

March 3, 1970

J. D. McEWEN ET AL
OIL WELL DERRICK SUBSTRUCTURE WITH BLOWOUT
PREVENTER DOLLY

3,498,375

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4 Sheets-Sheet 1

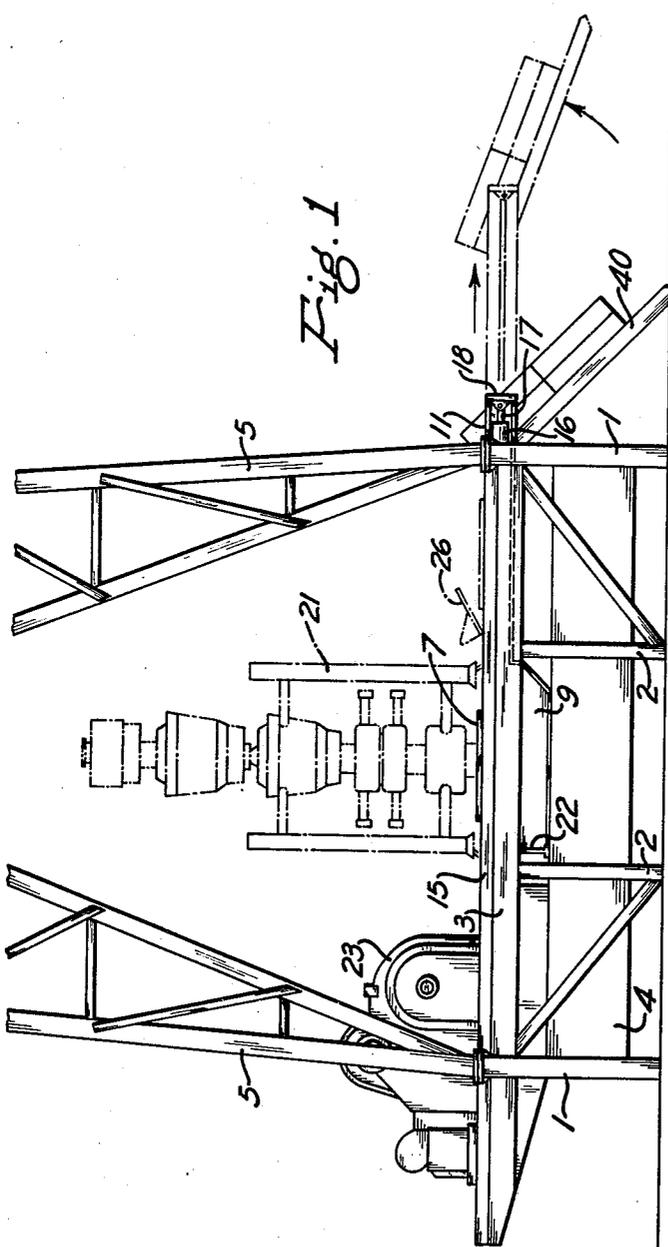


Fig. 1

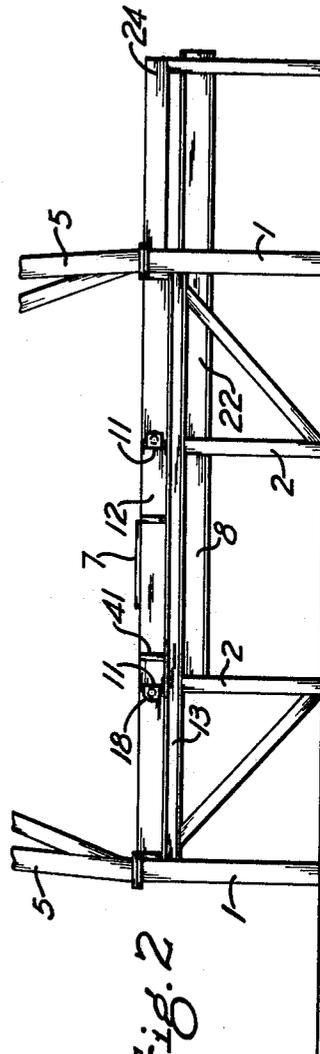


Fig. 2

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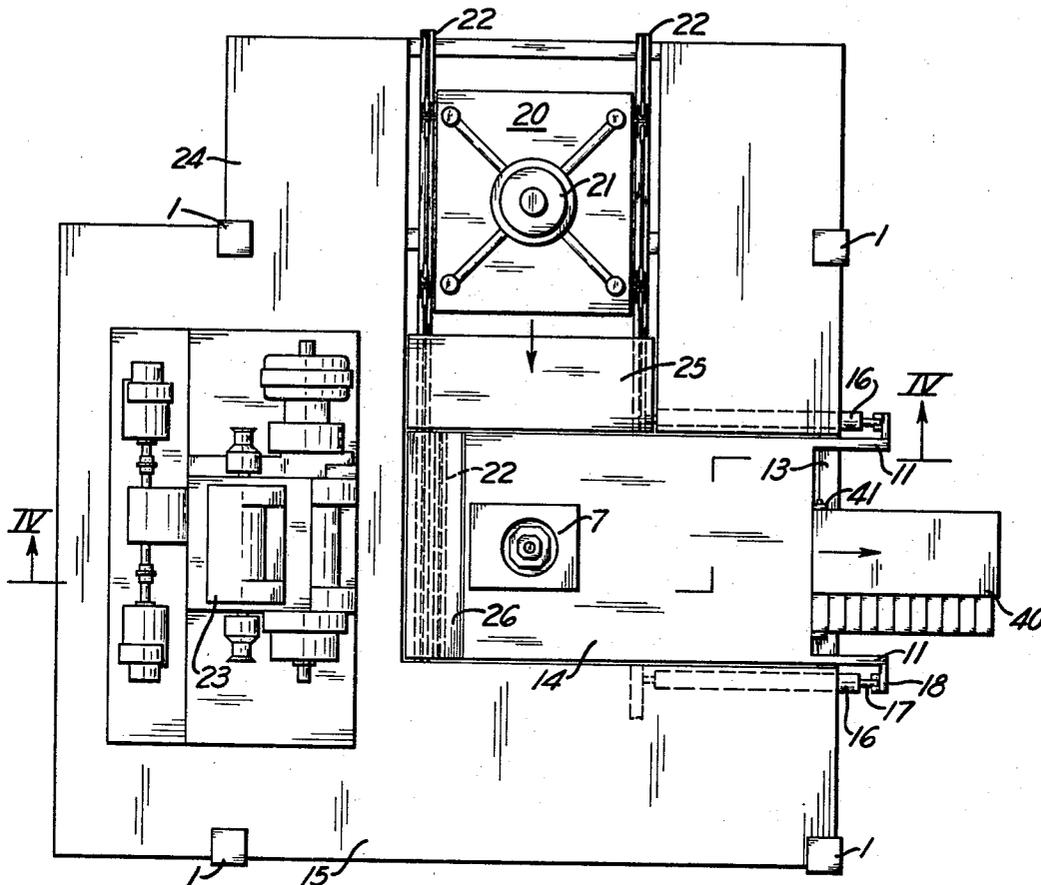


Fig. 3

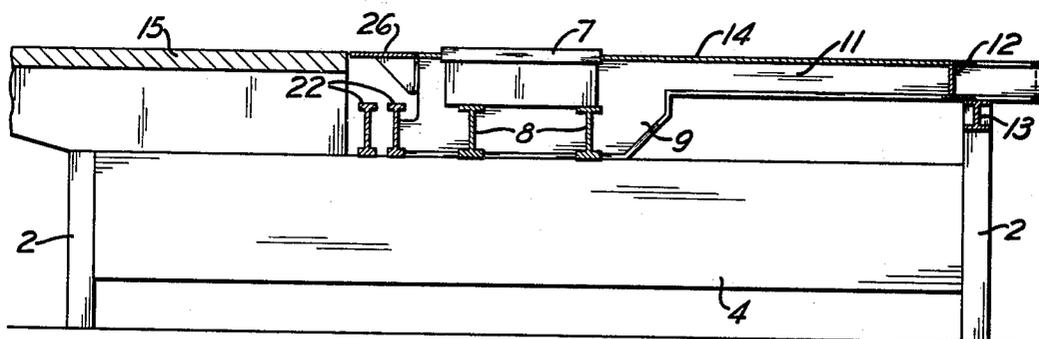


Fig. 4

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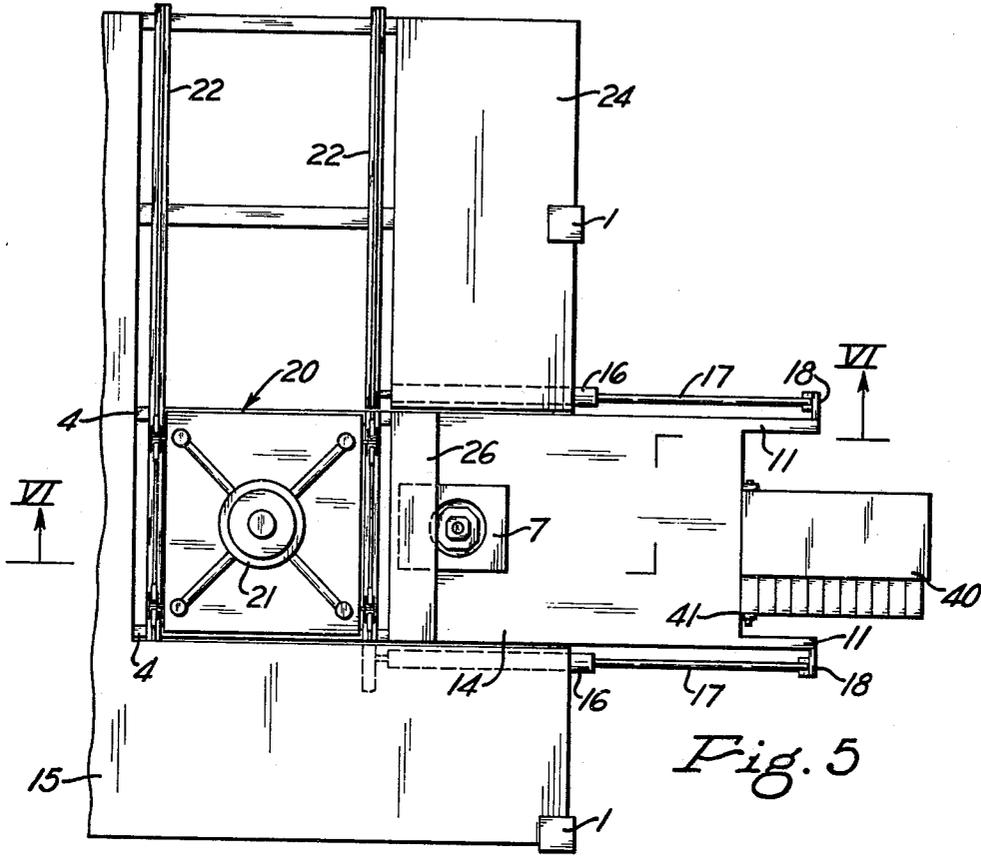


Fig. 5

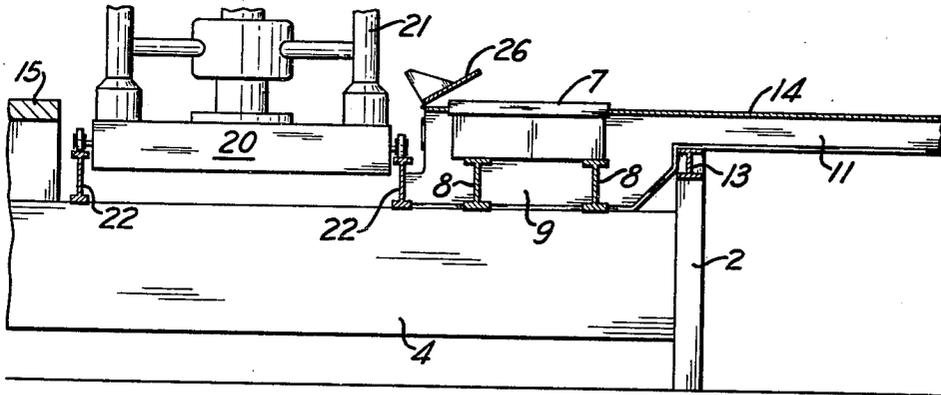


Fig. 6

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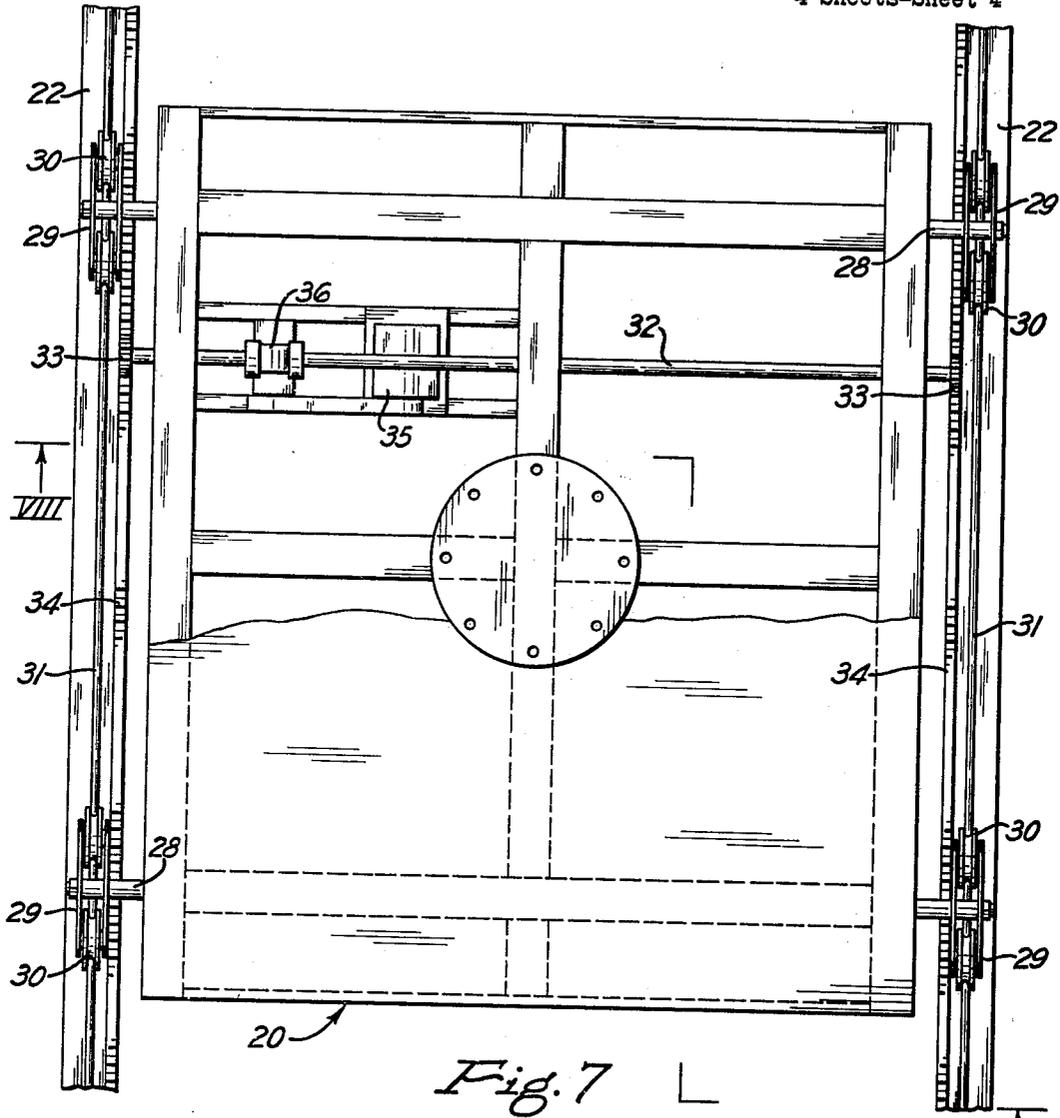


Fig. 7

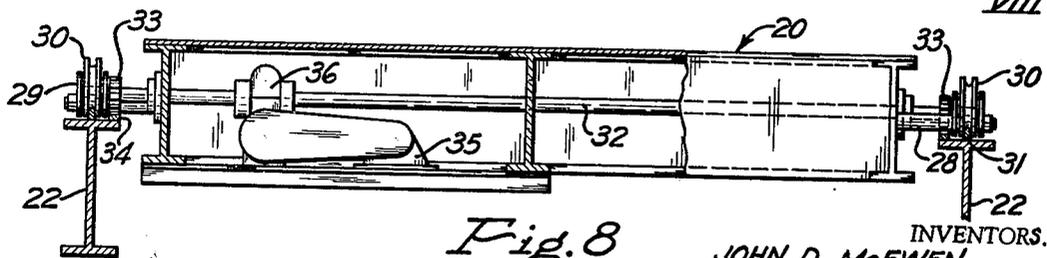


Fig. 8

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OIL WELL DERRICK SUBSTRUCTURE WITH BLOWOUT PREVENTER DOLLY

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10 Claims

ABSTRACT OF THE DISCLOSURE

A removable rotary table support is normally mounted on the central area of the structural steel framework of an oil well derrick substructure. Also normally mounted on the framework at one side of the central area is a blowout preventer dolly which can be moved into the central area after the rotary table support has been removed therefrom.

BACKGROUND OF THE INVENTION

Blowout preventer stacks used in oil well drilling operations are large and cumbersome, but they must be removed from the well head every time a new string of casing is run into a well and then reinstalled. When the drilling is being done on land, where there usually is no reason for not using tall substructures, the blowout preventers are handled beneath the substructures, usually either on dollies running on tracks at ground level, or suspended from overhead trolleys below the derrick floor. On the other hand, for offshore operations where the blowout preventer may be as much as 25 feet tall and weigh from 80,000 to 100,000 pounds, it is impractical for reasons of stability to build a substructure high enough on a ship or barge to permit such a large blowout preventer to be moved laterally below the derrick floor into and out of operative position.

It is among the objects of this invention to provide an oil well derrick substructure of relatively small height, with which a blowout preventer of greater height can be used and installed and removed without difficulty.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

FIG. 1 is a side view of an oil well drilling substructure;

FIG. 2 is a front view thereof;

FIG. 3 is a plan view;

FIG. 4 is an enlarged vertical section taken on the line IV—IV of FIG. 3;

FIG. 5 is a fragmentary plan view, similar to FIG. 3, but showing the rotary table moved aside;

FIG. 6 is an enlarged vertical section taken on the line VI—VI of FIG. 5;

FIG. 7 is an enlarged plan view of the dolly with its floor broken away; and

FIG. 8 is a vertical section taken on the line VII—VII of FIG. 7.

Referring to the drawings, a relatively low substructure, suitable for use on a ship or anywhere else that a

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low substructure is desired, has a structural steel framework formed from corner and side posts 1 and 2 that support a number of horizontal beams, such as side beams 3 and intermediate parallel beams 4. The corner posts also are designed for supporting the four legs 5 of an oil well drilling derrick extending up above the substructure as shown in FIGS. 1 and 2. In the center of the area enclosed by the base of the derrick there is a rotary table 7. As shown in FIG. 4, this table is mounted on a support constructed from a pair of short I-beams 8 secured at their ends to the lower portions of a pair of much thicker members 9 seated on the heavy intermediate beams 4 that are supported on opposite sides of the well by some of the side posts 2 at their ends. The tops of beams 8 are located a considerable distance below the top of the substructure so that the top of the rotary table will be at the correct level, substantially flush with the floor that is laid on the substructure framework.

The rotary table support is removable from this central area of the framework, preferably by sliding it outwardly on beams 4 toward one side of the substructure. For this purpose the rotary table support may be secured to the inner end of a frame formed from a pair of parallel members 11 integrally joined at their inner ends to members 9 and connected near their outer ends by a cross brace 12. This frame extends outwardly across the floor beam 13 at the side of the substructure toward which the rotary table is movable. The frame supports a section 14 of the floor that is movable with it relative to the rest of the floor 15.

The frame just described and the rotary table support may be slid outwardly as a unit in any suitable manner. A preferred way of doing it, as shown in FIG. 3, is to rigidly mount parallel fluid pressure cylinders 16 in the substructure at opposite sides of the frame and connect the outer ends of their piston rods 17 to laterally projecting brackets 18 on the outer end of the frame. When fluid under pressure is delivered to the inner ends of the cylinders, the frame is forced outwardly and pulls the rotary table support with it far enough to remove the rotary table from the central area of the substructure, as shown in FIG. 5.

It is a feature of this invention that when the rotary table support is moved outwardly away from its operative position a dolly 20 (FIGS. 3 and 5) that supports a blowout preventer 21 can be moved across the upper part of the substructure and into the space just vacated by the rotary table support. Then the blowout preventer can be lifted from the dolly by the traveling block, the dolly retracted to its outer position, and the blowout preventer lowered into position. When the dolly is in its outer position, a blowout preventer can be placed on it or removed from it by a suitable crane located beside the substructure. To support the dolly, a pair of parallel rails 22 are mounted in the upper part of the substructure framework and extend inwardly on opposite sides of the central area of the framework normally occupied by the rotary table, as shown in FIG. 5. Since the drawworks 23 is mounted on the substructure in back of the derrick, it generally is necessary for the tracks to extend perpendicular to the

direction of movement of the rotary table support. This being the case, the inner end portions of the rails are seated on beams 4 and their outer end portions are supported by a lateral extension 24 of the substructure outside of the derrick base. The portions of the rails extending away from the side of floor sections 14 may be covered by one or more removable floor plates 25 (FIG. 3) while the dolly is in its outer position.

The section of a rail 22 nearest the side of the substructure toward which the rotary table support is retracted must be removable to permit the table to be returned to its central position. The other section of the same rail and the entire other rail are rigidly mounted on the substructure framework and extension 24. The removable rail section most conveniently is rigidly connected to the inner end of the rotary table support so that it will be moved back and forth with the rotary table. Therefore, when the rotary table is in operative position, the movable rail section is located close to the opposite rail, as shown in FIG. 4. At this time the parallel adjacent portions of the two rails are covered by a narrow plate 26 that must be removed to expose the movable rail when the rotary table is in its outer position. A suitable way of doing this is to hinge the floor plate to the inner end of the rotary table support so that the plate can be lifted and swung back toward the rotary table to uncover the underlying rail as shown in FIGS. 5 and 6.

The blowout preventer dolly 20 running on the rails has a rectangular body, in the opposite ends of which parallel shafts 28 are mounted as shown in FIGS. 7 and 8. They project from the opposite sides of the body and are supported by brackets 29, each of which is supported by a pair of wheels 30 journaled in the brackets. Preferably, these wheels are grooved and fit over ribs 31 that extend along the tops of the rails to guide the wheels. To propel the dolly along the rails, it is provided with a drive shaft 32 that is rotatably mounted therein and projects from its opposite sides. Rigidly mounted on the ends of the drive shaft are pinions 33 that mesh with racks 34 extending lengthwise of the rails and secured thereto. This shaft can be turned by means of a hydraulic motor 35 or the like suspended from the dolly and driving a gear reducer 36 that is operatively connected with the shaft.

Assuming that the rotary table is in central operative position and it becomes necessary to remove the blowout preventer, the fluid pressure cylinders are energized to pull the rotary table outwardly to one side of the central area of the substructure as shown in FIGS. 5 and 6. This also pulls the movable dolly rail section into alignment with the stationary section of the same rail. Floor plate 26 is swung up and out to uncover the movable rail section. The traveling block then is lowered and connected to the blowout preventer, which then is lifted above the substructure. The empty dolly then is driven inwardly on the rails until it is over the well and beneath the blowout preventer, which is then lowered onto it as shown in FIG. 5 and disconnected from the traveling block. The dolly then is reversed to carry the blowout preventer out to the side of the derrick. After a string of casing has been run, the operation is reversed by returning the blowout preventer to the central area of the substructure, lifting it from the dolly, retracting the dolly, lowering the blowout preventer into position and disconnecting the traveling block from it, and then moving the rotary table back to the center of the derrick and swinging the hinged floor plate 26 into position over the underlying rails as shown in FIGS. 3 and 4.

A combination ramp and stair 40 may be attached to the outer end of the movable floor section. To prevent the ramp and stair from interfering with retraction of the rotary table, their upper ends may be pivotally connected at 41 to the movable frame so that their lower ends can be swung up away from the ground during the movement of the frame outwardly. The catline can be used for

lifting the ramp and stair. The ramp and stair do not need to be lifted while the frame is moved back into the substructure, because they can be dragged along the ground by the inwardly moving frame.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. An oil well derrick substructure comprising a structural steel framework, a removable rotary table support normally mounted on the central area of the top part of the framework, a blowout preventer dolly normally mounted on said framework at one side of said central area at substantially the same level as said table support, means for removing the rotary table support from said central area, and means for moving the dolly inwardly into said central area after the rotary table support has been removed therefrom.

2. An oil well derrick substructure according to claim 1, including a pair of parallel rails supporting said dolly and extending inwardly on opposite sides of said central area of the framework to permit said inward movement of the dolly, the dolly having an upper surface for supporting a blowout preventer above said framework.

3. An oil well derrick substructure according to claim 1, including a pair of parallel rails supporting said dolly and extending inwardly on opposite sides of said central area of the framework to permit said inward movement of the dolly, the dolly having an upper surface for supporting a blowout preventer above said framework, and a rack rigidly mounted lengthwise of said rails; and said dolly-moving means including a pinion engaging said rack, means rotatably mounting the pinion on the dolly, and a motor mounted on the dolly for driving the pinion.

4. An oil well derrick substructure according to claim 1, in which said support-removing means slide the rotary table support laterally away from said central area out of the path of the dolly.

5. An oil well derrick substructure according to claim 4, in which said support-removing means include a fluid pressure cylinder and piston rod supported by said framework.

6. An oil well derrick substructure according to claim 4, including a frame connected to one side of said rotary table support and extending outwardly to the side of said framework toward which said support is moved, a floor on said frame, and a floor on said framework beside the frame floor, said frame and its floor being movable with the rotary table support.

7. An oil well derrick substructure according to claim 4, including a frame connected to one side of said rotary table support and extending outwardly to the side of said framework toward which said support is moved, a ramp inclined outwardly and downwardly from the outer end of said frame, and means hinging the upper end of the ramp to the frame so that the lower end of the ramp can be lifted before the frame is moved outwardly.

8. An oil well derrick substructure according to claim 1, in which said support-removing means slide the rotary table support laterally away from said central area along a path at right angles to the path or movement of said dolly, and said substructure includes a pair of parallel rails supporting the dolly and extending inwardly on opposite sides of said central area when the rotary table support has been removed therefrom, the section of the rail between said central area and the removed rotary table support being separate from the rest of that rail and secured to said support for movement with it laterally across said central area when the rotary table support is returned.

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9. An oil well derrick substructure according to claim 8, including a floor plate hinged on a horizontal axis to the inner end of the rotary table support outwardly of said movable rail section and positioned to cover said section and the adjoining portion of the other rail when the rotary table support is in operative position in said central area.

10. An oil well derrick substructure according to claim 8, including a frame connected to one side of said rotary table support and extending outwardly to the side of said framework toward which said support is moved, a floor on said frame, and a floor on said framework beside the frame floor, said frame and its floor being movable with the rotary table support.

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U.S. Cl. X.R.

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