

June 18, 1963

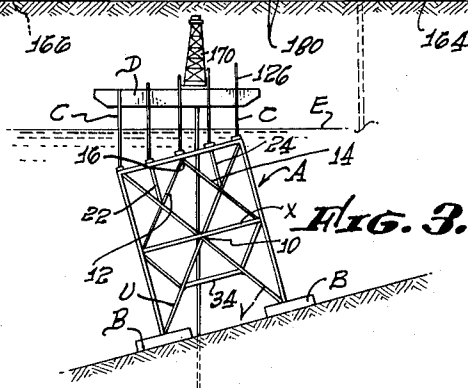
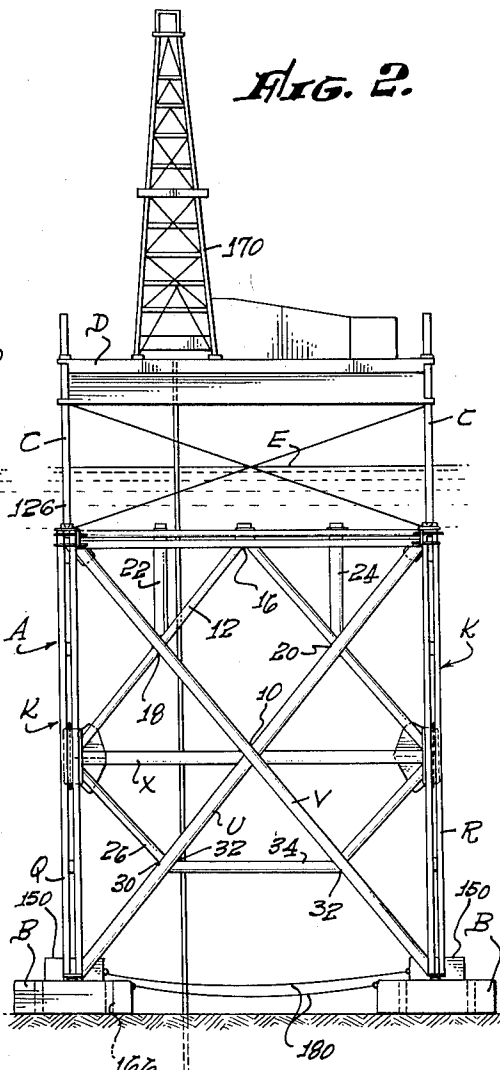
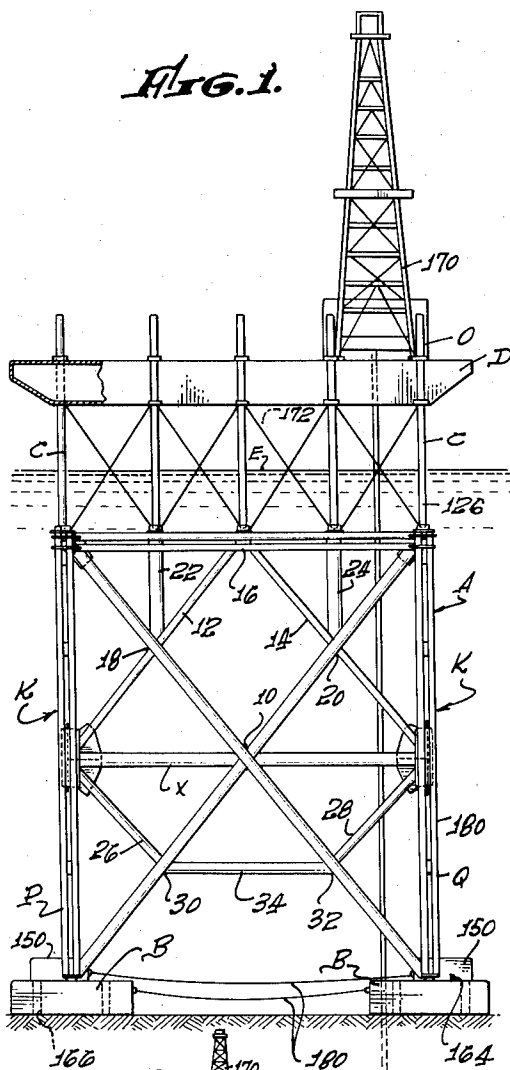
M. R. WARD, JR

3,093,972

PORTABLE MARINE PLATFORM

Filed Feb. 1, 1962

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

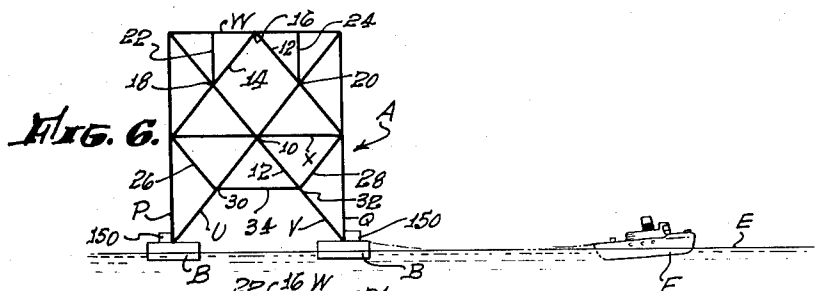


FIG. 6.

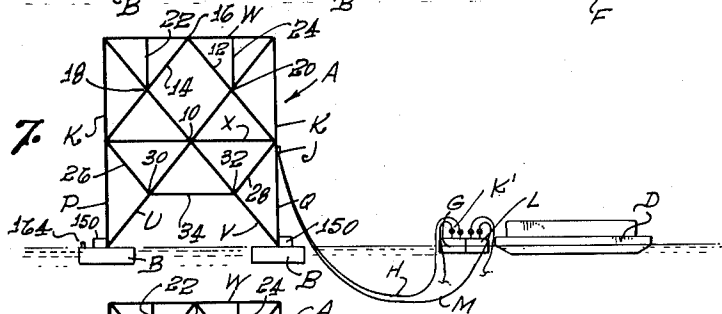


FIG. 7.

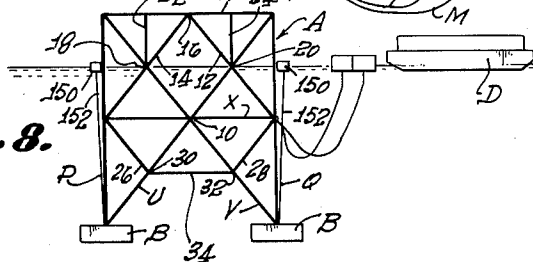


FIG. 8.

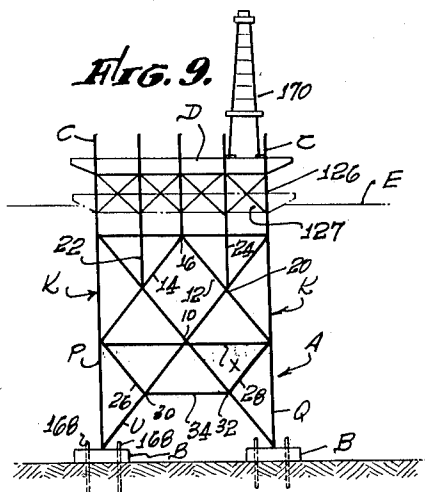
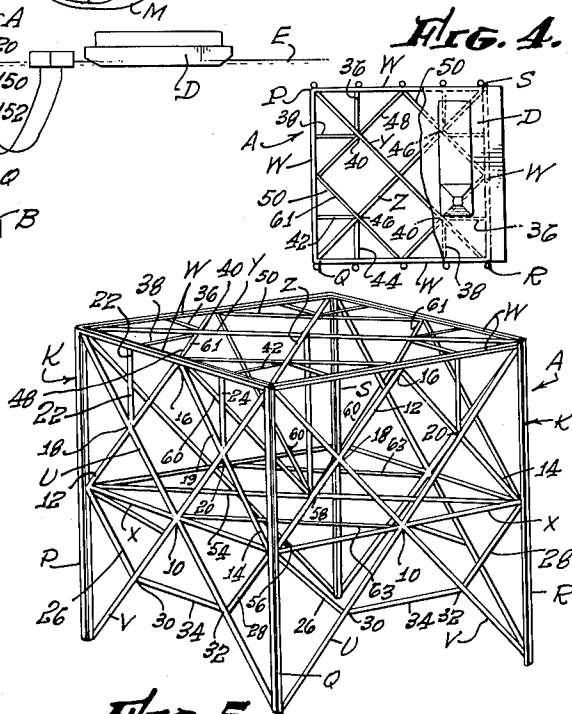


FIG. 9.



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Filed Feb. 1, 1962

3 Sheets-Sheet 3

FIG. 10.

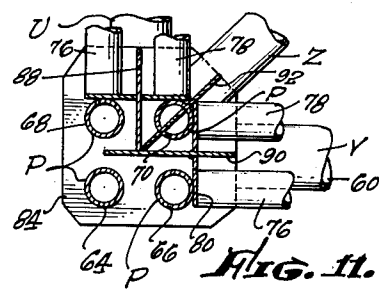
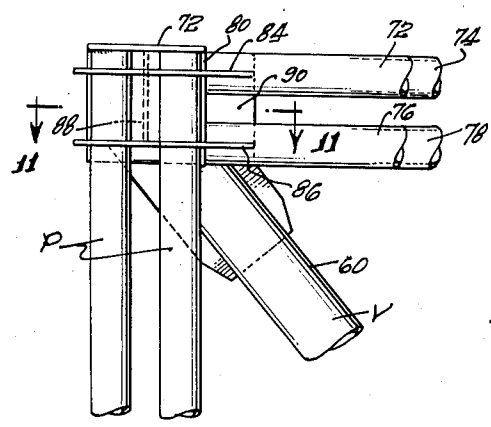


FIG. 13.

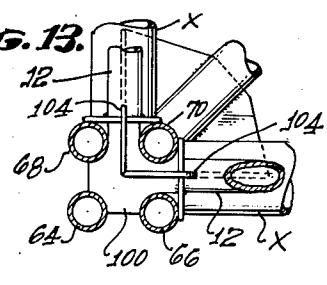


FIG. 12.

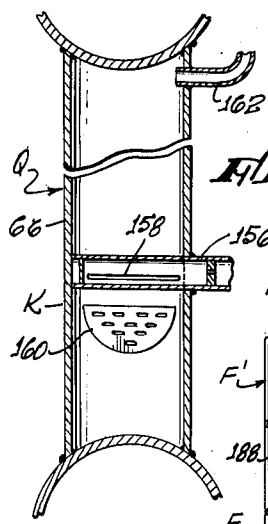
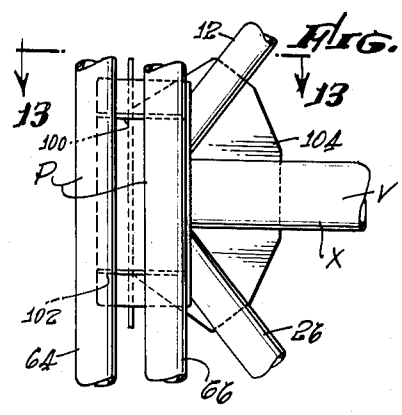


FIG. 17.

FIG. 15.

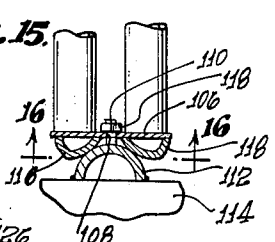


FIG. 18.

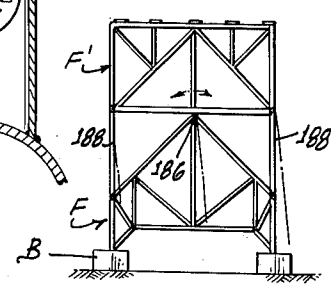


FIG. 16.

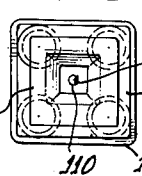
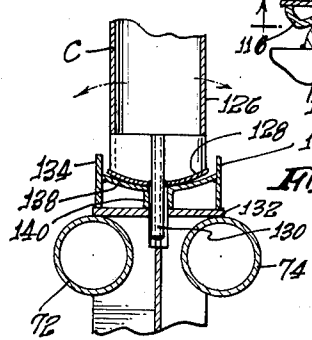


FIG. 14.



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1

3,093,972
PORTABLE MARINE PLATFORM
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 Long Beach 15, Calif.
 Filed Feb. 1, 1962, Ser. No. 173,086
 4 Claims. (Cl. 61—46.5)

The present invention relates generally to the field of marine structures, and more particularly to a tubular pontoon-supported frame that can be towed to a desired off-shore location and then submerged to support a barge or other platform-defining means at a sufficient elevation above the water surface to be free from the buffeting action of waves.

A major object of the invention is to provide portable and interchangeable structures for installation in deep water that are adapted for both easy installation and removal, yet when so installed, are capable of withstanding severe forces of wind, waves, currents, earthquakes, storms, and the like.

Another object of the invention is to provide a stable, deep water marine platform of such strength, size and rigidity as to be adapted for use in oil well drilling, radar stations or the like.

Yet another object of the invention is to provide a pontoon-supported frame that is first submerged at the desired off-shore location whereby a barge or other platform-defining means may be floated above the submerged frame and subsequently raised by the use of the frame to the desired elevation above the water surface.

A still further object of the invention is to provide a pontoon-supported tubular frame that is relatively light in weight, less expensive to construct than competitive marine platforms now in use for oil well drilling and producing operations, and one that can be utilized for the support of platforms of varying floor area.

Yet still another object of the invention is to provide a portable unit that can be submerged or raised in a relatively short time, may be moved from location to location in the drilling of wells, and one that may be disposed in a stable position on a sloping bottom, or on a shifting bottom such as quicksand which provides uneven settlement for the pontoon supports.

A further object of the invention is to supply a unit of such design that a minimum of structural members are exposed to the effects of wind and water, and one that is safe to handle both in making the original installation as well as when it is moved from one location to another.

These and other objects and advantages of the invention will become apparent from the following description of a preferred form thereof when taken in conjunction with the drawings illustrating that form, in which:

FIGURE 1 is a side elevational view of the submerged invention shown supporting a barge on which an oil well derrick is mounted at an elevated position above the water surface;

FIGURE 2 is an end elevational view of the invention as shown in FIGURE 1;

FIGURE 3 is a side elevational view of the submerged invention shown resting on a sloping bottom;

FIGURE 4 is a top plan view of the invention;

FIGURE 5 is a perspective view of the invention;

FIGURE 6 is a side elevational view of the invention shown being towed to the desired off-shore location;

FIGURE 7 is a side elevational view of the invention shown with vent and fill liner connected thereto;

FIGURE 8 is a side elevational view of the invention partially submerged;

FIGURE 9 is a side elevational view of the invention in a submerged position shown supporting a platform at an elevated position above the water surface;

2

FIGURE 10 is a fragmentary side elevational view of one of the upper corner portions of the invention;

FIGURE 11 is a fragmentary horizontal cross-sectional view of a corner portion of the invention taken on line 11—11 of FIGURE 10;

FIGURE 12 is a fragmentary side elevational view of the central portion of the invention;

FIGURE 13 is a fragmentary horizontal cross-sectional view of the invention taken on line 13—13 of FIGURE 2;

FIGURE 14 is a fragmentary vertical cross-sectional view taken on line 14—14 of FIGURE 1 showing one of the lower end portions of the piles that support the platform above the water surface;

FIGURE 15 is a fragmentary vertical cross-sectional view taken on line 15—15 of FIGURE 1 showing one of the lower end portions of one of the corner columns of the invention;

FIGURE 16 is a bottom plan view of one of the corner columns of the invention taken on line 16—16 of FIGURE 15;

FIGURE 17 is a vertical cross-sectional view of a typical tubular member utilized with the invention showing the liquid fill line and air vent associated therewith; and

FIGURE 18 is a diagrammatic view of an alternate form of the invention.

Referring now to FIGURES 1, 2, 4 and 5 for the general arrangement of the invention it will be seen to include a generally cubic framework A fabricated from tubular members and which rests on pontoons B. By means of a number of vertically positionable piles C framework A supports platform-defining means D at a sufficient elevation above the surface of the water E as to be immune from the buffeting action of waves. Platform-defining means D is preferably a barge having a large enough floor area to permit the erection of an oil well derrick thereon, as well as the storage of accessories required in the drilling or producing of an oil well.

In use, the pontoon-supported framework A is towed by a suitable boat F to the desired off-shore location. Situated at this location is a float G, which by pump means (not shown) is adapted to pump water through a hose H connected to the central portion of the tubular framework A. Framework A, by valves J forming a part thereof, is divided into sections K, any one of which sections may be flooded with water to stabilize the invention, as well as to reduce its buoyancy and cause it to submerge at the desired location. In addition, a float L is provided from which a second hose M extends to the framework A, through which hose air is vented as the framework sections K are flooded with water.

FIGURES 6 to 8 inclusive graphically illustrate the steps required in towing the framework A to the desired off-shore location and submerging it until the pontoons B rest on the ocean floor. After the framework A is so submerged, the piles C in combination with elevating means O that will be described in detail hereinafter, are employed to raise the platform-defining means D to the position shown in FIGURE 9. Framework A is so constructed that it may be angularly positioned when submerged (FIGURE 3), and yet be used to raise and support the platform-defining means in a horizontal position.

In detail, the framework A is illustrated as including four vertical tubular columns P, Q, R and S that define the four corners thereof and which are reinforced by identical tubular diagonals U and V that extend from opposing tops and bottoms of the corner columns to intersect at junctions 10 as shown in FIGURE 5. In addition, each of the columns is connected at the upper ends thereof by upper tubular cross pieces W and at the center

portions by lower tubular cross pieces X. The upper ends of columns P, R and Q, S are connected by horizontal diagonally disposed tubular members Y and Z respectively (FIGURE 5). Although four vertical columns P, Q, R and S are shown as defining the corners of framework A, it will be apparent that a suitable three dimensional framework can be fabricated from but three corner columns should it be desired.

The tubular reinforcing on each side of the framework A are identical, and only will be described in detail herein. Two tubular members 12 and 14 extend upwardly from the ends of the lower cross piece X to meet at an apex 16 at substantially the center of the upper cross piece W. Members 12 and 14, as can best be seen in FIGURE 5, intersect the diagonals U and V at junction points 18 and 20, respectively. Two vertical tubular members 22 and 24 lead upwardly from junction points 18 and 20, respectively, to be rigidly connected to the upper cross piece W. Two downwardly and inwardly extending tubular members 26 and 28 project from the ends of the lower cross piece X and intersect diagonals U and V at junctions 30 and 32, respectively. A horizontal tubular reinforcing member 34 connects diagonals U and V and extends between junction points 30 and 32. Two horizontal tubular members 36 and 38 extend inwardly from the upper corner portions of member W adjacent columns P and R to intersect the diagonal Y at junction point 40. Similar horizontal tubular members 42 and 44 extend inwardly from member W adjacent columns Q and S to intersect the diagonal Z at junction 46, as may best be seen in FIGURE 4. Two horizontal tubular members 48 are provided that are parallel to diagonal Z and extend from the center portion of member W through the junction point 40. Similar horizontal tubular members 50 also extend between the center portion of member W and pass through junction point 46. Two tubular reinforcing members 54 and 56 extend between the opposing junctions 10, as shown in FIGURE 5, and intersect at their centers at a junction point 58. Four downwardly and inwardly inclined members 60 are provided that project from the upper end portions of columns P, Q, R and S and intersect at the junction point 58. Upper cross pieces W are reinforced by a number of rigid members 61 that extend between same directly above the apex portions 16. Similar reinforcing members 63 extend between the lower cross pieces X and are joined to same at junction points 10.

All of the above-described tubular members are joined to define sections K which can be closed off from one another by means of valve J to permit any one of the sections to be flooded by water as desired, or to permit displacement of the water therefrom by application of air under pressure. The flooding or removal of water from sections K is of the utmost importance, for it permits the stable positioning of the framework A on the pontoons B, particularly when the framework is angularly disposed as shown in FIGURE 3.

Columns P, Q, R and S are all of identical construction, and the detailed structure of one of the columns (P) is shown in FIGURES 10 and 11. Structurally column P is representative of the balance of the columns and is formed from four heavy tubular members 64, 66, 68 and 70 that are disposed in spaced parallel relationship, with the upper ends thereof being closed by a plate 72 that is welded or otherwise affixed thereto. Upper member W is formed from four spaced horizontal tubular members 72, 74, 76 and 78. A heavy plate 80 is welded to the exterior surface of tubular members 66 and 70, and the ends of tubular members 72, 74, 76 and 78 are welded or otherwise rigidly affixed to the exterior surface of this plate as shown in FIGURE 11. Two vertically separated, horizontally disposed plates 84 and 86 are provided in which openings are formed through which tubular members 64, 66, 68 and 70 extend and that are welded thereto to add rigidity to the framework. Two vertical reinforcing plates 88 and 90 are provided which are welded or

otherwise affixed to the diagonals U (FIGURE 11). A heavy, rigid reinforcing plate 92 is affixed to plates 84 and 86, and bisects the angle between plates 88 and 90 to engage one of the downwardly and inwardly extending members 60 to which it is also welded or otherwise affixed.

The center portion of column P is reinforced by two vertically spaced, horizontally disposed plates 100 and 102 that are welded to tubular members 64, 66, 68 and 70, and in addition a gusset plate 104 extends from plates 100 and 102 to tubular members 12 and 26 and the lower cross piece X, as shown in FIGURE 12. Heavy plates 106 are welded or otherwise affixed to the lower ends of tubular members 64, 66, 68 and 70 comprising columns P, Q, R and S to prevent entry of water thereto, and a bore 108 is formed in plate 106 that loosely engages a heavy bolt 110 which extends upwardly from an elongate member 112 of semi-circular cross section, the free ends of which are affixed to the deck portion 114 of one of the pontoons B. Two elongate members 116 and 118 of identical construction are disposed in parallel relationship on the under side of plate 106 and welded thereto, with the exterior surface of the two members 116 and 118 resting on the exterior surface of member 112 and being able to move relative thereto. Displacement of the plate 106 from bolt 110 is prevented by a nut 118 that is securely affixed to the bolt. This construction permits columns P, Q, R and S to move relative to pontoons B in the event settlement of the pontoons occurs when resting on the ocean floor, without stresses being applied to the bottom portions of the columns. Members W, as may best be seen in FIGURE 5, cooperate with columns P, Q, R and S, members 22 and 24, and the apex 16, to support a number of piles 126 of identical construction (FIGURES 1-3 and 9) that support the platform-defining means D.

Each of the piles 126 is of tubular construction and terminates on its lower end in a rigid member 128 having a convex exterior surface. A pin 130 extends downwardly from the member or plate 128. Tubular members 72 and 74 forming a part of each of the upper cross pieces W are, at the desired intervals, provided with a heavy plate 132 from which flanges 134 and 136 project upwardly that support a member 138 therebetween and on the upper concave surface of which the convex exterior surface of member 128 rests. Member 138 has a bore formed in the center thereof from which a tubular member 140 extends downwardly and in which tubular member the pin 130 is loosely disposed.

Each of the pins 130 is sufficiently smaller in transverse cross section than the interior transverse cross section of the tubular member 140 in which it is disposed that the pile 126 of which it forms a part can pivot or move angularly relative to the framework A as rigid convex member 128 rocks on member 138. Thus, the pins 136 serve to removably connect the piles C to the framework A for pivotal or angular movement relative thereto.

Piles C, as may best be seen in FIGURES 1, 2, 3 and 14, are adapted to be lowered for the pins 136 thereof to removably engage the framework A irrespective of whether the framework is vertically disposed on the bottom or angularly disposed. Thus, the piles C when in engagement with framework A can assume vertical positions as shown in FIGURE 14, even though the framework A is angularly disposed as shown in FIGURE 3.

After the framework A has been submerged to the position shown in FIGURES 1, 2, 3 and 9, the platform-defining means D is moved directly over the frame and the piles C are lowered to engage the frame in the manner previously described, with the piles also cooperating with jacks or other raising means associated with the barge to raise same upwardly from the position shown in phantom line in FIGURE 9 to that shown in solid line.

On each of the columns P, Q, R and S the framework

A is equipped with a vertically movable stabilizing pontoon 150. When the framework A is towed to an off-shore location, the pontoons 150 are disposed on the upper surface of the pontoons B. By means of cables or other guide means, pontoons 150 are at all times maintained in close contact with the column P, Q, R or S with which the pontoons are associated, but with each pontoon being vertically movable relative to framework A. Thus, as pontoons B are flooded and framework A starts to submerge, by means of cables 152 the stabilizing pontoons are held at the water surface and the framework is permitted to move downwardly relative thereto. In this manner any sidewise movement of framework A as it sinks is substantially eliminated, particularly when it is considered that water is admitted through hose H into the central portion of the framework (FIGURE 17), to fill the lower sections K thereof.

Tubular members 64, 66, 68 and 70 comprising column Q have fill line 156 extending into the confines thereof, which fill line is connected to a branch of hose H. A slot 158 is formed in line 156 within the confines of the tubular member 66, and water is discharged through the slot 158 onto a perforated baffle 160 that disperses water into a number of individual streams whereby the impact of the solid stream of water is avoided and the interior surface of tubular member 66 is not subjected to any extensive abrasive action therefrom. As each of the tubular members 66 fills with water, air contained in the member is displaced therefrom through a vent tube 162 that is connected to a branch of hose M extending back to the vent float L. By use of valving J on framework A, any one or all of the sections K can be filled with fluid to reduce the buoyancy of the framework until it sinks to the ocean floor.

The pontoons B are hollow rectangular bodies of conventional design and sufficiently heavy in construction to withstand the high pressures to which they are subjected when disposed several hundred feet under water. Each of the pontoons is preferably provided with a relief valve 164 to prevent the possibility of a dangerously high pressure building up within the confines thereof. Each of the pontoons B preferably has a number of pipes 166 extending therethrough that are adapted to receive piles 168 after the pontoons have been positioned on the ocean floor. Piles 168 prevent lateral movement of the framework A as well as undue stressing of the framework due to sidewise movement thereof caused by ocean currents or the like.

After the framework A has been disposed on the bottom of the ocean and it is desired to raise same, the vent 162 and hose M are utilized to pump air into the confines of the framework, with water being displaced therefrom through the fill line 156 and the hose M, coupled with the buoyancy of the framework and that of the pontoons, being sufficient to raise the frame to the position shown in FIGURE 6. Of course, previous to raising the framework, the platform-defining means D is lowered by the use of jacks to the ocean surface and the piles C then raised upwardly relative to the platform or barge to separate them from the framework A, and the barge and piles then moved to a position apart from the framework.

The framework A may then be raised to the ocean surface (FIGURE 6) and the platform-defining means D and framework A transferred to another location where the framework is lowered by the flooding operation previously described and the piles C placed in engagement therewith whereby the platform-defining means may be raised to the position shown in FIGURES 1 and 2 by the use of jacks or other raising equipment. The operation previously described is then repeated, with the platform being used for supporting one or more oil well derricks for use in drilling or producing.

It will be particularly noted that the platform-defining means D is raised to a sufficiently high elevation above the water surface so that the maximum wave 172 that will be encountered as shown in dotted line in FIGURE 1,

does not actually contact the barge or platform. Due to the construction of the invention and the elevation at which the platform is supported above the surface of the water, the only wave action is against the piles C, with the barge being immune to the wave action because of its elevation, and the frame A likewise is immune from any extensive wave action due to the depth of the upper portion thereof below the surface of the sea.

In the event it is not desired to use valves J on framework A, the framework can be permanently divided into sections K by sealing the converging tubular members from one another, such as at the junction points 10 and apex portions 16. When the framework A is permanently subdivided into section K, each section is provided with a fill line 156 and air vent 162, and a number of hoses H and M extend to the floats G and L where they are connected to valving K' to permit the sections to be flooded or evacuated of fluid.

In FIGURES 1 and 2 it will be seen that a number of cables or chains 180 extend upwardly from the pontoons B to the corner columns P, Q, R and S, as well as between the pontoons, which cables or chains limit the heel of the flooded pontoons when submerged, to prevent them from fouling other parts of the apparatus or overloading thereof. Reinforcement of the piles 126 as shown in FIGURE 9 is easily accomplished by the use of diagonally disposed rigid members 127.

An alternate form of the invention is shown in FIGURE 18 in which the framework F is provided with a centrally disposed pivot 186 on which a second framework F' is mounted. This second framework F' includes tension members 188 which hold the two frameworks in fixed relationship during the time they are being moved to the desired off-shore location. After frameworks F and F' are submerged, the tension members 188 are loosened relative to the second framework F', which permits framework F' to be vertically disposed irrespective of whether framework F is vertically or angularly disposed when resting on the bottom of the sea.

Although the form of the invention herein shown and described is fully capable of achieving the objects and providing the advantages as herein set forth, it is to be understood that it is merely illustrative of the presently preferred embodiments thereof and that I do not mean to limit myself to the details of construction described and shown other than as defined in the appended claims.

I claim:

1. A structure for providing a working area over a body of water, comprising:

- (a) a framework having a plurality of spaced downwardly extending bores formed in the upper extremity thereof;
- (b) a plurality of hollow pontoons affixed to the lower portion of said framework, which pontoons have sufficient buoyancy to float said framework at a desired location in said body of water;
- (c) means to admit water into said pontoons for lessening the buoyancy thereof to cause said framework and pontoons to concurrently move downwardly in said body of water until said pontoons rest on the bottom thereof;
- (d) a buoyant platform that defines said working area and is capable of being floated to said desired location;
- (e) a plurality of vertically disposed piles vertically and adjustably supported from said platform;
- (f) a plurality of pins projecting downwardly from said piles that removably engage said bores, which pins are smaller in transverse cross section than that of said bores to permit angular positioning of said framework relative to said piles; and
- (g) means to raise said platform upwardly on said piles when said pins are in said bores to a position sufficiently high above the surface of said body of water as to not be buffeted by waves formed thereon.

2. A structure as defined in claim 1 in which a plurality

7

of concave surfaces are defined in said framework around said bores, and said piles are formed with lower convex surfaces that rest on said concave surfaces when said pins engage said bores.

3. A structure as defined in claim 1 in which said frame- 5
work is of closed tubular construction to augment the buoyancy of said pontoons.

4. A structure as defined in claim 1 in which said frame-
work is divided into a plurality of separate sections, with 10
each of said sections being capable of separate flooding to

8

lessen the buoyancy of said framework and cause it to move in a desired direction.

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