Oct. 19, 1943. H. J. WOOLSLAYER ET AL 2,332,479

MAST STRUCTURE

Filed April 10, 1943 2 Sheets-Sheet 1

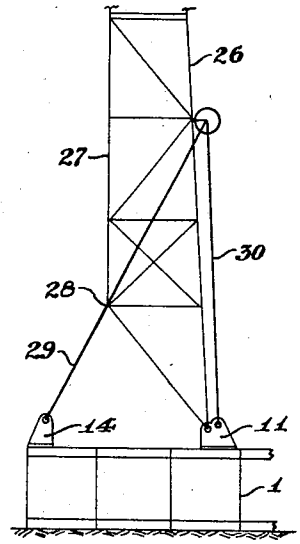


Fig. 6.

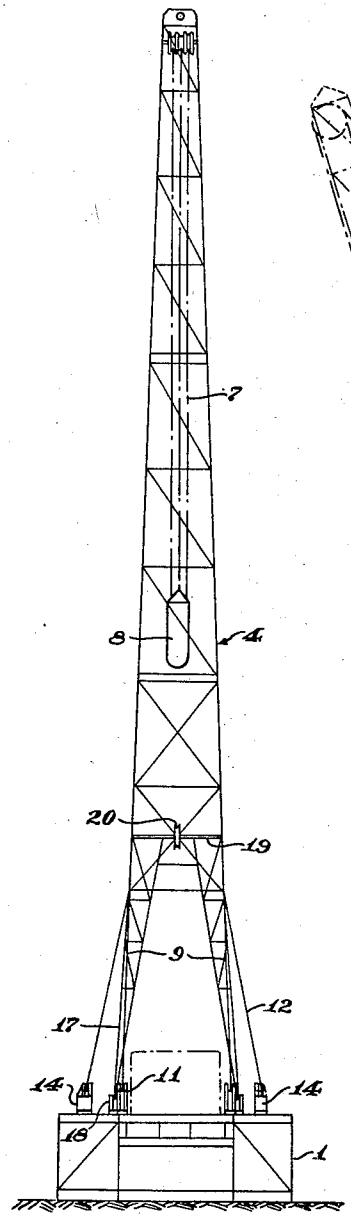


Fig. 2.

Fig. 1.

WITNESSES.
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MAST STRUCTURE

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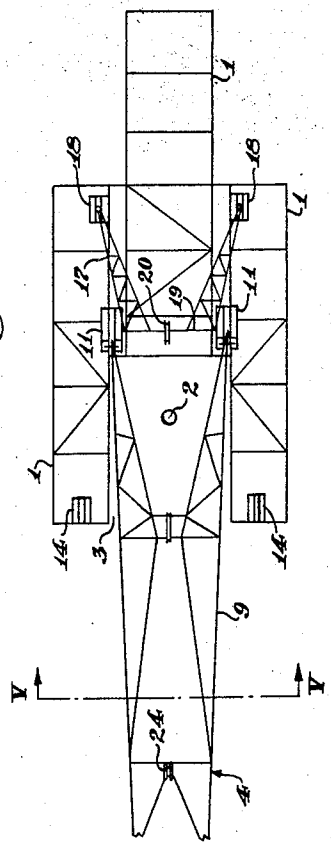


Fig. 4.

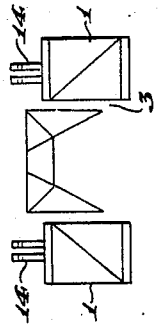


Fig. 5.

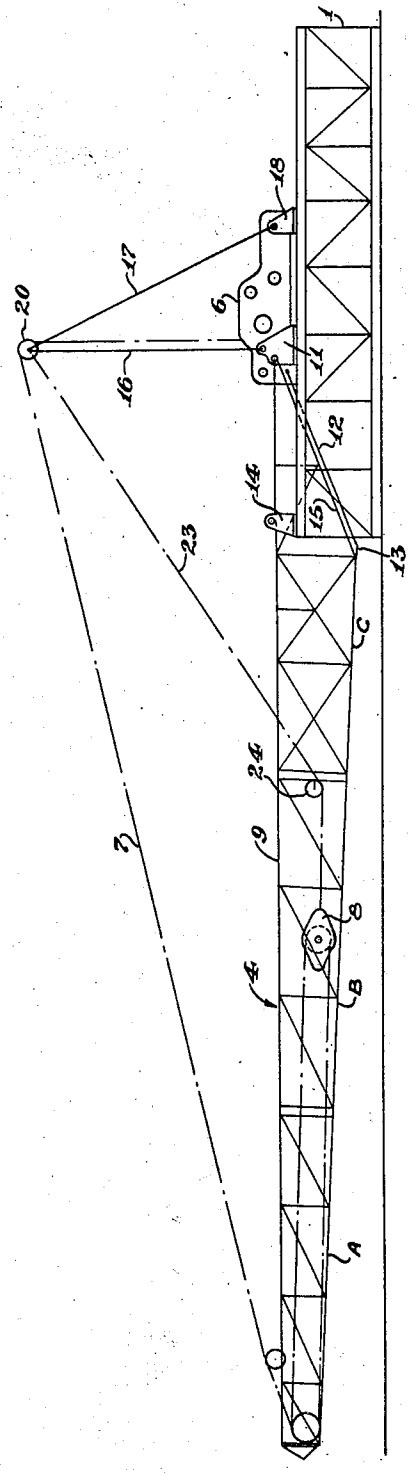


Fig. 3.

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UNITED STATES PATENT OFFICE

2,332,479

MAST STRUCTURE

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Application April 10, 1943, Serial No. 482,554

11 Claims. (Cl. 189—16)

This invention relates to oil well masts or derricks that are adapted to be assembled in sections along the ground and then swung upwardly into upright position.

It now is not uncommon to erect oil well masts by assembling them in prone position along the ground from large prefabricated sections, and then swinging them up into upright position over the wells. For this purpose the lower ends of the front legs are hinged to supporting means, and cables attached to the masts are passed over gin poles to the draw-works by which the masts are raised from the ground. These masts generally are let down and separated into sections again after they have served their purpose, and the sections are trucked to new locations where the masts are again erected the same as before. It will be seen that to save time and labor it is desirable to make the mast from as few prefabricated sections as possible, but state highway and railroad clearance regulations limit the height and width of loads that can be carried over the highways and railroads. Also, there are the economical limitations of ocean shipments of masts, because the cost of such shipments is determined by volume. It follows that if a mast is to be assembled from only a few sections, the width of the mast must be as small as possible so that in shipment those sections will not be too wide nor too high for the highways, railroads, or ocean shipments. However, in a mast having a small base the customary practice is to hang the traveling block close to the front of the mast, so the well, which should be directly below the block, is located much closer to the front than the rear of the mast where the draw-works is located. Although this leaves sufficient working space behind the well, it does not leave as much clearance in front as desired. As it is the front legs that are hinged to the supporting structure, their lower portions can not be swung forward away from the well after the mast has been swung up into upright position to increase that clearance. Such a mast is less suitable for use with a substructure which raises its base several feet above the ground because, when the mast is in prone position extending substantially horizontally out from the substructure, it requires the men who are assembling or disassembling the mast to stand on scaffolding in order to reach it, and it also requires larger or longer hoisting equipment for handling the sections.

It is among the objects of this invention to provide an oil well mast structure of the character referred to above which includes a substructure; in which the mast can be assembled close to the ground and then swung up into upright position; in which the mast is relatively small in transverse section; and which has adequate clearance within its base all around the well.

In accordance with this invention, a mast is mounted on top of a substructure which is open inwardly from its front end so that it can straddle a well. The mast and substructure are located so that the center-line of the well is adjacent or in the front plane of the mast the rear legs of which straddle the draw-works mounted on the substructure behind the well. The rear legs are pivotally connected to the substructure while the front legs are detachably connected to supporting means mounted on the substructure. To provide adequate working space between the well and the front legs of the mast, the members that form the lower end portions of the front legs are inclined forwardly and/or laterally so that their feet are connected to the substructure a considerable distance in front of the front plane of the mast and/or beyond its sides. The lower end portions of the front legs preferably are pivoted to their upper portions. Thus, by disconnecting the front legs from the substructure and swinging them either up against their upper portions or back toward the rear legs, the mast is free to be swung forward and down until it extends substantially horizontally along the ground. The open or slotted front end of the substructure permits the lower portion of the mast to move down into the substructure and thereby lie close to the ground. The mast may be lowered by a cable supported by a gin pole mounted on the substructure above the draw-works. The mast is erected by reversing the procedure.

The invention is illustrated in the accompanying line drawings in which Fig. 1 is a side view of our mast structure in operative position; Fig. 2 is a rear view thereof; Fig. 3 is a side view showing the mast in its lowered position extending along the ground; Fig. 4 is a fragmentary plan view of Fig. 3; Fig. 5 is a transverse section taken on the line V—V of Fig. 4; and Fig. 6 is a fragmentary side view of a modified embodiment of the invention.

Referring to the drawings, a structural steel substructure 1 rests on the ground over the well 2 that is to be worked upon. Such a substructure generally is several feet in height. As shown in Fig. 4, the substructure has an open area 3 near its front that surrounds the well and extends out through the front end of the substructure. The bifurcated substructure thus formed therefore straddles the well, but its open front end may be closed temporarily by braces when the mast 4 is in operating position.

Mounted on the substructure directly behind the well is the usual draw-works 6 (Figs. 1 and 3) by which the cable 7 (shown in broken lines) that supports the traveling block 8 in the mast is reeled in and out. The mast itself is mounted on top of the substructure and is only wide enough at its bottom to permit its rear legs 9 to straddle the

draw-works. By making the mast as narrow as possible it can be divided into fewer sections when disassembled for transportation to a new location, and still stay within the load limits set by highway regulations.

In accordance with this invention the lower ends of the rear legs are detachably pivoted in hinge brackets 11 mounted on the substructure on opposite sides of the draw-works in a position that leaves plenty of working space between the well and the back of the mast. The result, however, is that the front plane of the mast is located so close to the well that with masts of this type known heretofore there would be but little working space between the well and front legs within the base of the mast. It is therefore an object of this invention to increase this working space by connecting the lower portion 12 of each front leg to its upper portion by a hinge joint, indicated at 13. This leaves lower portions 12 free to be swung relative to the rigid upper portions of the front legs. The lower ends of the front legs are detachably connected to brackets 14 mounted on the substructure a considerable distance in front of the mast and, preferably, somewhat outwardly beyond its sides. If desired, however, the brackets can be located in front of the mast in line with its sides, or beyond the sides but within the front plane of the mast. In any case, by inclining the lower portions of the front legs outwardly in this manner, as much working space is provided within the base of the mast in front of the well as behind it.

When it is desired to take down the mast and transport it to a new location, the front legs are disconnected from brackets 14 and pivoted portions 12 may be swung back against the main diagonal braces 15 at the lower end of the mast. The legs can be temporarily fastened to these braces in any suitable manner to hold them in their rear position. The weight of the mast is then supported entirely from hinge brackets 11 on which the mast can be swung forward and down to the ground.

Cable 7 and the draw-works are used for raising and lowering the mast. To provide an elevated support for the cable while it is employed for swinging the mast, a gin pole is mounted on the substructure directly behind the mast and it projects above the draw-works. The gin pole comprises substantially vertical members 16 fastened to hinge brackets 11, and diagonal bracing members 17 fastened to brackets 18 mounted on the substructure near the near end of the draw-works. These members are connected at the top by a cross member 19 (Figs. 2 and 4) which supports a sheave 20 engaged by cable 7. If desired, the top of the gin pole can be rigidly connected to the mast by suitable members 21 (Fig. 1) to help steady the mast. In preparation for lowering the mast, the traveling block 8 is hoisted up in the mast and a cable sling 23 (shown in broken lines in Figs. 1 and 3) is fastened temporarily to the bottom of the block and passed under a sheave 24 mounted in the center of the mast and over to the top of the gin pole to which the sling is anchored. As cable 7 is paid out by the draw-works in order to lower the traveling block, the mast swings forward, its weight being supported in part by the sling on which sheave 24 rests as shown in the broken line position of the mast in Fig. 1. Continued lowering of the traveling block tends to increase the slack in the sling which thereby permits the mast to swing down until it reaches the ground or comes to rest on temporary blocks (not shown) that support it in prone position. It will be noted that the open front end of the substructure permits the lower portion of the mast to enter the substructure so that the mast can lie close to the ground where it can easily be separated into its component prefabricated sections A, B, and C and transported to a new well site. To erect the mast, the lowering procedure just outlined is reversed.

In the modification shown in Fig. 6, the lower ends of the rear legs 26 of a mast are hinged to brackets 11 on the substructure 1, but the front legs 27 do not reach down to the substructure. Instead, the lower ends of the front legs are detachably connected at 28 to the central portions of the downwardly and forwardly inclined front legs 29 of a gin pole. The vertical rear legs 30 of the gin pole are attached to brackets 11, and the front legs extend down past the opposite sides of the mast with their lower ends connected to supporting brackets 14 mounted on the substructure in front of the mast. Adequate clearance in front of the well is thus provided. By disconnecting the mast from gin pole legs 29 at the connection 28, the mast can be swung forward and down to the ground in the same manner as the mast first described herein.

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. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, means detachably connecting the front legs to the substructure, and means for swinging the mast forward and down when said front legs are disconnected from the substructure, whereby the mast will extend out through said open front end of the substructure and along the ground.

2. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs extending outwardly in front of the front plane of the mast to provide increased clearance in front of the well within the derrick base, means detachably connecting the front legs to the substructure, and means for swinging the mast forward and down when said front legs are disconnected from the substructure, whereby the mast will extend out through said open front end of the substructure and along the ground.

3. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs being pivoted to their upper portions and extending outwardly in front of the front plane of the mast to provide increased

clearance in front of the well within the derrick base, means detachably connecting the front legs to the substructure, and means for swinging the mast forward and down when said front legs are disconnected from the substructure and swung back, whereby the mast will extend out through said open front end of the substructure and along the ground.

4. An oil well mast structure comprising a substrucutre for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs being hinged to their upper portions and extending outwardly in front of the front plane of the mast and laterally beyond the side planes of the mast to provide increased clearance in front of the well within the derrick base, means detachably connecting the front legs to the substructure, and means for swinging the mast forward and down when said front legs are disconnected from the substructure, whereby the mast will extend out through said open front end of the substructure and along the ground.

5. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, draw-works mounted on the substructure behind the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure on opposite sides of the draw-works, the lower ends of the front legs extending outwardly in front of the front plane of the mast to provide increased clearance in front of the well within the derrick base, means detachably connecting the front legs to the substructure, and means including a gin pole mounted on the substructure for swinging the mast forward and down when said front legs are disconnected from the substructure, whereby the mast will extend out through said open front end of the substructure and along the ground.

6. An oil well mast structure comprising a substructure adapted to straddle a well and being open from its front end inwardly to the well, a mast mounted on the substructure with its front plane much closer than its rear plane to the well, said mast having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs extending outwardly in front of said front plane to increase the clearance between the well and the lower portions of the front legs, means detachably connecting the front legs to the substructure, and means mounted on the substructure for swinging the mast forward and down when said front legs are disconnected from the substructure, whereby the mast will extend out through said open front end of the substructure and along the ground.

7. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs extending outwardly in front of the front plane of the mast to provide increased clearance in front of the well within the derrick base, means detachably connecting the front legs to the substructure, a gin pole mounted on the substructure behind the mast and detachably connected to the mast to steady it, and means cooperating with said gin pole for swinging the mast forward and down after said front legs have been disconnected from the substructure and the gin pole has been disconnected from the mast, whereby the mast will extend out through said open front end of the substructure and along the ground.

8. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, supporting means on the substructure, means detachably connecting the front legs to said supporting means, and means for swinging the mast forward and down when said front legs are disconnected from said supporting means, whereby the mast will extend out through said open front end of the substructure and along the ground.

9. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs extending outwardly relative to their upper portions to provide increased clearance in front of the well within the derrick base, means detachably connecting the front legs to the substructure, and means for swinging the mast forward and down when said front legs are disconnected from the substructure, whereby the mast will extend out through said open front end of the substructure and along the ground.

10. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, supporting means attached to the top of the substructure in front of the front plane of the mast, means detachably connecting the front legs to said supporting means, and means for swinging the mast forward and down when said front legs are disconnected from said supporting means, whereby the mast will extend out through said open front end of the substructure and along the ground.

11. An oil well mast structure comprising a substructure for straddling a well and open at its front end inwardly to the well, a mast mounted on top of the substructure and having front and rear legs, means hinging the rear legs to the substructure behind the well, the lower ends of the front legs being spaced from the top of the substructure, rigid members extending downwardly from the rear of the mast past its opposite sides to points in front of the front plane of the mast, means at said points connecting said members to the substructure, means independent of the mast supporting the upper ends of said members, means detachably connecting the lower ends of said front legs to said members, and means for swinging the mast forward and down when said front legs are disconnected from said members, whereby the mast will extend out through said open front end of the substructure and along the ground.

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