LOCATING AN OFFSHORE DRILLING PLATFORM

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The present invention relates to offshore well drilling and production, and more particularly relates to a method of placing a drilling platform over a submarine formation whereby the platform can readily be precisely relocated relative to the formation, subsequent to the initial drilling operations.

In offshore drilling operations due to the additional expenses involved as compared to on-shore drilling operations, quite often drilling is discontinued in a given area for economical reasons and commenced some years later thus making desirable the relocation of bore holes previously drilled to rework such well bore holes. Soft or loose surface sediment such as clay, ooze, mud, etc., are sometimes encountered in offshore drilling operations, also making desirable the establishment of a firm footing for a drilling platform.

The conventional landing pad used to hold the foundation legs of a drilling platform is not adequate in soft surface sediments particularly in oceanic areas subject to storms, waves, seismic disturbances and other disruptive influences, nor are these pads sufficiently stationary to precisely relocate the drilling or production equipment relative to the well bore in the event drilling is attempted.

It has herebefore been proposed to provide platform leg foundations lowered from the platform structure to the submarine floor to receive the foundation legs and thus provide footing for the platform. Such proposals, however, do not provide permanent foundations which can be precisely relocated for reworking.

Accordingly, it is a primary object of the present invention to provide apparatus and a method for locating a drilling and/or production platform adjacent an offshore formation whereby such position can be precisely relocated to rework the formation subsequent to the initial drilling operation.

It is also an object of the present invention to provide apparatus and a method for firmly affixing an offshore drilling and/or production platform to a submarine formation.

Further objects and a more complete understanding of our present invention may be had by referring to the following specification and claims taken in conjunction with the drawings, in which:

FIG. 1 shows in partial sectional elevation, the drilling platform utilized in our present invention as transported to the predetermined submarine formation;
FIG. 2 shows in elevation, the manner in which the foundation legs of the drilling platform are landed;
FIG. 3 illustrates in elevation, a manner in which the transporting barge may be removed from the platform after the foundation legs have been landed;
FIG. 4 shows in elevation the drilling apparatus used to drill into the submarine formations sufficiently to achieve permanent footing, floating a drilling and/or production platform adjacent the pre-constructed bases located in the submarine formation, lowering foundation legs into the pre-constructed bases, and reducing the buoyancy of the barge used to transport the platform to the drill site to facilitate removal of such barge preparatory to the drilling operations.

Referring now more particularly to the drawings, FIG. 1 illustrates the manner in which the drilling platform is transported on barge to the pre-selected offshore drilling site. The platform is provided with retractable foundation legs which are vertically slideable in tubular platform in leg sockets and as shown in FIG. 1 are retracted when the platform is being transported, and oriented over a pre-selected drilling site. The platform legs may be hollow tubular members adapted to hold water so that they can be weight by pumping water into their hollow interior, which weight facilitates lowering the legs through the platform legs. Centrifugal pumps (not shown) may be used near the top of the legs to fill and empty the hollow legs with water. Conventional jacking equipment may also be provided for lowering and raising the legs.

Prior to lowering the foundation legs to the submarine formation, excavations are made in the submarine formation with conventional large diameter post hole or cesspool digging equipment from a work barge and bases constructed in such excavations to provide sufficient bearing for the retractable legs. To facilitate proper spacing of the bases, a template may be lowered to the formation and the bases constructed therethrough. Any conventional construction method may be employed to construct the bases, for example, when a concrete base is preferred, the "tremere" concrete mixing and pouring procedure whereby concrete is mixed on the work barge and run down to the submarine floor through a hose. Alternatively, a concrete base may be preconstructed and lowered intact from the platform. The base members are provided with a recess or socket such as pipe socket therein, adapted to receive the lower end of the legs or rod members rigidly affixed to the lower extremity of the legs, to firmly secure the foundation legs within the bases. Numerous varieties of permanent base structures may be provided depending on the conditions encountered. For example, closely spaced piles may be driven into the formation and a recessed or socketed cap set thereon to engage the foundation legs.

As shown in FIG. 2, when the leg bases have been established in the submarine formation the foundation legs are lowered through the tubular platform sockets so that the lower end of the leg is lowered to the foundation and into contact with the barge thereby providing a rock member to the socket members provided in the base.

While the legs are being lowered onto the leg bases, the platform is floating on the barge. After the legs are lowered and firmly affixed to the leg bases by stabbing the leg or rod member into the socket, the foundation legs are locked as with locked locking pins (not shown) relative to the tubular sockets in the formation and the buoyancy of the barge structure is reduced as by flooding, to facilitate removal of the barge from the area of the platform as shown in FIG. 3. Thus, numerous platforms may be set with just one floating barge.

With the drilling platform firmly established in the submarine formation, the platform operation may then be conducted through a cellular riser provided between the well bore and the drilling platform, according to any suitable procedure as, for example, the procedure outlined in copending patent application of Travers et al. executed contemporaneously herewith, or any conventional marine drilling technique. Conventional drilling equipment may include a conventional der-
rick structure 32 mounted on the drilling platform 10 to facilitate the lowering of drill pipe and other equipment through the platform and into the well bore. Conventional draw works 34 may be used for hoisting well equipment with a traveling block 36 used in conjunction with a hoisting cable 38 over a crown block 40 with a conventional swivel 42 and kelly 44. A conventional rotary table (not shown) may be utilized to rotate drilling tools in the well. A cargo crane 46 may be employed in the conventional manner to lift sections of drill pipe 48 through the rotary table mounted in the platform and into the well bore 30. A test trap and tank 50 may be utilized on the barge to make water shutoff or formation tests.

According to our present invention leg bases 24 are initially located at the desired submarine drilling site. The drilling platform 10 is then transported with legs 16 retracted, to a location adjacent the previously located bases 24, on a floating barge 14 and the retracted legs 16 lowered through the platform sockets 18 and stabbled into the leg bases 24. The buoyancy of the barge 14 is then reduced and the barge removed from the drilling platform so that drilling operations may be conducted from the drilling platform 10 in the conventional manner. By our present invention, because of the use of permanent leg bases 24, it is possible to rework the wells such as well 30 drilled from the platform 10, and in so doing to precisely orient the platform 10 relative to the well bore 30 each time working is performed.

Our invention is particularly useful in submarine floors which are composed of clay-like material or other unconsolidated surface sediments since the concrete leg base is designed to be sufficiently large to extend into the more consolidated or firm layers of the formation.

Having fully described our invention, it is to be understood that we do not wish to be limited to the details set forth, but our invention is of the full scope of the appended claim:

We claim:

A method for locating with a removable barge a removable marine drilling platform over a drilling site in a formation underlying a body of water, comprising the steps of: establishing in said formation adjacent said site a plurality of submerged base structures having sockets therein, transporting on a floating barge to a position over said site, a drilling platform having support legs therefor retracted, lowering said legs through said body of water to extend the lower extremities of said legs into said sockets, lowering said barge relative to said platform by reducing the buoyancy of said barge, and removing said barge from under said platform.

References Cited in the file of this patent

UNITED STATES PATENTS

201,569 Striedinger et al. Mar. 19, 1878
2,210,408 Henry Aug. 6, 1940
2,308,743 Bulkeley et al. Jan. 19, 1943
2,592,626 Walker Apr. 15, 1952
2,675,680 Emshwiller Apr. 20, 1954
2,775,869 Pointer Jan. 1, 1957
2,931,184 D'Arcangelo Apr. 5, 1960
2,935,854 Thompson et al. May 10, 1960

FOREIGN PATENTS

924,645 France Mar. 10, 1947