Aug. 17, 1943. J. D. MacKNIGHT 2,327,118

SUBMERSIBLE BARGE

Filed Dec. 28, 1940 3 Sheets-Sheet 1

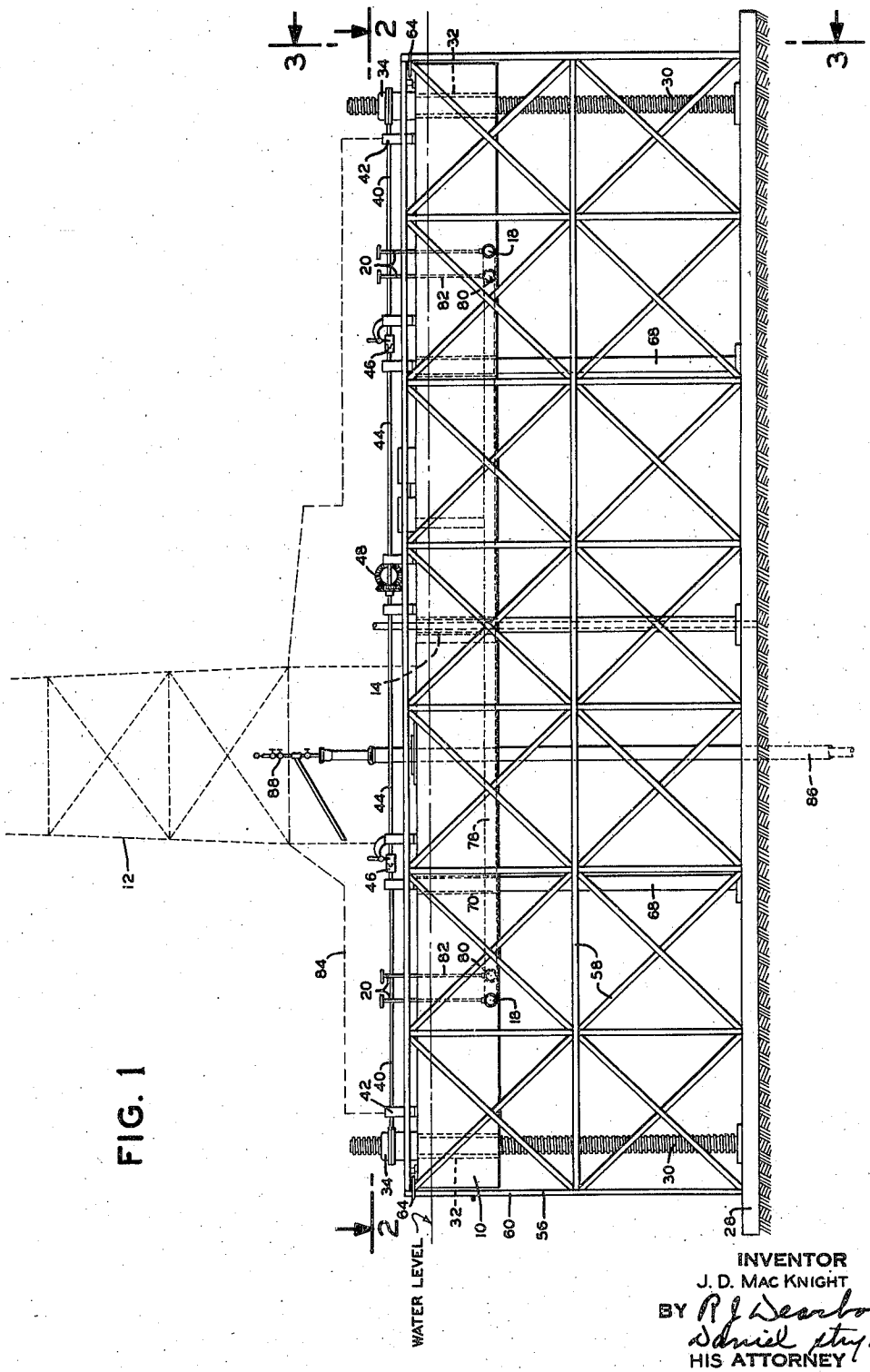


FIG. 1

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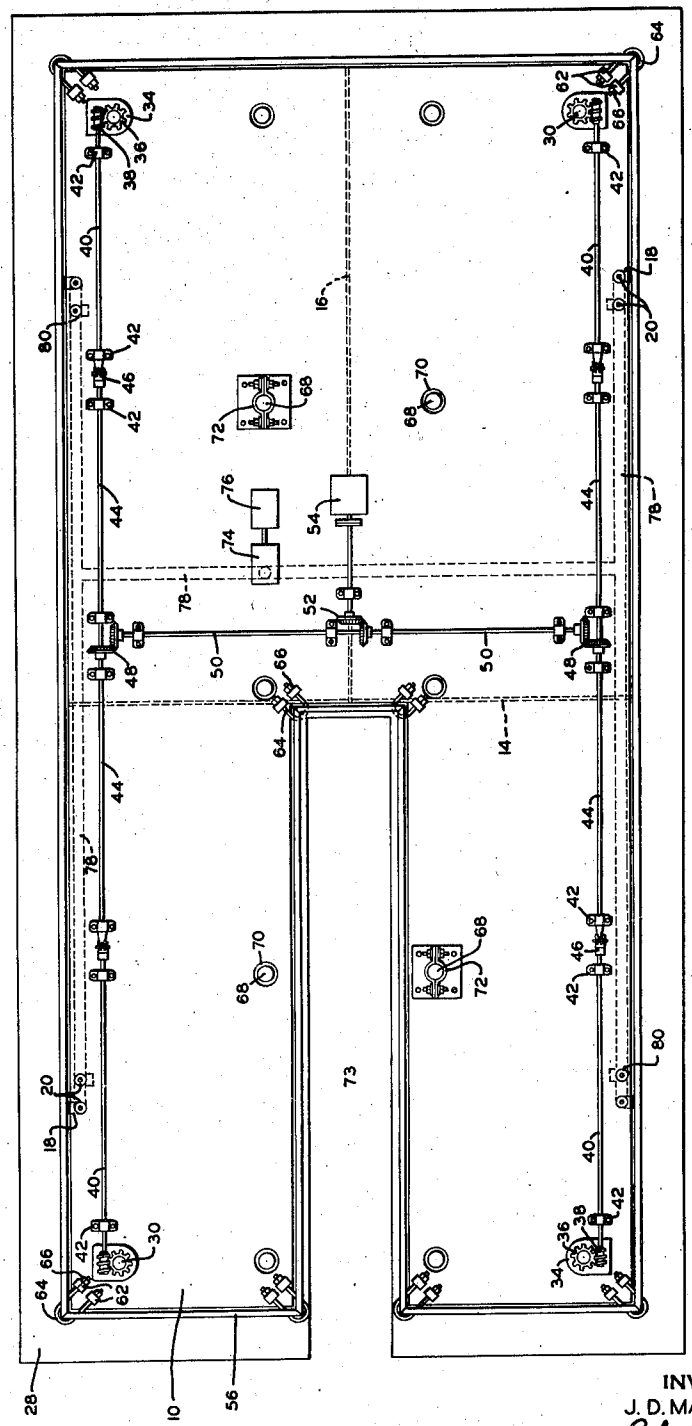


FIG. 2

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SUBMERSIBLE BARGE

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FIG. 3

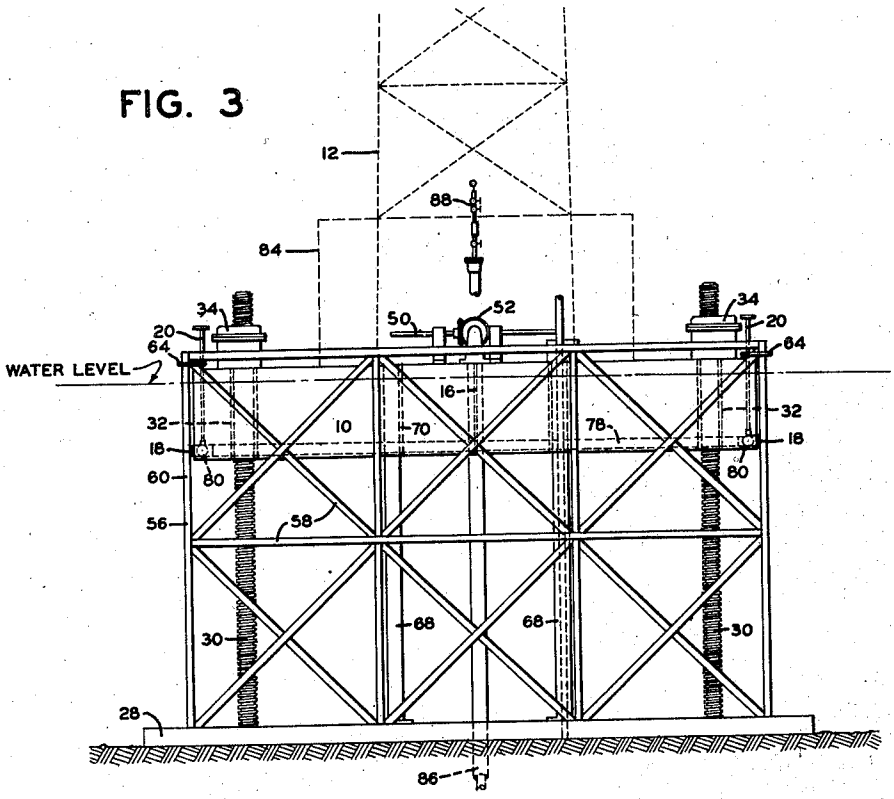
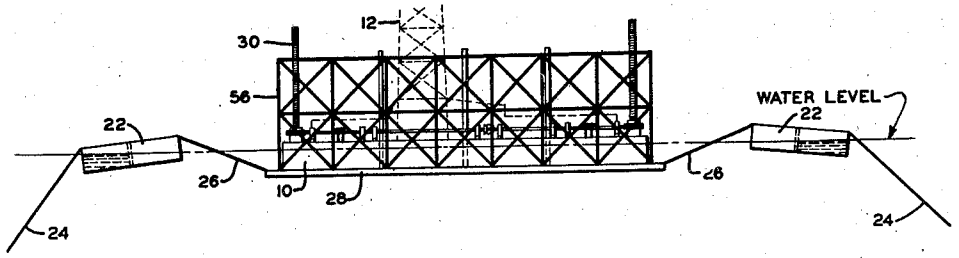


FIG. 4



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Patented Aug. 17, 1943 2,327,118

UNITED STATES PATENT OFFICE

2,327,118

SUBMERSIBLE BARGE

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Application December 28, 1940, Serial No. 372,060

7 Claims. (Cl. 61—46)

This invention relates to barges which are adapted to be submerged to rest on the bottom of a body of water to form a foundation support from which operations such as the drilling of wells may be conducted. More particularly, the invention relates to a barge of this type having a vertically adjustable bottom plate or floor for resting on the bottom of the body of water with means for supporting the main hull of the barge thereabove so that it will not be necessary for the hull to be sunk all the way to the "bottom." As used hereinafter, the term "bottom" will designate the bottom of the body of water in which the barge is to be used.

In the United States Letters Patent No. 1,681,533, issued August 21, 1928 to Louis Giliasso, a submersible barge is disclosed; this device including a closed hull adapted to be sunk so as to rest on the bottom of a body of water. A superstructure supported on the top of the hull carries a platform above which is mounted a derrick and other equipment used in the drilling of wells. These barges are now being used rather extensively in the drilling of wells in waters from 5 to 12 or 15 feet in depth, but for use in waters from, say, 15 to 30 feet in depth a hull larger in horizontal and vertical dimensions would be required. It is often necessary to drill wells in waters slightly inland from a large body of water and it is thus necessary to tow the barges through canals or other streams in order to reach the locations where the wells are to be drilled. Many of these canals, such as are common in the southern part of Louisiana, are narrow and but slightly wider than the width of a hull such as is described in the aforementioned Giliasso patent. Consequently, a barge having a hull sufficiently large to support a derrick and other drilling equipment in deeper waters could not be moved readily through these narrow streams.

The primary object of the present invention is to provide a submersible foundation for well pumping and producing operations which will be sufficiently small in horizontal dimensions so that it can be towed through the canals or other streams without requiring the dredging and widening thereof and which can be used in waters varying in depth from, say, 5 feet to 30 feet or more.

In accordance with the invention, an enclosed hull is provided with an additional floor plate or base member which can be lowered below the bottom of the hull to form a support for the hull and barge structure and which can be raised or retracted so as to occupy but little additional space below the bottom of the hull. Attached to and extending upwardly from the bottom plate are a plurality of supporting legs provided with external screw threads. These legs extend through wells or openings in the hull and are movable vertically with respect to the hull by means of gearing attached to the hull. As the gearing is rotated, the legs will be raised or lowered, depending upon the direction of rotation of the gearing. A superstructure carried by the hull may support a well derrick and other associated equipment. The hull is provided with seacocks adapted to be opened to allow water to enter the hull so as to sink the same to cause the bottom plate to rest on the bottom of the body of water. Pump means are also provided for removing the water from the hull when it is desired to remove it so that the entire structure can be towed to another location.

For a better understanding of the invention reference may be had to the accompanying drawings in which

Figure 1 is a side elevation showing the structure in position on "bottom."

Figure 2 is a plan view of the hull showing the edge of the base plate.

Figure 3 is an end elevation looking from the right in Figure 1 and

Figure 4 is a somewhat schematic view showing the structure afloat and ready to be lowered.

Referring to the drawings, a hull 10 comprising top, bottom and side walls is constructed of a size sufficient to support a drilling derrick 12 and other well producing equipment. The interior of this hull is preferably divided into a plurality of compartments by vertical partitions 14 and 16. Although only four compartments are shown, it is understood that any number of such spaces may be formed in this manner. Each compartment is provided with at least one seacock 18 adapted to be controlled from above the hull by means of valve control rods 20. When the seacocks 18 are open, water will flow into the compartments of the hull until the weight is sufficient to cause the hull to sink. In the barge disclosed in the aforementioned Giliasso Patent No. 1,681,533 the hull will sink to the bottom and the working platform will remain above the water level providing, of course, that a location is selected where the depth of the water is not greater than the height of the working platform above the bottom of the hull.

In Figure 4 the hull 10, above which is surmounted the derrick 12 and other drilling equip-

ment, is shown in its floating position and ready to be lowered at a location where it is desired to drill a well. Pontoons 22 may, if desired, be anchored by cables 24 and connected to the hull by other cables 26 in order to guide the barge during the lowering operation. The barge described up to this point is substantially the same in principle as that disclosed in the Giliasso Patent No. 1,681,533. Assuming that the hull 10 has a vertical dimension of 10 feet and that a working platform is supported 8 feet above the top of the hull, it is obvious that the barge could not be sunk and used in water having a depth of more than 15 feet and even this would allow only 3 feet for wave action and tide variations.

In accordance with the present invention, means are provided whereby a barge of this type may be used in deeper waters. A floor plate or base member 28 is adapted to be carried directly beneath the bottom of the hull 10 in a retracted position, as shown in Figure 4 so that the barge may be towed through shallow waters and also through canals or natural streams but slightly wider than the barge itself. Attached to and extending upwardly from the base member 28 are a plurality of legs 30 provided with external screw threads and adapted to slide through openings or wells 32 in the hull 10. Mounted on the top of the hull 10 above each well 32 is a gear box 34 in which is disposed a gear 36 provided with internal screw threads to engage the threads on the legs 30. The gears 36 are also provided with external threads adapted to be engaged by a worm 38 mounted at the end of a shaft 40. The shafts 40 connected to the worms 38 are supported in bearings 42 and connected to other shafts 44 by means of releasable couplings 46. The shafts 44 are arranged to be driven through gears 48 by a transverse shaft 50 which in turn is driven through gears 52 by means of a suitable reversible motor or engine 54. It will thus be seen that when the couplings 46 are all connected, rotation imparted by the engine 54 will be transmitted to the worm gears 38 to rotate the gears 36 and this rotation of the gears 36 will cause the legs 30 and the plate 28 to be raised or lowered with respect to the hull 10, depending on the direction of rotation.

Mounted upon and extending upwardly above the base member 28 is an open trestle work 56, comprising horizontal and diagonal braces 58 and vertical braces 60. A pair of lugs 62 extend upwardly from each corner of the hull 10 and a U-bolt 64 is adapted to be placed around each of the corner vertical braces 60 and secured to the lugs 62 by means of suitable nuts 66. By means of the U-bolts 64 the base member 28 can be rigidly clamped to the hull 10 at any position below the hull.

In order to afford additional support between the base plate 28 and the hull 10 a plurality of rod or pipe members 68 are secured to the base plate and extended upwardly through openings 70 in the hull 10. Secured to the top of the hull around each of the openings 70 is a suitable clamping device 72 adapted to engage the members 68 and to hold the same rigidly with respect to the hull. As shown in Figure 2, the hull 10 and base plate 28 are preferably formed so as to provide a cut-out portion or bay 73 through which the drilling or producing operations are conducted.

In order to remove the water from the compartments of the hull, a pump 74 driven by suitable motor or engine 76 is disposed at any convenient place with respect to the hull and is connected to each of the compartments by means of piping 78. Valves 80 are provided in the piping 78 and may be controlled from above the hull by means of suitable valve rods 82.

It is understood that any desired superstructure or housing 84 can be mounted upon and supported by the hull 10 but, since this does not form a part of the invention, it has been shown in dotted lines only.

In operation, let us assume that the base member 28 has been drawn upwardly in its retracted position, as shown in Figure 4, and that the barge has been towed to a position where it is desired to drill a well or to rework or pump an existing well. In case a completed well is to be pumped or drilled deeper, the barge is towed around the well so that the later will be within the bay 73, directly under the derrick 12. The compartments of the hull will, of course, be empty, or substantially so, and pontoons 22 may, if desired, be connected to the barge so as to guide it during the lowering operation. The U-bolts 64 are then removed or loosened, as well as the clamps 72, and the motor 54 is then energized to rotate the gearing 36 and 38 in the proper direction to lower the legs 30 and thus the base member 28. If the water is sufficiently shallow, such as is the case shown in Figures 1 and 3, the base plate 28 may be lowered all the way to the "bottom," the top of the hull 10 remaining above the water level. The U-bolts 64 and clamps 72 are then tightened so as to hold the hull rigid with respect to the base plate 28. The seacocks 18 may then be opened to allow water to enter the compartments of the hull so as to provide additional weight and stability. The well is then drilled or worked in the usual manner, this operation taking place within the bay 72. The casing 86 of the well will, of course, project upwardly above the water level and after the drilling operation the usual Christmas tree or other connections 88 may be made.

After the drilling operation has been completed and it is desired to move the barge to another location, the seacocks 18 are closed and the pump 74 actuated to withdraw the water from the compartments of the hull. In some instances it may be desirable to have more weight in one or more of the compartments and this can be effected by suitable control of the valve 80. Again it may be that because of a slightly sloping "bottom" or for other reasons the base plate 28 should not be exactly parallel with the bottom of the hull. Before or during the lowering operation, one or more of the couplings 46 may be disengaged so that the leg or legs controlled thereby will not be lowered as far as the other legs. After the water has been pumped from the interior of the hull, the U-bolts 64 and clamps 72 are loosened or removed and the motor 54 actuated in a direction to rotate the gearing 36 and 38 to raise the legs 30. When the base plate 28 has been retracted to the position shown in Figure 4, the U-bolts and clamps can again be tightened after which the barge will be in condition to be towed to another location. In case it is not necessary to tow the barge through shallow waters the base plate need be raised only part way, it being only necessary to clear the "bottom" during the towing operation.

In the event that the bottom plate 28 should tend to stick in the sand or mud of the "bottom," water or mud can be pumped downwardly through the vertical pipes 68 to break the suc-

tion. Although the member 28 has been illustrated as a single solid plate without bracing other than that formed by the pipes 68 and the supports 58 and 60, it is obvious that an additional bracing or grill work may be attached directly to the upper side of the plate 28 at a plurality of points to strengthen the base member. The base member may also be formed as a hollow hull of a relatively small vertical height and a pipe extending upwardly through or around the main hull 10 would serve to conduct water to or from the interior of such a secondary hull to aid in the lowering and raising operations.

In case the water is deeper than that shown in Figures 1 and 3, the base plate 28 may be lowered as far as practicable, after which the water may be allowed to flow into the hull to sink the hull below the water level, it being only necessary that the superstructure and controls be supported sufficiently high above the hull as to remain above the water level.

It will thus be observed that a stable foundation has been provided for well drilling or producing operations and which can be used in waters considerably deeper than those where submersible barge drilling is now being carried on. The barge built in accordance with the invention can be towed easily through canals or natural streams.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof and, therefore, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A foundation structure for use in conducting oil well producing operations in a body of water comprising a submersible hull including top, bottom and side walls, a unitary base member carried by said hull substantially coextensive with, and disposed below and substantially parallel to said bottom wall, means for lowering said member to rest on the bottom of the body of water, a frame secured to the periphery of said base member and extending upwardly to embrace said hull, means for clamping said frame to said hull when said base member is in its lowered position, and means for weighting said hull so that when said base member rests on "bottom," a stable foundation is formed for operations conducted from said hull.

2. A foundation structure for use in conducting oil well producing operations in sub-aqueous locations comprising a submersible hull including top, bottom and side walls, a plate member disposed below and parallel to said bottom wall, said plate member being of substantially the same size and shape as said bottom wall, means for lowering and raising said plate with respect to said bottom wall, means for submerging said hull so that said plate will rest on "bottom" to form a foundation for operations conducted from said hull, a trestle work frame secured to the periphery of said plate member and extending upwardly to embrace said hull, means for locking said frame to said hull when said base is in its lowered position, and means for raising and refloating said hull so that said structure may be moved to another location.

3. A foundation structure for use in conducting oil well producing operations in sub-aqueous locations comprising a submersible hull including top, bottom and side walls, a base member disposed below and substantially parallel to said bottom wall and having substantially the same size and shape as said bottom wall, means for lowering and raising said member with respect to said bottom wall, said means comprising legs secured at their lower ends to said base member and extending upwardly, means on said hull for engaging said legs and moving said legs downwardly and upwardly to lower and raise respectively said base member, a trestle work frame secured to the outer edge of said base member and projecting upwardly so as to embrace said hull, means for locking said frame to said hull when said base member is in its lowered position, and means for submerging said hull so that said base member will rest on "bottom."

4. A submersible barge foundation for well drilling and producing operations in sub-aqueous locations comprising a hull, a vertically movable base plate having substantially the same horizontal dimensions as said hull disposed beneath said hull and adapted to be lowered to rest on "bottom," screw threaded supporting pillars secured to said plate and extending upwardly through said hull, rotatable screw means on said hull for engaging said threaded pillars and adapted when rotated to move said base plate upwardly or downwardly with respect to said hull, and means for rigidly securing said plate to said hull comprising a trestle work member attached to said plate around its outer edge and extending upwardly so as to surround said hull, and means for locking said trestle work member to said hull when said base plate is in a predetermined position with respect to said hull.

5. A submersible barge foundation for well drilling and producing operations in sub-aqueous locations comprising a hull, a vertically movable base plate disposed beneath said hull and adapted to be lowered to rest on "bottom," said plate having substantially the same dimensions as the bottom of said hull, screw threaded supporting pillars secured to said plate and extending upwardly through said hull, rotatable screw means on said hull for engaging said threaded pillars and adapted when rotated to move said base plate upwardly or downwardly with respect to said hull, a trestle work frame secured to the periphery of said base plate and extending upwardly around the outer edge of said hull, means for locking said frame to said hull when said base plate is in its lowered position, and means for weighting said structure to insure firm engagement between said base plate and the "bottom" comprising means for filling said hull with water.

6. A submersible barge foundation for well drilling and producing operations in sub-aqueous locations comprising a hull, a vertically movable base plate of substantially the same size and shape as the bottom of said hull disposed beneath said hull and adapted to be lowered to rest on "bottom" so as to support said hull above the "bottom," to facilitate the use of said barge foundation in waters deeper than the height of said hull above the bottom of said hull, means for connecting said base plate rigidly to said hull but at predetermined distances therefrom comprising screw threaded supporting pillars secured to said plate and extending upwardly through said hull, rotatable internally threaded members on said hull engaging said pillars, means for rotating said members to move said pillars and said base plate toward or away from the bottom of said hull, a frame work secured to the base plate around its outer edge and extending upwardly to

have sliding engagement with the outer walls of said hull, and means for clamping said framework to said hull to afford additional rigidity between said hull and said base plate.

7. A foundation structure for carrying on well producing operations comprising a hull, means for submerging said hull and means for supporting said hull above the "bottom" in locations where the water is deeper than the height of said hull comprising a base plate disposed horizontally directly below said hull and being substantially coextensive with the bottom of said hull, and means for connecting said base plate rigidly to said hull but at predetermined distances therefrom comprising screw threaded supporting pillars secured to said plate and extending upwardly through said hull, rotatable threaded members on said hull engaging said pillars, means for rotating said members to move said pillars and said base plate toward or away from the bottom of said hull, clamping means for securing the base plate to said hull, said clamping means comprising a trestle work frame secured to the periphery of said base plate and projecting upwardly to embrace said hull, and means for locking said frame to said hull when said base plate is in a predetermined lowered position at a desired position below the hull.

JOHN DONALD MACKNIGHT.

CERTIFICATE OF CORRECTION.

Patent No. 2,327,118. August 17, 1943.

JOHN DONALD MACKNIGHT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 13, claim 7, strike out the words "at a desired position below the hull" and insert the same after "hull" and before the comma in line 7, same claim; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of November, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.