Jan. 21, 1964 M. E. TRUE ETAL 3,118,283

DRILLING BARGE

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FIG. 1.

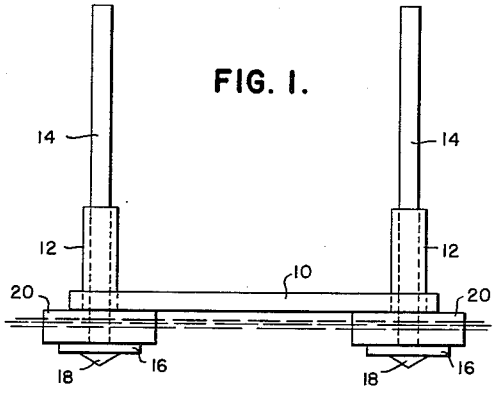



FIG. 2.

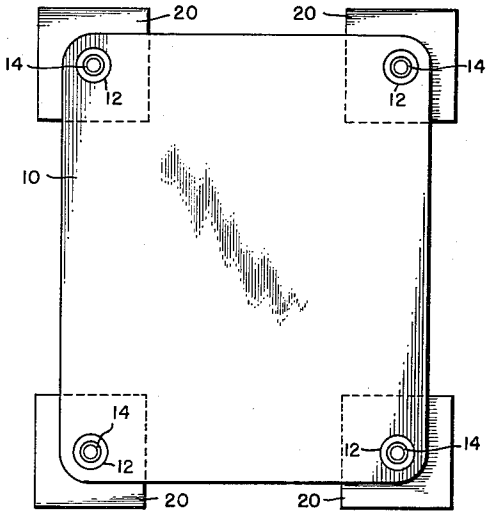



FIG. 3.

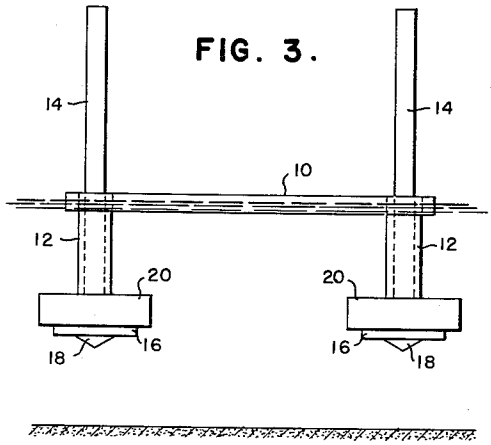



FIG. 4.

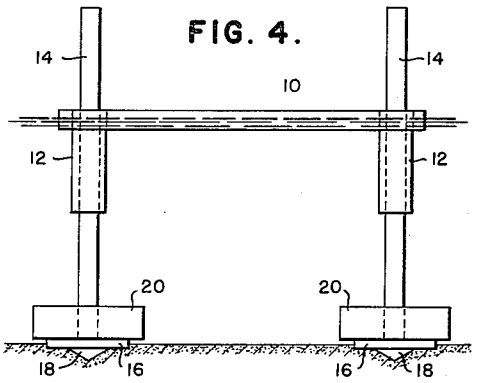
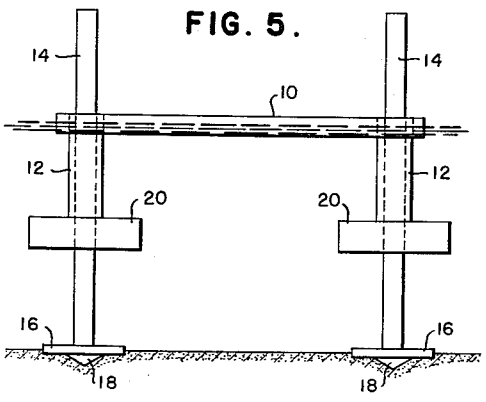



FIG. 5.




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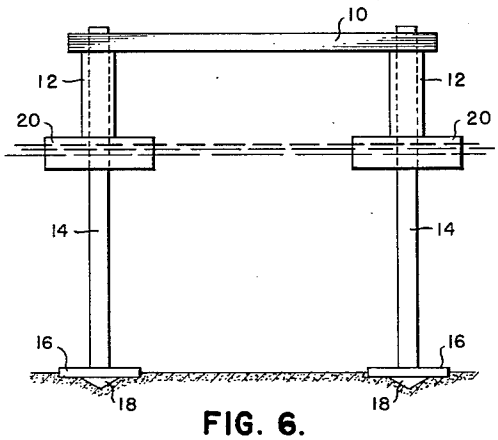



FIG. 6.

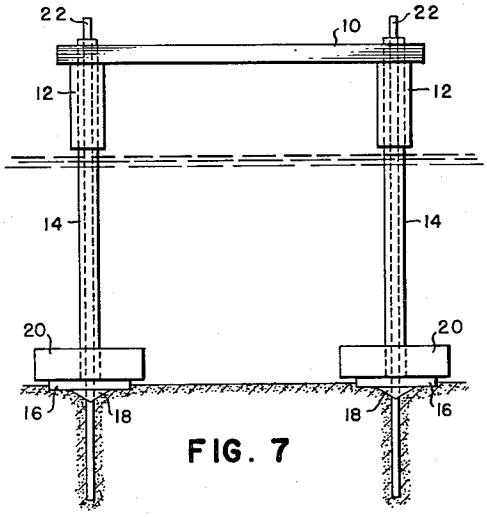



FIG. 7

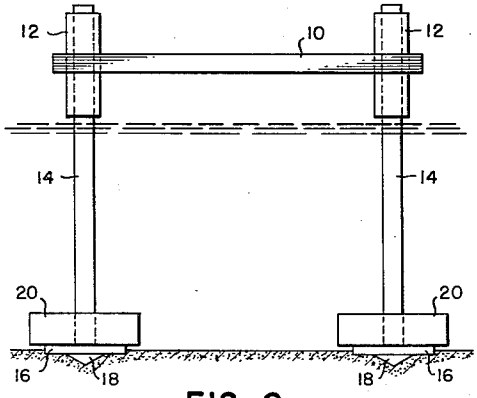



FIG. 8.

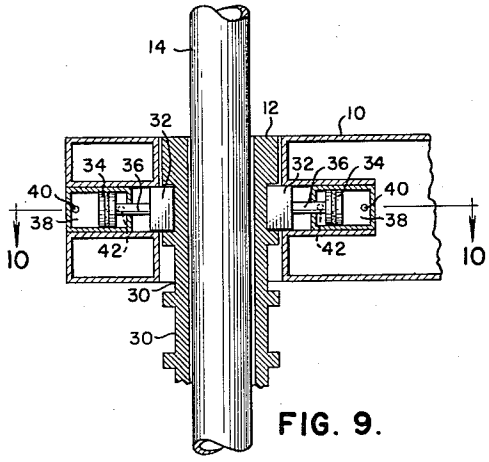



FIG. 9.

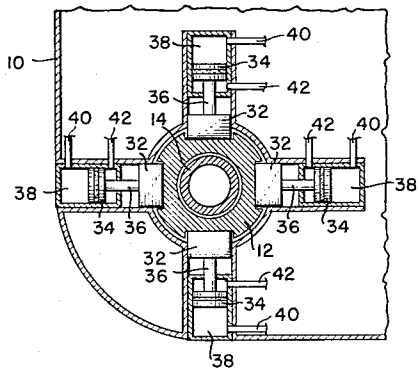



FIG. 10.

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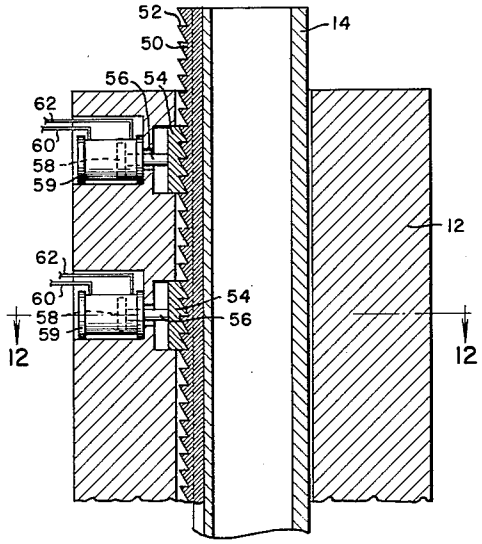



FIG. 11.

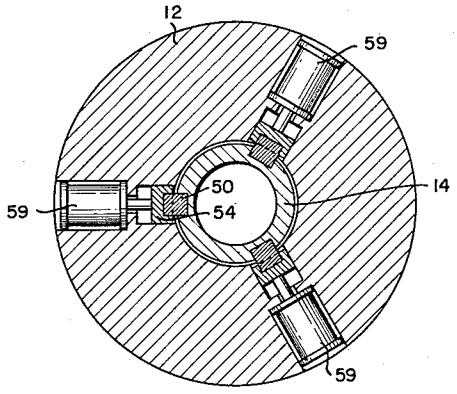



FIG. 12.

FIG. 14.

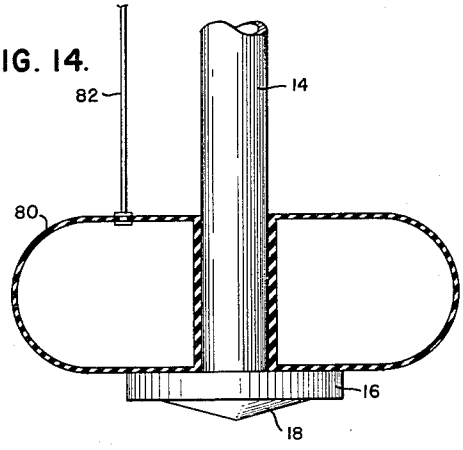
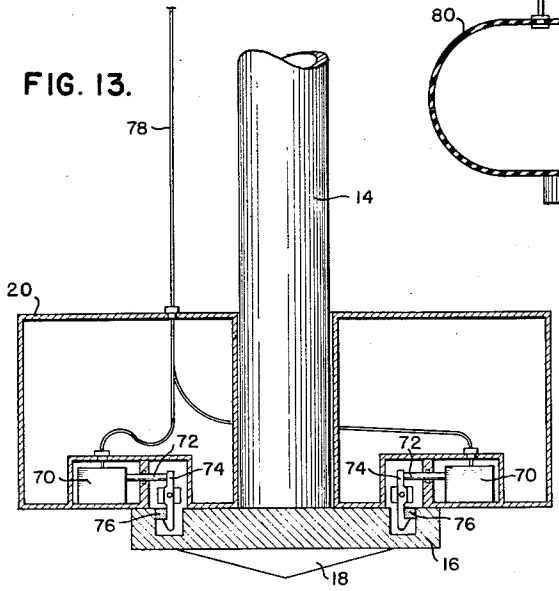



FIG. 13.




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United States Patent Office

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3,118,283

# DRILLING BARGE

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Filed Aug. 7, 1957, Ser. No. 676,844
1 Claim. (Cl. 61—46.5)

This invention relates to portable drilling barges such as those used in conducting offshore operations. More particularly, this invention relates to an offshore structure which utilizes natural forces for raising the platform above sea level.

In conducting offshore operations, such as drilling operations, the usual procedure is to utilize a floating platform supported by columns and buoyant members for floating the platform to desired locations. The buoyant members serve as floats while the platform is towed to the desired location. The buoyant members are then flooded. They settle to the bottom and then serve as anchors for the platform. The platform is then raised above sea level by means for various man-made equipment such as a winch and pulley system and locked in the raised position by various locking means. The equipment used to raise the platform is necessarily very large and heavy. This requires additional weight to be placed on the platform and hence decreases the platform stability.

Also, the additional cost of the heavy equipment utilized to raise the platform is high.

It would be highly desirable, therefore, to have an offshore structure which utilizes natural forces to raise the platform, thus obviating the need for the heavy mechanical and electrical equipment currently utilized.

It is an object of this invention to provide a novel offshore structure which utilizes a unique assembly including buoyant members for raising the platform above sea level.

Briefly described, this invention includes a floating working platform. Means are provided for supporting the working platform. The supporting means may consist of support columns which extend through wells or openings pierced through the platform. Buoyant means are provided for raising the platform a desired distance above the water level.

Referring to the drawings:

FIG. 1 is a schematic view showing our new offshore structure with the elements in position to permit the towing of the structure from one location to another;

FIG. 2 is a plan view of FIG. 1;

FIG. 3 is a schematic view showing the elements in an alternative relative position for transporting the platform from one position to another;

FIGS. 4, 5, 6, and 7 are schematic views illustrating the sequence of operations used in anchoring the floating platform at the desired location and then raising the platform a desired height above sea level by use of natural forces;

FIG. 8 is a schematic view showing the relative position of the elements when the platform is raised to a height above sea level different from that shown in FIGS. 4 through 7, inclusive;

FIG. 9 is a sectional view illustrating one type of locking mechanism for locking the elevating member to the floating platform;



FIG. 10 is a sectional view taken along lines 10—10 of FIG. 9;

FIG. 11 is a sectional view illustrating one type of locking mechanism for locking the support columns to the elevating members;

FIG. 12 is a sectional view taken along lines 12—12 of FIG. 11;

FIG. 13 is a schematic view of a buoyant member resting on the foot of a support column and illustrates one means for locking the buoyant members to the foot of the support columns; and

FIG. 14 is a sectional view illustrating a second type of buoyant member.

Referring to FIG. 1, numeral 10 designates a floating working platform. The heavy equipment (not shown) used in offshore operations rests upon the platform and is supported thereby. For example, if drilling operations are to be performed, a drilling rig and associated equipment will be placed upon platform 10. Floating platform 10 is pierced with a plurality of wells or openings.

Positioned within each of the openings is an elongated elevating member 12. Elevating members 12 may be cylindrical in form or any other desired shape. Each elevating member 12 has a bore through the axis thereof and along its entire length. The bores in each elevating member 12 receive a support column 14.

Elevating members 12 are slidable and may be moved upwardly or downwardly so that the portion of an elevating member 12 contained within its respective opening in platform 10 may be changed. Each support column 14 is also slidable with respect to its elevating member 12 so that the support columns may be moved upwardly, permitting the platform to be towed from one location to another, and then moved downwardly when the platform is at a desired location to provide support for the platform against overturning due to winds, waves, and any other extraneous forces.

From the foregoing, it can be seen that each elevating member 12 is movable with respect to platform 10 and each support column 14 is movable with respect to an elevating member 12. Any of the various types of locking means may be provided to lock the elevating members 12 to platform 10 in any desired position. Also, any of various conventional locking means may be provided for locking the support columns 14 to their respective elevating members 12.

Three or more support columns 14 may be utilized. The schematic representations shown in the figures show a platform which uses 4 columns, as clearly shown in FIG. 2.

Each support column 14 has at its lower extremity a foot member 16 having a pointed portion 18. A buoyant member 20 is slidably arranged about each support column 14. The buoyant member 20 is located between the elevating member 12 and the foot portion 16. The buoyant members are in dimensions large enough to provide sufficient buoyancy to raise the combined weight of the elevating members and the working platform. Conventional means well known in the art may be used to flood or remove water from the substantially hollow members 20, thereby varying the buoyancy of said members.

When the offshore structure is being moved from one location to another, it is highly desirable that the platform be just above the water level. If the structure is

transported with the platform high above the water level, the structure is very unstable and there is danger of overturning. Our new structure is towed from one location to another with the relative positions of the platform 10, elevating members 12, support columns 14, and buoyant members 20, as shown in FIG. 1. Alternatively, the relative positions of these members may be as shown in FIG. 3 or any other position in which the foot members 16 are raised above the mud line. Notice that in FIG. 1 and FIG. 3 the support platform 10 is maintained on the water line (FIG. 3) or just above the water line (FIG. 1).

The sequence of operations for securing the offshore structure at the desired location is illustrated in FIGS. 4 through 7, inclusive. Referring to FIG. 4, the support columns 14 are released from their locked positions to their respective elevating members 12. Support columns 14 may be allowed to drop to the mud line, or in the alternative, a controlled dropping may be obtained by controlling the buoyancy of buoyant members 20. The foot portions of columns 14 are shaped so that they bury themselves into the mud line. A deeper penetration of foot members 16 into the mud line is accomplished after the columns have been dropped by increasing the ballast within buoyant members 20, thus increasing the weight upon the foot member 16. This is accomplished by conventional methods well known in the art. The offshore structure is then secured firmly to the sea bottom and danger of overturning is minimized.

After the columns 14 have been secured in the mud line, the next operative step is as illustrated in FIG. 5. The ballast in buoyant members 20 is reduced, thus increasing their buoyancy. This reducing of ballast may be done, for example, by removing water by conventional means from the interior of the buoyant members. The increased buoyancy of buoyant members 20 causes them to slide upwardly along the support columns 14 and against the lower portion of the elevating members 12. The locking means connecting elevating members 12 to platform 10 is then unlocked. Further increasing of the buoyancy of buoyant members 20 will then raise the elevating members 12 to any desired position with respect to the platform 10. In FIG. 5, the buoyancy of the buoyant members has been controlled to place the upper portion of elevating members 12 in alignment with the upper portion of platform 10. When the elevating members 12 are placed in their desired position, they are again locked to the platform 10.

The next procedural step is as illustrated in FIG. 6. The buoyancy of the buoyant members 20 is increased to a point sufficient to raise the combined weight of the platform 10 and the elevating members 12. It can be seen, therefore, that our arrangement of offshore structure utilizes the natural forces of buoyancy to raise the platform above sea level. This use of natural buoyancy eliminates the need for the currently used heavy mechanical man-made equipment, such as the heavy mechanical jacks, winches, and hoists. The elimination of this heavy equipment for raising the platform above sea level decreases the required weight upon the platform 10. Also, of course, the cost of the necessary equipment for offshore operations is decreased greatly.

The next procedural step is as illustrated in FIG. 7. After the platform 10 has been raised above sea level, the buoyant members 20 are then flooded with water to decrease their buoyancy and increase their weight. The buoyant members then slide along support columns 14 and upon foot members 16. Locking means may be provided for securing buoyant members 20 upon the foot members 16. This added weight upon foot members 16 tends to push the foot members further into the mud line. Also, by positioning the buoyant members 20 upon the sea bottom, the wind and wave effects upon the members 20 is minimized, and thereby increases the stability of the offshore structure. To further increase the stability, spuds 22 are driven through bores in columns 14 and into the mud line.



The height of platform 10 above the sea level is determined and controlled by the portion of elevating members 12 encompassed by the openings within platform 10. The platform is raised to its highest height when the upper extremity of elevating members 12 are flush with the top of platform 10. A minimum height above sea level is obtained when the elevating members 12 are locked to platform 10 with the lower extremity of elevating members 12 flush with the lower portion of platform 10. Intermediate heights are accomplished by locking elevating members 12 to platform 10 with intermediate portions of the elevating members encompassed by the platform openings, as illustrated in FIG. 8.

FIGS. 9 and 10 illustrate one type of locking means for locking elevating members 12 in a desired position with respect to platform 10. Circular grooves 30 are formed along the elevating members 12. These grooves are adapted to receive a hydraulically-operated member 32 which is connected to a piston 34 through a piston rod 36. The piston 34 is reciprocated within a chamber 38. Hydraulic pressure applied against the piston 34 through passageway 40 causes the member 32 to be moved into a groove 30, thus locking elevating member 12 to platform 10. Hydraulic pressure applied through passageway 42 and against the piston 34 moves the members 32 out of the groove 30, permitting the elevating member 12 to be slidably moved within the opening in platform 10.

FIGS. 11 and 12 illustrate one locking means for locking the support columns 14 to the elevating members 12. Racks 50, having a plurality of teeth 52, are formed on the outside of the columns 14. Correspondingly toothed members 54 are connected through piston rods 56 to pistons 58 in cylinders 59 which are hydraulically operated. The application of hydraulic pressure through passageways 60 move the pistons 58 within cylinders 59 so that the toothed members 54 engage their respective racks 50. Application of hydraulic pressure through passageways 62 move the toothed members 54 away from racks 50, thus unlocking elevating members 12 from support columns 14.

Buoyant member 20 may be locked to foot member 16 by means of a solenoid 70 which operates an armature 72 connected to a pivotable latch 74 (see FIG. 13). Pivotable latch 74 engages a circular ring 76 located within a circular groove formed within the foot member 16 and securely holds buoyant member 20 against the foot member 16. A flexible cable 78 containing the necessary conductive wires extends from the buoyant member 20 up to the platform 10 which contains the required electrical equipment. If desired, a pneumatic or hydraulically-operated piston may be used in place of the solenoid 70, and a flexible hydraulic hose in place of the flexible cable 78.

An alternative type of buoyant member for use in place of the rigid buoyant members 20 may be the donut-shaped inflatable bladder 80, such as shown in FIG. 14. The use of a bladder 80 as a buoyant member has the advantage that when it is not in use to raise the platform above sea level, it may be deflated. In the deflated state, the bladder 80 takes up much less room and is less cumbersome than a rigid buoyant member. Bladder 80 is slidably arranged about support column 14. The buoyancy of the bladder is controlled by air introduced or removed from within the bladder by means of an air line 82 connected to the bladder 80. The inflow and outflow of air from bladder 80 is controlled by means of air compressors contained on the platform.

It is to be understood that various other modifications of our invention may be made without departing from the scope of the appended claim.

We claim:

In a floating barge for underwater operations: a floating working platform having a plurality of openings therethrough; an elongated cylindrical platform elevating member slidably extending through each opening in the floating barge and having a bore through its axis; an elongated

cylindrical leg slidably extending through the bore and having a foot member at its lower extremity; a buoyant member slidably arranged about each leg below the platform elevating member and above said foot member, said buoyant member being large enough to provide sufficient buoyancy to raise the combined weight of the elevating member and working platform; means for locking each leg to its respective elevating member; means for locking each elevating member to the working platform, and means for varying the buoyancy of the buoyant members whereby the floating working platform may be towed to a desired position above the mud line, the legs lowered to penetrate the mud line, the buoyancy of the buoyant members increased to cause them to contact their respective elevating members and move the elevating members



to a desired position with respect to the platform, the platform locked to the elevating members, and the buoyancy of the buoyant members decreased so that the buoyant members seat on the foot members.

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