

Dec. 23, 1958

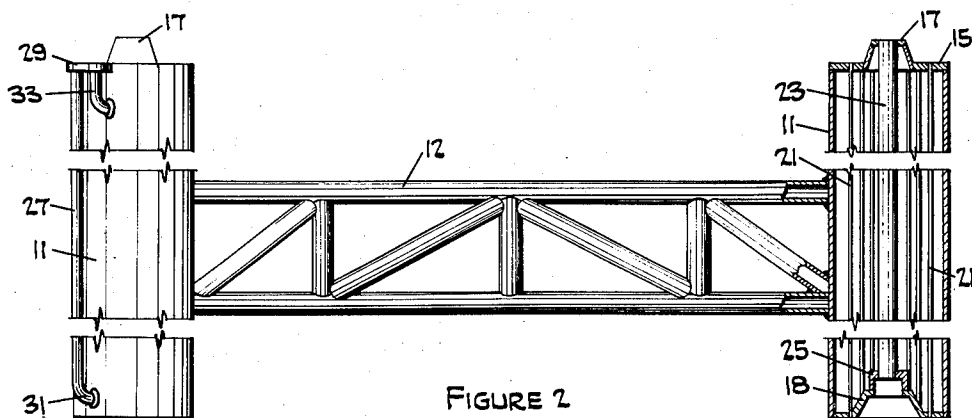
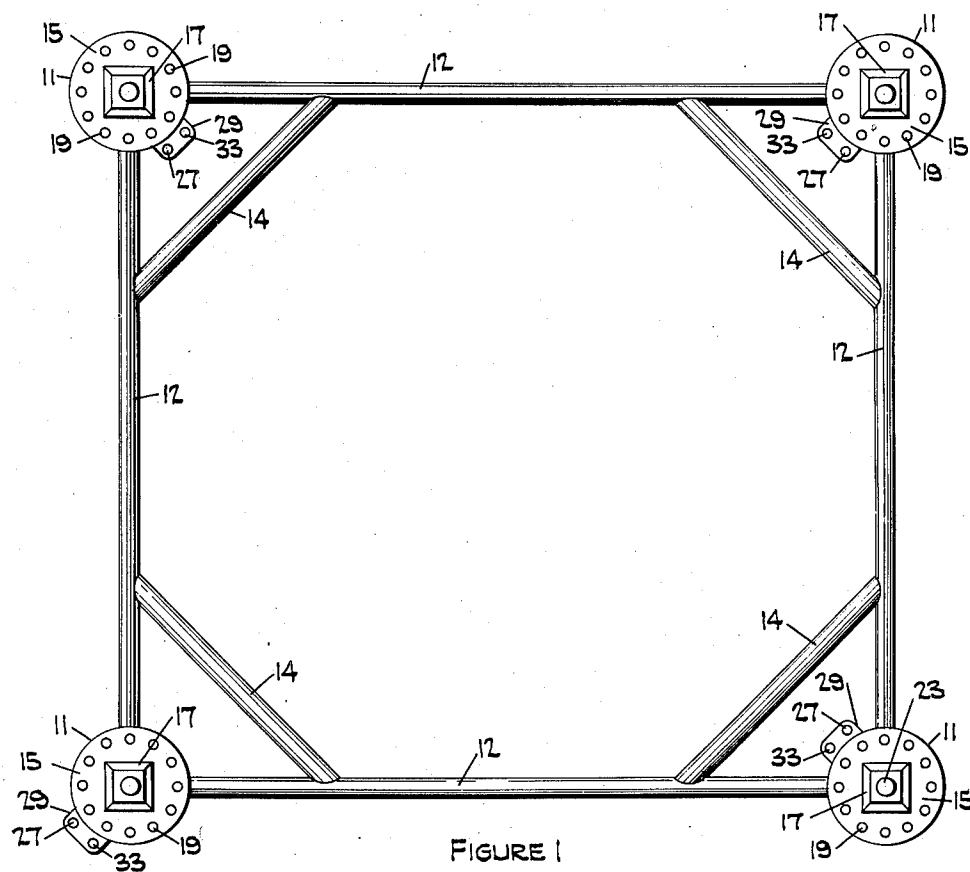
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2,865,179

OFFSHORE DRILLING STRUCTURE

Filed Sept. 28, 1953

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

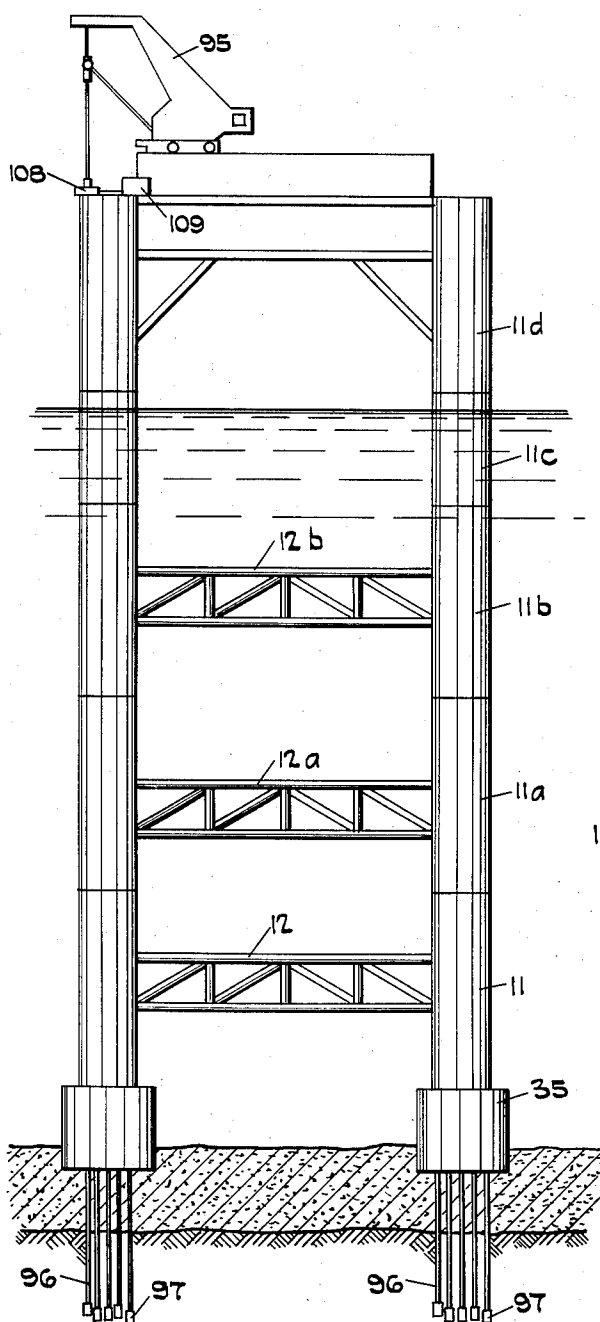


FIGURE 3

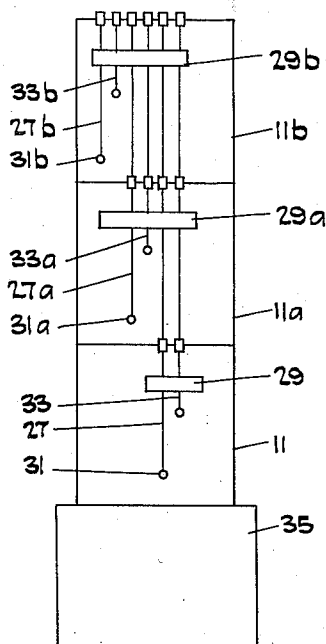


FIGURE 7

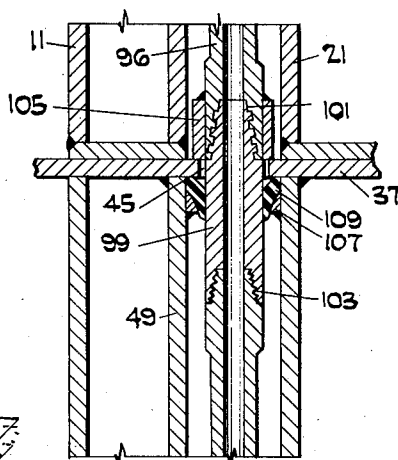


FIGURE 6

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4 Sheets-Sheet 3

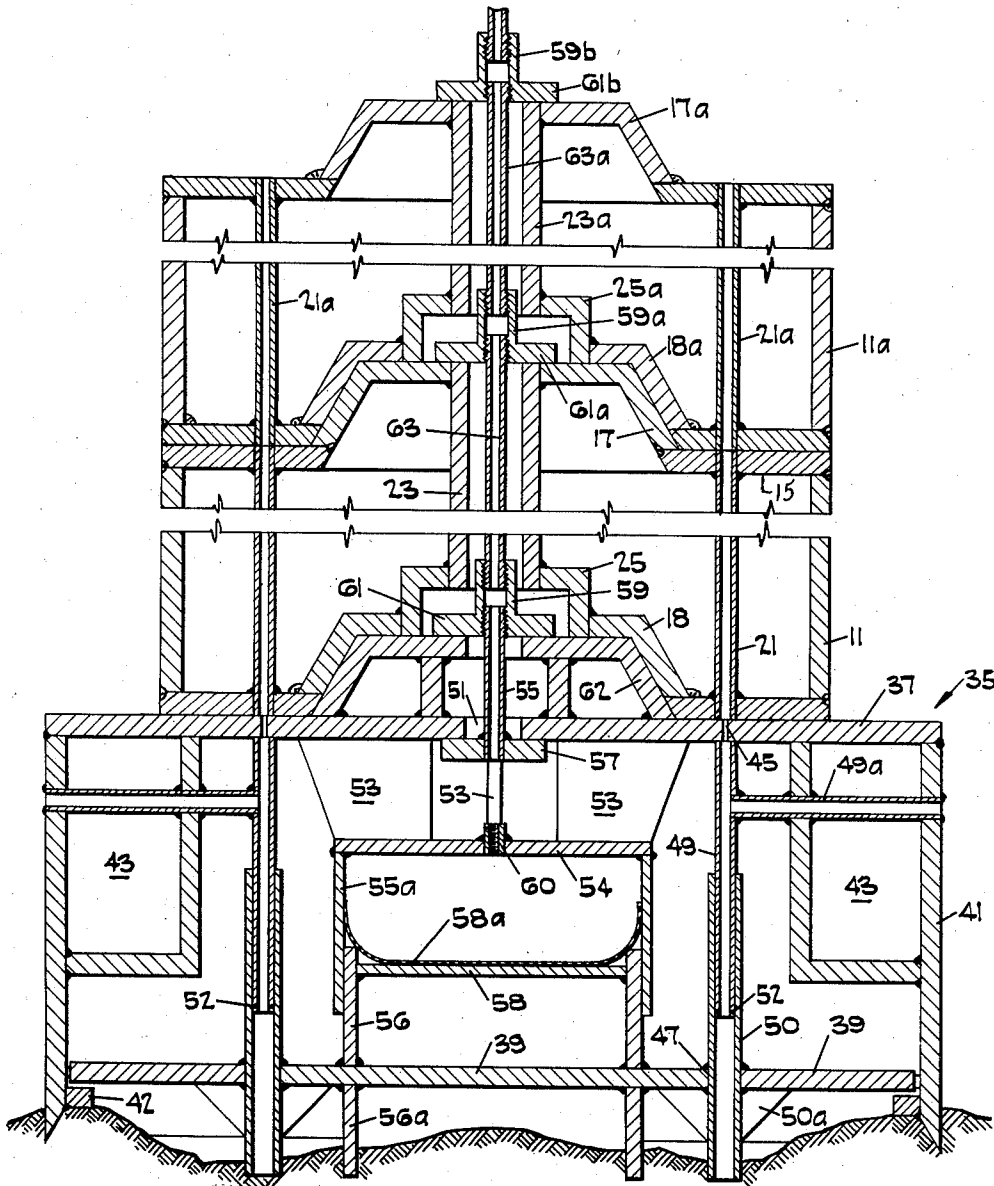


FIGURE 4

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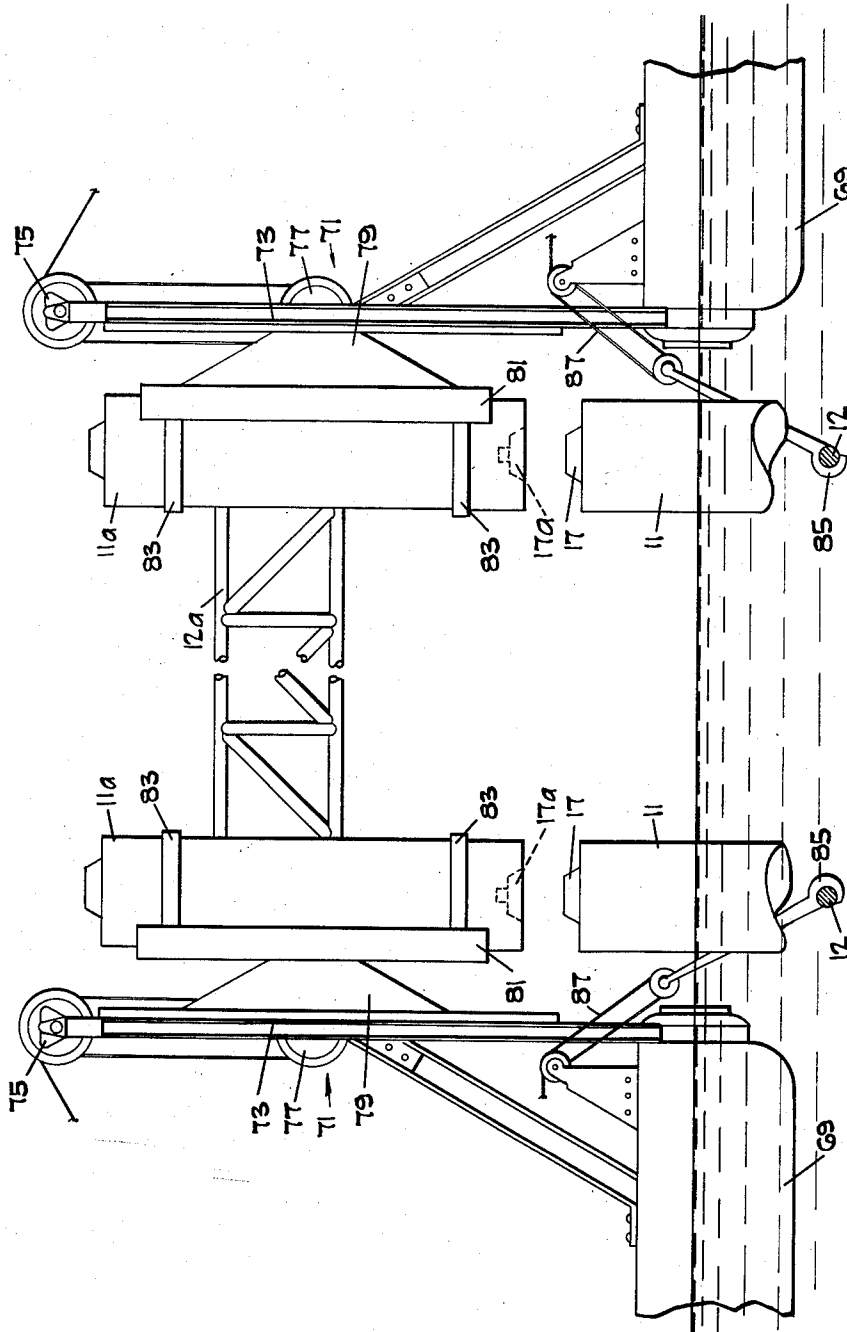


FIGURE 5

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2,865,179

OFFSHORE DRILLING STRUCTURE

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Application September 28, 1953, Serial No. 382,708

9 Claims. (Cl. 61—46.5)

This invention relates to offshore marine structures or platforms such as are required to drill and produce oil and gas wells in submerged areas.

It is a general object of this invention to provide a prefabricated, unitized structure which can be readily erected in offshore waters and which is especially well adapted for use in waters of considerable depth.

It is also an object of this invention to provide an offshore drilling structure comprising prefabricated units or sections which are sufficiently small for easy handling and launching and which have sufficient buoyancy to be floated or towed to a desired location, requiring only about fifteen feet of draft for this purpose.

It is also an object of this invention to provide a structure which may be readily assembled at sea under relatively severe weather conditions, which is provided with special means for anchoring to the bottom, and whose load on the bottom can be controlled by regulating the buoyancy of the structure.

It is also an object of this invention to provide a structure which may be easily detached from the bottom, and which may then be floated and moved to a new location in water of similar depth.

It is also an object of this invention to provide a structure whose base pedestals may be permanently secured to the bottom and whose upper sections may be easily removed from and reinstalled onto said base pedestals to provide a submerged support for underwater well heads.

It is also an object of this invention to provide a structure which may be erected and leveled on an ocean floor having a sloping or irregular character, the leveling control means being a permanent part of said structure.

It is also an object of this invention to provide a marine drilling and production structure having main support columns of large diameter capable of serving as housing and storage space for production facilities, drilling fluid, fresh water, engine fuel, and the like.

These and other objects of this invention will be understood from the following description taken with reference to the attached drawings, wherein:

Figs. 1 and 2 are, respectively, diagrammatic plan and elevation views, partly in cross-section, of one of the units or structural sections of the present invention.

Fig. 3 is a diagrammatic elevation view of the assembled structure of the present invention erected over submerged ground, shown in cross-section.

Fig. 4 is a detail view in cross-section of a part of the structure of Fig. 3.

Fig. 5 is a diagrammatic drawing illustrating the present method of erecting the structure of this invention.

Fig. 6 is a detail view in cross-section of a safety joint used in erecting the present structure.

Fig. 7 is a diagram showing the arrangement of flooding and deflooding lines for the present structure.

Referring to the drawings, the present structure is composed basically of unitary structural sections such as shown in Figs. 1 and 2. Each section comprises any desired number but normally four cylindrical columns

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11, preferably made of steel, which are held together by means of tubular bracing generally indicated at 12. Additional bracing may be used at the corners as indicated at 14. The columns 11 may have dimensions such as about 12 feet in diameter and about 50 feet in height or axial length, and the square area occupied by the whole structure of Fig. 1 may have overall dimensions such as about 80 feet by 80 feet.

The columns 11 are closed at the top and bottom by circular plates 15, welded, riveted or otherwise suitably attached thereto. Each top plate 15 has a preferably square or polygonal opening cut in the central portion thereof, said opening being covered by a fabricated member 17, having generally the shape of a truncated pyramid. The members 17 are welded, riveted or otherwise suitably attached to the plates 15. In the same fashion, the lower plates 15 of each section are provided with similar openings similarly closed by truncated pyramid members 18. The top plates of the members 18 are in turn provided with square openings having preferably square box members 25 welded or riveted thereto, which box members serve to lock casing collars during the assembly of the present structure, as will appear hereinbelow.

The lower pyramid member 18 of each unitized section is made somewhat larger than the upper pyramid member 17, so that when two sections are lowered on top of each other, the upper pyramid member 17 of the lower section registers with and enters or fits within the lower pyramid member 18 of the upper section, thereby locking said sections together, somewhat in the manner of a dowel pin.

Each of the plates 15 has therethrough from 6 to 12 or more perforations or openings 19, which are arranged along a circle about 9 feet in diameter around the central pyramid members 17 and 18, each of the perforations in the upper plate being in register with one of the perforations in the lower plate. Passing through said perforations between the upper and lower plates 15 within the column 11 are a plurality of open ended guide tubes 21 flush with the upper and lower faces of said plates, respectively, and welded or otherwise fixedly attached thereto. Suitable guide tubes 21 may consist, for example, of 8% in. O. D. casing.

Another guide tube member 23, made for example of 10% in. O. D. casing, passes centrally through the column 11 and is welded at the top to the upper plate of the pyramid member 17, and at the bottom to the upper plate of the square or polygonal box 25.

The columns 11 are provided with pipe lines for purposes of buoyancy control. These lines are attached by suitable brackets to the columns 11 exteriorly thereof, and may comprise, for example, a water-flooding line 27, having a vertically directed upper open end clamped to column 11 by a bracket 29. This upper end has coupling means for connection to the lower end of a corresponding water-flooding line carried by the column 11a seating on top of the section 11. The lower end 31 of the line 27 is formed as an L-connection in communication with the inside of the column 11 near the bottom thereof. It is obvious that the section seating on top of that shown in Figs. 1 and 2 will have two water-flooding lines: one similar to that shown, and one connecting at its lower end with the upper end of line 27. The next higher unit or section will have one water-flooding line more, and so on for each succeeding section.

Each of the columns 11 has also exteriorly attached thereto a pressure-air or deflooding line 33, having a vertically extending open upper end which may be clamped to column 11 by the same bracket 29, and an L-shaped connection at the bottom in communication with the inside of column 11 near the top thereof. The

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arrangement of the deflooding lines 33 throughout the assembled or superimposed sections is similar to that of the lines 27. It is sufficient to say that lines 27 carry water pumped therethrough to flood the columns 11, while the lines 33 carry compressed air pumped therethrough to deflood said columns, whereby the buoyancy of the columns can be controlled. The above arrangement of flooding and deflooding lines is diagrammatically illustrated in Fig. 7 with regard to superimposed columns 11, 11a and 11b.

Although the lines 27 and 33 and the supporting bracket 29 are shown for clarity in Fig. 2 (and on the lower left-hand column 11 of Fig. 1) as mounted on an outward segment of column 11, it is understood that they are preferably mounted on an inward segment within the guard formed by brace work 12 and 14, as shown in Fig. 1, to protect these lines from damage by impact or collision with small craft, floating objects, etc.

The columns 11 of the lowermost section are fitted with base pedestals 35, shown in Fig. 3 and in greater detail in Fig. 4. These bases are preferably of cylindrical shape and comprise an annular wall 41 and upper and lower closure plates 37 and 39. Plate 37 is permanently welded to the annular wall 41, but the lower plate 39 is free to move vertically within the cylindrical base pedestal 35, the outer rim of plate 39 being in sliding contact with the wall 41. Stop or lug means 42 are welded to the wall 41 to limit the downward travel of the plate 39. When the plate 39 rests on the lug means 42 and the base pedestals are sunk to the bottom of the sea, the lower rim of wall 41 penetrates the silt, sand or other material at the bottom to a depth such as 6 inches, depending on the hardness of said material.

The upper plate 37 is provided with a circular row of openings 45, which are adapted to register with the lower ends of the guide tubes 21 within the columns 11. The lower plate 39 is provided with a similar circular row of openings 47 in register with the openings 45. Fitted into the openings 45 and welded to the upper plate 37 flush therewith is a plurality of tubular guide members 49. Fitted into the openings 47 and welded to the lower plate 39 so as to extend about 3 feet therebelow is another plurality of tubular guide members 50. The diameters of the tubular guides 49 and 50 are chosen so as to permit these guides to telescope with each other with a close fit when the plate 39 moves vertically towards the plate 37. Rubber seals 52 are provided at the lower end of tubular members 49. Radial T-connected pipes 49a are provided in communication between the tubular members 49 and the outside of the base pedestals. The pipes 49a may pass through an annular buoyancy tank 43 which is provided within each base pedestal and is suitably welded thereto in fluid tight manner.

The upper plate 37 is provided with a central opening 51, around which there are arranged four or more flat steel guide plates 53, welded to the lower face of the upper plate 37 in a radial or cross-like pattern.

Positioned below the four plates 53 and having its upper horizontal cover plate 54 welded thereto is a downwardly open hydraulic cylinder 55a, fitted for sliding vertical motion over a cylinder 56 welded to the plate 39 and closed at the top by a horizontal plate 58 to serve as a piston for cylinder 55. A rubber sheet 58a or other packing means may be provided for making the space within the hydraulic cylinder fluid tight when a fluid is supplied to said space by means of an internally threaded tubular collar 60 provided through the plate 54 at the center thereof.

The base pedestals are connected to the columns 11 as follows. A short tubular stud 55 having a flange member 57 welded to the lower end thereof is installed within the base 35 during the manufacturing thereof. The stud 55 extends loosely through the opening 51 and

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is held from falling back through said opening by having a collar 59 screwed to the upper end thereof. The internally screw-threaded collar 59 (which is not at this time connected to any other element) has a square-shaped plate 61 welded or formed integrally with the lower end thereof.

When the column 11 is positioned on top of the base 35 with the central opening 51 in register with the central guide tube 23 of column 11 and the circularly arranged openings 45 in register with the guide tubes 21, a pipe 63, such for example as a length of 8½ in. casing is lowered through the central guide tube 23 and is screwed inside the upper end of collar 59, the latter being prevented from rotating by its square lower flange 61 which enters and just fits within the square box 25 attached to the top of the pyramid member 18. Another collar 59a, identical with collar 59 is tightly screwed on the upper end of pipe 63 and is preferably tack-welded thereto. The length of casing 63 is tightened between the collars 59 and 59a by rotation until the flange 61a is pressed firmly against the top plate of the truncated pyramid 17 of column 11. The base pedestal and the column 11 are thus held firmly together by the tension of tubular members 55, 59, 63 and 59a, said tension being applied to the lower face of plate 37 by the flange 57 and to the upper face of the truncated pyramid member 17 by the flange 61a. The truncated pyramid 62, welded to the top of plate 37, mates within the lower truncated pyramid 18 of the section 11.

The method of grounding and erecting the assembly structure of Fig. 3 on the bottom of the sea may be briefly described as follows with reference to Figs. 3, 4 and 5.

After the columns 11 of the lowermost unit section have been fitted with base pedestals 35 as described hereinabove, said section is launched, floated to the desired location, and submerged by flooding with water through lines 27 until only approximately the upper ten feet of the columns 11 are above the water level, as shown in Fig. 5.

The next unit section, comprising columns 11a, which has also been floated or towed to the desired site, is then raised out of the water by means of two barges 67 and 69. These barges are provided with lifting equipment such as special A-frame hoists generally indicated by 71. The vertical members of these frame hoists may consist of two heavy H-beams 73, spaced apart to allow the use of multisheave blocks 75 and 77. The traveling block 77 of each hoist is provided with a saddle support 79 comprising a guide bar sliding inside of the flanges of the H-beam 73 as the traveling block 77 is lifted or lowered. The saddle support 79 is affixed to a saddle or receiver 81 which is adapted to fit or bear against a portion of the circumference of the columns 11, and which is equipped with quick-latching straps or slings 83, whereby column 11 may be firmly held to the saddle 81. Two hoisting installations such as shown at 71 are carried by each of the two barges 67 and 69, and these barges are brought along opposite sides of the quadrangle formed by the columns 11 of each section in order that all four columns may be strapped at the same time to the saddles. It will be seen that when all columns of a section are thus held by the hoisting saddles and raised from the water to a desired height by the hoisting equipment, the two barges are firmly held together in rigid relationship with each other by and through the section itself.

The two barges and the hoisted second section 11a are then floated in such a manner that the second section is positioned directly over the floating lowermost section 11, as shown in Fig. 5. When the second or upper section is in proper position, hooks 85 carried by the barges are secured to the bracing 12 of the lower section, and a strain is placed thereon by means of tackle 87 attached thereto, to tie the lower section and the barges fixedly together. A further adjustment of the exact position of the lower

section may be effected by slacking and tightening as required by the tackle 87.

The two sections and the two barges are now secured to form an integrated structure so that they all are capable of rolling in the swell together. The upper section 11a is then lowered to mate with the lower section 11, the upper truncated pyramids 17 of the latter entering within the lower truncated pyramids 18a of the upper section, whereby all tubes 21 and 21a are brought into register. The two sections are then secured together by lowering a length of 8½ in. casing 63a, having a collar 59b firmly attached to the upper end thereof, through the central tube 23a of the upper section 11a and screwing the lower end of said casing 63a into the locked collar 59a until the flange 61b of the upper collar 59b is firmly pressed against the upper face of the truncated pyramid 17a, as may be seen from Fig. 4.

The water and air pipe lines 27 and 33 of the upper section are then connected to corresponding lines of the lower section, the hooks 85 are removed, and the hoisting lines are slackened to allow the two assembled sections to sink until they become self-buoyant. The lifting straps 83 are then released first on one of the barges and then on the other, and the barges are pulled away from the floating sections, which are then flooded further until again only about 10 ft. of the columns of the upper section extend above the water surface.

The process described above may then be repeated to add to the assembly, if necessary, a section 11b and any desired succeeding sections, depending on the depth of the water at the location. Special non-braced independent spacer columns 11c may be placed at the top of the regular unit sections to adjust for depths which are not nearly multiples of 50 ft., if such be the exact height of columns 11, plus about 15 ft. for the height of the pedestal base 35. The spacers 11c are placed on top of regular columns such as columns 11b either by a crane 95 at the location, or are affixed thereto before the section 11b is brought to the location. Spacers 11c are fastened to the rest of the structure by means of central connectors in the same manner as already described hereinabove.

The special drilling section 11d may be floated to the location with some of the major items of drilling equipment and a deck crane 95 already installed thereon, since each foot of submergence of the four 12 ft. dia. columns provides about 25,000 lbs. of buoyancy.

After the drilling section 11d has been installed, the assembled structure is held off the bottom by the barges while the columns are flooded further to make the structure heavier than water and thus to ensure that it will definitely sink to the bottom when the barge support is released.

The structure is then lowered by slacking off the hoist lines until the bases rest on the bottom and the barges are withdrawn. Anchor lines may be run out from the corners of the structure to stabilize it if necessary and the present structure may be further leveled in the following manner.

As stated hereinabove, the lower plate 39, having the tubular guide members 50 attached thereto, is mounted for vertical motion within the base pedestal 35. The tubular members 50 telescoping with the tubular members 49 and the piston formed by cylinder 56 and cover plate 58 telescoping with the cylinder 55a rigidly attached to the upper plate 37 of the base pedestal. If the structure is being positioned on a soft bottom, it may be assumed that the lower rim of the outer cylindrical wall 41 of the pedestal base 11 will penetrate into the bottom material until the plate 39 is fully retracted and contacts the bottom of the annular buoyancy tank 43. If the ocean floor slopes at this location, or if for some reason the cylindrical walls of the four pedestal bases do not penetrate this floor to an equal depth, the whole structure will have a certain degree of tilt. The hydraulic cylinders 55a in the

pedestal base or bases at the corner or corners of the platform structure where the deck elevation is the least may then be pressurized sufficiently to force the hydraulic cylinder 55a and the structure connected thereto upward to level the deck of the platform. This may be done by lowering a string of tubing, such as 2½ in. O. D. tubing through the 8½ in. O. D. casing 63 at the center of each column, screwing the lower end of said tubing to the threaded collar 60 provided in the center of the top plate 54 of the hydraulic cylinder 55a, and supplying sufficient fluid under hydraulic pressure to cause the cylinder 55a to travel upwards until the plate 37 and the structure thereon is at the desired level. The 2½ in. O. D. tubing string (which is not shown in order not to complicate Fig. 4 further) may then be closed and secured at the top by suitable means.

In dealing with soft bottom sediments, some leveling control may further be effected by causing the columns on the high side to settle or penetrate more by additionally flooding said columns and by lightening or de-flooding the columns on the low side.

Similarly, if the structure is located or set down on a hard bottom, the piston may be retracted so that the ends of the guide tubes 50 are resting on the bottom at the same level as the lower edge of the cylinder wall 41, thus giving additional stability and strength to the structure. For the same purpose, a supporting cylinder 56a may be welded to the lower plate 39 centrally of the tubes 50 to take up a portion of the load on said tubes and to prevent them from sinking into the pile holes as they are being drilled, which would defeat the effect of the leveling means. Further, reinforcing gusset plates 50a may be welded between the tubes 50 and the plate 39.

A string of drill pipe, such as a 4½ in. or 5 in. O. D. drill pipe, is then run from the top through one of the 8½ in. O. D. guide tubes 21, 49 and 50 and is drilled into the formation to serve as an anchoring piling string for the present structure. As shown in Fig. 3, the piling strings 96, which are run through all of the guide tubes 21 of each section (or through as many of the latter as may be thought desirable) have low cost drag bits 97 attached to the lower end thereof.

As shown in Fig. 6, each piling string 96 is preferably provided with a special safety joint having a coupling 99 with quick-joint type threads at 101 and regular threads at 103. The safety joint has also a plurality of flutes 105, such as four, six, etc., welded or otherwise outwardly affixed to the lower end of the upper drill pipe 96. These flutes while readily passing through the guide tubes 21 and permitting the circulation of drilling fluid there-through, do not allow the safety joint to pass below the upper pedestal plate 37, since the openings 45 through said plate are made of a diameter smaller than that of tubes 21. Welded to the underside of plate 37 below each of the openings 45 is a short tubular sub 107 having attached thereto a rubber wiper or protector ring 109, adapted to surround the string 96 and to prevent the drilling fluid from circulating up the tubes 21.

One of the safety joints is installed in each string 96 at a predetermined distance above the bit 97, said distance being selected so that when the flutes 105 come to bear against the restricted opening 45, the bit 97 and the lower part of drill pipe 96 have penetrated through the overburden of sand and silt and on into a hard formation such as shale to a sufficient distance to provide a restraining force to stabilize the structure against the wave, wind, tide current and other forces which may be brought to bear on the structure under the most severe conditions.

The bits 97 are spudded and the strings 96 are rotated by conventional means which need not be described in detail, it being sufficient to state that a light rotary table 108 with prime mover 109 may be temporarily installed

on top of the columns 11, and the string, together with the swivel and the kelly may be supported from the crane 95. Sea water may be circulated down the string 96. The guides 49 and 50 in the pedestal base act as conductor pipe and serve to prevent the sand, silt or clay under said base from being carried up with the circulating fluid to create a washout or cavity. The circulating fluid rising through the tubes 49 and 50 passes to the outside through the radially arranged pipes 49a.

Any of the piling strings 96 is drilled into the formation until the safety joint 99 is stopped at the plate 37. The string 96 is then secured at the top by means of slips or other fastening devices, the kelly and the rotary table are moved to another guide tube 21, and drilling is resumed through said guide tube. As many piling strings may be installed as desired, but some of the tubes 21 are preferably left empty to permit the pedestal base to be later cemented therethrough if desired.

After all drill pipe piling strings have been secured at the top of the guide tubes 21 by means of drill pipe slips, air is forced into the columns 11 until a predetermined amount of net buoyant force is applied upwards against the slips for all conditions of tide and wave trough level. This buoyancy may be increased as the load on the platform increases during the drilling process.

The structure is at this moment in a substantially assembled state and is ready to serve as an offshore drilling platform. The drilling equipment not on the drilling section at the time of its installation may now be raised and placed in position by means of the deck crane. The four sectional columns 11 serve as storage tanks for drilling fluid, fresh water, engine fuel, etc.

The deck and equipment layout should preferably be designed so that several wells may be drilled from one platform.

If the platform is to be relocated for any reason, such for example as when abandoning a well, the following procedure may be followed.

First, the sectional columns 11 are flooded until the assembled structure is heavier than water and rests with a positive force on the bottom. The slips or other means securing the piling drill strings 96 at the top are then removed and the whole upper portion of each string down to the safety joint 99 is released by rotating the string to the left, which disengages the quick-joint threads 101. The tubular stud 55 is likewise disengaged by means of a suitable tool lowered through the tubular string 63. These salvaged drill pipe strings are then withdrawn from the guide tubes 21, and the barges with the hoists 71 are brought alongside and secured to the structure as described hereinabove. A strain is taken on the hoists, and the structure is lightened by forcing air into the sectional columns, if necessary, until the structure is lifted sufficiently to be taken off the unsalvaged lower portion of the piling drill pipe. The structure is then floated and/or towed to a new location and reinstalled as previously described.

The description of the present method of constructing, operating and disassembling the structure of this invention, and the details presented as to shape, size, number, etc., of columns, tubular strings and other elements, have been given hereinabove only by way of illustration, and can be modified in any desired way without departing from the spirit of this invention, as will be understood by those skilled in the art, the scope of said invention being limited only by the appended claims.

I claim as my invention:

1. A method of erecting an offshore structure comprising the steps of floating to a desired site at least two prefabricated sections each comprising a plurality of buoyant vertical columns braced together to form a closed polygonal figure, flooding the columns of one of said sections so as to submerge a major axial portion of said columns, gripping a second section from diametrically opposite

sides thereof by first and second floating hoisting means, raising said second section to a height in excess of that of the non-submerged portion of the first section, floating said hoisting means and the section raised thereby as a single unit toward said first section and lowering said second section on top and in register with the first section, joining each two registering columns vertically together by passing a tubular member axially therethrough and bracing said member in tension centrally between the bottom of the lower column and the top of the upper column, submerging the major axial portion of the unit formed by the vertically joined sections, continuing the process of joining the sections and submerging the resulting structure until the lowermost section rests on bottom, and anchoring the structure on the bottom.

2. The method of claim 1, wherein the step of anchoring the structure on the bottom comprises the steps of passing a plurality of tubular strings axially throughout each set of vertically joined columns substantially in a circle around the central axial bracing member thereof, drilling said strings into the ground below said columns and locking said strings with said sectional columns to anchor said columns to the ground.

3. A method of erecting an offshore drilling structure comprising the steps of floating to a desired site a plurality of prefabricated sections each comprising four buoyant vertical columns braced together to form a closed polygonal figure, flooding the columns of one of said sections so as to submerge a major axial portion of said columns, gripping a second section from diametrically opposite sides thereof by first and second floating hoisting means, raising said second section to a height in excess of that of the non-submerged portion of the first section, floating said hoisting means and the section raised thereby as a single unit toward said first section and lowering said second section on top and in register with the first section, joining each two vertically registering columns together by passing a tubular member axially therethrough and bracing said member in tension between the bottom of the lower column and the top of the upper column, submerging the major axial portion of the unit formed by the joined sections, the process of joining the sections and stepwisely submerging the resulting structure continuing until the lowermost section rests on the bottom, passing a plurality of tubular strings axially through each composite sectional column substantially in a circle around the axial bracing member joining said columns, drilling said strings into the bottom below said columns to anchor said columns thereto, and locking said strings with said sectional columns at a point near the top of said columns and at a point near the bottom of said columns.

4. An offshore drilling structure comprising a prefabricated section having a plurality of hollow cylindrical columns provided with upper and lower closure plates, bracing means connecting said columns together to form substantially a closed polygonal figure, said upper and lower closure plates having openings therethrough, upper and lower polygonal key members, which are convex and concave respectively, covering said openings and welded to said plates to extend above said upper and lower plates respectively, the dimensions of said lower key members being sufficiently greater than those of the upper key members to receive therein the upper key members when two prefabricated sections are lowered in register on top of each other, a first cylindrical tubular guide member passing axially through each column and welded at its upper and lower ends respectively to the upper and lower key members, and a plurality of second tubular guide members passing through each column around said first tubular member, said second tubular members being welded at their upper and lower ends to the upper and the lower closure plates respectively, the diameter of said second tubular members being sufficient to permit a drilling string to pass therethrough.

5. An offshore drilling structure comprising a set of prefabricated sections vertically assembled on top of each other to extend from the bottom of the water to a level above its surface, each of said sections comprising four hollow cylindrical columns having upper and lower closure plates, said columns being held together by bracing to form a rectangular figure, polygonal key members forming part of said upper and lower cover plates, said key members being convex on the upper plates and concave on the lower plates and registering with and engaging each other when said sections are disposed on top of each other, a first guide tube passing axially through each column and welded to the upper and lower plates thereof, a plurality of second guide tubes passing axially through each column and welded to the upper and lower plates thereof, said second guide tubes being disposed around said first guide tube, a tubular string freely passing throughout each set of axially assembled columns within the first axial guide tube thereof, said string being braced in tension between each of the columns of the lowermost section and each of the columns of the top section to hold said sections together as a single unit, a drill string passing within at least some of said second guide tubes of each of the column sets, each of said drill strings penetrating to a desired depth into the ground below the column sets, and means for locking said drill strings with said columns to anchor said columns to the ground.

6. The structure of claim 5, comprising a pedestal base below the lowermost column of each vertical column set, said base comprising a cylindrical chamber having an upper and a lower closure plate, the diameter of said base being larger than that of said columns, said upper closure plate having a central axial opening and a plurality of openings therearound adapted to register with the first and second guide tubes of the columns respectively, said lower closure plate having a plurality of openings in register with the openings through the upper plate, coupling means extending upwardly through said central axial opening of the upper plate and engaging in tension the lower end of the axial tubular member passing through the guide tube of the lowermost column for rigidly connecting said column to said base, and reservoir means within said base for controlling the buoyancy thereof.

7. An offshore drilling structure comprising a set of prefabricated sections vertically assembled on top of each other to extend from the bottom of a water body to a level above its surface, each of said sections comprising four hollow cylindrical columns held together by bracing means to form a rectangular figure, tubular connecting means passing axially through each of said columns to hold said vertically assembled sections rigidly together, a cylindrical pedestal base below each of the columns of the lowermost section, the diameter of said base being greater than that of said column, said base having a fixed upper closure plate and a lower closure plate mounted for

vertical motion within the cylindrical walls of the base, and means for maintaining said structure in a vertical position over an uneven bottom, said means comprising hydraulic cylinder and piston members fitted for mutual reciprocation within each of said bases, one of said members being fixedly attached to the upper and the other to the lower closure plate of the base centrally thereof, and means comprising a port opening to said hydraulic cylinder in register with said tubular means axially passing through the vertically assembled columns for supplying a pressure fluid to said cylinder member, whereby the cylinder and piston members are reciprocated with regard to each other and the height of each of the four vertically assembled columns is selectively adjusted in accordance with the configuration of the bottom of the water body.

8. A method of erecting an offshore structure comprising the steps of floating to a desired site at least two prefabricated sections each comprising a plurality of buoyant columns braced together with their axes parallel to form a closed polygonal figure, flooding the columns of one of said sections to submerge a major axial portion of said columns, gripping a second section by floating hoisting means, lifting said second section to a height in excess of that of the non-submerged portion of the first section, floating said hoisting means and the section raised thereby toward said first section and lowering said second section on top and in register with the first section, joining each two registering columns vertically together by passing an elongated connecting member axially therethrough and anchoring it to the two columns, and submerging a major axial portion of the unit formed by the vertically joined sections, said lifting, joining and submerging process being continued until the lowermost section rests on bottom.

9. The method of claim 1, wherein the first and second hoisting means, after raising the second section and after being floated as a single unit toward the first section, are fixedly attached to said first section on opposite sides thereof so that said hoisting means and the raised second section is capable of floating and rising in the swells as a single unit with the first section onto which the raised second section is to be lowered.

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