ANTI-ROLL FLOATING SUPPORT
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Abstract of the disclosure

The drilling platform of a marine drilling structure is mounted on hinges spaced lengthwise of a floating barge or ship, so that the ship may roll relative to the platform. A lever fixed to the drilling platform projects downward through the drilling well in the barge and the submerged lower end of the lever is connected to cables which extend transversely under the ship and are fixed to certain of the anchor lines which hold the ship in position over the drilling site.

Background of the invention

This invention may be classified as apparatus for boring a submerged formation.

This invention relates to apparatus for supporting heavy loads in or over a body of water, and is particularly directed to improvements over apparatus of the type shown in my copending application Ser. No. 488,378, filed Sept. 20, 1965, for "Floating Support," now Patent No. 3,323,478. The present invention has particular usefulness as a support for marine drilling, salvage or construction operations. This invention will be described in connection with marine drilling apparatus although this is only by way of illustration.

The present practice, where buoyant members are used to support a derrick and derrick floor for drilling operations over a body of water, is to attach the derrick and derrick floor rigidly to the buoyant member. Thus, the rolling motions of the supporting buoyant member are imparted to the derrick and derrick floor. During periods of bad weather, when wind and wave action may be severe, the rolling motion imparted to the derrick and derrick floor may be so violent that it will be necessary to suspend drilling operations until the weather improves. Even during periods of moderate weather, the rolling motion induced on the derrick and derrick floor may be great enough to interfere to some degree with drilling operations.

Relatively large and hence expensive buoyant supporting members are currently being used in an effort to reduce the motion on the derrick and derrick floor caused by rolling of the supporting member. Many of these supporting members are so large and are of such specialized construction that they are difficult to move from one site to another and cannot readily pass through existing canals or waterways.

The aforementioned copending application Ser. No. 488,378 discloses apparatus for minimizing rolling motion of the derrick and derrick floor by minimizing rolling of the supporting vessel. That apparatus, however, involves the use of two buoyant members connected together by articulated members, which increases the cost and requires additional steps in joining the two vessels together at the drilling site.

Summary

The present invention provides apparatus for minimizing rolling motion of the derrick and derrick floor, while permitting the floating member to roll. A single buoyant member is used and the forces required to stabilize the derrick and derrick floor against rolling motion are provided by tie lines attached to anchor lines which extend to anchors engaging the sea bed.

The derrick is fixed to a platform, and the platform is mounted upon a floating member by means of a pair of hinges or pivots spaced lengthwise of the floating member, together with means to stabilize the platform and derrick, and to enforce turning motion around the hinges as the floating member rolls.

Brief description of the drawing

FIGURE 1 is a plan view showing a typical floating drilling vessel anchored in position at a drilling site with anchor lines extending from the vessel to anchors engaging the sea bed.

FIGURE 2 is a transverse sectional view in diagrammatic form taken substantially along the lines 2-2 of FIGURE 1.

FIGURE 3 is a side elevation in diagrammatic form.

FIGURE 4 is a view similar to FIGURE 2 showing a modification.

Description of the preferred embodiments

The well-drilling derrick 10 is fixed to the platform 11 which has an upper surface forming the derrick floor 12. The platform includes structural members 13, supported on hinges 14 and 15 spaced lengthwise of the supporting vessel 16 and mounted thereon on opposite sides of the center well 17. A structural member or lever 18 is secured to the underside of the platform 11 in such manner that the angle between the derrick floor 12 and the lever 18 is constant and so that a transverse force applied at or near the lower end of the lever 18 will produce turning motion about the hinges 14 and 15.

The lever 18 may be formed with a telescoping lower section 19 that can be withdrawn into the upper portion in order to facilitate movement of the vessel from one site to another site. The lever section 19 is extended so as to protrude below the bottom of the vessel 16 when drilling operations are in progress. Conventional marine drilling apparatus (not shown) is employed with the derrick 10 and platform 11.

The position of the vessel 16 as shown in solid outline in FIGURE 2 is the calm weather position with no roll indicated for the vessel. The position of anchor cables 21 and 22 as shown in full lines also correspond with this assumed condition of calm weather with no roll for the vessel 16. The same is true of the full line position of cables 23 and 24 which are attached to the anchor cables 21 and 22 at points 25 and 26, and are attached to the lever section 19 at its lower end 27. Conventional anchors (not shown) are attached to the lower ends of the cables 21, 22, 29 and 30 and engage the sea bed. The upper ends of these cables are connected to winches 31.

When there is little or no rolling motion of the vessel 16, the tie cables 23 and 24 prevent transverse movement of the lower end 27 of the lever, and hence the platform 19 remains horizontal. When adverse conditions such as bad weather cause wave action or other forces to act on the vessel, rolling of the vessel may take place. This rolling motion constitutes turning movement about the axis of oscillation, which is indicated at 32 in FIGURE 2. The phantom lines in FIGURE 2 indicate a position which the vessel 16 might typically take under such rolling conditions, and the phantom lines also indicate the corresponding positions assumed by the anchor cables 21 and 22.

When the vessel 16 rolls from the full line position to the phantom line position, as shown in FIGURE 2, the upper end of the anchor cable 21 moves upward and the upper end of the anchor cable 22 moves downward. All parts of the vessel 16, and including the winches
3. The combination set forth in claim 1 wherein the support means for the platform includes structural members mounted on said hinge supports.

4. The combination set forth in claim 1 wherein the lever projects downward through the drilling opening.

5. The combination set forth in claim 1 wherein the lever is provided with a retractable lower section.

6. The combination set forth in claim 1 wherein the lower portion of the lever is weighted.

7. The combination set forth in claim 5 wherein removable struts are mounted between the platform and the vessel to prevent relative movement between the vessel and the platform about the hinge supports.

8. In combination a floating vessel having a drilling opening, means for anchoring the vessel over a drilling site including a pair of inclined anchor cables extending downward and laterally away from the vessel on opposite sides thereof, a drilling platform above the drilling opening, a pair of hinge supports on the vessel spaced longitudinally thereon, means supporting the platform on said hinge supports, a lever fixed to the platform and projecting downward to a position below the vessel, and the lines fixed to said anchor cables pass around sheaves positioned at the lower end of the lever and are received by winches mounted on said platform, whereby said tie-lines acting on the lever minimize rolling movement of the drilling platform.

9. In combination, a floating vessel having a drilling opening, means for anchoring the vessel over a drilling site including a pair of inclined anchor cables extending downward and laterally away from the vessel on opposite sides of the drilling opening, a drilling platform above the drilling opening, a well-drilling derrick fixed to the drilling platform, a pair of hinge supports on the vessel spaced longitudinally thereon and positioned fore and aft of the drilling opening, the platform having structural members mounted on said hinge supports, a lever fixed to the platform and projecting downward through the drilling opening near one of the hinge supports to a position below the vessel, and the ties connected to the lower end of said lever and fixed to said anchor cables, whereby the ties act on the lever to minimize rolling movement of the drilling platform and derrick.

References Cited

UNITED STATES PATENTS

3,110,330 11/1963 Spiri 175—5
3,221,506 12/1965 Stratton et al. 175—7 X
3,323,478 6/1967 Hunsucker 114—5

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