Oct. 28, 1969 M. L. WOODSON 3,474,629

ROTATABLE DRILLING PLATFORM

Filed Dec. 8, 1967

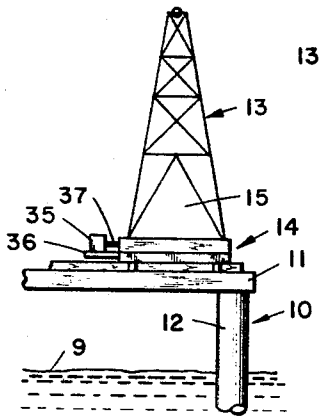


FIG. 1

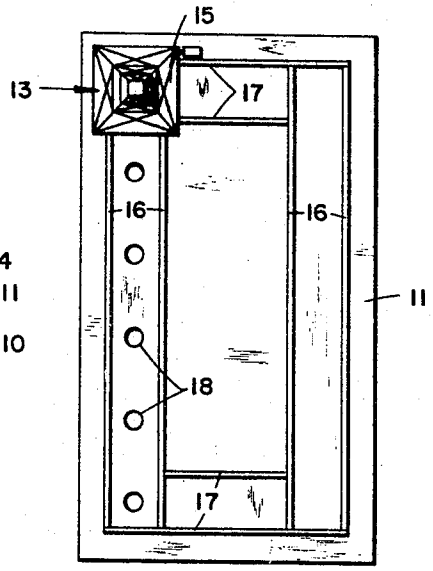


FIG. 2

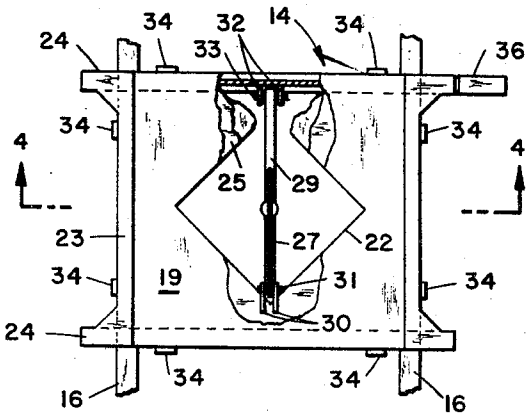


FIG. 3

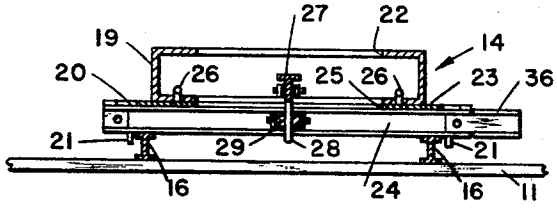


FIG. 4

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ROTATABLE DRILLING PLATFORM

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ABSTRACT OF THE DISCLOSURE

A drilling derrick of the type having an enlarged opening or "window" in one side of the derrick to provide access to the interior of the derrick, wherein the derrick is supported on a rotatable base so that the derrick may be turned to face the "window" in any given direction. The derrick is particularly adaptable to offshore platforms where a single derrick is moved about on rails on the platform in order to drill multiple wells.

This invention relates to offshore installations and more particularly to drilling derricks employed with offshore installations for drilling oil or gas wells in the ocean floor.

BACKGROUND OF THE INVENTION

The search for new oil and gas deposits has resulted in increased drilling activity in offshore locations. Generally, oil and gas wells are drilled in the floor of a body of water from an offshore installation or "platform" which is supported by legs on the water floor. A drilling derrick similar in design to those used in drilling oil and gas wells on land is supported on the working deck of the platform and the drilling operations performed through holes or openings in the platform.

The super structure of the derrick includes cross and diagonal bracing members which form a lattice work in the general form of a pyramid. The derrick includes suitable hoisting equipment for lifting and lowering a drill string used in drilling the well. The derrick is also provided with an enlarged opening in the super structure on one side of the derrick by increasing the spacing between the cross and diagonal bracing of the derrick near the lower end thereof. This opening or so-called "window" provides access to the interior of the derrick for introducing or withdrawing lengths of pipe such as drill string and/or casing used in drilling and completing the well. The drill string and casing typically come in thirty to forty-five foot lengths. Hence, the enlarged opening or window is necessary in order to accommodate the long lengths involved.

When drilling offshore it is common practice to drill a plurality of wells from a single platform. Rather than employing a separate derrick for each well, a single derrick is mounted on skids or rails positioned along the upper surface of the working deck of the platform to permit the derrick to be relocated so that a plurality of wells can be drilled with the same derrick. Typically, the wells are drilled at spaced intervals near the outer edge of the platform in order to obtain the maximum spacing between the wells. Thus, in the case of the square or rectangular platform it is necessary to move the derrick in a square or rectangular path near the edge of the platform working surface.

It will be apparent that since the derrick is located near the edge of the platform, it is necessary for the window to face inwardly so that workmen can obtain access to the deck from the interior of the derrick. However, when the derrick is moved from one side of the platform to the other side, it may be seen that the derrick window will then face away or outboard from the platform and access cannot be obtained. It is therefore highly desirable when drilling oil or gas wells from an offshore platform to provide a derrick which can be moved to drill wells at spaced intervals about the periphery of the platform but at the same time always be arranged so as to provide the derrick window toward the interior of the platform. It is to this end that the apparatus of the subject invention is directed.

SUMMARY OF THE INVENTION

In accordance with the invention a drilling derrick of the type described above is mounted on a rotatable supporting structure so that the derrick can be turned to face in a manner such that the derrick window is toward the interior of the platform. The entire derrick supporting structure is carried on rails or skids mounted on the working surface of the platform so that the derrick and support structure can be slid along the deck of the platform to any desired location. When the drilling operations have been completed along one side of the platform, the derrick is rotated an appropriate amount and slid along rails to a new location at another side of the platform.

The subject invention thus provides a portable derrick structure which can be employed at any desired location on an offshore platform in a relatively easy and efficient manner without the necessity of disassembling and reassembling the derrick structure. Furthermore, existing derrick structures may be employed without necessitating any modification to the structure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a partial elevational view of an offshore platform and a drilling derrick incorporating the subject invention;

FIGURE 2 is a plan view of the working deck of an offshore platform;

FIGURE 3 is a plan view of the rotatable support structure on which the derrick is mounted and is partially cut away to show the rotating mechanism; and,

FIGURE 4 is a cross-sectional view of the rotating support structure taken along lines 4—4 in FIGURE 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGURE 1 a typical offshore platform indicated generally by the numeral **10** is shown positioned in a body of water **9** and includes a working deck **11** supported by a plurality of legs **12**, one of which is shown. A drilling derrick **13** is supported on the deck **11** by means of a rotatable support structure **14** and is of a typical design having suitable hoisting equipment (not shown) carried internally at the upper end of the derrick. The derrick **13** also includes a large opening or "window" **15** in the derrick near its lower end to provide access to the interior of the derrick.

As shown in FIGURE 2 the working deck **11** of the platform **10** is generally rectangular in shape and is provided with two pairs of parallel rails **16** which slidingly support the rotatable derrick support structure **14**. Also provided on the surface of the working deck **11** are parallel transfer rails **17** which permit the derrick to be moved from one side of the platform to the other. Although a rectangular working deck is disclosed and the rails are shown in a rectangular pattern, it will be apparent on further reading that the subject invention may be suitably employed on any shape of platform and with any rail configuration.

A plurality of openings or holes **18** are spaced near the edge of the working deck **11** between the rails **16** so that the derrick **13** can be positioned over each opening **18** for the purpose of drilling a well therethrough. In operation, when the derrick has completed its drilling opera-

tions through the holes **18** along the left side of the deck **11** as shown, the derrick is skid or rolled across transfer rails **17** onto the pair of rails **16** on the right side of the platform as shown where subsequent drilling operations may be performed. When the derrick is moved across rails **17** to the right side of the deck as shown, it is necessary to rotate the derrick structure **13** 180° so that the window **15** remains facing the interior of the platform.

The rotatable support means **14** as shown in FIGURES 3 and 4 includes an upper support **19** rotatably mounted to a lower support **20**. The entire structure in turn is carried by the rails **16** fixedly mounted to the working deck **11**. Removable guide plates **21** may be attached to the lower side of the support **20** and adjacent the rails **16** to prevent the derrick and support structure from the sliding off the rails.

The upper support **19** is a generally box-like structure having an opening **22** extending therethrough. The lower structure is comprised of a flat plate **23** rigidly attached to I-beams **24**. An opening **25** in the plate **23** corresponds to the opening **22** in the box-like upper support **19** so that a through passageway is provided in the rotatable support structure **14** to permit drilling operations to be carried on from the derrick through the openings **18** in the working platform **11**.

The lower surface of the upper support **19** bears directly against the upper surface of the plate **23** of the lower support **20**. Since there is relative movement between the two parts during rotation as will be described later, the interface between the upper and lower supports **19** and **20** is preferably lubricated through grease fittings **26** on the upper support **19**. Due to the weight of the derrick structure carried by the upper support **19**, which may typically be in the order of 300,000 pounds, it is desirable that the upper support **19** and the plate **23** be made of heavy steel plate which has been machined at the interface to provide a smooth sliding surface.

In order to assure that the upper support **19** remains centered over the lower support **20** during rotation, suitable pivot means are attached to the supports prior to rotation. The pivot means comprise rotatably cooperating members in the form of a removable upper cross bar **27** haveing a depending pin **28** which is pivotally received in a lower cross bar **29** removably connected to the lower support **20**. The cross bar **27** is attached to the upper support **19** by means of brackets **30** and pins **31**. Similarly, the cross bar **29** is attached to the lower support **20** by brackets **32** and pins **33**. The bars **27** and **29** are arranged across the openings **22** and **25** so that the pin **28** is located in the geometric center of the entire support structure **14**. It will be seen that the pin **28** cooperates with the two bars **27** and **29** to maintain the upper and lower supports **19** and **20** in axial alignment during rotation. The bars **27** and **29** are only used when the derrick is being rotated and accordingly are removed when drilling operations are taking place.

Suitable stops **34** are preferably attached to the upper support **19** and depend downwardly alongside the lower support **20** so as to prevent inadvertent rotation or other movement during drilling and are then removed while the upper support **19** is being rotated.

Any suitable turning means may be employed to physically move the upper support **19** and derrick **13** when rotation is desired. For example, a suitable jack **35** may be mounted on an extension **36** which may be removably attached to either end of the I-beams **24**. The jack may be mechanical, electrical or hydraulic and includes a piston **37** which acts against a corner of the upper support **19** to rotate the derrick **13**. The jack **35**, of course, may also be fixed to the working deck **11** without departing from the scope of this invention. In addition, other turning arrangements will readily come to mind to one skilled in the art, for example, gear drives, a winch and cable and the like.

The subject invention thus provides a drilling derrick apparatus for use on an offshore platform which can be quickly and easily rotated to any desired position so as to orient the derrick "window" in the most advantageous position. Further, the subject apparatus can be operated with a minimum of time and effort and without any disassembling or modification of the drilling derrick itself.

Having thus described the invention what I claim is:

I claim as my invention:

1. A rotatable drilling derrick apparatus comprising:
an offshore platform of the type having a substantially horizontal working deck arranged above the surface of a body of water and supported on leg means extending to the floor of a body of water, said working deck having a polygonal configuration when viewed from above;
rail guide means attached to the surface of said working deck and arranged with portions parallel to at least two sides of said working deck;
non-rotatable lower derrick support means cooperatively positioned on said rail guide means and adapted to be moved therealong;
upper derrick support means rotatably supported by said lower support means; and,
a drilling derrick carried by said upper derrick support means and having a vertically enlarged opening in one side thereof of a size sufficient to permit the passage of lengths of pipe to the interior of said derrick.

2. An apparatus as defined in claim **1** including:
turning means engageable between said upper and lower derrick support means for rotating said upper derrick support means.

3. An apparatus as defined in claim **2** where said turning means comprising:
jack means carried by one of said derrick support means and adapted to act against the other of said derrick support means.

4. An apparatus as defined in claim **1** wherein said upper derrick support means is rotatably supported by said lower derrick support means by means of:
two rotatably cooperating members, one of said members removably connected to said lower derrick support means and the other of said members removably connected to said upper derrick support means.

5. An apparatus as defined in claim **4** including:
pin means located at the geometric center of said support structure and carried by one of said rotatably cooperating members, said pin means cooperable with the other of said rotatably cooperating members to provide an axis of rotation between said members.

6. An apparatus as defined in claim **1** including:
removable stop means attachable to one of said support means and adapted to engage the other of said support means to prevent said upper derrick support means from rotating when said derrick is in use.

7. An apparatus as defined in claim **1** wherein said rail guide means are arranged near the outer periphery of said working deck.

8. An apparatus as defined in claim **8** wherein said rail guide means comprise:
pairs of rails extending along each side of said working deck.

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U.S. Cl. X.R.

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