United States Patent [19]

Kolb

[11] **3,825,076**

[45] **July 23, 1974**

[54] **PILE MOUNTED DRILLING RIG AND METHOD**

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[22] Filed: **Feb. 9, 1973**

[21] Appl. No.: **331,006**

[52] **U.S. Cl.** **175/5,** 61/46.5

[51] **Int. Cl.** **E21b 7/12**

[58] **Field of Search** 175/579, 58; 61/46.5, 46, 61/53, 53.5, 81; 166/.5

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[57] **ABSTRACT**

A rig for drilling in a pile projecting from a submerged surface to a location above the surface of a water body includes an elongate derrick operable to support drilling equipment and a deck fixed to the derrick at one end thereof. An elongate open ended sleeve for telescopingly receiving a pile is suspended from the deck. An apertured rig support, fixed to and generally aligned with the sleeve, is engageable with a pile received by the sleeve and provides freestanding support of the rig on the pile. A conduit communicates with the interior of the pile and projects through a sleeve aperture. The conduit provides an outlet for drilling fluid and impedes turning of the rig on the pile.

A method for drilling in piles of an offshore structure entails supporting the rig in a freestanding manner on one pile, drilling a borehole at the pile base, and lifting the rig from the pile with lifting cables arranged in a sling arrangement. Thereafter the rig is supported on another pile and a borehole is drilled at the base thereof.

21 Claims, 6 Drawing Figures

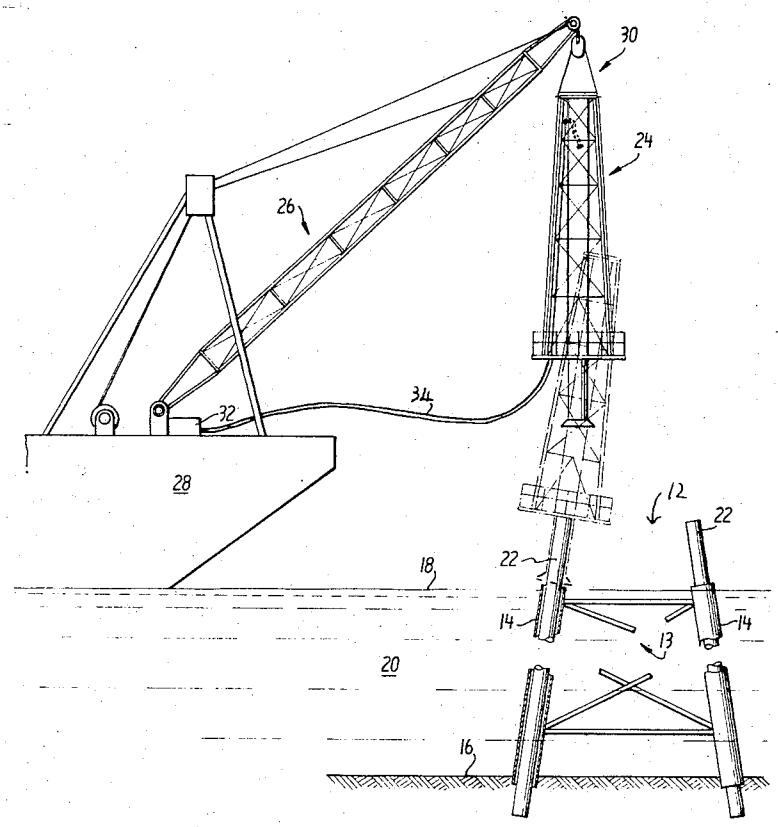


FIG. 1

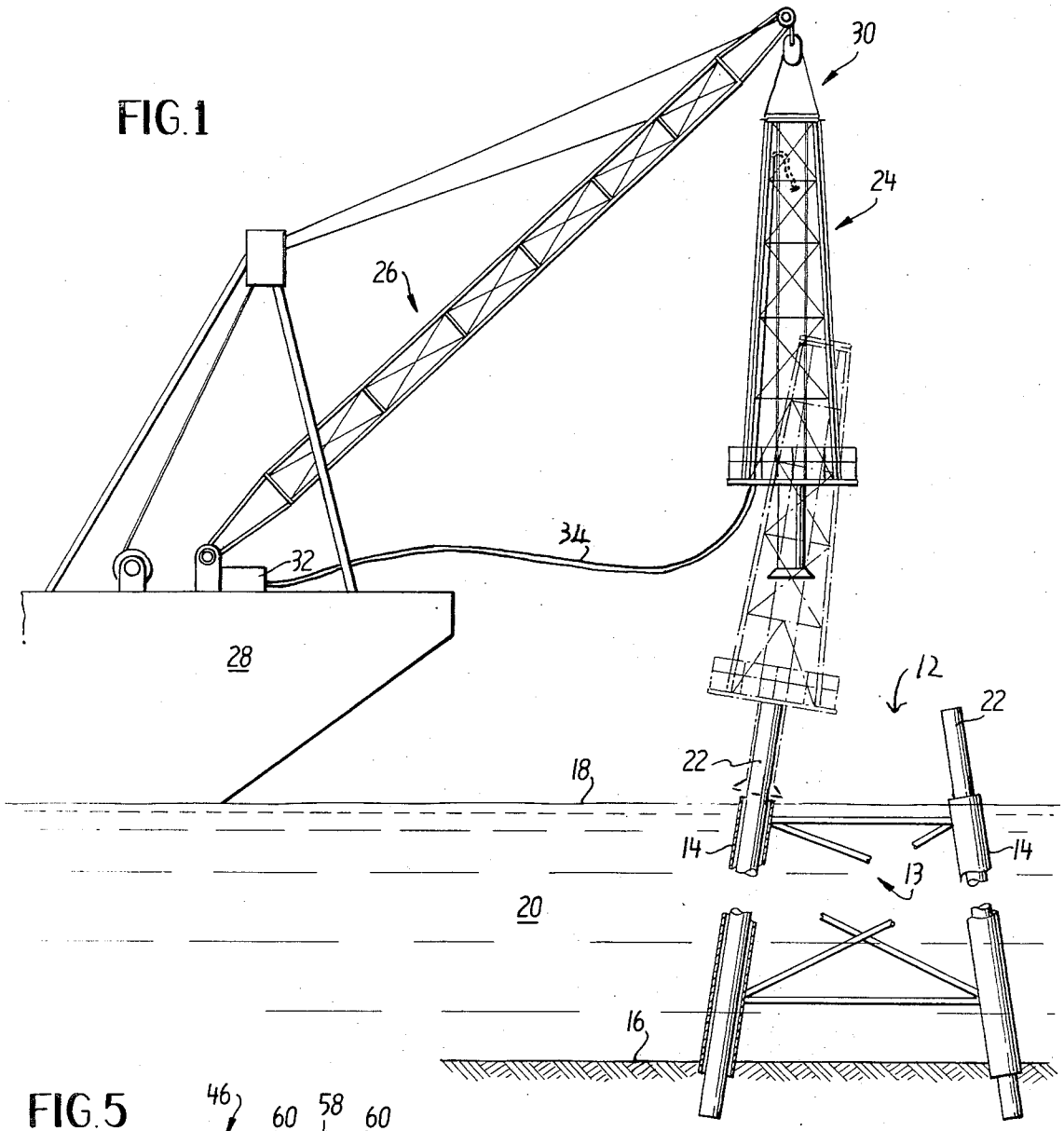


FIG. 5

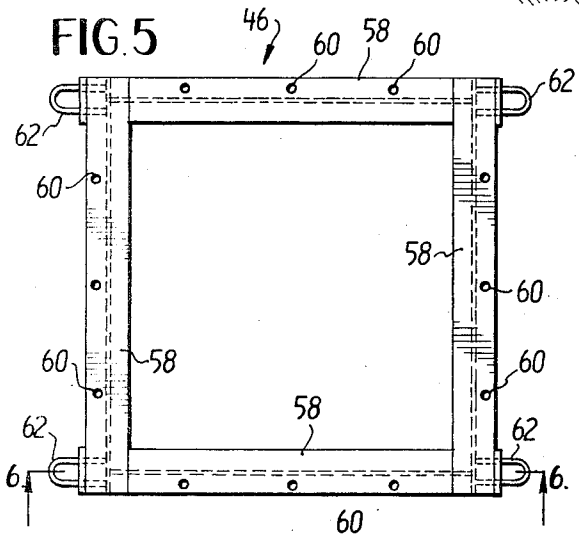
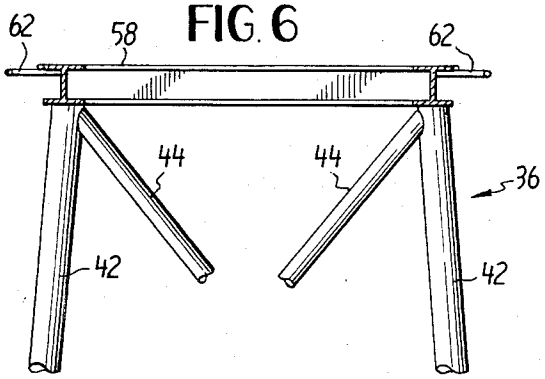


FIG. 6



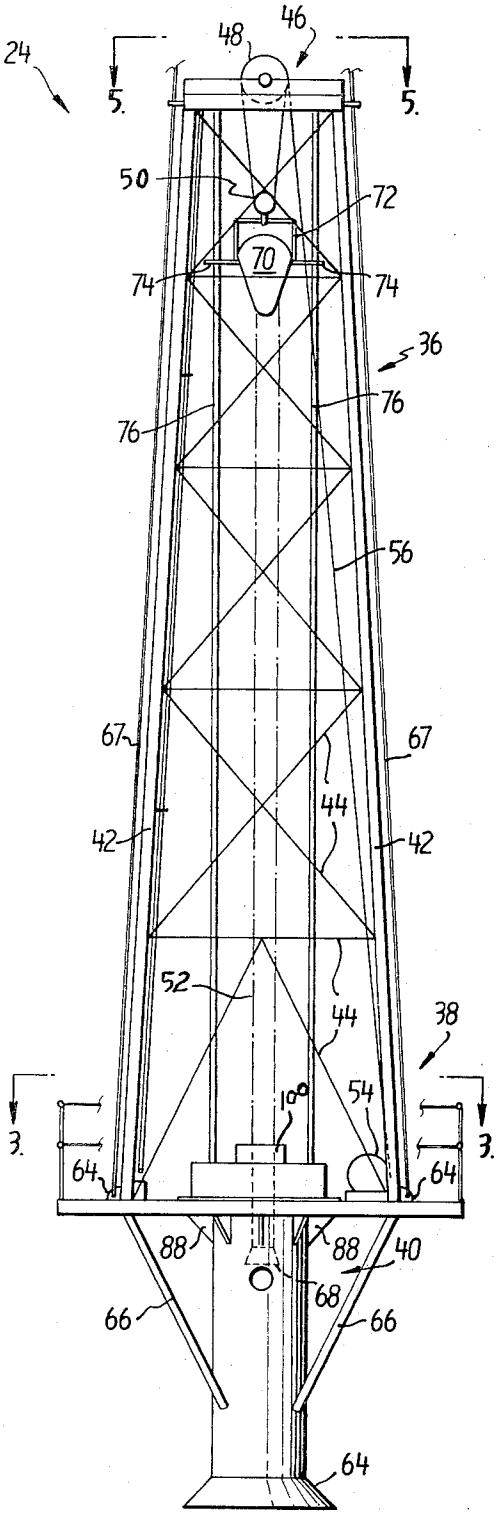


FIG. 2

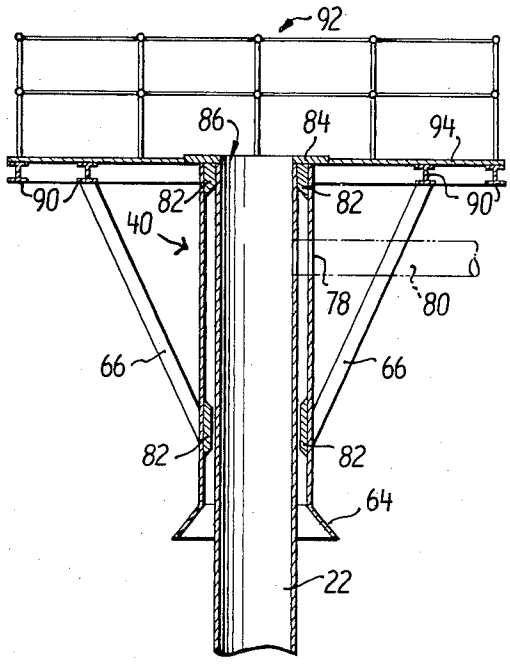


FIG. 4

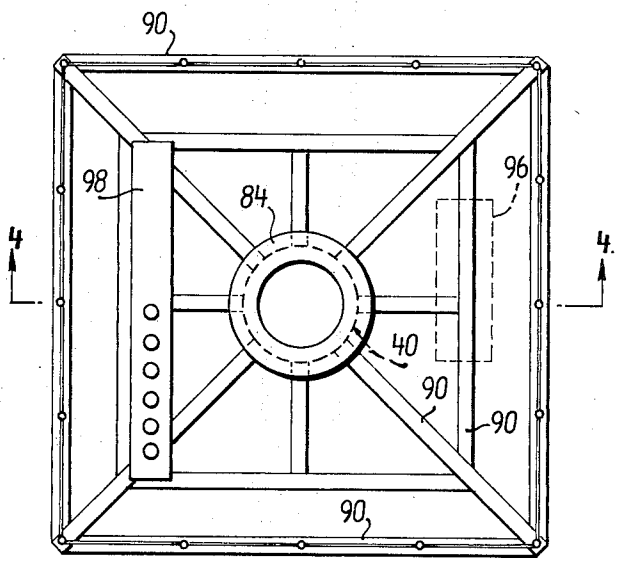


FIG. 3

PILE MOUNTED DRILLING RIG AND METHOD

BACKGROUND OF THE INVENTION

This invention relates to drilling operations associated with the setting of piling utilized to support and stablize off-shore well drilling platforms. More particularly, this invention relates to operations involving the drilling of boreholes at the base of installed piles so as to enable the driving of such piles further beneath the submerged surface.

In the past, such drilling operations have often been performed utilizing drilling rigs carried by a floating vessel or barge. Such techniques may often be suitable; however, they may not be entirely desirable for a number of reasons. For example, where a floating barge is employed as the support for the drilling equipment, the drilling equipment is rendered responsive to wave action induced barge motions which could impede pile drilling operations.

It would, therefore, be desirable to provide for pile setting techniques wherein the drilling equipment would be essentially isolated from wave action effects associated with barge movement or the like.

Although elimination of such effects of wave action may be realized by the mounting of the drilling rig on a platform associated with and supported by the piles to be drilled, it will be recognized that mounting of this type may often not be practical. For example, the time factor required for constructing a platform may present significant problems, particularly where rough waters are often encountered. In such cases, delay of the pile drilling operation while awaiting platform construction would not be entirely feasible by reason of the increased possibility of damage to the offshore structure by sea effects prior to the time that the piles are suitably set.

It would, therefore, also be desirable to provide for pile setting techniques wherein the drilling equipment is not only essentially isolated from wave action effects but according to which drilling operations may be conveniently commenced and practiced at environmentally suitable times.

In addition, it will be appreciated that the inclined nature of the jacket legs associated with many offshore structures could hamper any attempts to rely upon platform mounted pile drilling rigs. These legs are often inclined for their major extent and then joined to a straight section adjacent the zone of the platform. As a result, the similarly oriented piles would not be particularly amenable to receipt of drilling equipment mounted on the platform. Therefore, added construction and handling expenses might result from attempted use of platform mounted drilling rigs.

It would thus be further desirable to provide for pile setting techniques wherein construction and handling expenses associated with mounting of the rig are minimized.

OBJECTS AND SUMMARY OF A PREFERRED FORM OF THE INVENTION

It is, therefore, a general object of the present invention to provide for pile setting techniques wherein a drilling rig is rendered essentially nonresponsive to wave induced motion such as that affecting any associated construction barge.

It is a further object of the present invention to provide for pile setting techniques wherein pile drilling operations may be conveniently practiced at times consistent with sea conditions.

It is an additional object of the present invention to provide for pile setting techniques according to which wave action effects on the drilling equipment are isolated and construction and handling expenses associated with mounting of the drilling rig are minimized.

It is a particular object of the present invention to provide a novel method and apparatus wherein a pile is set utilizing a pile drilling rig supported on the pile itself.

It is a further object of the present invention to provide a simple lightweight means of drilling in piling with equipment that is portable, self-supporting when associated with a pile, and operable in a position isolated from wave action motions.

A preferred form of the invention intended to accomplish at least some of the foregoing objects entails a method and apparatus wherein a pile drilling rig is supported on the pile itself during drilling of the borehole at the pile base for purposes of setting the pile.

According to method and apparatus aspects of the invention, an open-ended tubular projection is suspended from a drilling rig which includes a derrick structure operable to support drilling apparatus. This tubular projection and a pile projecting generally upwardly from a submerged surface are telescoped together. By engaging the pile with rig support means, the rig is then supported in a free standing manner on the pile telescoped with the tubular projection.

Preferably the open-ended tubular projection is in the form of elongate sleeve means for telescopingly receiving the pile. Sleeve mounting means, which may be in the form of braces, suspend the sleeve means from a deck means which is fixed to the derrick at one end thereof.

Free standing support of the rig on the pile is preferably accomplished utilizing an apertured rig support means fixed to and generally aligned with the sleeve means. The apertured rig support means may advantageously constitute an annular plate located at the level of the deck means and gusseted to the sleeve means.

The sleeve means includes a wall defining an aperture through which projects a conduit means communicable with the interior of a pile received by the sleeve means. This conduit means provides an outlet for drilling fluid. Advantageously, where rotary drilling apparatus is employed, the conduit means also constitutes torque resistant means for impending turning of the rig on the pile received by the sleeve means.

The sleeve means may be provided with annular stabilizing means supported internally of the sleeve means for stabilizing the rig on the telescopingly received pile against substantial lateral movement with respect to that pile. The annular stabilizing means may be in the form of removable shims having an internal diameter appropriately sized with respect to the external diameter of the pile to be received by the sleeve.

In order to telescope the sleeve over the pile, the rig may be supported in a generally upright posture by a cable sling. Thereafter the sling supported rig, including the sleeve, is lowered over the pile until the apertured rig support plate engages the upper end of the pile. For purposes of arranging the sling, the derrick

means includes lifting eyes and cable retainers adjacent opposite ends thereof.

With the rig supported in a freestanding manner on the pile, the rig is isolated from any wave action that might otherwise interfere with drilling operations. In this connection, a nearby barge may be employed to provide power to the drilling equipment on the rig through various hoses, but only the hoses would be subject to wave induced motion.

The derrick may be provided with suitable elevated work platforms if desired, as well as with various drilling tool guides, drilling pipe storage compartments, and primary and/or auxilliary power equipment usually associated with drilling operations.

During drilling of the borehole at the pile base, the pile remains in position by reason of the skin friction between the pile and the surrounding submerged ground. After removing the rig from the pile, the pile may be driven into the ground in any suitable manner, and the pile may be permanently set. It is, however, contemplated that underreaming of the pile may be practiced so that the pile, with the rig mounted thereon, penetrates further into the ground during drilling, and is thereafter set.

DETAILED DESCRIPTION

With reference now to FIG. **1** is a partially completed off-shore platform **12** for use in well drilling operations may be seen. This platform **12** may be positioned in any suitable manner at its off-shore location.

As may be noted in FIG. **1,** the platform **12** includes a conventional tower structure **13** provided with legs **14** projecting generally upwardly, at an incline, from a submerged surface **16** to a location above the surface **18** of a water body **20.** These legs **14** constitute jackets surrounding hollow piles **22** received by the legs and operative to stabilize the platform **12** at its off-shore location. When the platform **12** is completed, deck sections (not shown) may be provided at the upper end thereof. These deck sections are conventionally associated with legs constituting generally vertical continuation of the inclined legs of the illustrated, partially completed, platform **12.** Such vertical legs may be joined to the inclined legs illustrated by a miter joint.

In the condition depicted in FIG. **1,** the piles **22** penetrate beneath the submerged surface **16.** However, the piles are not finally set. Operations for subsequent setting of the piles include the drilling of a borehole beneath the open bottom of the hollow piles to accomodate deeper penetration of the piles beneath the submerged surface **16.**

According to the present invention, this is accomplished utilizing a pile drilling rig **24** supported in a freestanding fashion on the pile. In this manner, the rig **24** is isolated from wave action which might otherwise have adverse effects on pile drilling operations. In addition, the mounting of the rig **24** on the piles enables completion of the pile drilling operations without the need for awaiting construction of a deck on which pile drilling equipment can be supported at the upper end of the platform **12.**

It will be appreciated that awaiting such construction would present an inherent delay in the setting of the piles. Moreover, such delay could prove particularly undesirable in off-shore locations where rough seas are often encountered. At any rate, decks associated with the construction of completed platform **12** will not always be acceptable for mounting of pile drilling equipment insofar as such decks are, as earlier noted, often associated with generally vertical legs mitered to the inclined legs of the illustrated, partially completed platform.

Locating of the pile drilling rig **24** in its position of freestanding support on a pile **22** may be accomplished by lowering of the rig **24** onto the upper pile section projecting above the surface **18** of the water body **20.** A crane assembly **26** mounted on a floating barge **28** may be employed for such lowering. In this connection, a cable sling support **30** for the rig, discussed more fully hereinafter, may be suitably connected to the crane assembly **26;** and the crane assembly **26** may be operated to lower the sling supported rig **24** from its full line position, as depicted in FIG. **1,** to its inclined dotted line position supported on the pile **22.**

Upon completion of pile drilling operations associated with one pile **22,** the crane assembly **26** may be employed to lift, by means of the sling assembly **30,** the pile drilling rig **24** from that pile **22.** Then the rig **24** may be similarly repositioned above another pile and similarly lowered into its position of freestanding support on that other pile.

It will be appreciated that the barge **28** may be employed to provide power for operations associated with pile drilling operations. Such power sources, schematically indicated at **32** in FIG. **1,** may be suitably connected by means of hoses, cables, etc., to the suitable equipment on the drilling rig **24** as indicated schematically at **34.** Although the cables, hoses, etc. may be subject to the effects of barge motion induced by wave action, the drilling rig **24** is essentially isolated from those effects.

With reference to FIGS. **2** through **6,** the structure and operation of the drilling rig **24** depicted in FIG. **1** may be more fully appreciated.

As shown in FIG. **2,** the rig **24** includes an elongate derrick **36** projecting upwardly from a deck assembly **38** fixed to the derrick **36** at one end thereof. An open ended tubular structure **40** is suspended from the rig.

The derrick or mast portion **36** of the rig **24** may be suitably fabricated in any desired length from a plurality of legs **42** and a network of interconnected structural members **44** forming braces and struts. In that the construction of derrick structures of drilling rig masts is conventional, the illustrated derrick **36** need not be described in detail. In this connection, reference may be had to Irons et al U.S. Pat. No. 3,539,024 issued Nov. 10, 1970, and assigned to the assignee of the present invention, for an example of a drilling rig mast.

The derrick **36** may be connected at one end thereof to the deck assembly **38** in any suitable manner. At the other end of the derrick, a crown block assembly **46** is provided.

This crown block assembly **46** is employed to mount a fixed pulley or block section **48** in a conventional manner. The fixed block **48** forms part of a pulley system which also includes a travelling block **50.** The travelling block **50** is employed to raise and lower a drill string, schematically indicated in phantom at **52,** at desired times. In this connection, it may be noted that control of movement of the travelling block **50** may be accomplished utilizing a winch, schematically indicated at **54,** mounted on the deck assembly **38** and operative

to control a cable **56** passing through the crown block assembly **46** and around the fixed pulley **48.** Again, reference may be had to the previously indentified Irons et al U.S. Pat. No. 3,539,024 for an example of operations for controlling the raising and lowering of a drill string.

In FIGS. **5** and **6** the basic structure of the crown block assembly may be seen. The associated pulleys and drilling equipment have been omitted for clarity from these figures, and the derrick structure **36** is shown only partially in FIG. **6.**

The crown block assembly **46** may be comprised of a plurality of I-beams **58** suitably interconnected to form a generally rectangular framework. These I-beams **58** may be provided with a plurality of apertures **60** spaced about the framework to facilitate bolting of the crown block assembly to the derrick structure **36** at the upper end thereof. The provision for bolting of the crown block assembly to the derrick structure facilitates shifting of the position of that assembly or removal of that assembly if desired.

Adjacent opposite ends of two parallel ones of the I-beams **58,** generally U-shaped eyelets **62** are bolted into position. These eyelets, together with pad eyes **64** (see FIG. **2**) appropriately secured to the rig adjacent the base of the derrick legs **42,** provide means for receiving rig lifting cables **67** in a sling arrangement. The sling **30** formed by these cables **67** may be suitably attached to the barge mounted lifting crane **26** to enable lowering of the rig **24** onto a pile **22** and to facilitate removal of the rig therefrom.

In the preferred and illustrated form of the present invention this lowering of the rig onto the pile **22** is accomplished by forming the previously identified tubular projection **40** as a sleeve for telescopingly receiving a pile **22.** The lower end **64** of the sleeve **40** may be generally outwardly flared so as to facilitate guiding of the rig into its position supported on the pile **22** with the pile telescopingly received by the sleeve **40.**

As may be seen in FIGS. **2** and **4,** the sleeve **40** may be suspended from the rig by a suitable number of circumferentially spaced, inclined brace members **66** attached to the deck assembly **38.** As will be appreciated, the suspension of the sleeve **40** from the rig by means of the braces **66** is accomplished so as to align the longitudinal axis of the sleeve **40** with the path of travel of a drill string **52** controlled by the travelling block **50.** In this fashion, a drilling bit schematically indicated at **68** in FIG. **2,** may be lowered through the pile **22** telescopingly received by the sleeve **40.**

At this juncture it may be noted that where rotary drilling equipment is employed, rotation of the drill string and the associated drilling bit **68** may be accomplished by utilization of a power swivel **70** suitably connected to the travelling block **50** as by means of a bracket **72.** This power swivel **70** is operative in a known manner to not only rotate the drill string and drilling bit **68** but also to maintain the string **52** and bit **68** at the appropriate inclination aligned with the inclined pile **22.** Drilling fluid and power may be supplied to the drilling equipment through the power swivel **70** by appropriate hoses (not shown in FIG. **2**) that may lead back to the barge **28** as schematically indicated at **34** in FIG. **1.**

Any suitable power swivel **70** may suffice such as the 100-ton power swivel commercially available from the Baash-Ross division of Joy Manufacturing Company, Houston, Texas.

During lowering of the drill string **52,** legs **74** on the bracket **72** may be guided by suitable rails schematically indicated at **76.** The interaction of the legs **74** and the rails **76** also provides a reaction to torque generated during rotation of the drilling equipment.

As may be seen in FIG. **4,** torque resistance constituting an impendence to turning of the rig **24** on the telescopingly received pile **22** may also be provided. In this connection, it may be noted that the cylindrical sleeve **40** includes an aperture **78** in its wall, and a conduit **80** passing through this aperture is connected in any suitable manner to the pile **22** so as to communicate with the internal portion thereof. This conduit **80** may be employed as an outlet for drilling fluid, which outlet may be directly to the water body **20** or may be suitable connected by flexible hoses or the like to any desired disposal equipment. At this same time, the generally rigid conduit **80** provides the torque resistance impending turning of the rig on the pile.

It will, however, be appreciated that the present invention embraces the use of a non-rotating drill string. For example, turbine drilling or jetting may be employed.

In this connection, it is particularly envisioned that drilling apparatus employing an hydraulic jetting and air lift principle may be utilized. Reference may be had to U.S. Pat. No. 3,597,930, issued Aug. 10, 1971, and assigned to the assignee of the present invention for a disclosure of the general principle of this type, i.e., jetting and gas lift, in the environment of a pile clean out operation. It is, however, particularly noted that in the pile drilling environment of the present invention, jetting nozzles may be disposed in an annular fashion radially outward of the apertures providing for air lift. It is also noted that the drilling apparatus utilized in the jetting and air lift apparatus may include circumferentially disposed, projecting teeth to aid in breaking up the ground material upon the application of vertically recipricatory and/or rotational forces to the apparatus.

As illustrated in FIG. **4** the sleeve **40** may include stabilizers in the form of annular shims **82** for stabilizing the rig on the received pile against substantial lateral movement with respect to the pile **22.** These shims **82** are sized to have an internal diameter slightly greater than the external diameter of the pile **22** and, preferably, may be removed and replaced with other appropriately sized shims for accomodating piles **22** of other external diameters.

As best viewed in FIGS. **3** and **4,** the freestanding support of the rig **24** on the pile **22** is accomplished by engagement of the pile **22** with rig support means. Preferably this rig support means is in the form of an annular plate **84** attached to the sleeve **40.** The central aperture in the annular plate **84** has a diameter substantially equal to the internal diameter of the pile **22** so that the plate may rest fully on the pile as indicated at **86** in FIG. **4.** Securing of the plate **84** to the tubular sleeve **40** may be accomplished by a plurality of circumferentially spaced gussets **88** as may be seen in FIG. **2.**

The plate **84** resting on the pile **22** bears essentially the entire weight of the pile drilling rig **24** and its associated equipment, with force being advantageously transmitted to the pile receiving sleeve **40** through the

gussets **88** and to the deck assembly **38** through the braces **66.**

From FIGS. **3** and **4,** it may be seen that the deck assembly **38** may be comprised of a plurality of suitably interconnected I-beams **90** forming a network having a generally rectangular boundary and emanating from a central portion at which the sleeve **40** and plate **84** are located. Around this rectangular boundary is disposed a fence like structure **92** comprised of a plurality of handrails and stanchions. A suitable platform floor **94** (omitted in FIG. **3** for clarity) is provided for walking area.

If desired, the deck assembly may support conventional air tuggers, schematically shown at **96** in FIG. **3,** for use in connection with operating the power swivel **70** and for handling pipe sections for the drill string. A suitable pipe rack **98** for storage of drill string pipe may also be provided. The deck may also support a suitable slip assembly **100** (see FIG. **2**) to facilitate adding of pipe sections to the drill string.

Connection and disconnection of pipe sections may be accomplished in a conventional manner. Reference may be had to Lawrence U.S. Pat. No. 3,472,034 issued Oct. 14, 1969, and assigned to the assignee of the present invention, for an example of pipe section handling techniques and use of a slip assembly in connection with a derrick, but in a pipeline laying environment.

As will be appreciated, the rig **24** is positioned on the pile **22** with a sufficient amount of pipe in the rack **98** to facilitate drilling. After completion of drilling of the borehole at the base of the pile, the rig may be removed and the pile may be driven and set in any suitable manner.

SUMMARY OF ADVANTAGES

From the foregoing it will be apparent that in accordance with the present invention a novel method and apparatus is proivded wherein a pile drilling rig is advantageously isolated from wave action effects by free-standing support on the pile itself.

Also significant is the provision for stabilizing the rig on the pile against turning and lateral movement.

Of additional importance are the ease with which the rig may be positioned on and removed from the piles with a sling arrangement, and the telescoping action which facilitates the rig positioning.

Although the present invention has been described with reference to a preferred form thereof, it will be appreciated that additions, modifications, substitutions and deletions may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A rig for drilling in a pile projecting from a submerged surface to a location above the surface of water body, comprising:
- elongate derrick means operable to support drilling means;
- deck means fixed to said derrick means at one end thereof;
- elongate, open ended, sleeve means for telescopingly receiving a pile;
- sleeve mounting means for suspending said sleeve means from said deck means generally in alignment with said derrick means; and
- apertured rig support means, fixed to and generally aligned with said sleeve means, for engaging a pile received by said sleeve means and providing free-standing support of said rig on the pile.

2. A rig according to claim **1** wherein:
- said sleeve means includes annular stabilizing means supported internally of said sleeve means for stabilizing said rig on a pile received by said sleeve means against substantial lateral movement with respect to the pile.

3. A rig according to claim **1** wherein said apertured rig support means is located adjacent said deck means, and said sleeve mounting means comprises:
- brace means operable to transmit force to said deck means.

4. A rig according to claim **3** wherein:
- said apertured rig support means is gusseted to said sleeve means.

5. A rig for drilling in a pile projecting from a submerged surface to a location above the surface of a water body, comprising:
- elongate derrick means operable to support drilling means;
- deck means fixed to said derrick means at one end thereof;
- elongate, open ended, sleeve means for telescopingly receiving a pile;
- sleeve mounting means for suspending said sleeve means from said deck means; and
- apertured rig support means, fixed to and generally aligned with said sleeve means, for engaging a pile received by said sleeve means and providing free-standing support of said rig on the pile;
- said sleeve means including a wall defining an aperture, the rig further including:
- conduit means communicable with the interior of a pile received by said sleeve means and projecting through said aperture defined by said sleeve means wall,
- said conduit means providing an outlet for drilling fluid and constituting torque resistant means for impending turning of said rig on a pile received by said sleeve means.

6. A rig according to claim **5** wherein:
- said sleeve means includes annular stabilizing means supported internally of said sleeve means for stabilizing said rig on a pile received by said sleeve means against substantial lateral movement with respect to the pile.

7. A rig for drilling in a pile projecting from a submerged surface to a location above the surface of a water body, comprising:
- elongate derrick means operable to support drilling means;
- deck means fixed to said derrick means at one end thereof;
- elongate, open ended, sleeve means for telescopingly receiving a pile;
- sleeve mounting means for suspending said sleeve means from said deck means; and
- apertured rig support means, fixed to and generally aligned with said sleeve means, for engaging a pile received by said sleeve means and providing free-standing support of said rig on the pile;
- said derrick means including means adjacent opposite ends thereof for receiving rig lifting cables in a sling arrangement.

8. In a method of drilling in a pile projecting from a submerged surface to a location above the surface of the water body, the method utilizing a rig including a deck mounted, elongate derrick means operable to support drilling means, the improvement comprising:
suspending an open ended sleeve means from the deck on which the derrick means is mounted, with the sleeve means generally in alignment with the derrick means,
telescoping the sleeve means over the pile, and
supporting the rig on the pile received by the sleeve means in a freestanding manner by engaging the pile with apertured rig support means fixed to and generally aligned with said sleeve means.

9. The improvement according to claim 8 including the step of:
stabilizing the rig against substantial lateral movement with respect to the pile by annular shims supported internally of the sleeve means.

10. In a method of drilling in a pile projecting from a submerged surface to a location above the surface of the water body, the method utilizing a rig including a deck mounted, elongate derrick means operable to support drilling means, the improvement comprising:
suspending an open ended sleeve means from the deck on which the derrick means is mounted,
telescoping the sleeve means over the pile,
supporting the rig on the pile received by the sleeve means in a freestanding manner by engaging the pile with apertured rig support means fixed to and generally aligned with said sleeve means, and
impending turning of the rig on the pile with conduit means communicable with the interior of the pile and projecting through an aperture in the sleeve means, the conduit means also establishing an outlet for drilling fluid.

11. The improvement according to claim 10 including the step of:
stabilizing the rig against substantial lateral movement with respect to the pile by annular shims supported internally of the sleeve means.

12. In a method of drilling in a pile projecting from a submerged surface to a location above the surface of the water body, the method utilizing a rig including a deck mounted, elongate derrick means operable to support drilling means, the improvement comprising:
suspending an open ended sleeve means from the deck on which the derrick means is mounted,
telescoping the sleeve means over the pile,
supporting the rig on the pile received by the sleeve means in a freestanding manner by engaging the pile with apertured rig support means fixed to and generally aligned with said sleeve means, and including:
supporting the rig, in a generally upright posture, by a cable sling comprised of rig lifting calbes extending between locations adjacent opposite ends of the derrick means, and
lowering the slong supported rig, including the sleeve means, over the pile until the rig support means engages the pile.

13. In a method of drilling in a pile projecting generally upwardly from a submerged surface, the method utilizing a drilling rig including a derrick means operable to support drilling means, the improvement comprising:
suspending an open ended tubular projection from the rig;
telescoping the tubular projection and the pile together; and
supporting the rig on the pile telescoped together with the tubular projection, in a free standing manner, by engaging the pile with rig support means.

14. Apparatus for drilling in a pile projecting from a submerged surface to a location above the surface of a water body, comprising:
floating vessel means supporting power supply means, and
a drilling rig including:
elongate derrick means operable to support drilling means powered by said power supply means;
deck means fixed to said derrick means at one end thereof;
elongate, open ended, tubular projection means for telescoping together with a pile;
sleeve mounting means for suspending said sleeve means from said rig; and
rig support means, generally aligned with said tubular projection means, for engaging a pile and providing freestanding support of said rig on the pile isolated from any wave action on said floating vessel means.

15. In a method of drilling in piles of an offshore structure, which piles project generally upwardly from a submerged surface, the method utilizing a drilling rig including a derrick means operable to support drilling means, the improvement comprising:
suspending an open tubular projection from the rig;
telescoping the tubular projection and one of the piles together;
supporting the rig on the pile telescoped together with the tubular projection, in a free standing manner, by engaging the pile with rig support means;
drilling a borehole at the base of the pile;
lifting the rig from the pile;
telescoping the tubular projection and another of the piles together;
supporting the rig on the another pile, in a free standing manner, by engaging the another pile with the rig support means; and
drilling a borehole at the base of the another pile.

16. A rig for drilling in a pile projecting from a submerged surface, comprising:
elongate derrick means operable to support drilling means;
a tubular projection operable to be telescoped together with the pile;
means for suspending the tubular projection from the rig; and
rig support means engageable with the pile telescoped together with the tubular projection, for supporting the rig on the pile in a freestanding manner.

17. A rig according to claim 16 including:
conduit means communicable with the interior of a pile telescoped together with said tubular projection,
said conduit means providing a passage for drilling fluid and constituting torque resistant means for impeding turning of the rig on a pile telescoped together with said tubular projection.

18. A rig according to claim 16 including:

means adjacent opposite ends of said derrick means for receiving rig lifting cables in a sling arrangement.

19. In a method of drilling in a pile projecting from a submerged surface, the method utilizing a rig including elongate derrick means operable to support drilling means, the improvement comprising:

suspending a tubular projection from the rig;

telescoping the tubular projection together with the pile; and

supporting the rig on the pile telescoped together with the tubular projection in a freestanding manner by engaging the pile with rig support means fixed to and generally aligned with the tubular projection.

20. The improvement according to claim **19** including the step of:

impending turning of the rig on the pile with conduit means communicable with the interior of the pile, the conduit means also establishing a passage for drilling fluid.

21. The improvement according to claim **19** wherein the step of telescoping comprises:

supporting the rig by a cable sling comprised of rig lifting cables extending between locations adjacent opposite ends of the derrick means, and

lowering the sling supported rig, including the tubular projection, until the rig support means engages the pile.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,825,076 Dated July 23, 1974

Inventor(s) Alfred Reeves Kolb

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 52, read "impending" as -- impeding --.

Column 3, line 13, read "auxilliary" as -- auxiliary --.

Column 3, between lines 24 and 25, insert the following:

-- BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIGURE 1 shows a barge disposed adjacent to a partially completed offshore platform with a pile drilling rig suspended above the platform, the rig also being shown in dash lines in position and supported by a pile;

FIGURE 2 illustrates the pile drilling rig of FIGURE 1 on a larger scale;

FIGURE 3 is a view taken along line 3-3 of FIGURE 2 showing the annular rig support plate;

FIGURE 4 is a view taken along line 4-4 of FIGURE 3 illustrating support of the rig on a pile:

FORM PO-1050 (10-69)

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☆ U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

FIGURE 5 is a view taken along line 5-5 of FIGURE 2 depicting the crown block assembly of the rig; and

FIGURE 6 is a view taken along line 6-6 of FIGURE 5 showing a portion of the structural network of the mast portion of the rig. --

Column 3, line 51, read "accomodate" as -- accommodate --.

Column 6, line 9, read "impendence" as -- impedence --.

Column 6, line 17, read "suitable" as -- suitably --.

Column 6, line 20, read "impending" as -- impeding --.

Column 6, line 51, read "accomodating" as -- accommodating --.

Column 8, line 42, read "impending" as -- impeding --.

Column 9, line 32, read "impending" as -- impeding --.

Column 9, line 59, read "slong" as -- sling --.

Column 12, line 3, read "impending" as -- impeding --.

Signed and sealed this 29th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents