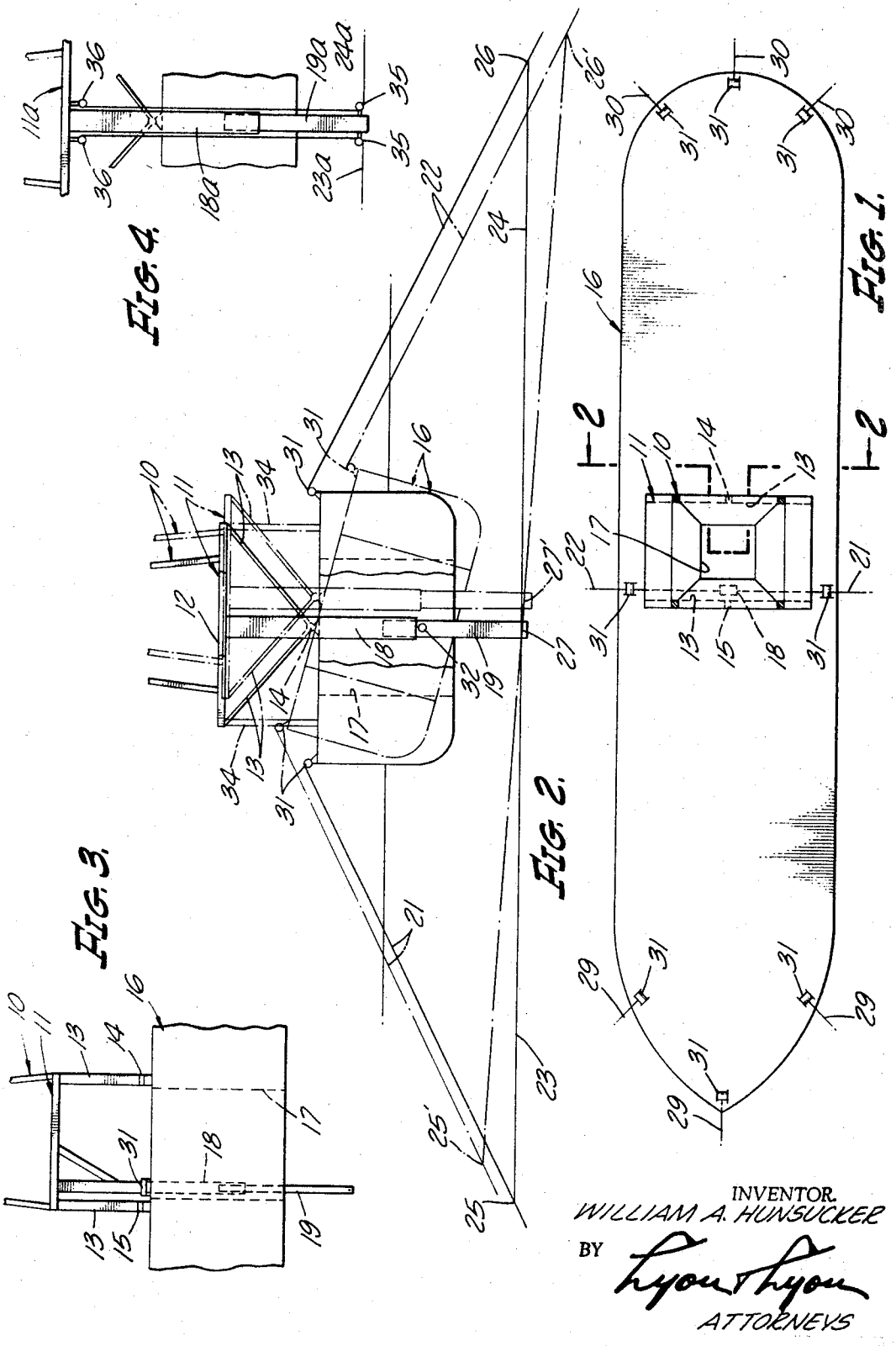
April 8, 1969 W. A. HUNSUCKER 3,437,064

ANTI-ROLL FLOATING SUPPORT

Filed Jan. 3, 1967



United States Patent Office 3,437,064 Patented Apr. 8, 1969

3,437,064

ANTI-ROLL FLOATING SUPPORT

William A. Hunsucker, 3741 Prestwick Drive, Los Angeles, Calif. 90027

Filed Jan. 3, 1967, Ser. No. 606,823
Int. Cl. B63b 35/44, 21/50
U.S. Cl. 114—.5 9 Claims

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 vesel 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

31, turn about the axis of oscillation 32. The tension in the anchor cable 21 increases and the tension in the anchor cable 22 decreases. Since the total lengths of the anchor cables 21 and 22 extending from the winches 31 to the sea bed anchors (not shown) is relatively great as compared to the portions of those anchor cables extending between the winches 31 and the connections 25 and 26, respectively, the lengths of 25–27 and 26–27 remain approximately equal to 25′–27′ and 26′–27′, respectively. The hinge pivots 14 and 15 shifts laterally so that some lateral shifting movement of the lever 18, platform 11 and derrick 10 occurs. However, the platform 11 remains substantially horizontal even through it shifts laterally, because of the action of the tie lines 23 and 24 attached to the lever extension at 27. The lever 18 is positioned away from the center of the drilling opening 17 in order to avoid interference with drilling tools extending through the opening. The lever section 19 may be weighted in any suitable manner, such as for example by filling it with lead so as to provide a counterweight effect, to furnish additional stability for the platform 11 and the derrick 10.

Tests have shown that even if the relationships shown in FIGURE 2 and described above are not rigorously adhered to, the stabilizing effect of the system on the platform 11 and derrick 10 is nevertheless very largely achieved. so that the rolling motion of the platform 11 and derrick 10 is effectively minimized.

Removable struts 34 as shown in phantom lines in FIGURE 2 are fixed between the platform 11 and the vessel 16 when the vessel is being moved from one place to another, or whenever the anchor cables and tie lines are not in place. These removable struts 34 may also be used during periods of good weather when there is little or no rolling motion of the vessel 16.

In the modified form of the invention shown in FIGURE 4, the tie lines 23*a* and 24*a* are not fixed to the lower end of the lever section 19*a*, but instead pass around sheaves 35 mounted on the lower end of the member 19*a* and then pass upward along the lever member 18 to winches 36 fixed to the platform 11*a*. The winches 36 provide constant tension on the tie lines 23*a* and 24*a*. In other respects the construction and mode of operation of the apparatus shown in FIGURE 4 is the same as that previously described.

I claim:

1. In combination, a floating vessel having a drilling opening, means for anchoring the vessel over a drilling site including a pair inclined anchor cables extending downward and laterally away from the vessel on opposite sides thereof, 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, means supporting the platform on said hinge supports, a lever fixed to the platform and projecting downward to a position below the vessel, and tie lines connected to the lower end of said lever and fixed to said anchor cables, whereby said tie lines acting on the lever minimize rolling movement of the drilling platform.

2. The combination set forth in claim 1 wherein said hinge supports are positioned fore and aft of the drilling opening.

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 betwen 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 vesel 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 tie lines connected to the lower end of said lever and fixed to said anchor cables, whereby the tie lines acting on the lever minimize rolling movement of the drilling platform and derrick.

References Cited

UNITED STATES PATENTS

3,110,350	11/1963	Spiri	175—5
3,221,506	12/1965	Stratton et al.	175—7 X
3,323,478	6/1967	Hunsucker	114—.5

TRYGVE M. BLIX, *Primary Examiner*

U.S. Cl. X.R.

61—46.5; 175—7