Oct. 9, 1951 H. J. WOOLSLAYER ET AL 2,570,901

MAST STRUCTURE

Filed Oct. 9, 1946 2 Sheets-Sheet 1

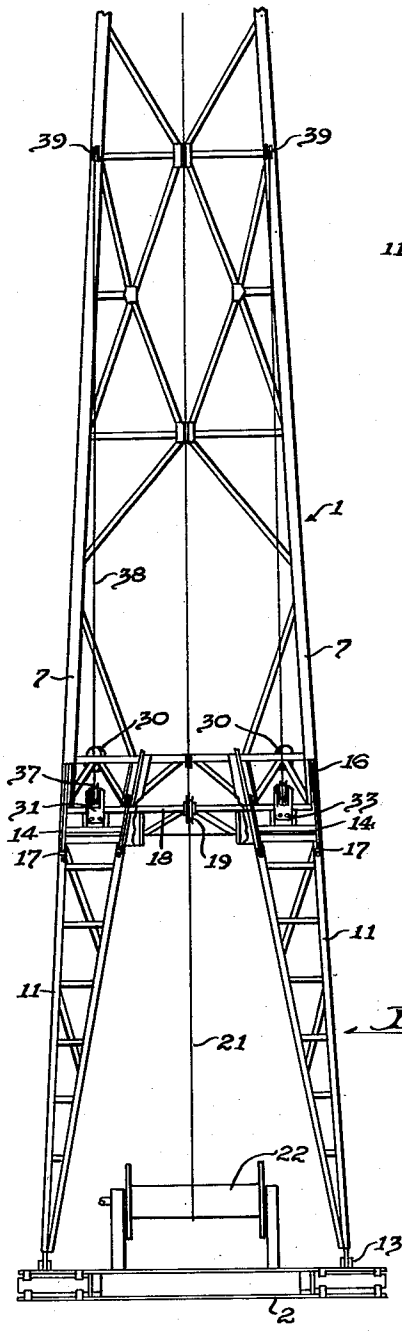


Fig. 1.

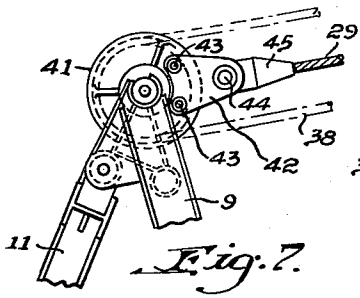


Fig. 7.

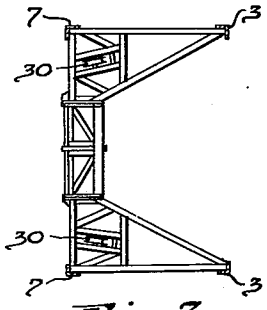


Fig. 3.

Fig. 2.

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MAST STRUCTURE

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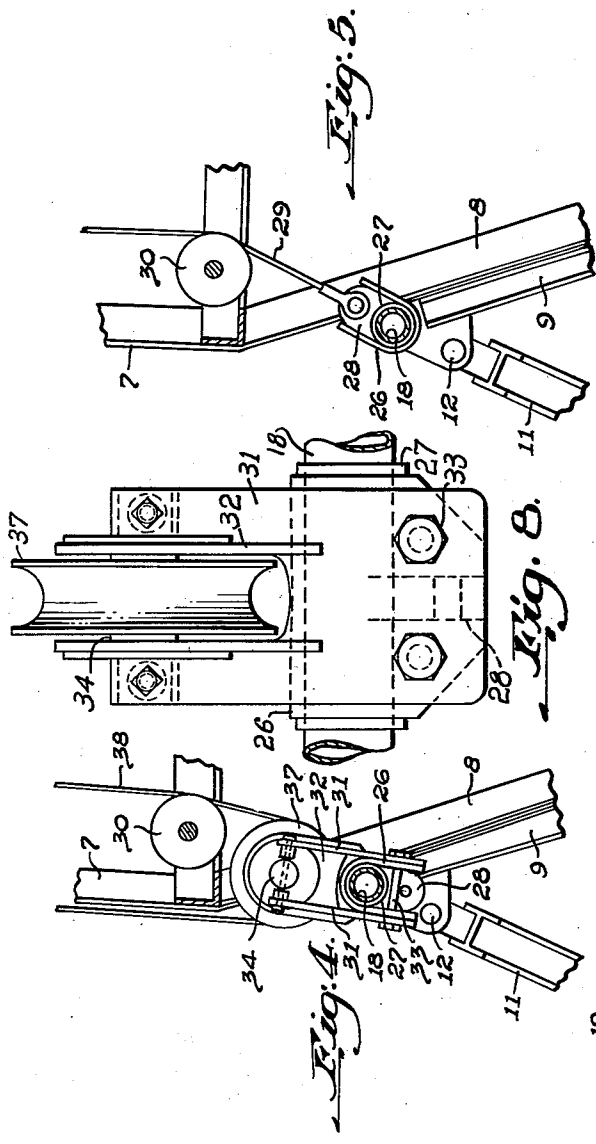


Fig. 5.

Fig. 8.

Fig. 4.

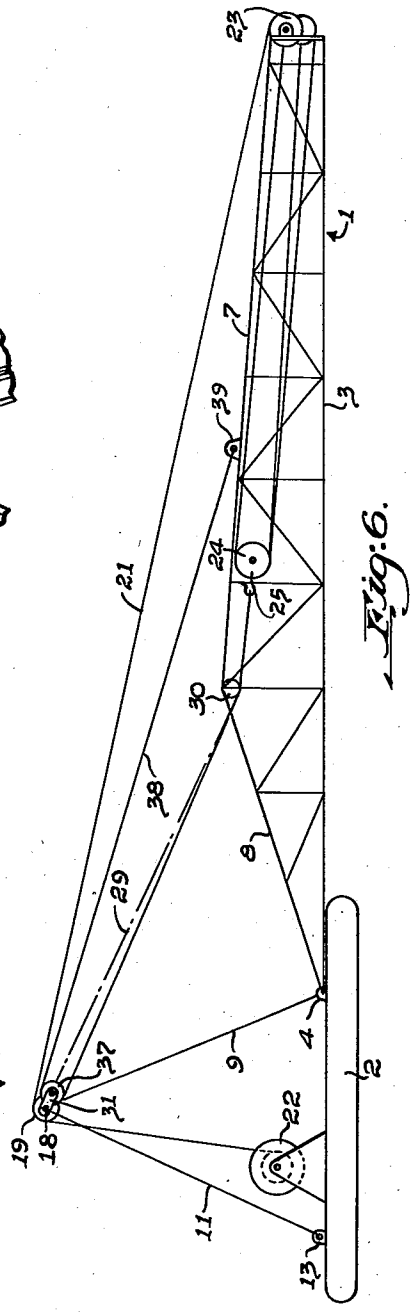


Fig. 6.

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UNITED STATES PATENT OFFICE

2,570,901

MAST STRUCTURE

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Application October 9, 1946, Serial No. 702,156

2 Claims. (Cl. 254—139)

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This invention relates to oil well derricks or mast structures which are adapted to be assembled in sections on the ground and then swung upwardly into upright position. The mast structure disclosed herein is an improvement on the one disclosed in our Patent No. 2,271,578.

It is among the objects of this invention to provide a mast structure in which either short or tall masts may be raised and lowered equally well, in which a mast can be swung into upright position safely, which can be converted quickly for handling either short or tall masts, and which can have maximum thickness consistent with highway transportation restrictions.

In accordance with this invention the foot of a mast is hinged to a base so that it can be swung upwardly from prone position to upright position after it has been assembled along the ground, and also can be swung back down again so that it can be moved to a new location. A line extends downwardly in the upright mast from its upper end and is connected to the usual drum for pulling the line up in the mast or lowering it therein. Mounted on the base beside the mast is a gin pole that is used in raising and lowering the mast.

The mast itself is variable in height. When it is short or of moderate height it can be swung up into operative position by means of a sling formed from a cable doubled upon itself. The ends of the cable are connected to the head of the gin pole while the opposite end of the sling is connected to the line inside the mast. When this line is pulled toward the head of the mast the sling raises the mast. The sling passes under sheaves mounted in the mast, preferably at about the level of the top of the gin pole when the mast is erect. If the height of the mast is increased, a longer sling is used in place of the one just mentioned. This sling is connected to the outside of the mast at points above the head of the gin pole when the mast is upright, and extends down around sheaves connected to the head of the pole and up into the mast where it is connected to the line mentioned before. These sheaves preferably are carried by members which are rotatably mounted on a horizontal axis in the head of the gin pole. The lower ends of the mast legs on the side adjacent the gin pole preferably terminate above the head of the pole by which they are supported when the mast is standing up.

The invention is illustrated in the accompanying drawings in which Fig. 1 is a view of the gin pole side of the lower portion of the mast;

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Fig. 2 is a side view of the structure; Fig. 3 is a horizontal section taken on the line III—III of Fig. 2, but with the gin pole and base not shown; Fig. 4 is an enlarged fragmentary sectional detail of the upper end of the gin pole and the adjoining portion of a tall mast; Fig. 5 is a view similar to the preceding figure but showing how the gin pole is used with a short mast; Fig. 6 is a diagrammatic view of this mast structure, with a tall mast about to be swung up into upright position from the ground; Fig. 7 is a fragmentary side view of the upper end of a gin pole provided with different means for connecting slings to it; and Fig. 8 is an enlarged front view of one of the sheave supporting members shown in Fig. 4.

Referring to the drawings, the foot of a vertical oil well derrick or mast 1 is mounted on a supporting base 2 so formed as to be slidable along the ground or transportable from one location to another as desired. The mast is made from prefabricated sections that have been assembled at the well site to form a mast extending along the ground, as shown in Fig. 6. It has a pair of legs 3, which only for convenience of description shall be called front legs, hinged to the base by means of brackets 4 and removable pivot pins 6, as shown in Fig. 2. The lower ends of the opposite or rear legs 7 of the mast are located a considerable distance above the base and are connected to the lower ends of the front legs by inclined braces 8.

The mast is swung up into erect position with the aid of a tapered gin pole that also supports the mast when it is upright. The gin pole is formed from legs, for convenience here called front and rear legs 9 and 11, respectively, which converge upwardly as shown in Fig. 2 and are hinged together at the top of the pole at points 12 so that the rear legs can be folded against the front legs when the mast is down. The lower ends of the front legs may be pivotally connected to pivot pins 6 in brackets 4, while the lower ends of the rear legs of the gin pole are detachably connected by means of pins 15 to shoes 13 mounted in the base behind the mast.

The inclined braces 8 at the bottom of the mast rest against the front of the tapered gin pole which thereby supports the mast in upright position. The mast is detachably connected to the gin pole by eye bolts 14 pivotally supported by plates 16 secured to the lower ends of the rear legs of the mast. The lower ends of these bolts are detachably connected to brackets 17 mounted on the upper ends of the rear legs of

the gin pole. The upper ends of the front legs of the gin pole are connected by a heavy tubular member 18 on the center of which a pulley 19 (Fig. 1) is rotatably mounted. A drilling line 21 extends upwardly from a drawworks drum 22 past this pulley to the crown block 23 (Fig. 6) and then down inside the mast where the line supports the usual traveling block 24 (Fig. 6) provided with a hook 25. During erection of the mast the drilling line passes over pulley 19 as shown in Fig. 6.

Rotatably mounted on each end of tubular member 18 is a bracket 26 formed, as shown in Figs. 4 and 5, by a U-shape plate in which is welded a short tube 27 that is rotatably mounted on member 18. The U-shape plate has parallel ends projecting from the tubes, and a center piece 28 is welded between those projecting ends. When a mast that is short or of moderate height is to be raised to operative position, a relatively short sling 29 is attached to these brackets and to the hook of the traveling block inside the mast. This sling is formed from a cable doubled upon itself with its ends detachably connected to the outer ends of center piece 28 as shown in Fig. 5. The sling, indicated in part by a broken line in Fig. 6, passes under a pair of sheaves 30 journaled in the mast near its rear legs and at about the level of their lower ends. The sling is looped over traveling block hook 25 inside the mast. When the drawworks drum is driven to reel in the drilling line, the traveling block moves toward the head or crown block of the mast and simultaneously pulls on the sling to shorten the distance between the head of the mast and the head of the gin pole. This combined action of line and sling raises the mast until it is erect.

The location of sheaves 30 at the lower ends of the rear legs of the mast places them but a short distance above the head of the gin pole when the mast is erect, as shown in Fig. 2. Consequently, as the rising mast approaches its seat on the gin pole the sling extends substantially horizontally from the pole to sheaves 30. This produces a gradual and substantially uniform pull on the mast so that it approaches the gin pole slowly instead of being more or less snapped against the pole as is the case when sheaves 30 are located farther up in the mast. Therefore, there is no danger of the mast striking the gin pole too hard and possibly causing it to collapse.

In case a tall mast is used, or mast sections are furnished for converting the short mast into a tall one, a different sling and some additional parts are employed for erecting the taller and heavier mast. Thus, parallel bearing arms 31, rigidly connected by parallel bearing plates 32, are secured to each bracket 26 by bolts 33 extending through holes in the parallel ends of the brackets. These arms project from the side of tubular member 18 opposite to center piece 28, and plates 32 support a pin 34 on which a sheave 37 is journaled. In place of sling 29, a long or double sling 38 is used. This sling likewise is formed from a cable doubled upon itself, but its free ends are connected to lugs 39 on the rear legs of the mast a considerable distance from their lower ends. The sling extends from these lugs to the gin pole where it passes around the sheaves 37, and then extends into the mast and around sheaves 30. The free end of the sling is looped over hook 25 of the traveling block.

This double sling is shown in full lines in Fig. 6 in readiness for raising the mast. When the drilling line 21 is wound up on drum 22, the traveling block pulls the free end of the sling toward the head of the mast and, in obvious manner, swings the mast up into operative position against the gin pole to which it then is fastened by eye bolts 14, as shown in Fig. 2. The sling then is removed from the traveling block, and the gin pole sheaves 37 and their supporting arms can be removed from brackets 26, or they can be allowed to swing down into the gin pole until it is desired to lower the mast. They likewise can be removed from the brackets if the height of the mast is reduced so that the multiple pulley advantage of the double sling line no longer is needed.

In Fig. 7 a different way of connecting the slings to the top of the gin pole is shown. Thus, a sheave 41 is rotatably mounted in the upper end of each side of the gin pole and is provided with a pair of transverse openings to which a bracket 42 may be detachably connected by removable pins 43. The outer end of each bracket is pivotally connected by a pin 44 to a terminal member 45 secured to an end of cable sling 29, by which short masts are raised and lowered as previously described. When a tall mast is to be raised, pins 43 are removed in order to disconnect brackets 42 from sheaves 41 which then are free to rotate. The long sling 38, shown in broken lines, then can be passed around the two sheaves.

It will be noted in Fig. 2 that the point 12 at which the front and rear legs of the gin pole are hinged together is substantially directly below the lower ends of the rear legs 7 of the mast and is as close as those lower ends to the front legs 3 of the mast. It also will be seen that the head of the gin pole does not project an appreciable amount behind a vertical plane parallel to the front of the mast and passing through the most rearward point of the mast, which is at the rear edges of plates 16 at the heel of the mast. In this arrangement, with the head of the gin pole beneath the heel of the mast, the combined thickness of mast and gin pole from front to back through the head of the gin pole when it is folded against the mast is substantially no greater than the thickest part of the mast, which is above the gin pole. The reason for this arrangement is to permit the mast to be thicker at the heel than otherwise would be allowed. That is, in transporting these masts in sections on trucks over highways, the lower sections generally are laid on their sides with the gin poles folded against them, it being the practice to leave the gin poles attached to the masts. As there are highway restrictions which limit the width of truck loads, usually to eight feet, if the head of the gin pole is located behind the rear legs of the mast the thickest part of the mast must be enough less than eight feet through to allow for the thickness of the gin pole head. In other words, the combined maximum thickness of mast and folded gin pole must not exceed the highway limitation. By locating the head of the gin pole beneath the heel of the mast in the manner disclosed in the drawings, the mast can be approximately eight feet thick at the heel because the folded gin pole does not add to the thickness of the mast and therefore does not have to be taken into account.

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 mast structure intended for use with both short and tall masts that are designed to be swung up into upright position from prone position with the help of cable slings extending into the masts, said structure comprising a base, means on the base adapted to hinge the foot of a mast thereto, a gin pole mounted on the base behind said hinging means, a pair of laterally spaced brackets pivotally mounted on a horizontal axis at the head of the gin pole and having projecting ends adapted to be connected to the opposite ends of a cable which has been doubled upon itself to form a sling for swinging a short mast upward, supporting means connected to each bracket and having an end projecting therefrom, and sheaves journaled in the projecting ends of said supporting means so that a sling can extend from inside a tall mast and around the sheaves to anchor points on the back side of that mast when it is desired to raise a tall mast instead of a short one.

2. A mast structure intended for use with both short and tall masts that are designed to be swung up into upright position from prone position with the help of cable slings extending into the masts, said structure comprising a base, means on the base adapted to hinge the foot of a mast thereto, a gin pole mounted on the base behind said hinging means, a pair of laterally spaced brackets pivotally mounted on a horizontal axis at the head of the gin pole and having projecting ends formed for connection to the opposite ends of a cable which has been doubled upon itself to form a sling for swinging a short mast upward, supporting means detachably connected to each bracket and having an end projecting therefrom in the direction opposite to said projecting end of the bracket, and sheaves journaled in the projecting ends of said supporting means so that a sling can extend from inside a tall mast and around the sheaves to anchor points on the back side of that mast when it is desired to raise a tall mast instead of a short one.

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