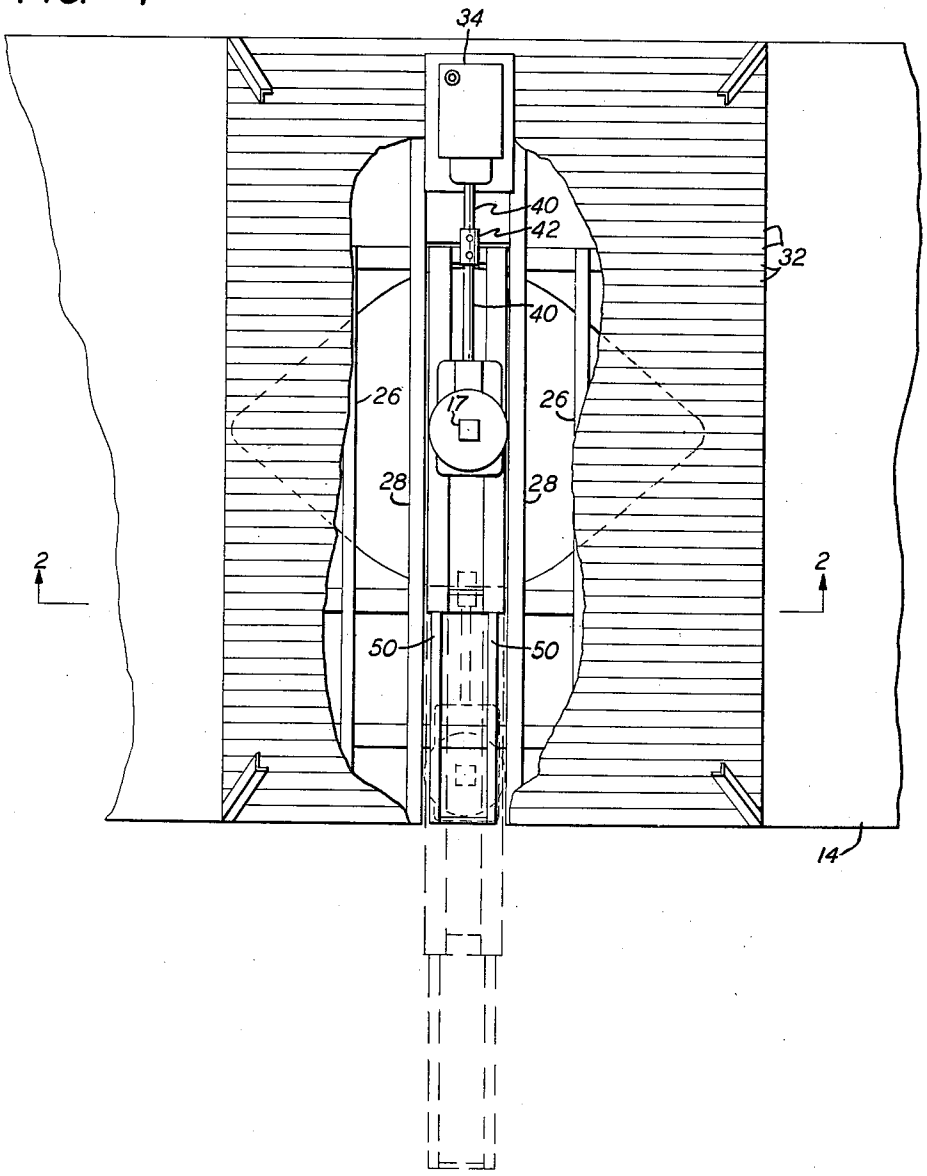
April 25, 1961 R. F. BAUER ET AL 2,981,346

ROTARY DRILLING TABLE MOUNTING

Filed Aug. 30, 1957 3 Sheets-Sheet 1

FIG. 1



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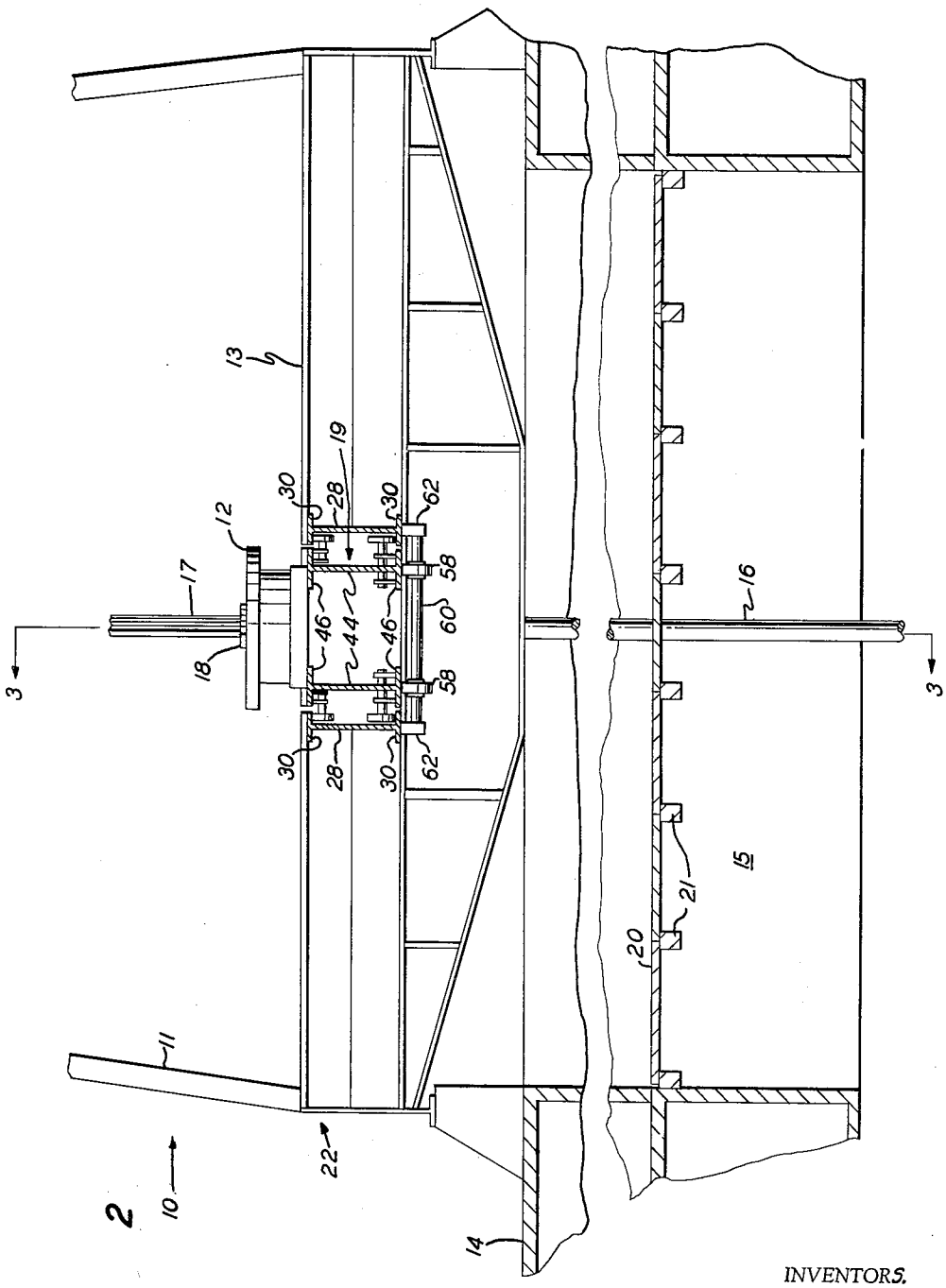

FIG. 2

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FIG. 3

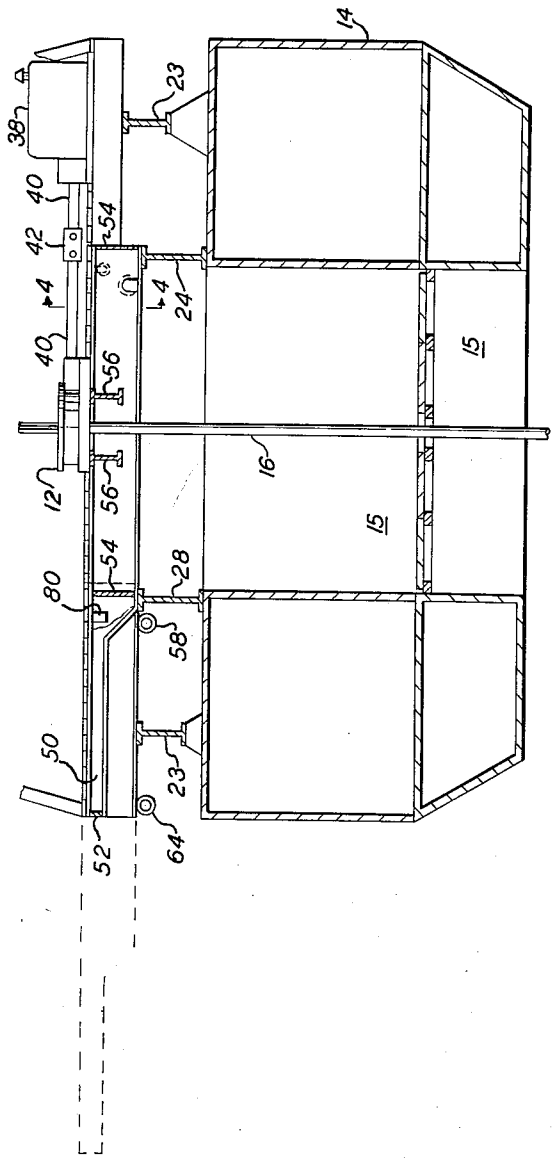


FIG. 4

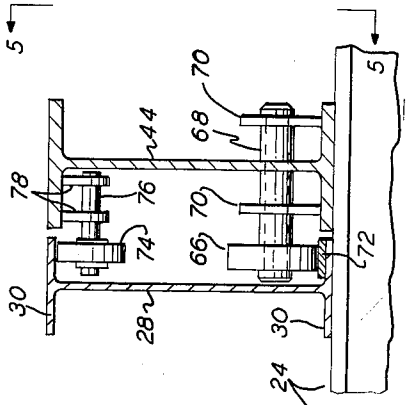
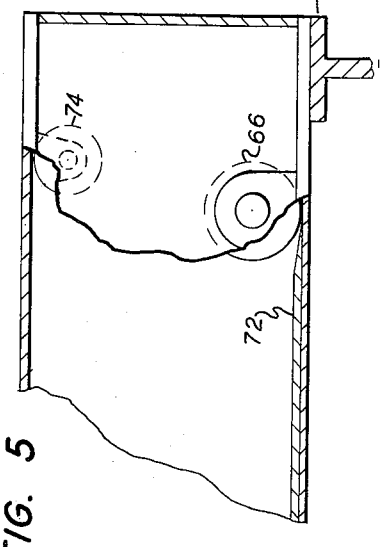


FIG. 5



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ROTARY DRILLING TABLE MOUNTING

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10 Claims. (Cl. 175—5)

This invention relates to apparatus for mounting a rotary table used in well drilling equipment.

Although the rotary table mounting of this invention can be used in any type of rotary drilling rig, it is particularly useful in drilling rigs mounted on floating vessels adapted to drill wells in underwater formations.

In conventional rotary drilling rigs, the rotary table is mounted in a more or less permanent position over an opening in the derrick floor, and equipment is moved to and from a well through the center of the rotary table. However, in drilling underwater wells, this conventional arrangement is often inconvenient because special equipment of odd and unusually large dimensions is sometimes required to be lowered from the drilling rig into the underwater well. To this end, this invention provides a rotary table mounting which permits the rotary table to be slid easily and quickly out of the way to provide a relatively large opening so the equipment can easily be raised and lowered with the rig hoisting works.

Briefly, the invention contemplates apparatus for drilling a well comprising a derrick floor having a centrally located opening. A track is mounted on the floor adjacent the opening, and a slidable carriage is mounted on the track. A rotary drilling table is mounted on the carriage and adapted to extend over the platform opening. Means are provided for sliding the carriage on the track to move the rotary table toward and away from the opening in the derrick floor.

In the preferred form, the derrick floor is mounted around a cellar opening out the bottom of a floating vessel, and the slidable carriage includes rollers adapted to ride on the track. Preferably, the track runs athwartship, i.e., transverse to the longitudinal axis of the vessel, so that the carriage extends over the side of the vessel when it is moved to carry the rotary table away from the derrick floor opening. Also in the preferred form, the track comprises a pair of rails, each of which have upper and lower flanges on which carriage wheels ride to prevent the frame from tilting as it is operated.

These and other aspects of the invention will be more fully understood from the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a fragmentary and schematic plan view, partially broken away, of a rotary drilling rig mounted on a floating vessel;

Fig. 2 is a fragmentary and schematic longitudinal sectional elevation taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary and schematic sectional view, partially broken away, taken on line 3—3 of Fig. 2;

Fig.4 is a sectional view taken on line 4—4 of Fig. 3; and

Fig. 5 is a fragmentary elevation taken on line 5—5 of Fig. 4.

Referring to Figs. 1, 2 and 3, a drilling rig 10 including a derrick 11, a rotary table 12, and a derrick floor 13 are mounted on the deck of a floating vessel 14, such as a drilling barge. The rig is mounted over a centrally located opening or cellar 15 which opens through the bottom of the vessel into the body of water in which it is floating. A drill string 16, including a kelly joint 17, extends down through kelly bushings 18 in the rotary table, which is mounted on a carriage 19 adapted to slide transversely to the longitudinal axis of the vessel. A removable grating 20 is supported on cross braces 21 in the cellar below the rotary table.

The derrick rests on a supporting frame 22 which includes a pair of outboard longitudinal support beams 23 and a pair of inboard longitudinal support beams 24 mounted on opposite edges of the sides of the cellar. A pair of laterally spaced and transverse support beams 26 are carried by the longitudinal support beams, and a pair of laterally spaced and parallel track beams 28 are disposed on the longitudinal support beams between transverse support beams on each side of the rotary table. Preferably, each track beam is a section of I-beam with the flanges 30 located in horizontal planes, the upper flanges being flush with the bottom of the rotary table (see Fig. 2). A plurality of removable derrick floor planks 32 are disposed on the supporting frame. A rotary table power unit 34 resting on the derrick floor planks supplies power to the rotary table through a shaft 40 and coupling 42.

The slidable carriage 19, on which the rotary table is mounted, includes a pair of laterally spaced parallel and transverse traveling beams 44 located under opposite sides of the rotary table. Preferably, the traveling beams are I-beams having upper and lower flanges 46 lying in the same respective planes as the upper and lower flanges of an adjacent respective track beam. With the carriage in the drilling position shown in solid lines in Fig. 3, the traveling beams rest at each end on the inboard longitudinal beams 24. The left-hand end (as viewed in Fig. 3) of each slidable traveling beam is welded to a horizontal and outwardly projecting extension beam 50. Preferably, each extension beam is a section of an I-beam smaller than the traveling beam and has its upper surface flush with the upper surface of each respective traveling beam. The outboard end of the extension beams are connected by a cross brace 52, and the ends of the traveling beams are connected by cross braces 54. A pair of cross bracing I-beams 56 under each side of the rotary table provide additional strength and tie the central portion of the traveling beams together.

Referring to Figs. 2 and 3, a pair of inboard stationary rollers 58 are mounted on a longitudinal and horizontal shaft 60 secured at each end to pillar blocks 62 on the underside of the track beams just outboard of the left-hand (as viewed in Fig. 3) longitudinal support beam 24. A pair of outboard stationary rollers 64 are similarly mounted on the underside of the track beams at the end of the beams outboard of the inboard stationary rollers.

Referring to Figs. 3, 4 and 5, the right-hand end (as viewed in Fig. 3) of each traveling beam includes a lower traveling roller 66 mounted on a horizontal and longitudinal shaft 68 journalled through the web of the traveling beam and a pair of vertical support plates 70 on each side of the traveling beam web. Each traveling lower roller is adapted to ride on a track bar 72 mounted on the upper surface of the lower flange of the respective adjacent track beam. As shown most clearly in Fig. 5, the track bar is tapered at its right-hand end so that with the carriage in the position shown in the solid lines of the drawings, the traveling beams

rest directly on the support beams 24 so the lower traveling rollers are not required to support the large loads imposed on the carriage by the rotary table during drilling operations.

As shown most clearly in Figs. 3, 4 and 5, the right-hand end of each traveling beam includes an upper traveling roller 74 mounted on a longitudinal and horizontal shaft 76 supported by a pair of downwardly extending plates 78 welded at their upper ends to the undersurface of the upper flange of each traveling beam. As seen most clearly in Fig. 5, each upper traveling roller is spaced slightly below the lower surface of the upper flange of an adjacent track beam. Thus, when the carriage is pulled to the left as viewed in Figs. 3 and 4, the lower traveling rollers ride up on the track bar, carrying the upper rollers into engagement with a respective upper flange of the track beams, thereby providing positive means for preventing the carriage from tilting.

The operation of the apparatus is as follows:

Any time it is desired to remove the rotary table, say to install some underwater wellhead equipment, the drill string is removed from the rotary table, and the drive shaft coupling 42 is disconnected so the rotary table is free to move, and the removable planks resting on the track beams are removed. A boom (not shown) is mounted to extend out over the left-hand side (as viewed in Fig. 3) of the vessel. Using conventional block and tackle with the boom, a line (not shown) is attached to the outboard ends of the extension beams, and the carriage is pulled to the left (as viewed in Fig. 3). As the carriage is moved, the left-hand ends of the traveling beams ride up on the inboard stationary rollers, each lower traveling roller moves up on its respective track bar, and each upper traveling roller engages the underside upper flange of its respective track beam. A separate downwardly extending stop 80 is welded to the underside of the upper flange of each track beam just above the inboard stationary rollers to limit the amount of outward travel of the carriage. Preferably, a security line (not shown) is attached to the right-hand (as viewed in Fig. 3) end of the carriage and kept taut to prevent excessive travel of the carriage due to pitching or rolling of the floating vessel. The carriage is pulled out to the position shown in phantom lines in Figs. 1 and 3 and held in that position until the equipment is lowered by the derrick hoisting gear to the well. If necessary, the removable grating and cross braces in the cellar are removed to provide the required opening for the equipment.

When drilling operations are to be resumed, the carriage is moved to the right by pulling on the security line and slacking off on the boom line. As the carriage nears the solid line position, each lower stationary roller moves down off its respective track bar and the left-hand end of the traveling beams move down off the inboard stationary rollers so that the traveling beams rest at each end securely on the support beams 24. The removable planks are replaced on the track beams, the power shaft coupling reconnected, and drilling operations are ready to be resumed.

Thus, the invention provides apparatus for quickly and easily sliding the rotary table completely out of the central working area of the derrick platform, so that equipment can easily be moved to and from the well. In addition, the arrangement shown in the drawings has the advantage that the carriage is moved to a cantilevered position over the side of the vessel so that a minimum amount of deck space is required for the sliding operation. The upper traveling rollers of the carriage provide the necessary stability to prevent the carriage from tilting when it is in the cantilevered position.

We claim:

1. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, an elongated track mounted on the derrick frame adjacent the cellar, a movable carriage mounted on the track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, the track extending away from the cellar and power unit, coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar and the power unit.

2. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, a pair of elongated spaced track beams mounted on the derrick frame over the cellar, a movable carriage mounted on the track beams, a rotary drilling table mounted on the carriage between the track beams, a power unit mounted on the vessel for the rotary table, the track extending away from the cellar and power unit, coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar and the power unit.

3. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom near the center of the vessel, a rotary drilling rig derrick frame mounted around the cellar, an elongated track mounted on the derrick frame adjacent the cellar and extending in a direction transverse to the longitudinal axis of the vessel, a movable carriage mounted on the track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar, the carriage including an elongated section extending from the rotary table toward the power unit, the track including an elongated section extending from the cellar away from the power unit to terminate adjacent a side of the vessel, and interlocking means for the said elongated sections of the carriage and track to permit a portion of the carriage to be cantilevered from the track when the rotary table is disconnected from the power unit and moved toward the said side of the vessel.

4. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, a pair of spaced tracks mounted on the derrick frame adjacent the cellar, each track having an upper and a lower flange, a movable carriage mounted on the track, a pair of lower rollers mounted on the carriage and adapted to ride on the lower flanges of the track beam, a pair of upper rollers mounted on the carriage and adapted to ride against the underside of the upper flanges, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, and coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar.

5. Apparatus according to claim 4 which includes a support on which the carriage rests when in a first position to reduce the load on the lower rollers, and a separate track bar on the lower flange of each of the track beams which raises the lower rollers to lift the carriage off the support beams when the carriage is moved from the said first position.

6. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, an elongated track mounted on the

derrick frame adjacent the cellar, a movable carriage mounted on the track, a stationary roller mounted at one end of the track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, and coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved along the track onto the stationary roller to carry the rotary table away from the cellar.

7. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, a track mounted on the derrick frame adjacent the cellar, a movable carriage mounted on the track, a pair of stationary rollers at one end of the track, the stationary rollers being spaced from each other in the direction of the longitudinal axis of the track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, and coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar.

8. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, a pair of spaced tracks mounted on the derrick frame adjacent the cellar, each track having a flange, a movable carriage mounted on the track, a pair of rollers mounted on the carriage and adapted to ride on the flanges of each track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar, supporting beams on which the carriage rests when in a first position with the rotary table over the cellar to reduce the load on the rollers, and a separate track bar on the flange of each track which raises the lower rollers to lift the carriage off the support beams when the carriage is moved from the said first position to carry the rotary table away from the cellar.

9. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, an elongated track mounted on the derrick frame adjacent the cellar, a movable carriage mounted on the track, a stationary roller mounted at one end of the track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved along the track onto the stationary roller to carry the rotary table away from the cellar, a first bearing member mounted on the frame, and a second bearing member mounted on the carriage to move under the first bearing member as the rotary table moves away from the cellar.

10. Apparatus for drilling an underwater well comprising a floating vessel having a cellar opening out of its bottom, a rotary drilling rig derrick frame mounted around the cellar, a track mounted on the derrick frame adjacent the cellar, a movable carriage mounted on the track, a pair of stationary rollers at one end of the track, the stationary rollers being spaced from each other in the direction of the longitudinal axis of the track, a rotary drilling table mounted on the carriage and adapted to extend over the cellar, a power unit mounted on the vessel for the rotary table, coupling means for connecting the power unit to and disconnecting it from the rotary table so the carriage can be moved on the track to carry the rotary table toward and away from the cellar, a first bearing member mounted on the frame, and a second bearing member mounted on the carriage to move under the first bearing member as the rotary table moves away from the cellar.

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