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H. J. WOOLSLAYER ET AL
WELL DRILLING STRUCTURE PROVIDED
WITH A DRILL PIPE HOIST

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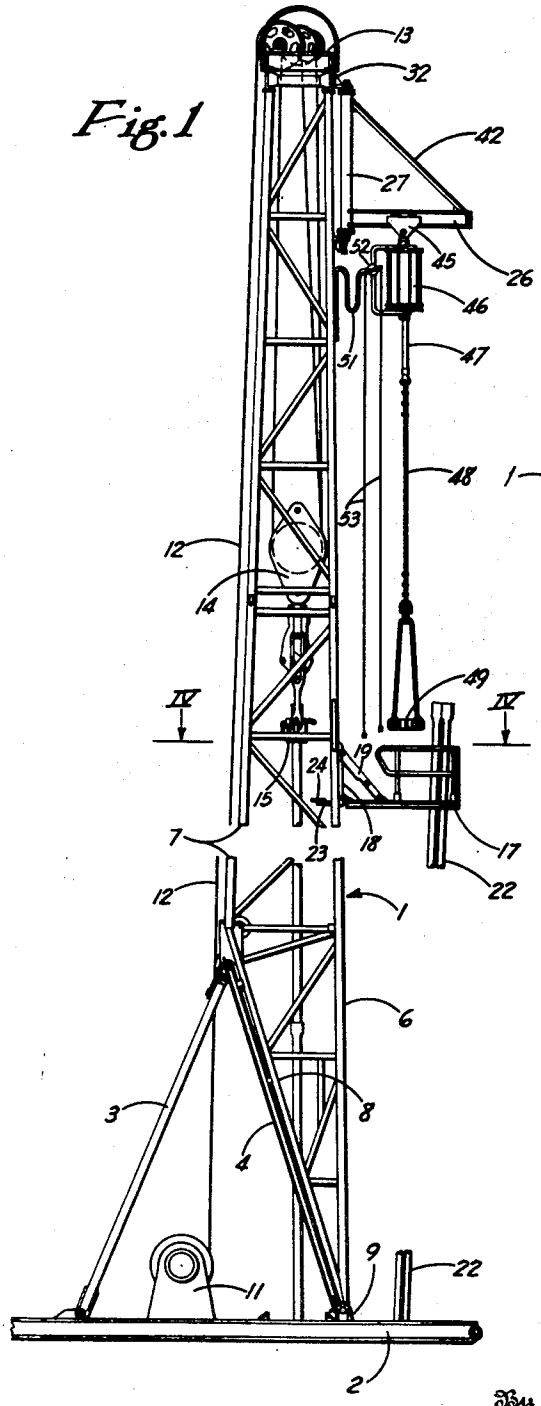
2 Sheets-Sheet 1

Fig. 1



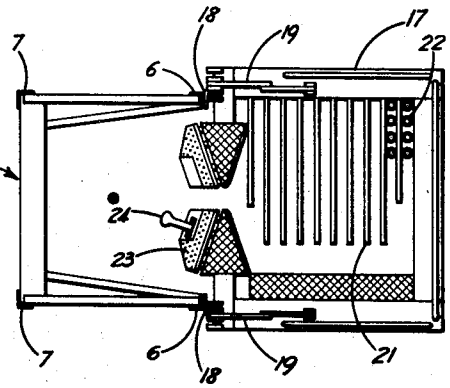


Fig. 4

Inventors
Homer J. Woolslayer
Cecil Jenkins

By
Brown, Critchlow, Flick & Peckham
Attorneys

Nov. 28, 1950 H. J. WOOLSLAYER ET AL 2,531,930

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Filed Dec. 2, 1947 2 Sheets-Sheet 2

Fig. 2

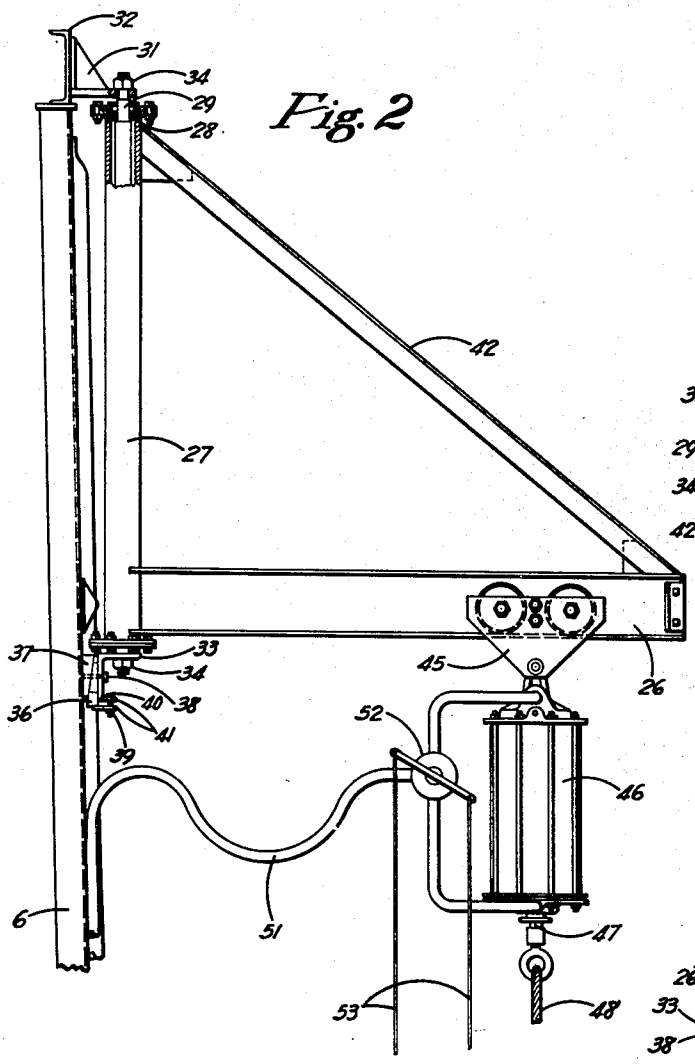
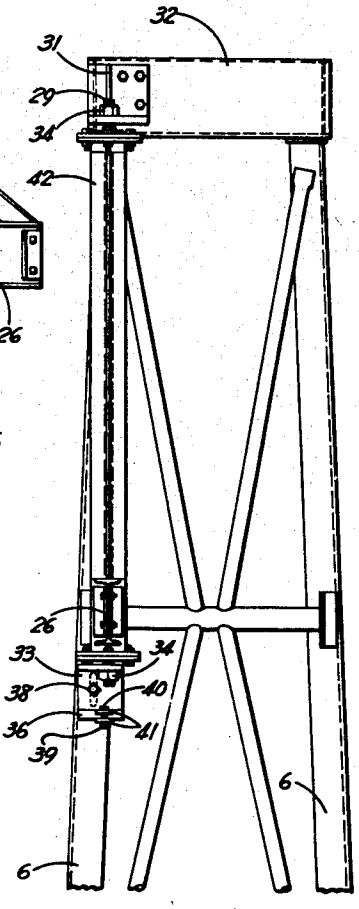


Fig. 3



Inventor
Homer J. Woolslayer
Cecil Jenkins

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Attorneys

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WELL DRILLING STRUCTURE PROVIDED WITH A DRILL PIPE HOIST

Homer J. Woolslayer and Cecil Jenkins, Tulsa, Okla., assignors to Lee C. Moore Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

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5 Claims. (Cl. 214—1)

1

This invention relates to oil well drilling derricks or masts, and more particularly to a mast supporting a pipe racking platform for receiving the upper portions of stands of drill pipe.

In drilling deep wells it is the usual practice, when pulling drill pipe out of the hole to change bits or to take cores, to stand the pipe several sections high in the derrick or mast and to move the stands of pipe laterally into a racking platform attached to a side of the mast. Since one hundred or more stands of pipe may be involved, it is common practice to mount a horizontal rake or series of fingers in the racking platform to receive the stands and hold them in predetermined positions. In racking pipe a stand of drill pipe, consisting of two or more joints, is drawn out of the hole by elevators connected to the traveling block and then is held while the joint is broken at the derrick floor level. The stand is then set down on the derrick floor and leaned against a stabbing finger at the level of the racking platform while the elevators are disconnected from the pipe. A man on the racking platform then manipulates the stand into its proper place between the fingers of the rake. When the mast has one face open, the racking platform is attached to the outside of the mast, and the stands of pipe are moved out through the open face and into the rack. As this manual operation is very heavy work, the speed of operation of the entire crew will be limited where heavier strings of pipe are involved.

It is an object of this invention to provide a well drilling structure in which stands of drill pipe can be quickly racked with little manual effort when the racking platform is inside or outside of the mast. Other objects are to provide for that purpose hoisting mechanism supported by the mast which is movable laterally toward and away from a side of the mast, which is movable laterally by gravity in one direction, and which can be swung around an upright axis.

In accordance with this invention a skeleton mast supports a pipe racking platform frame projecting from a face of the mast. A hoist beam is fastened to the mast above the platform frame. Hoisting mechanism is suspended above the frame from the beam, and elevators supported by that mechanism are adapted to be connected to a stand of drill pipe in the mast. Consequently, the stand can be lifted by the hoisting mechanism and swung into the platform frame where it can be racked. Preferably, the hoisting mechanism is carried by a trolley that travels along the hoist beam, and the beam is

2

pivoted to the mast on an upright axis so that it can be swung laterally into different positions. It also is desirable to be able to tilt the beam lengthwise so that the trolley will gravitate toward one end of the beam. When the mast has an open side and the platform frame is located outside the mast, the frame has an open inner side to permit the stands of drill pipe to be moved laterally into it from inside the mast.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a side view of our drilling structure; Fig. 2 is an enlarged fragmentary side view, partly broken away, of the upper end of the structure; Fig. 3 is a view from the outer end of the hoist beam with the trolley removed; and Fig. 4 is a horizontal section taken on the line IV—IV of Fig. 1.

Referring to Fig. 1 of the drawings, the bottom of an oil well drilling mast 1 is mounted on a base 2 that preferably is portable. The mast can be made in any convenient manner, but most suitably is formed from two structural sections detachably connected together. One of these sections is relatively short and includes the lower portions 3 of the two rear legs of the mast supported by inclined braces 4 connected to the base. The other tall section of the mast consists of the remaining portion of it and includes the front legs 6, which are mounted on the base, and the upper portions 7 of the rear legs. The lower ends of legs 6 and 7 are rigidly connected by inclined braces 8. The adjoined ends of the rear legs 3 and 7 are detachably connected together in any suitable manner. The lower ends of the front legs are detachably connected to the base by hinge brackets 9 to permit the tall section of the mast to be swung in a vertical plane when the two sections are not connected together, whereby the tall section can be lowered to the ground and disconnected from the base.

The drawworks 11, shown diagrammatically, is mounted on base 2, and a cable 12 extends from the drawworks up over the crown block 13 and down into the mast where it supports a traveling block 14 carrying elevators 15 for pulling the drill pipe out of the well.

As the space inside such a mast is quite limited, the pipe racking platform that is provided is outside of the mast. Also, the face of the mast most of the way up the side bounded by front legs 6 is open, as shown in Fig. 4. The racking platform includes a horizontal frame 17 having an open inner side beside the open face of the mast and having the inner ends of its side mem-

bers pivotally connected to vertical angle bars 18 secured to front legs 6. Folding inclined braces 19 pivotally connect the upper ends of these bars to the sides of the frame to hold it horizontal when the mast is erect. Inside the frame is a series of spaced parallel fingers 21 forming a rake in which stands 22 of drill pipe are placed after having been pulled from the well. Extending part way across the open inner side of the frame is a floor member 23 from which projects a stabbing finger 24 that a stand of pipe leans against between the time elevators 15 are removed from it and the time that it is moved into the rake.

It is a feature of this invention that the mast supports an outside hoist for transferring stands of pipe from the stabbing finger to their proper locations in the rake carried by the racking platform. Accordingly, as shown in Figs. 2 and 3, an I-beam 26 is disposed above the racking platform with its inner end welded to the lower end of a heavy sleeve 27. Mounted in the opposite ends of this sleeve are bearings 28 which are carried by a post 29 extending through the sleeve and projecting from its opposite ends. The upper end of this post extends through an oversized hole in a bracket 31 attached to one of the cross members 32 at the top of the mast. This bracket is directly above the upper end of one of the front legs 6. The lower end of the post likewise extends through an oversized hole in a bracket 33 that supports the lower end of the pipe. Threaded on the opposite ends of the post are nuts 34.

The lower bracket is connected to the adjoining leg of the mast through a vertically adjusted wedge. Thus, an upwardly tapered wedge 36 has one side engaging the inner face of the lower bracket and its opposite side engaging one side of a downwardly tapered wedge 37 welded to the mast leg. A bolt 38 extends through the lower bracket and a vertical slot in wedge 36 for normally bolting the bracket tight to the leg. However, when the bolt is loosened, the outer wedge can be raised or lowered by adjusting a nut 39 on the lower end of a bolt 40 extending through parallel horizontal plates 41 projecting from the lower ends of the bracket and adjoining wedge. Vertical adjustment of the wedge will move the lower bracket 33 either toward or away from the mast to level hoist beam 26 or to cause it to be inclined slightly. The outer end of the beam is connected to the upper end of sleeve 27 by an inclined brace 42.

The wheels of a trolley 45 travel along the lower flanges of I-beam 26. Suspended from the bottom of the trolley is a fluid pressure cylinder 46, preferably pneumatically operated. The piston in this cylinder is mounted on a rod 47 that projects from the bottom of the cylinder and supports a hoisting line, such as a chain or cable 48. The lower end of the line supports elevators 49 of conventional construction for gripping drill pipe below its enlarged upper end. Air under pressure is supplied to the cylinder from a suitable source through hoses 51 by a valve 52 that preferably is operated through pendant controls 53 by the man on the racking platform.

In using this hoist, a stand 22 of drill pipe, which has been pulled from the hole by the traveling block 14 and disconnected from the string of pipe in the well, is leaned against the stabbing finger 24 as before and the elevators are disconnected from it. The hoist elevators 49 then are attached to the upper end of the stand so that the hoist will lift it when fluid pressure is admitted to the lower end of cylinder 46. By swinging the hoist beam 26 and by moving the trolley along the beam, the stand of pipe can be carried quickly to any desired place in the racking platform and then lowered by the hoist until the stand again rests on the base 2. To put the pipe back into the hole, the procedure just outlined is reversed. The trolley can be caused to travel by gravity toward the inner or the outer end of the beam by tilting the beam through the vertical adjustment of wedge 36. Thus, while pipe is being racked in the platform the trolley can be caused to gravitate toward the outer end of the beam, and while the pipe is being put back in the hole the adjustment of the wedge can be changed so that the trolley will roll towards the inner end of the beam. This further diminishes the work required of the man who racks the pipe.

If desired, two hoists can be provided, one on each front leg of the mast. In such a case one hoist would be designed to handle the heavy stands of drill collars and the other for handling the lighter stands of drill pipe. This would result in shorter hoist beams in some cases as each one would have to cover only part of the platform area.

According to the provisions of the patent statutes, we have explained the principle and construction 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. A well drilling structure comprising an oil well derrick, a pipe racking platform supported by the derrick and including a rake for receiving the upper portions of stands of drill pipe movable laterally into it from the well, a hoist beam disposed above said platform, a pivotal support for one end of the beam connecting it to one leg of the derrick on an upright axis, adjustable means connected to said support for tilting it relative to said leg, a trolley movable along said beam, hoisting mechanism supported by the trolley, and elevators supported by said mechanism and adapted to be connected to a stand of drill pipe in the derrick, whereby said stand can be lifted by the hoisting mechanism and swung into said rake.

2. A well drilling structure comprising an oil well derrick, a pipe racking platform supported by the derrick and including a rake for receiving the upper portions of stands of drill pipe movable laterally into it from the well, a pair of vertically spaced brackets connected to the derrick, an upright rotatable member supported between said brackets, a hoist beam rigidly connected at its inner end to said member, a vertically adjustable wedge for moving one of said brackets toward and away from the derrick to tilt the hoist beam lengthwise, a trolley movable along said beam, a fluid pressure actuated hoist cylinder supported by the trolley, a hoisting line suspended from said cylinder, and elevators carried by said line and adapted to be connected to a stand of drill pipe in the derrick, whereby said stand can be lifted by said line and swung into said rake.

3. A well drilling structure comprising a skeleton mast having an open face between two of its legs, a pipe racking platform frame projecting

outward from said open face and having an open inner side to permit the upper portions of stands of drill pipe to be moved laterally into it from inside the mast, a hoist beam projecting outward above the platform frame from one of said two legs, a pivotal support for the inner end of the beam connecting it to said one leg on an upright axis, means for tilting said support in a vertical plane substantially perpendicular to the plane of said open face of the mast, a trolley movable along said beam, hoisting mechanism supported by the trolley, and elevators supported by said mechanism and adapted to be connected to a stand of drill pipe in the mast, whereby said stand can be lifted by the hoisting mechanism and swung out through the open face of the mast into the platform frame for racking.

4. A well drilling structure comprising a skeleton mast having an open face between two of its legs, a pipe racking platform frame projecting outward from said open face and having an open inner side to permit the upper portions of stands of drill pipe to be moved laterally into it from inside the mast, a hoist beam projecting outward above the platform frame from one of said two legs, a pivotal support for the inner end of the beam connecting it to said one leg on an upright axis, a vertically adjustable wedge between said leg and support for moving one end of the support toward and away from the leg to tilt said axis, a trolley movable along said beam, hoisting mechanism supported by the trolley, and elevators supported by said mechanism and adapted to be connected to a stand of drill pipe in the mast, whereby said stand can be lifted by the hoisting mechanism and swung out through the open face of the mast into the platform frame for racking.

5. A well drilling structure comprising a skeleton mast having an open face between two of its legs, a pipe racking platform frame projecting

outward from said open face and having an open inner side to permit the upper portions of stands of drill pipe to be moved laterally into it from inside the mast, a pair of vertically spaced brackets connected to the mast at one side of said open face, an upright rotatable member supported between said brackets, a hoist beam rigidly connected at its inner end to the lower end of said member, an inclined brace connecting the upper end of said member to the outer end of the beam, a vertically adjustable wedge for moving the lower bracket toward and away from the mast to tilt the hoist beam lengthwise, a trolley movable along said beam, a fluid pressure actuated hoist cylinder supported by the trolley, a hoisting line suspended from said cylinder, and elevators carried by said line and adapted to be connected to a stand of drill pipe in the mast, whereby said stand can be lifted by said line and swung out through the open face of the mast into the platform frame for racking.

HOMER J. WOOLSLAYER.
CECIL JENKINS.

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