

May 31, 1960

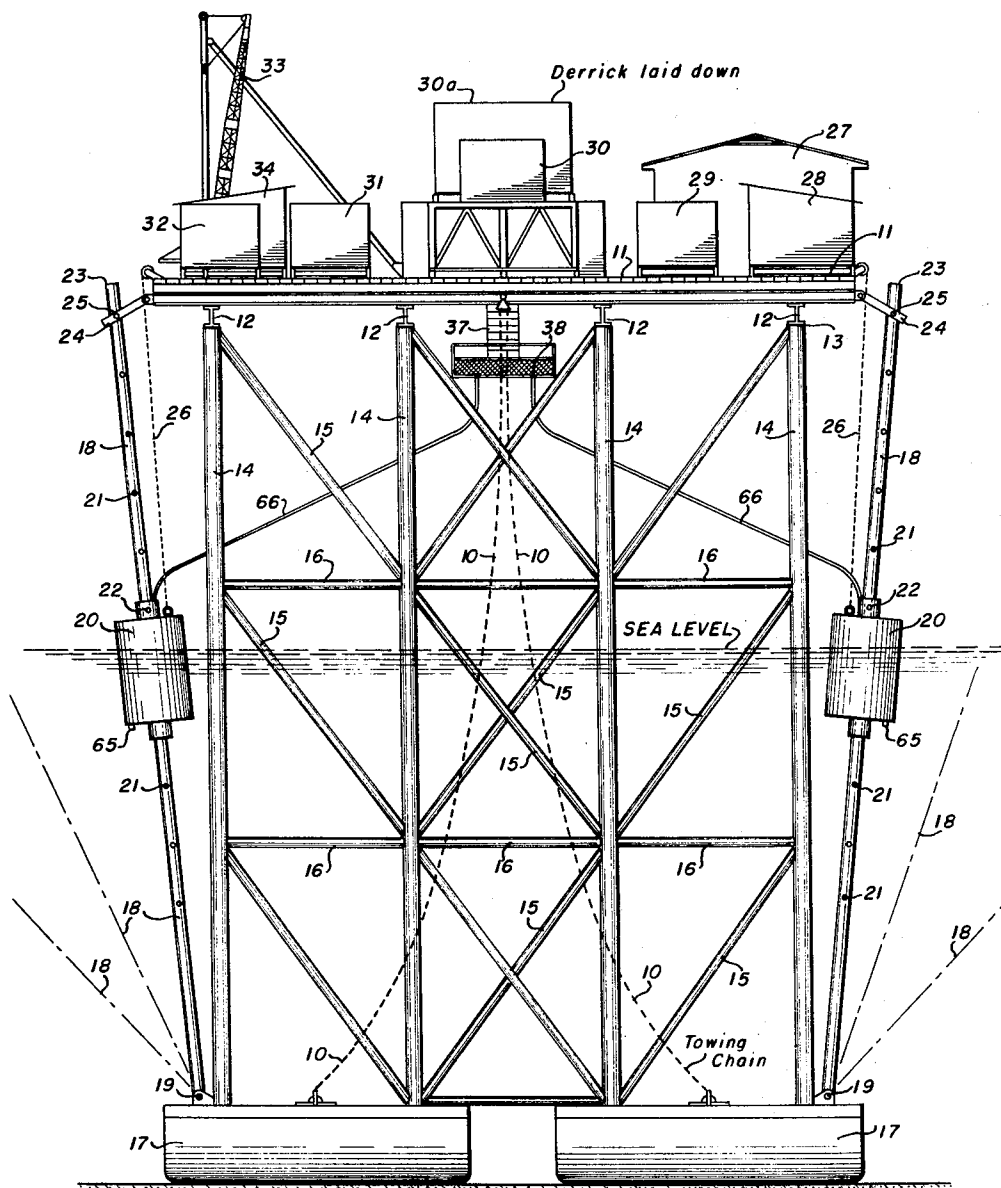
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2,938,352

DEEP WATER RECOVERABLE DRILLING PLATFORM

Filed Dec. 13, 1954

6 Sheets-Sheet 1



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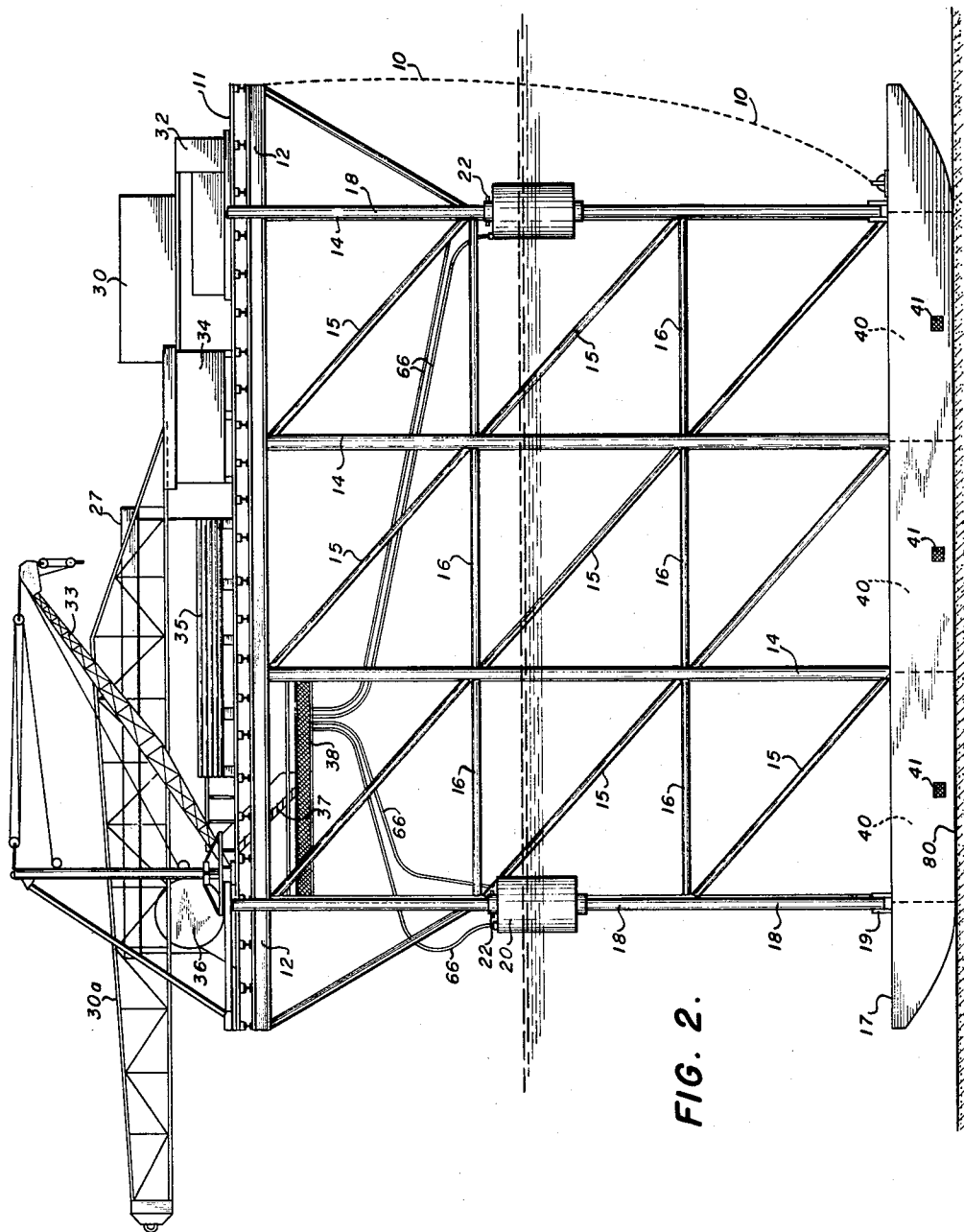
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DEEP WATER RECOVERABLE DRILLING PLATFORM

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6 Sheets-Sheet 2



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DEEP WATER RECOVERABLE DRILLING PLATFORM

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6 Sheets-Sheet 3

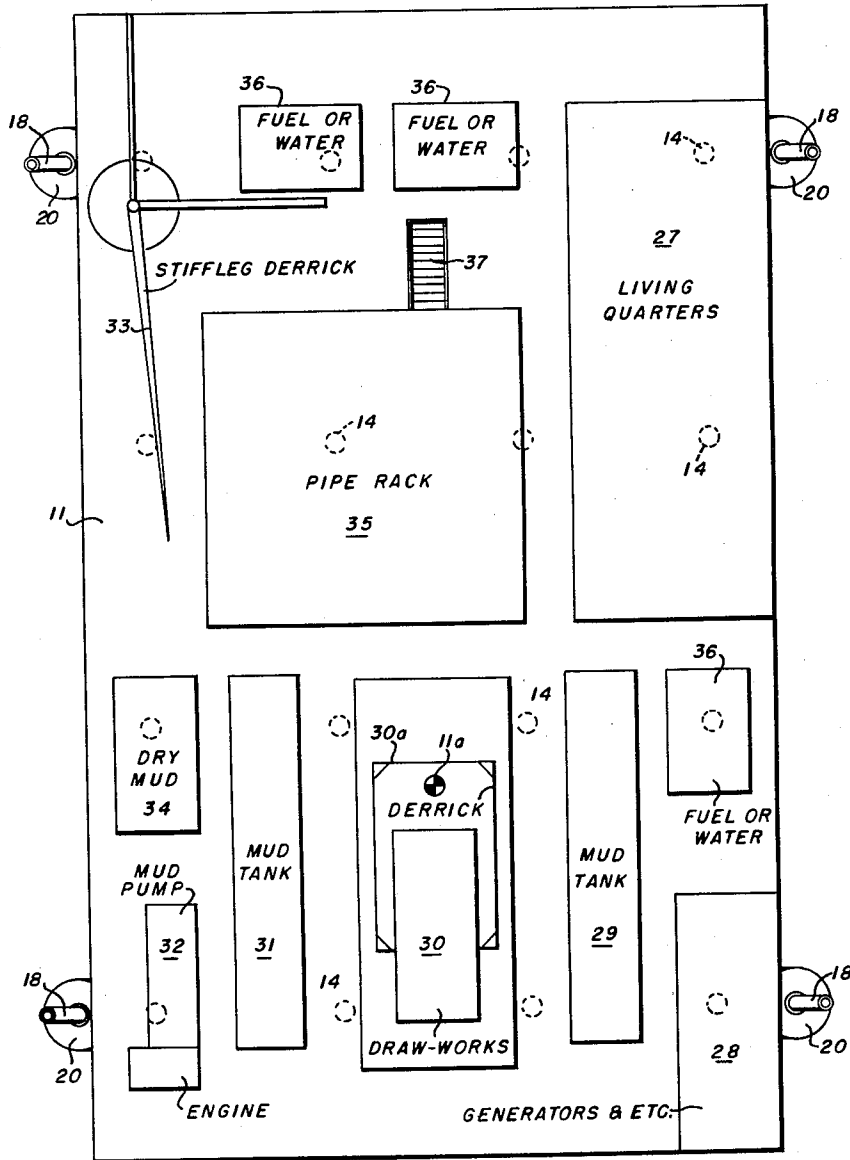


FIG. 2A.

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DEEP WATER RECOVERABLE DRILLING PLATFORM

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6 Sheets-Sheet 4

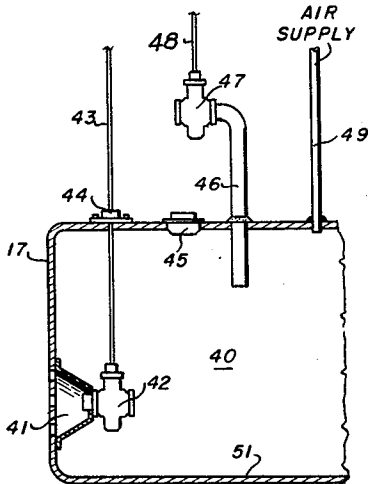


FIG. 3.

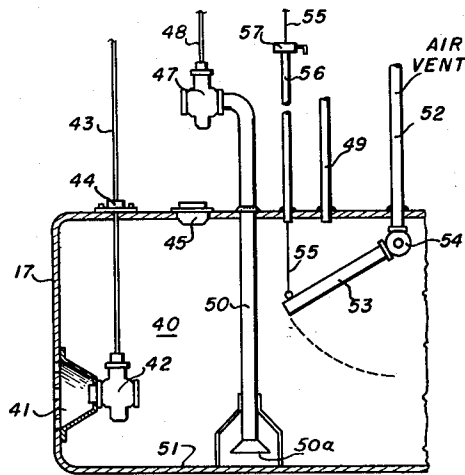


FIG. 4.

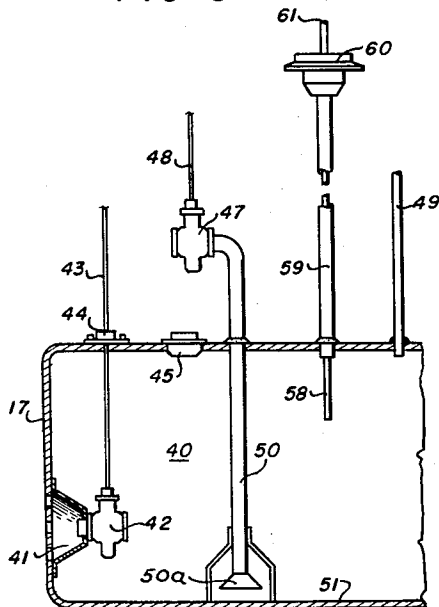


FIG. 5.

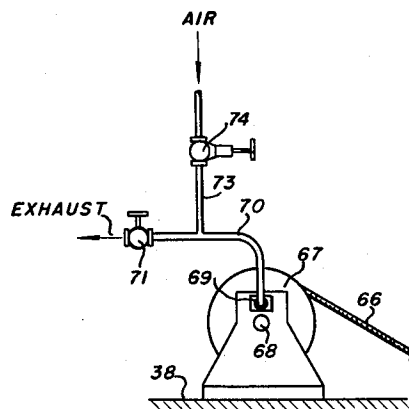


FIG. 6.

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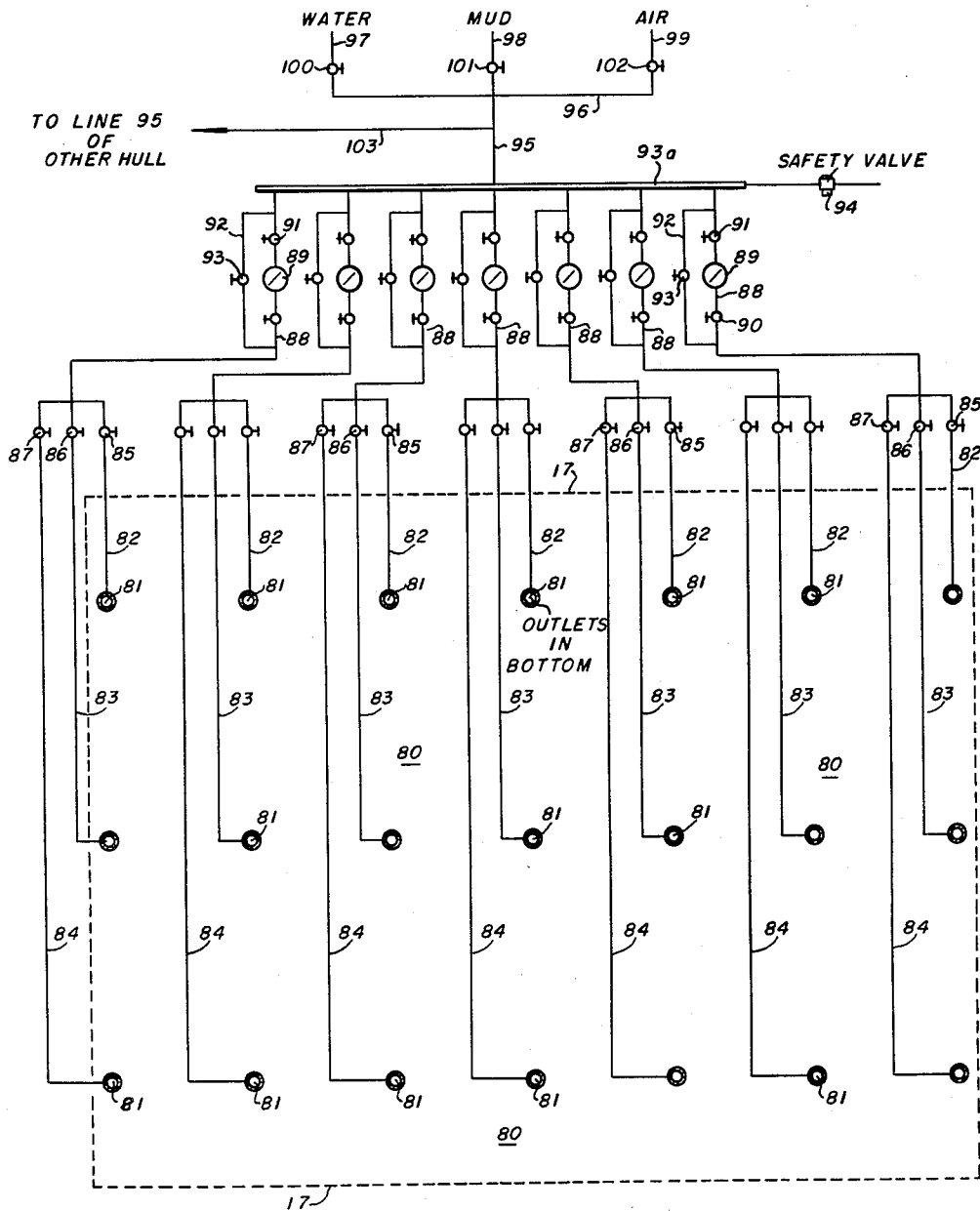


FIG. 7.

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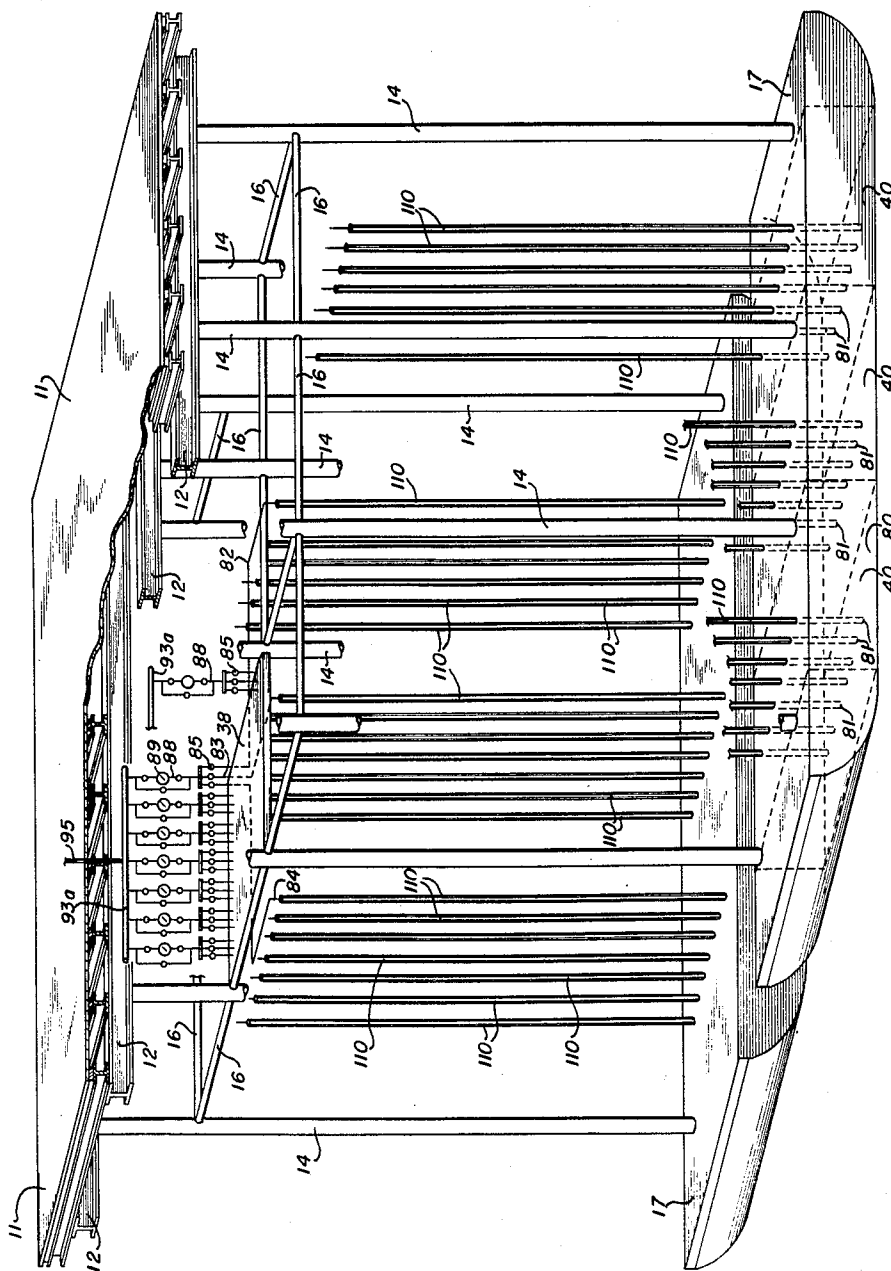
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FIG. 8.



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2,938,352

DEEP WATER RECOVERABLE DRILLING PLATFORM

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3 Claims. (Cl. 61—46.5)

The present invention is directed to a deep water recoverable structure adapted for use in well drilling operations and the like. More particularly, the invention is directed to a platform supported on a barge or barge members which may be sunk and raised at an offshore water location. In its more specific aspects, the invention is directed to an improved off-shore platform of improved stability and mobility.

The present invention may be briefly described as a deep water recoverable structure adapted for use in offshore well drilling operations and the like which comprises, in combination, a platform adapted to support well drilling equipment and the like. The platform is supported on at least one barge member and preferably on two horizontally spaced apart barges by structural supporting members attached to the platform and to the barges. The platform is supported above the water level of a water location when the structure is sunk to the underlying land bottom. In the structure of the present invention, auxiliary buoyancy means, such as pontoons, are carried laterally on at least one side of the structure; the auxiliary buoyancy members may be arcuately as well as slidably mounted outboard of the structure.

The auxiliary buoyancy means or pontoons are so arranged outboard of the structure so that they may be raised or lowered from one level to another or swung outboard from the structure arcuately so that they may rest in the water at a substantial distance from the structure. The auxiliary or supplementary buoyancy pontoons may be suitably mounted on a pivoted member in slidable position so that the auxiliary buoyancy means may assume several different positions as conditions demand.

The structure of the present invention is provided with a plurality of jets arranged on the bottom of the barge members and the jets are in fluid communication through conduits with means for introducing fluid through the jets for release of the barges from the land bottom to which they are sunk by flooding the barges.

The present invention will be further illustrated by reference to the drawing in which:

Fig. 1 is an end elevational view of the structure of the present invention;

Fig. 2 is a side elevational view of the structure of Fig. 1;

Fig. 2a is a top view of the structure of Figs. 1 and 2;

Fig. 3 illustrates means for buoyancy control of the barges;

Figs. 4 and 5 show modifications of variable volume buoyancy control of the barge members;

Fig. 6 illustrates means for introducing air to and exhausting water or ballast from the supplementary buoyancy pontoons of Fig. 1;

Fig. 7 is a diagrammatic view of the hydraulic jet system of the present invention; and

Fig. 8 is another view of the hydraulic jet system showing arrangement of conduits.

Referring now to the drawing, in which identical numerals will be employed to designate identical parts, and

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particularly to Figs. 1, 2, and 2a, numeral 11 designates a well drilling platform supported on I-beams 12 which, in turn, rest on a substructure 13 supported by the structural members 14 which are suitably braced by diagonal and horizontal braces 15 and 16, respectively. The structural elements 14 are attached to barge members 17 which may be suitably compartmented as shown more clearly in Fig. 8.

Pivotaly attached to the barge members 17 by pivot members 19 are guide means 18. Slidably mounted on the guide members 18 are supplementary pontoons 20 which are designed to move slidably on the guide members 18. The guide members 18 are provided with slots or ports 21 for locking the supplementary buoyancy pontoons 20 at a selected position by means of pins 22. The upper ends 23 of the guide members 18 may be attached to the platform 11 by means of lateral members 24 and locking pins 25. Members 24 are adapted to sustain guide members 18 in position. A chain or wire line, such as 26, is provided for laying down the guide member 18 and retrieving same so that it may swing through an arc about the pivot point 19 and assume positions, such as shown by the dotted lines. The supplementary pontoons 20 may be arranged on at least one or two sides of the structure or also on both ends thereof as may be desired. Any number of auxiliary pontoons 20 may be carried laterally outboard of the structure for arcuate and slidable movement.

Arranged on the platform 11 may be living quarters 27 for the drilling crew, generators and auxiliary equipment 28; reserve mud tank 29 and derrick and drawworks 30. Also provided on the platform 11 is a mud tank 31 and mud pump and power means 32. A stiff-legged derrick 33 may also be provided for lifting material from the water level to the platform 11 and vice versa.

A dry mud storage bin 34, a pipe rack 35 and fuel and/or water tanks 36 may also be provided on the platform 11, as shown in Fig. 2a. A staircase 37 gives personnel access to a ballast manifold platform 38.

In Fig. 2 the unit comprising the drawworks and derrick 30 is shown with the derrick 30a laid down over the platform 11.

The barge members 17 may suitably be provided with towing chains 10 for towing the structure to and from a water location.

Referring now to Figs. 3 to 5, numeral 40 designates one compartment of one of the barges 17 which is provided with a sea chest 41 and a valve 42 attached thereto controlled by a reach rod 43 which extends through a stuffing box 44 to the ballast manifold platform 38. The compartment 40 is provided with a pressure-vacuum valve 45 for maintenance of a pressure differential on the compartment 40. Leading from the compartment 40 is a conduit 46 controlled by a valve 47 which, in turn, is controlled from ballast manifold platform 38 by means of reach rods 48.

The compartment 40 is provided with an air supply conduit 49 for exhausting ballast from the compartment as will be described.

In Fig. 4, the valve 47 is connected to an elongated conduit 50 which extends adjacent the body 51 of the compartment 40 for venting water from the compartment under controlled conditions. An air vent 52 to which is connected a swing pipe 53 by a swing joint 54 is arranged on a wire line 55 which extends through a conduit 56 and a stuffing box or packing means 57 to the ballast access platform 38. It is to be noted that Fig. 4 differs from Fig. 3 in providing a water discharge vent conduit 50 arranged adjacent the bottom 51 of the compartment 40. In Fig. 5 the swing pipe arrangements 52, 53, and 54 of Fig. 4 are eliminated and replaced by a conduit 58 which extends through a guide conduit 59 to a sucker rod

stripper 60 located on the working platform 11. This provides a vent 61 for venting air from the compartment 40. While only one compartment 40 and its attendant conduits and valving equipment is shown, it is understood that each of the several compartments 40 of the barges 17 may be similarly equipped.

Referring again to Figs. 1, 2, and 2a, it will be seen that the auxiliary supplementary buoyancy pontoons 20 are provided with ports 65 for entry and exhaustion of water and with a flexible conduit 66 which extends to the platform 38.

In Fig. 6 the associated equipment for the flexible conduit 66 is shown with the flexible conduit being reeled on a spring loaded reel or drum 67 which is mounted on a shaft 68. The flexible conduit is connected by connection means 69 to a conduit 70 controlled by valve 71 which allows air to be exhausted from the pontoons 20. Air may be admitted to the pontoons 20 by means of conduits 73 controlled by regulator valve 74 which connects into conduit 70.

Arranged spaced apart on the bottom 80 of the barges 17 are a plurality of jets 81 which are employed to release the barge from the land bottom after it has been sunk thereto when it is desired to move the barge and structure to another location as may be desired. These jets 81 connect by means of conduits 82, 83, and 84 controlled, respectively, by valves 85, 86, and 87 into a manifold indicated generally by the numeral 88 provided with flow meters 89 and control valves 90 and 91 and with by-pass lines 92 and by-pass valve 93. This manifold system ties into a common line 93a provided with a safety valve 94. Line 95 communicates with a second manifold 96 to which lines 97, 98, and 99 communicate and which are controlled respectively by valves 100, 101, and 102. It is possible to inject water, mud, and air into the manifold 96, line 93 and manifold 98 through lines 97, 98, and 99, respectively, which communicate to a source of these materials. Line 103 connects into line 95 and leads to the other barge means 17.

In Fig. 8 an isometric view of the arrangement of the hydraulic jet system of Fig. 7 in connection with the barges 17 and platform 11 is presented. It is to be noted that the manifold 88 is carried by means of lines 85, 86, and 87 into a plurality of vertical conduits 110 which lead to the jets 81 on the bottom 80 of the barges 17.

In practicing the present invention, the structure as shown in the several figures of the drawing, would be prefabricated at a shore location and then towed by means of the towing chain 10 to a water location. Of course, in towing position, the compartments 40 of the barges 17 would be free or substantially free of water ballast and the auxiliary pontoons 20 would be in inoperative position. On reaching a water location, the sea chest 41 controlled by valve 42 would be opened upon manipulation of reach rods 43 and at the same time the valve 47 with respect to Fig. 3 and conduit 46 would be opened by manipulation of rod 48 allowing water to enter the compartments 40. The water may be allowed to enter any one or several of the compartments to submerge the barge members and its attendant structure in the natural and conventional manner. Control may be exercised on the sinking operation as desired. During the sinking operation air may be admitted through air supply line 49 to control the amount of ballast being admitted through the sea chest 41 and valve 42. In Fig. 3 when water is to be exhausted, air pressure is introduced by air supply line 49 exhausting water through conduit 46 and valve 47, a pressure differential of approximately 4 pounds being maintained with pressure-vacuum valve 45.

With respect to Fig. 4, water would be admitted as described with respect to Fig. 3 and air would be vented to the atmosphere through the system of conduits 53 and 52 connected by swing joint 54, the position of the conduit 53 being controlled through the wire line 55 leading to the platform 38. In this manner, it is possible to con-

trol the volume of the water by the position of the pipe 53.

When it is decided to exhaust water from the compartment 40 with respect to Fig. 4, air would be introduced by line 49 and water would be exhausted through pipe 50 with its opening 50a arranged adjacent the bottom 51, the water being exhausted through valve 47.

Fig. 5 operates similarly to Fig. 4 with exception that the conduit 58 may be manipulated upwardly and downwardly from the working or platform deck 11.

The water would be admitted into auxiliary pontoon means 20 by opening valve 71 which exhausts the air from the pontoon 20 allowing water to enter through the port 65 with the air exhaust being regulated through valve 71. Likewise, when it is desired to provide buoyancy to pontoons 20, admittance of air would be regulated through conduits 73 and regulator valve 74.

After the drilling operations and the like have been conducted with drilling rig 30 and 30a through the opening 11a on platform 11 and it is desired to move to a new location prior to exhausting or during the time ballast is exhausted from the compartment 40, the barges 17 would be broken loose from the adhering land bottom by introducing water, mud, air, and the like through the jets 81 by means of conduits 82, 83, and 84 connecting through manifold 88 into water, mud or air supply line 97, 98, and 99, as has been described. Assuming that air is to be injected under the barge 17, the air may be introduced simultaneously through all of the jets 81 or through selected jets 81 to lift one side of the structure and then the other side or to lift one end and then the other end or simultaneously to lift the whole structure while providing at least sufficient buoyancy to the barges 17 and the pontoons 20, as may be desired, to move the structure to another location.

The present invention is quite advantageous in that the auxiliary pontoons or buoyancy means 20 provide supplementary buoyancy and stability for movement of the structure. These pontoons may be used to lighten or lift the structure during moving operations while maintaining stability. For example of the use of the auxiliary pontoons when the structure is to be moved from one location to another, the structure would first be loosened from the land bottom by admitting air, mud or water underneath the bottom 80 to loosen or free the structure or release same following or during which supplementary buoyancy would be given to the structure by blowing or exhausting water from the supplementary pontoons 20. The degree of lift or the application of same would be controlled by the arcuate and slidable movement of the pontoons. In other words, during initial lifting operations, the pontoons 20 might be arranged at the end of the guide means 18 with the guide members 18 laid down to swing in an arc about the pivot point 19 and thereafter as the structure is freed from the land bottom the guide members 18 may be raised in the inboard direction to exert the greatest control of the lifting operations.

The auxiliary buoyancy members provide a means for lifting the whole structure from the underlying land bottom and for moving same in at least a partially submerged state. In other words, with the present invention it is not necessary to bring the supporting barge or barge members completely to the surface to move the structure. This operation contributes toward safety in such moving to another location and further contributes toward savings in time over that required in bringing the platform's hull to the surface of the water. Of course, under circumstances where the structure is to be moved a considerable distance it may be desirable to bring the barges to the surface of the water.

It is contemplated that one or more auxiliary buoyancy means or pontoons may be used on only one side of a marine vessel such as a barge when auxiliary lift is required for that side only. Thus an outboard auxiliary pontoon could be quite useful in this type of lifting while not detracting from the stability of the structure.

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In effecting only a limited vertical lift as above described, the auxiliary buoyancy member is designed to be of a magnitude and shape that the auxiliary buoyancy diminishes in a predetermined amount on emergence of the auxiliary buoyancy members from the water as the drilling platform is raised.

The pontoons 20 may be moved slidably on the guide means 18 by means of suitable chains or wire lines, such as 26, which may extend therefrom to the platform 11.

The structure of the present invention is quite advantageous in that supplementary buoyancy is provided to allow controlled sinking and raising of the platform structure including submergible and recoverable barge members. Also, the arrangement of a hydraulic jet system contributes to the controlled lifting and sinking arrangement in which auxiliary pontoon means are provided which may move arcuately and slidably outboard from the structure on which they are carried laterally. In other words, the present invention is directed to improved structure which has increased utility and stability for sinking and raising operations.

The nature and objects of the present invention having been completely described and illustrated, what we wish to claim as new and useful and to secure by Letters Patent is:

1. Apparatus adaptable for use in well drilling operations and the like which comprises, in combination, an offshore structure including a platform adapted to support well drilling equipment; a submergible barge; means interconnecting said barge and said platform adapted to support said platform above the water level of a water location when said barge is positioned on the underlying land bottom; a plurality of spaced-apart guide members pivotally secured to said barge along the sides thereof; a buoyancy adjustable, submergible, pontoon telescopically and movably arranged on each of said guide members for longitudinally adjusted position; and means interconnecting each of said guide members and said offshore structure adapted to sustain said guide members in positions ranging from substantially vertical adjacent the structure to substantially horizontal adjacent the underlying land bottom, each pontoon being cylindrically configured and arranged on its respective guide member such that said guide member extends along the axis of said cylinder.

2. Apparatus adaptable for use in well drilling operations and the like which comprises, in combination, an offshore structure including a platform adapted to support well drilling equipment; a submergible barge; means interconnecting said barge and said platform adapted to support said platform above the water level of a water location when said barge is positioned on the underlying land bottom; a plurality of spaced-apart guide members pivotally secured to said barge along the sides thereof, each of said guide members extending in length approximately the distance between said platform and said barge

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and being adapted to assume positions ranging from an upright position adjacent said platform to a substantially horizontal position; a buoyancy adjustable, submergible, pontoon telescopically and movably arranged on each of said guide members for longitudinally adjusted positions; and means interconnecting each of said guide members and said offshore structure adapted to sustain said guide members in positions ranging from substantially vertical adjacent the structure to substantially horizontal adjacent the underlying land bottom; each of said pontoons being arranged and configured whereby the water plane area through each pontoon is maintained substantially constant when each of said guide members is in a substantially upright position.

3. Apparatus adaptable for use in well drilling operations and the like which comprises, in combination, a platform adapted to support well drilling equipment; a submergible, buoyancy adjustable barge; members connected to said barge and to said platform adapted to support said platform above the water level of a water location when said barge is positioned on the underlying land bottom; a plurality of spaced-apart guide members pivotally secured to said barge along the sides and adjacent the peripheries thereof, each of said guide members extending in length approximately the distance between said platform and said barge and being adapted to assume positions ranging from an upright position adjacent said platform to a substantially horizontal position; a buoyancy adjustable, submergible, pontoon telescopically and movably arranged on each of said guide members; means connecting each of said guide members to said platform adapted to sustain each of said guide members in positions ranging from substantially vertical adjacent the structure to substantially horizontal adjacent the underlying land bottom; means for adjusting the buoyancy of each of said pontoons; means for locking each of said pontoons at selected positions along the length of each of said guide members; and jet means for releasing said barge for adhering underlying land when said structure is to be moved, each of said pontoons being arranged and configured whereby a substantially constant water plane area through each pontoon is maintained when each of said guide members is in a substantially upright position.

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