

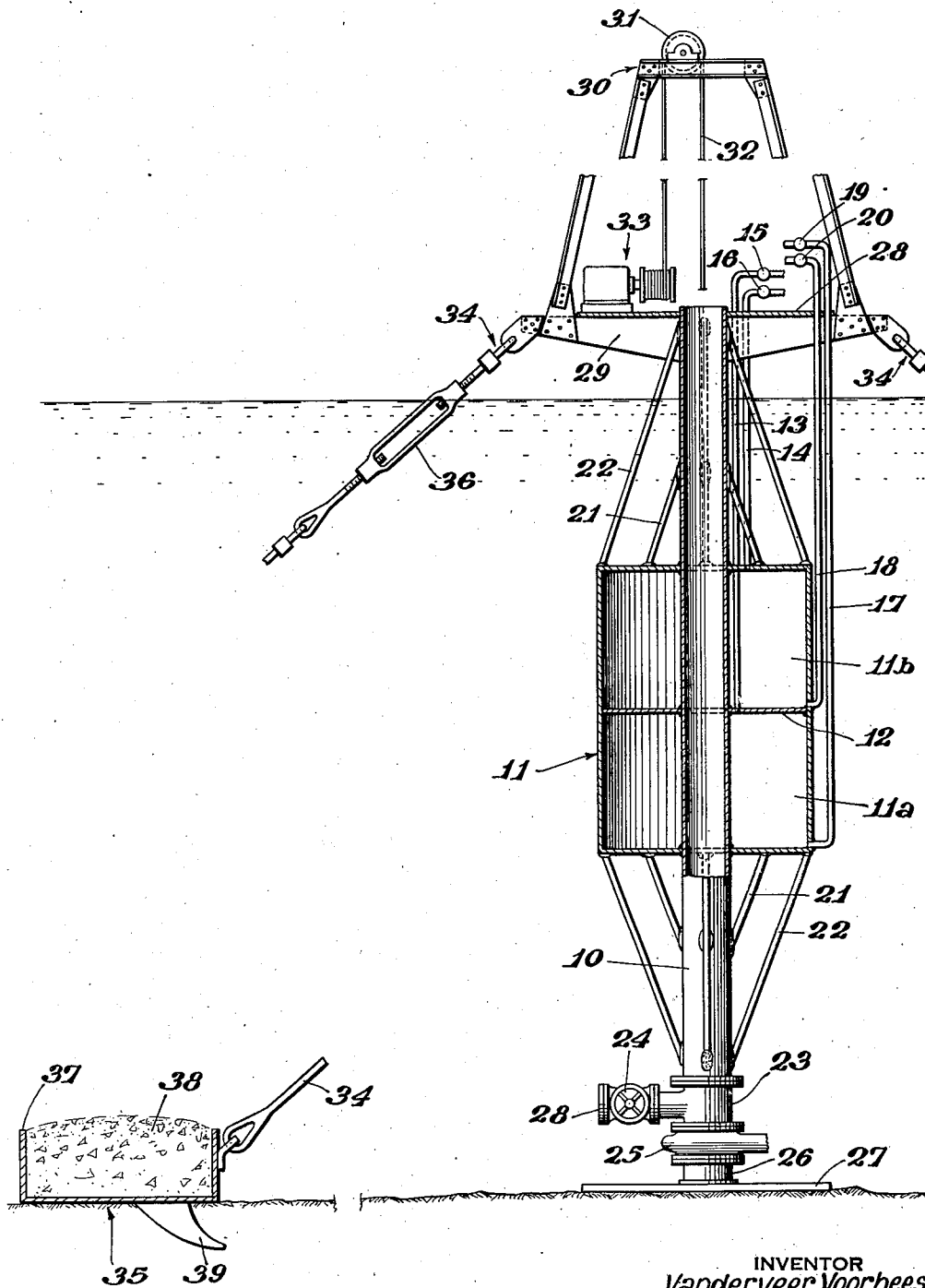
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V. VOORHEES

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UNDERWATER DRILLING

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INVENTOR
Vanderveer Voorhees
BY *Lyle S. Motley*
ATTORNEY

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UNDERWATER DRILLING

Vanderveer Voorhees, Hammond, Ind., assignor
to Standard Oil Company, Chicago, Ill., a corporation of Indiana

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This invention relates to a method and apparatus for drilling oil wells under water.

In the art of drilling oil wells under a body of water it is very important that the derrick and caisson equipment be installable quickly with the minimum of labor and cost of material, while at the same time securing the maximum of efficiency in the operation of the equipment. It is of equal importance that the greater portion of this equipment be readily and quickly removable as for example where the well is under sufficient pressure to flow without the use of a pump or where the well is to be closed down for any considerable period of time.

It is an object of my invention to provide a comparatively inexpensive but efficient derrick and caisson structure for drilling oil wells under water, particularly under deep water such as is found in lakes, bays and oceans where the depth may be of the order of thirty to two hundred feet or more where drilling operations are to be carried out.

It is a more particular object of my invention to modify in a novel manner the general type of tower or caisson structure shown in the Palmer Patent 525,795 in connection with taking samples of a bed under a body of water for analysis and to render this general type of tower equipment suitable for drilling subaqueous oil wells.

The above and other objects, advantages and uses of my invention will become more apparent from a reading of the following detailed description thereof including the claims taken in connection with the attendant drawing which forms part of this specification, and wherein the single figure illustrates schematically a preferred embodiment of apparatus built in accordance with my invention.

A caisson pipe 10 through which the drilling operations are to be carried out is provided intermediate its ends with an auxiliary caisson or tank 11 having sufficient displacement for floating the equipment so that it may be towed to the scene of operations and then filled with water to effect the lowering thereof into position on the bed underlying the water with the caisson 11 located well below the action of the waves. The auxiliary caisson 11 is divided into two compartments 11a and 11b by partition 12. Air lines 13 and 14 connect the respective compartments 11a and 11b with a suitable source of compressed air under the control of the operator by means of valves 15 and 16. Flood lines 17 and 18 connect the respective compartments 11a and 11b with a supply of water under the control of the operator by

means of valves 19 and 20. Alternatively water admission ports can be located below the water level. Valves 15 and 16 are opened to provide vents when water is being introduced into the corresponding compartments.

A plurality of guy rods or wires 21 and 22 are symmetrically and radially disposed about caisson 10 for reinforcement. These guys are indicated as being connected by welding for the purpose of simplicity. However, any one of the many well known forms of connections may be employed including such devices as turnbuckles for maintaining the proper tension. The lower end of caisson pipe 10 has attached thereto a conventional form of T connection 23 the side outlet of which is provided with auxiliary valve 24 while the lower outlet is provided with gate valve 25, preferably of the motor-driven type. Gate valve 25 in turn is mounted by means of nipple 26 on base plate 27 which is adapted to rest on the underlying bed. This base plate is preferably made very heavy and given a considerable horizontal spread.

The upper end of caisson 10 carries platform 28 additionally supported with respect thereto by means of reinforcing members 29 which also mount derrick 30 carrying crown block 31 for receiving cable 32 of the usual winch mechanism 33. The platform 28 is adapted to be positioned well above the level of the wave action. Symmetrically and radially disposed guy cables 34 extend from suitable attachments about the members 29 to anchors 35 and include turnbuckles 36 for adjusting the tension therein. The anchors (only one being shown for convenience) comprise open top boxes 37 filled with concrete 38 and provided on the bottom thereof with claws 39 for engagement with the bed of the stream. From three to ten anchors can suitably be used.

The necessary power, materials, etc., will be supplied by a service barge (not shown) anchored near by.

In accordance with my novel method of installing and removing this equipment, I first fill compartments 11a and 11b with air (if they are not already in this condition) and float the equipment to the scene of operations, for instance, by towing. Next the air is vented from compartment 11a by manipulation of valve 15 and filled with water by means of valve 19 thus causing the equipment to assume an upright position by virtue of the lowered center of gravity. Following this, upper compartment 11b is likewise flooded by the operation of valves 16 and 20 to effect the lowering of the apparatus to bring base plate

27 into contact with the underlying bed. Guy wires 34, extending from anchors 35 already installed, are next attached to the ends of members 29 as shown and turnbuckles 36 operated to give the desired tension. The derrick 30 is then preferably erected although it is possible to have it already in place when the caisson is towed into position. Next, the drill bit, drill collar, drill pipe, etc. are lowered through caisson 10 and the drilling operation is carried out in the conventional manner. The usual "surface" casing is put down through caisson 10 and cemented into section 26. Additional casing is then put down in the normal manner. When oil has been struck, the drilling tools are removed and the well is completed in any of the known manners. The conventional tubing is put in case, extending upward to a point just below valve 25 and cemented in place. Gate valve 25 is then closed, caisson 10 is removed from the top of T connection 23 and a cover plate substituted therefor. This removal operation is accomplished by reversing the previously enumerated steps, namely, displacing the water in compartments 11a and 11b with compressed air after making the necessary disconnections of guy wires, etc., and floating the equipment to another position where a second well is to be drilled.

When it is desired to allow the well to flow, gate valve 25 and auxiliary valve 24 are again opened and the oil conducted to the surface and received in suitable tank boats through the means of conduits (not shown) connected with the outlet of valve 24, or oil may be conducted to near-by shore points through lines laid on the bottom. Should it be desired to install a pump, the same may be mounted on the tee connection 23 in the manner of connecting the caisson 10 and manipulating the valves in the manner above described.

Where a flowing well is not obtained the caisson and all associated equipment can be left in place more or less permanently and the well can be pumped from platform 28 in the usual manner. When pumping is contemplated valves 24 and 25 can be dispensed with.

Since many modifications coming within the scope of my invention may be made by those skilled in the art, the above description is to be taken as illustrative and not as limiting the scope thereof except as indicated by the appended claims which should be construed as broadly as the prior art will permit.

I claim:

1. Apparatus for drilling subaqueous wells comprising an elongated primary caisson through which drilling operations may be conducted, an auxiliary caisson associated with said primary caisson adapted when empty to cause said primary caisson to float with its longitudinal axis in a substantially horizontal position, and means for flooding said auxiliary caisson.

2. Apparatus for drilling subaqueous wells comprising an elongated primary caisson through which drilling operations may be conducted, a plurality of auxiliary caisson chambers disposed along the length of said primary caisson and means for selectively introducing air and water into each of said auxiliary caisson chambers.

3. Apparatus for drilling subaqueous wells according to claim 2 including a work platform attached to the upper end of said primary caisson, a plurality of anchors adapted to be disposed radially about said caisson, and means attached to said anchors for holding said caisson in a substantially vertical position.

4. Apparatus for drilling subaqueous wells comprising an elongated primary caisson through which drilling operations may be conducted, an auxiliary caisson rigidly attached to said primary caisson and provided with a plurality of chambers therein disposed along the length of said primary caisson, said auxiliary caisson having sufficient displacement to float said primary caisson, means for selectively introducing air and water into each of said chambers, whereby said primary caisson may be positioned vertically with its lower end in contact with the underlying bed, a work platform disposed on the upper end of said primary caisson, means for anchoring the lower end of said primary caisson to said underlying bed, and means for anchoring the upper end of said primary caisson whereby said primary caisson is maintained in a substantially vertical position.

5. In an apparatus for drilling submarine oil wells in deep water wherein the drilling operation must be conducted over a ground location subject to wave action, the improvement comprising a hollow steel mast, of sufficient internal diameter to permit usual drilling operations to be conducted therethrough, extending from the ground to a point above the height of said wave action, a working platform surmounting said mast, a watertight caisson rigidly attached to said mast at a point intermediate the ends thereof sufficiently low to prevent any part thereof from extending into the zone of said wave action, of sufficient displacement to buoy said mast, means for controlling the admission of water into said caisson to submerge the lower end of said mast while maintaining the upper end thereof above the water level whereby the mast may be erected vertically on said location and means for laterally anchoring said mast in a stationary position against said wave action.

6. In an apparatus for drilling subaqueous wells, drilling equipment including a caisson through which drilling operations may be conducted, an auxiliary caisson mounted intermediate the ends of said first-named caisson, said auxiliary caisson having a sufficient displacement to float said equipment, control means connecting said auxiliary caisson with a source of compressed air and water whereby to selectively fill said caisson with air for the purpose of floating and towing said equipment to the scene of operations or flooding the same for effecting lowering thereof into position with the lower end of said first-named caisson in contact with the underlying bed, a work platform attached to the upper end of said first-named caisson, a plurality of anchors adapted to be disposed radially about said caissons, guy wires arranged to connect said anchors to attaching means located at points spaced about the outer periphery of said platform, a base for the lower end of said first-named caisson, said base comprising a substantially heavy member of a comparatively large horizontal cross-section having a centrally located vertical opening therethrough, means for detachably mounting the lower end of said first-named caisson on said base in cooperation with said opening therethrough comprising a gate valve through which drilling operations may be conducted and which is effective to shut off the well following the withdrawal of the drilling tools, and thus provide for the removal of said caissons to another scene of operations.

7. In an apparatus for drilling subaqueous wells, drilling equipment including a caisson through which drilling operations may be conducted, an auxiliary caisson mounted intermediate the ends

of said first-named caisson, said auxiliary caisson having a sufficient displacement to float said equipment, control means connecting said auxiliary caisson with a source of compressed air and water whereby to selectively fill said caisson with air for the purpose of floating and towing said equipment to the scene of operations or flooding the same for effecting lowering thereof into position with the lower end of said first-named caisson in contact with the underlying bed, a work platform attached to the upper end of said first-named caisson, a plurality of anchors adapted to be disposed radially about said caissons, guy wires arranged to connect said anchors to attaching means located at points spaced about the outer periphery of said platform, a base for the lower end of said first-named caisson, said base

comprising a substantially heavy member of a comparatively large horizontal cross-section having a centrally located vertical opening there-through, means for detachably mounting the lower end of said first-named caisson on said base in cooperation with said opening therethrough comprising a gate valve and a T connection, said T connection being interposed between the lower end of said first-named caisson and said gate valve and provided with an auxiliary valve for controlling the outlet therefrom, whereby said first-named caisson may be disconnected from said T connection and floated away following completion of drilling operations and said well allowed to flow through said auxiliary valve of said T connection.

VANDERVEER VOORHEES.