating a marine propeller alternately as a fully submerged propeller below the ship's bottom and as a surface propeller, dipping into the water to only a slight extent.

A further object of the invention is to provide a ship's propeller adapted to operate at least partially in a well projecting upwardly from the ship's bottom, in combination with means for lowering the level of the water in the well, whereby, during rotation of the propeller, the blades thereof may project below the ship's bottom only to the desired depth and operate after

the manner of a surface propeller, dipping into the surface of the water in the well maintained at said lowered level.

A further object of the invention is to increase the buoyancy of ships of the type having one or more wells projecting upwardly from their bottoms, in which propulsion units are mounted. To this end, the invention provides means for sealing the upper ends of the wells and for introducing air into their interiors under sufficient pressure to lower the level of the water in the wells, thereby increasing the buoyancy of the ships by an amount corresponding to the weight of the water displaced.

Other and further objects and advantages of the invention will be apparent to those skilled in the art from a consideration of the following description of an embodiment of the invention shown somewhat diagrammatically in the accompanying drawings.

In the drawings:

Figure 1 is a vertical view, partly in section and partly in elevation, through a well and propulsion unit in a ship of the type referred to above.

Figure 2 is a similar view, showing the parts in a different position.

Figure 3 is a plan view.

Figure 4 is a horizontal section taken substantially on line 4—4 of Figures 1 and 2, and

Figure 5 is a similar, fragmentary view taken on line 5—5 of Figures 1 and 2.

The ship's bottom, represented diagrammatically at 10, has an opening 11 therein, to the margins of which a well 12 is secured, as by welding. As shown in Figure 4, the well preferably is generally triangular in horizontal section, with arcuate side walls 13, 14 and a similar arcuate rear wall 16. If desired, the arrangement may be reversed, and the wall 16 disposed forwardly of the ship and the pointed end 17 of the well disposed aft, depending on the normal direction of rotation of the propeller, hereinafter referred to.

The upper end of the well is closed by a removable cover 20, secured in place by any appropriate means and preferably provided with a sealing gasket 21, to provide a substantially airtight connection with the well. The cover 20 may carry a suitable prime mover, diagrammatically indicated at 22 and including a housing 23 for reduction gears, reversing gears, a clutch and other conventional devices, not shown.

A marine propulsion unit, comprising an upper casing 25, is mounted for vertical adjustment in

the well. The casing 25 carries at its lower end a streamlined housing 26 for a propeller shaft 27, a drive shaft 28 and gears 29, 30. Adjacent the rear, at the enlarged end of the well opposite the wall 13, there is a marine propeller 35, mounted on the end of the shaft 27, appropriate bearings and packing gland being provided for the shaft.

The lower end wall 36 of the upper casing 25, or the upper end of the housing 26, carrying a plurality of upwardly projecting, non-rotatable screws, such as the three screws 37, 38, 39, disposed in nuts 40, 41, 42 carried by the lower ends of tubular sleeves 43, 44, 45, which extend downwardly through the upper wall 46 of the upper casing 25 and are rotatably supported by the cover 20. Packing means 47 establish a substantially air and water-tight connection between the sleeves and the end wall 46 of the upper casing, while similar packings 48 seal the sleeves with respect to the cover 20.

The upper ends of the sleeves 43-45 carry sprockets 50, 51, 52 about which a chain 53 is trained. The chain is similarly connected to a sprocket 54 having a gear 55 associated therewith, in mesh with a worm 56 and adapted to be rotated by a handle 57. Hence, when the crank handle 57 is operated, the sleeves 43, 44, 45 will be rotated in unison by the chain 53, to raise or lower the propulsion unit in the well, according to the direction of rotation.

The drive shaft 28 preferably has a telescopic connection with an upper drive shaft section 28', the latter being supported by and connected to the casing 23 associated with the prime mover, to receive power from the latter.

Means are provided for locking the marine propulsion unit against the walls of the well, in any desired position of vertical adjustment. Although any equivalent construction may be employed, a simple and efficient arrangement is shown in the accompanying drawings. A vertical bar 60, having a plurality of inclined, stepped, wedge surfaces 61 is welded to the walls of the well, preferably at the pointed end 17 thereof, between the edges of the walls 13, 14. A vertically movable wedge bar 62, disposed opposite the inner face of the bar 60, carries a plurality of rollers 63 in engagement with the inclined faces 61 thereof. The inner face 64 of the wedge bar 62 is disposed opposite to a vertical surface or track 65 associated with the upper casing section 25. At its lower end, the bar 62 is guided within a loop or strap 66, carried by the lower end of the bar 60, while at its upper end the bar 62 is connected to a piston rod 67 associated with a piston 68 mounted in a cylinder 69, carried by the upper end of the well. Fluid under pressure from a suitable source, controlled by conventional valve means, may be introduced into either end of the cylinder 69 by conduits 70, 71, to urge the piston 68 upwardly or downwardly, as desired. Downward movement of the piston causes the rollers 63 to ride downwardly on the inclined surfaces 61, thereby forcing the bar 62 against the track 65 carried by the upper casing 25 and wedging the casing against the wall 16 of the well and locking the propulsion unit in place, against the thrust of the propeller.

Of course, the wedging or locking means may be changed or reversed in position, if desired, so that it operates to wedge the propulsion unit in the opposite direction toward the pointed end 17, against the walls 13, 14 of the well.

Air or other gas under pressure from any suitable source may be delivered into the interior of the well, to lower the level of the water therein to any desired point, for instance, substantially to the level of the ship's bottom 10. For instance, a motor compressor unit 75, supported upon a deck 76 and provided with a line 77 leading through a coupling 78 may deliver air to the interior of the well adjacent the upper end thereof.

It will be understood that the well, at its wider end, is sufficiently large to permit the propeller 35 to rotate when disposed therein, as shown in Figure 2. When in this position and with the water level in the well substantially at the bottom thereof, the major portion of the propeller operates in air in the well, while the tips 36' of the blades dip into the surface of the water in the well and project slightly below the ship's bottom, thereby operating as a surface propeller. This slight projection of the blades below the ship's bottom will provide sufficient propulsive force to maneuver the ship in shallow water and when docking.

Of course, the propulsion unit and propeller may be positioned lower than shown, so long as the major portion of the propeller in the well operates in air instead of in water. If the well were substantially full of water, which would be the case if the water stood at the same level as the water outside of the ship's hull, the propeller could not operate with any degree of efficiency, since it would be immersed in the water in the well and the water would be projected by the propeller directly against the walls of the well. The turbulence in the well in such a case would be so great as to make the structure substantially inoperative. By operating the major portion of the propeller in the well in air; however, the propeller functions as a surface propeller and sufficient propulsive effect can be derived therefrom to maneuver the ship satisfactorily.

It will be understood that, when deep water is reached, the wedge bar 62 will be raised, to release the propulsion unit, the sleeves 43-45 will be rotated to lower the unit to the position shown in Figure 1, and the wedge bar will again be forced downwardly to lock the unit firmly in place. The propeller in this position, will operate efficiently below the ship's bottom as a fully submerged propeller. The air pressure in the well may be maintained, if desired, to keep the well substantially free of water, thereby increasing the buoyancy of the ship by an amount corresponding to the weight of the water displaced.

It must be understood that the invention is not limited to the details of construction shown diagrammatically in the accompanying drawings, as many modifications will readily occur to those skilled in the art, from a consideration of the foregoing description. The invention includes all changes coming within the scope of the appended claims and their equivalents.

I claim:

1. Ship propulsion means comprising, in combination, a well projecting upwardly from the ship's bottom, power transmission means mounted for vertical adjustment in the well, a propeller carried by said transmission means and normally positioned for rotation below the ship's bottom, means for raising the power transmission means and said propeller into the well to a position where only a portion of the propeller projects below the ship's bottom upon rotation of the propeller in the well, and means for lower-

ing the level of the water in the well below the water level outside of the ship.

2. Ship propulsion means comprising, in combination, a well projecting upwardly from the ship's bottom, power transmission means mounted for vertical adjustment in the well, a propeller carried by said transmission means and normally positioned for rotation below the ship's bottom, means for raising the power transmission means and said propeller into the well to a position where only a portion of the propeller projects below the ship's bottom upon rotation of the propeller in the well, and means for subjecting the water in the well to air pressure in excess of atmospheric air pressure, thereby to lower the level of the water in the well substantially to the level of the ship's bottom, whereby the major portion of the propeller in the well operates in air.

3. Ship propulsion means comprising, in combination, a closed, substantially air-tight well projecting upwardly from and opening downwardly through the ship's bottom, power transmission means mounted for vertical adjustment in the well, a propeller carrier by said power transmission means and normally positioned for rotation below the ship's bottom, means for raising said means and said propeller to a position where only a portion of the propeller projects below the ship's bottom upon rotation of the propeller in the well, and means for introducing air under pressure in excess of atmospheric pressure into the well to force water therein downwardly through the open bottom of the well to lower the water level in the well, whereby, when the propeller is rotated in the raised position, the major portion thereof in the well operates in air.

4. Ship propulsion means comprising, in combination, a well projecting upwardly from the ship's bottom and having its upper end substantially hermetically sealed, a casing mounted for vertical adjustment in the well, a propeller carried by the casing for rotation below the ship's bottom or at least partially in the well, depending upon the vertical adjustment of the casing, and means for introducing air under pressure in excess of atmospheric pressure into the well to lower the water level therein, whereby a major portion of the propeller when in the well is disposed above the water level therein and operates in air.

5. Ship propulsion means comprising, in combination, a substantially hermetically sealed well projecting into the interior of the ship from the ship's bottom, a casing mounted for upward and downward adjustment in the well, a propeller carried by the casing, power transmission means in the casing for rotating the propeller, means for adjusting the elevation of the casing in the well between positions where the propeller rotates entirely below the ship's bottom and partially within the well, means for establishing a thrust receiving connection between the casing and the well in any adjusted position of the casing and for releasing said connection during adjustment of the casing, and means for introducing gas under pressure above atmospheric pressure into the well to lower the water level therein, whereby the major portion of the propeller when rotating in the well rotates in gas.

6. Ship propulsion means comprising, in combination, a well projecting upwardly from the ship's bottom, a casing mounted for vertical adjustment in the well, a propeller carried by the casing and normally positioned for rotation below the ship's bottom, means for raising the casing and said propeller to a position where only a portion of the propeller projects below the ship's bottom upon rotation of the propeller in the well, means for establishing a wedging, propulsion thrust resisting connection between the casing and the walls of the well in any adjusted position and for releasing said connection during adjustment of the casing, and means for raising the air pressure in the well to lower the level of the water therein substantially to the level of the ship's bottom, whereby the major portion of the propeller, when rotating in the well, operates in air.

7. In a ship of the type wherein the ship is propelled by a marine propulsion unit mounted in a well projecting upwardly from the ship's bottom and including a downwardly projecting casing and a propeller mounted for rotation thereon below the ship's bottom, means for reducing the draft of the ship for operation in shallow water, said means comprising means for raising said casing and said propeller for rotation of the propeller in the well with only a portion thereof projecting below the ship's bottom, and means for subjecting the water in the well to air pressure in excess of atmospheric air pressure, thereby to lower the level of the water in the well substantially to the level of the ship's bottom, whereby the major portion of the propeller in the well operates in air.

8. The combination with a ship having a well projecting upwardly from its bottom and a propulsion unit mounted in the well and including a propeller supported for rotation therebelow, of means for closing the upper end of the well, thereby providing a substantially air-tight, enclosed chamber opening downwardly through the ship's bottom, and means for introducing air under pressure into said chamber to lower the level of the water in the well, thereby to increase the buoyancy of the ship by an amount equivalent to the weight of water displaced.

9. The combination with a well projecting upwardly from a ship's bottom and a marine propulsion assembly including a casing in the well and a propeller carried thereby, of means for locking the casing against a wall of the well, said means comprising fixed and movable members disposed between the well and casing and having cooperating wedge surfaces, and means for moving the movable member to exert wedging pressure upon the casing and to lock the same against the wall of the well.

10. The combination with a well projecting upwardly from a ship's bottom and a marine propulsion assembly including a casing in the well and a propeller carried thereby, of means for locking the casing against a wall of the well, said means comprising inclined wedge surfaces carried by the well, a movable bar associated therewith, and means for moving the bar to cause the same to be wedged against the casing, to lock the casing against the wall of the well.

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