

June 9, 1964

H. J. WOOLSLAYER ETAL

3,136,394

PORTABLE OIL WELL DRILLING APPARATUS

Filed Dec. 9, 1960

6 Sheets-Sheet 1

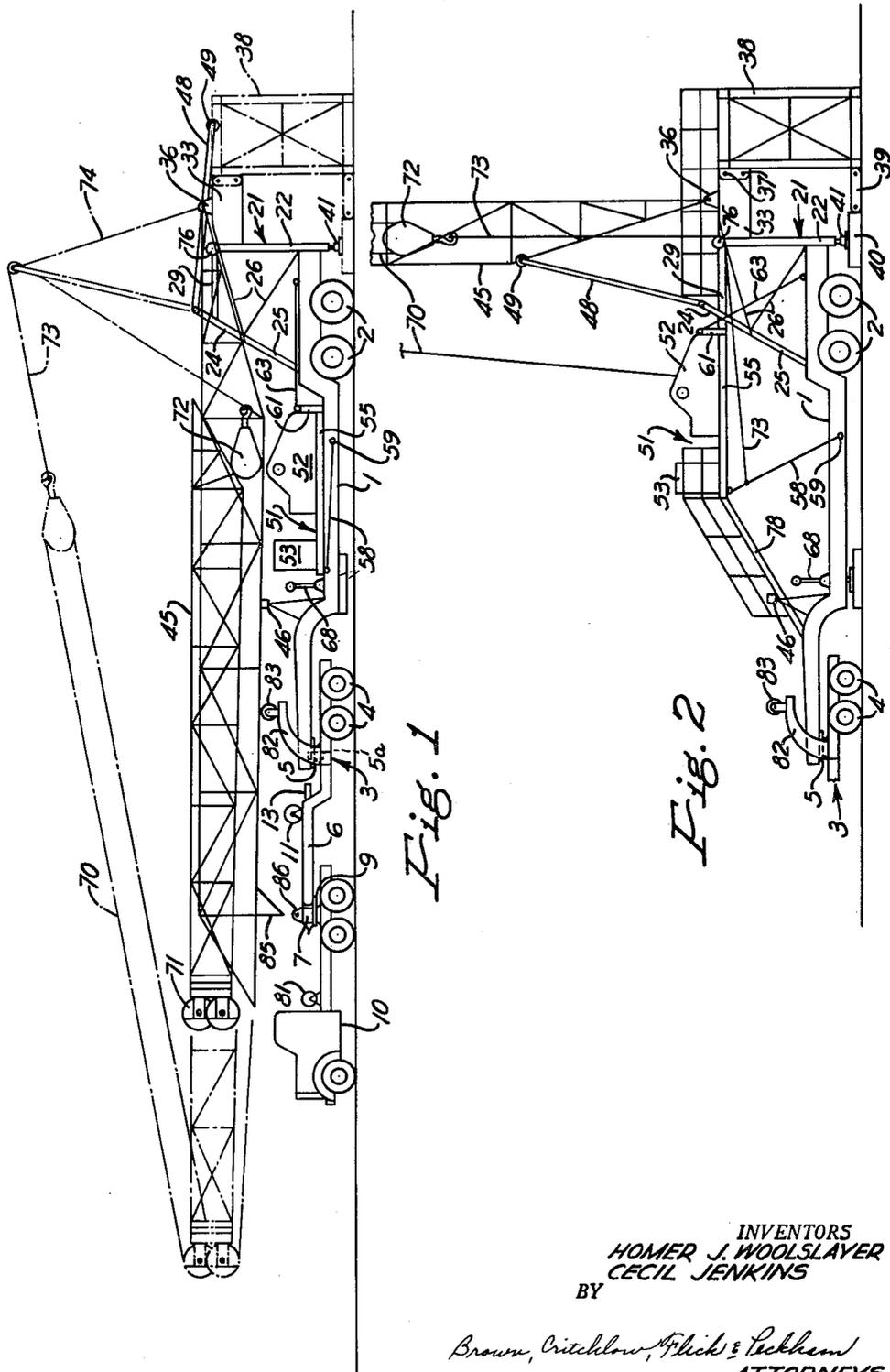


Fig. 1

Fig. 2

INVENTORS  
HOMER J. WOOLSLAYER  
CECIL JENKINS  
BY

Brown, Critchlow, Flick & Peckham  
ATTORNEYS

June 9, 1964

H. J. WOOLSLAYER ET AL

3,136,394

PORTABLE OIL WELL DRILLING APPARATUS

Filed Dec. 9, 1960

6 Sheets-Sheet 2

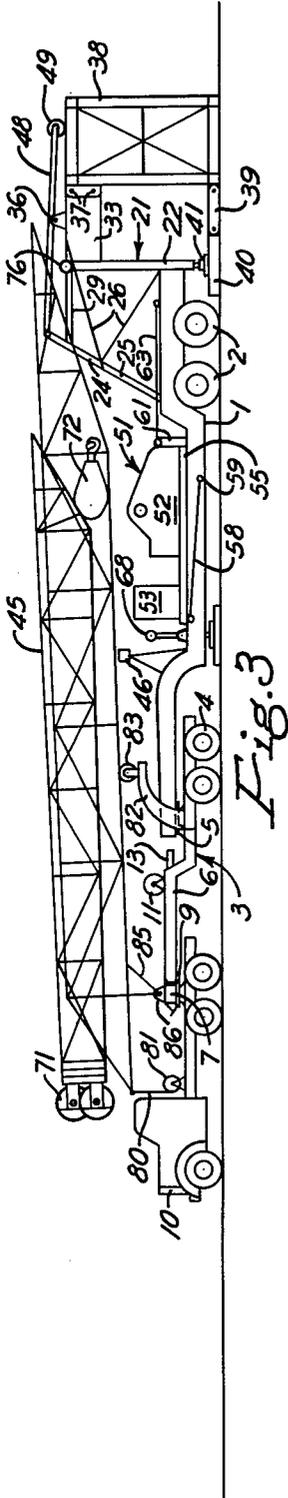


Fig. 3

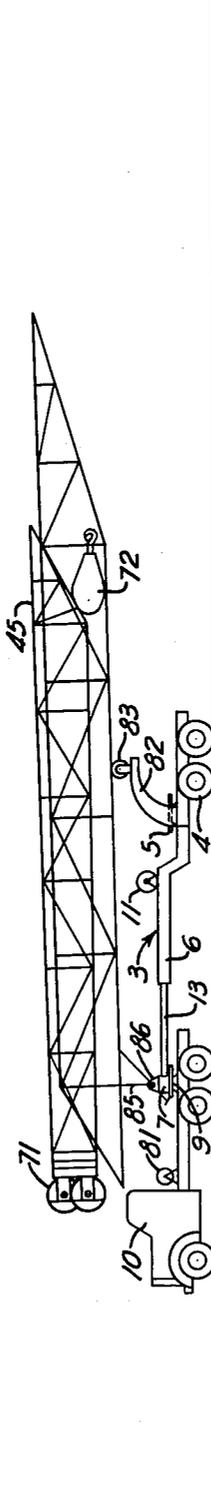


Fig. 4

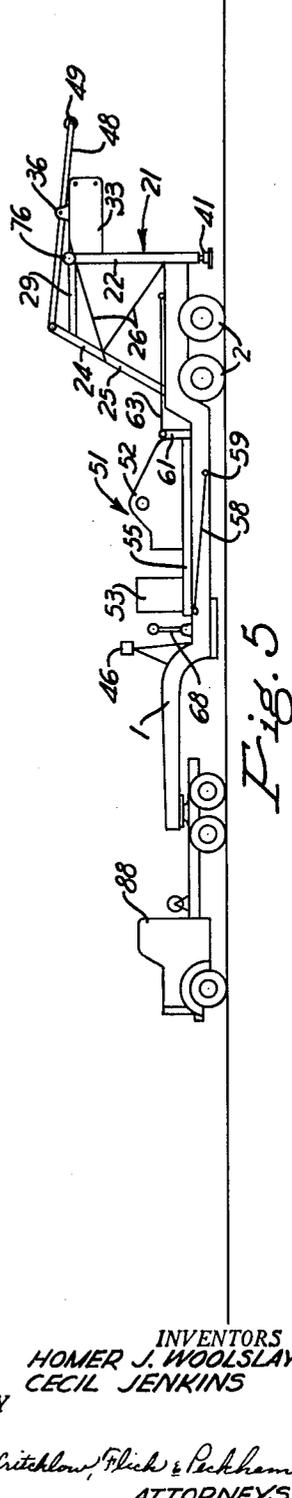


Fig. 5

INVENTORS  
HOMER J. WOOLSLAYER  
CECIL JENKINS  
BY

Brown, Critchlow, Flick & Peckham  
ATTORNEYS

June 9, 1964

H. J. WOOLSLAYER ET AL

3,136,394

PORTABLE OIL WELL DRILLING APPARATUS

Filed Dec. 9, 1960

6 Sheets-Sheet 3

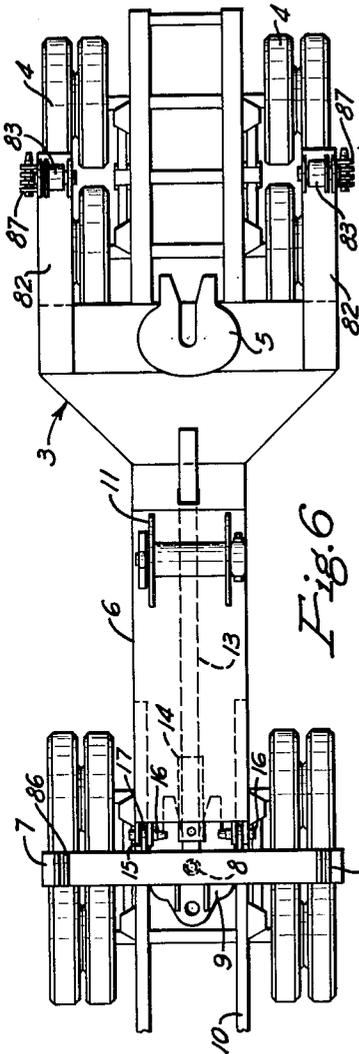


Fig. 6

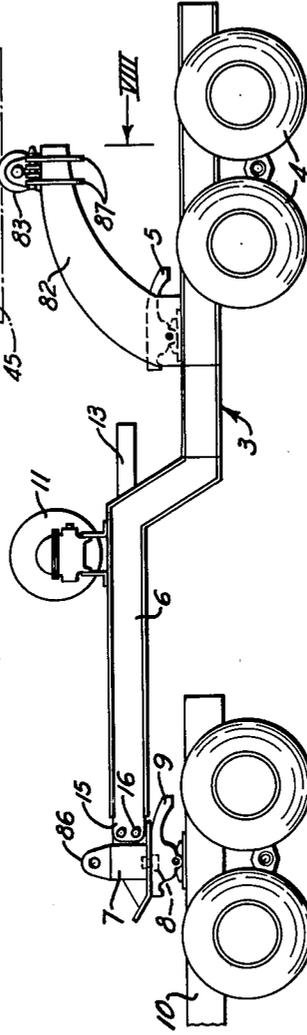


Fig. 7

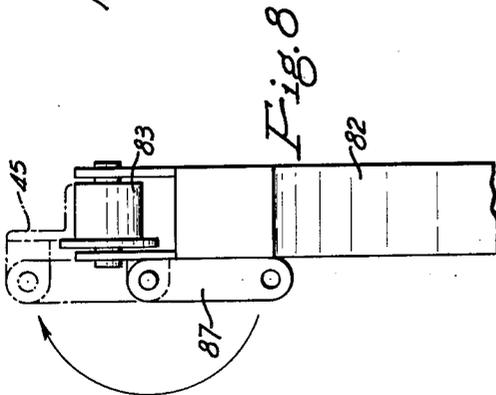


Fig. 8

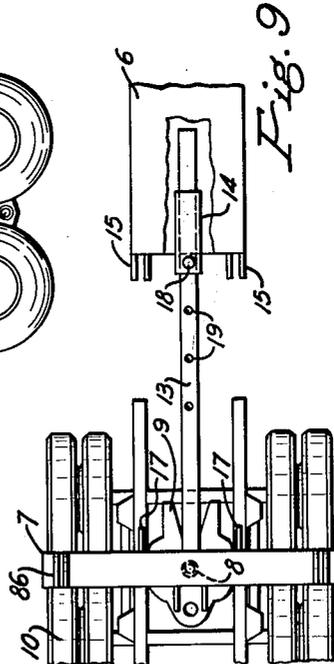


Fig. 9

INVENTORS  
 HOMER J. WOOLSLAYER  
 CECIL JENKINS  
 BY

Brown, Critchlow, Fitch & Leckman  
 ATTORNEYS



June 9, 1964

H. J. WOOLSLAYER ETAL

3,136,394

PORTABLE OIL WELL DRILLING APPARATUS

Filed Dec. 9, 1960

6 Sheets-Sheet 5

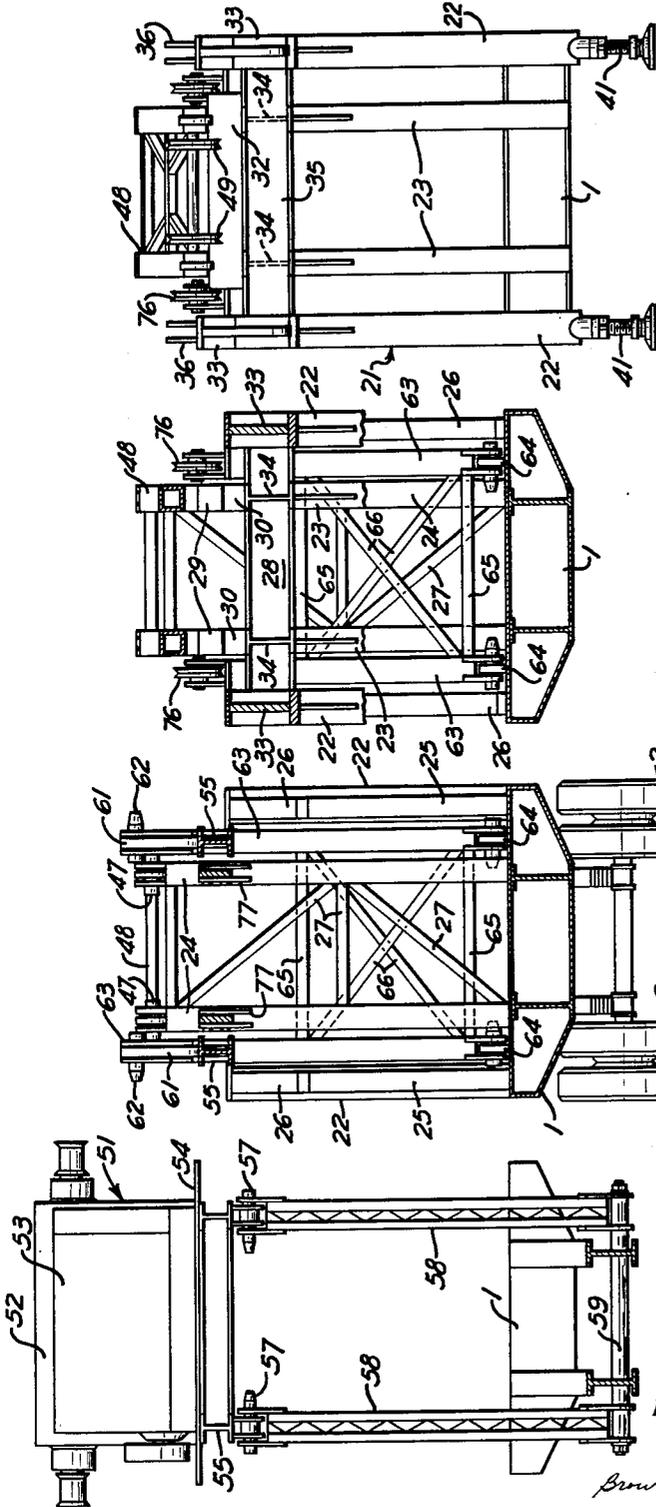


Fig. 14

Fig. 13

Fig. 12

Fig. 11

INVENTORS  
HOMER J. WOOLSLAYER  
CECIL JENKINS

BY

*Brown, Critchlow, Phipps & Robinson*  
ATTORNEYS

June 9, 1964

H. J. WOOLSLAYER ETAL

3,136,394

PORTABLE OIL WELL DRILLING APPARATUS

Filed Dec. 9, 1960

6 Sheets-Sheet 6

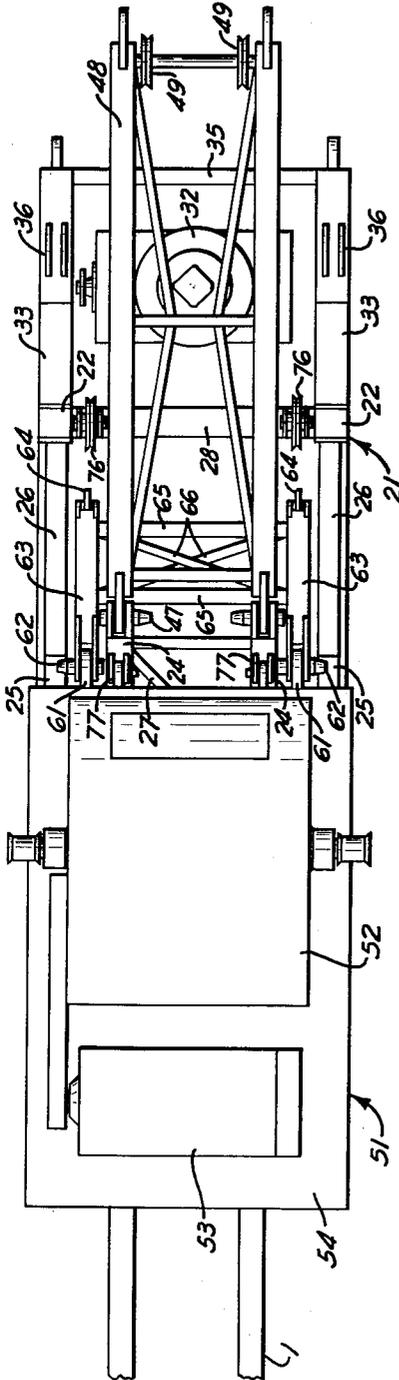


Fig. 15

INVENTORS  
HOMER J. WOOLSLAYER  
CECIL JENKINS  
BY

*Brown, Critchlow, Flick & Lockman*  
ATTORNEYS

1

3,136,394

**PORTABLE OIL WELL DRILLING APPARATUS**

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

Filed Dec. 9, 1960, Ser. No. 74,869

9 Claims. (Cl. 189-11)

This invention relates to trailer mounted oil well drilling equipment, and more particularly to means for transporting the equipment and setting it up for operation.

Trailer mounted oil well drilling masts are becoming more and more popular because it is so much easier and cheaper to erect them, take them down and carry them to new locations than to use trucks and trailers merely as transportation vehicles, from which the masts have to be unloaded at every drilling site. It also is desirable to carry the drawworks on the same trailer as a mast, but heretofore the drawworks has been permanently mounted at a low level on the trailer, which is undesirable because it limits the distance the rotary table can be spaced from the ground. Moreover, as the masts become taller and the drawworks heavier, the trailer loads become so heavy that they often cannot be transported over public roads because of highway load restrictions. In such cases a mast may have to occupy one trailer while the drawworks is carried by another trailer, with each trailer hauled by a different tractor. On the other hand, there are situations, such as on cross-country hauls or over desert roads, where the mast and drawworks could be carried on the same trailer, regardless of weight, thereby simplifying the transportation problem and materially reducing its cost.

It is among the objects of this invention to provide portable oil well drilling apparatus, in which a mast and drawworks are mounted on the same trailer and may be transported by it, in which the mast may readily be transferred from that trailer to another trailer when necessary for lightening the load, and in which the drawworks can be raised from a low position on the trailer to a high position at the level of the floor of a tall substructure.

In accordance with this invention a semi-trailer frame has wheels at its rear end and a king pin at its front end. A dolly supports the front end of the frame and is provided with means detachably receiving the king pin. Means are provided for detachably connecting the front end of the dolly to the fifth wheel of a tractor for pulling the dolly and trailer together. Mounted on the rear end of the trailer frame is a mast support, to which the rear end of a reclining mast is detachably hinged. The frame has a drawworks-receiving area in front of the mast support. The mast projects from the front end of the frame. A central support is mounted on the trailer frame in front of the drawworks area to support the reclining mast. In front of frame there is a front support for detachably connecting the reclining mast with the fifth wheel of the tractor when it is desired to pull the dolly and mast without the trailer. When the mast is detached from the rear mast support, the dolly has means for supporting the mast. With this arrangement the tractor can pull either the dolly and trailer together, with the mast and drawworks supported by the trailer, or it can pull the dolly alone, with the mast carried by the dolly. In the latter case the trailer may be pulled by another tractor. Front end rear links extend lengthwise of the trailer and have their front ends pivotally connected on transverse axes to the front and rear ends, respectively, of the drawworks units resting on the trailer frame. The rear ends of the links are pivotally connected on transverse axes to the trailer at longitudinally spaced points. Means are provided for swinging the drawworks unit upward

2

on the links to an elevated horizontal position, where the unit is locked in place during drilling of the well.

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

FIG. 1 is a side view of our drilling apparatus ready for hauling as a single unit;

FIG. 2 is a fragmentary side view showing the mast and drawworks in operative position;

FIG. 3 is a side view of the apparatus showing the mast transferred from the trailer to the dolly;

FIG. 4 is a side view of the mast being hauled on the dolly;

FIG. 5 is a side view of the mastless trailer being hauled by another tractor;

FIG. 6 is an enlarged plan view of the dolly connected to the fifth wheel of a tractor;

FIG. 7 is a side view of the dolly and rear end of the tractor;

FIG. 8 is an enlarged fragmentary rear view of one of the mast supports on the dolly;

FIG. 9 is a fragmentary plan view of the dolly tongue extended;

FIG. 10 is an enlarged fragmentary side view of the trailer with the drawworks in its upper position;

FIGS. 11, 12 and 13 are vertical sections taken on the lines XI—XI, XII—XII and XIII—XIII, respectively of FIG. 10;

FIG. 14 is a view of the rear end of the trailer; and

FIG. 15 is a fragmentary plan view of the trailer.

Referring to FIG. 1 of the drawings, a semi-trailer frame 1, preferably with its central portion depressed to provide as low a center of gravity as possible, has its rear end supported by tandem wheels 2. The front end of the trailer frame is supported by a dolly 3 that likewise includes tandem wheels 4. The connection between the trailer and dolly may be by means of a fifth wheel 5, which may be mounted on either the dolly or the trailer without affecting this invention. It is shown mounted on the dolly with the trailer king pin 5a extending down into it. The dolly includes a forwardly extending gooseneck 6, having at its front end a cross-tree 7 provided with a central king pin 8 (FIGS. 6 and 7) extending down into a fifth wheel 9 on the back of a tractor 10. Here again the fifth wheel and pin can be reversed if desired. The gooseneck may carry a wire line storage spool 11. It will be seen that the tractor pulls what amounts to two semi-trailers arranged in tandem.

The dolly can be located farther behind the tractor, as shown in FIG. 4 by inserting a separate tongue between cross-tree 7 and the gooseneck or, as shown in FIGS. 6 and 9, by originally providing the dolly with a tongue 13 rigidly connected at its front end to the center of the cross-tree. The tongue is telescoped in the gooseneck, such as in a sleeve 14 rigidly mounted in the front end of the gooseneck. The gooseneck has forwardly projecting brackets 15 that are connected by removable pins 16 to lugs 17 on the back of the cross beam. When the pins are removed and the tractor moved ahead to pull the tongue forward in sleeve 14, the dolly and tractor can be spaced the desired distance apart by inserting a pin 18 through the front end of the sleeve into one of a series of holes 19 through the tongue, as shown in FIG. 9.

Rigidly mounted on the back of the trailer over its wheels 2 is a superstructure 21, which, as shown in FIGS. 10, 12, 13, 14 and 15, includes a row of vertical columns 22 and 23 across the back of the trailer, inclined columns 24 between inclined posts 25, in front of the vertical columns, side braces 26 connecting the tops of the posts with columns 22, braces 27 connecting the inclined columns, a cross beam 28 connecting the upper ends of the verti-

cal columns, and box beams 29 extending rearwardly from the inclined columns and rigidly mounted on blocks 30 secured to the top of cross beam 28. Projecting rearwardly from columns 22 and cross beam 28 is a support for a rotary table 32, the support including parallel beams 33 and 34 connected at their outer ends by a rear beam 35. The rotary table is mounted on beams 34. Secured to the top of the side beams 33 are mast-receiving shoes 36. The rear end of the table support is adapted to be connected by removable pins 37 with a separate substructure 38 resting on the ground, as shown in FIG. 2. When that occurs, the bottom of the substructure may be connected by links 39 with pads 40 that support jacks 41 carried by the lower ends of vertical columns 22 in order to take the load off the trailer wheels.

As shown in FIGS. 1 and 2, a reclining mast 45 has its feet pivotally mounted in shoes 36 and extends forward over the trailer and dolly. It will usually be a telescoped mast, in which the upper section extends through the major portion of the lower section in a well known manner. The mast is supported substantially horizontally by a central support 46 mounted on the trailer in front of its depressed central portion. Hinged by pins 47 to the upper ends of inclined columns 24, shown in FIGS. 10, 12, and 15, are the feet of a reclining gin pole 48 that extends backward therefrom across the rotary table and projects from the rear end of the trailer. The top or rear end of the gin pole is provided with a pair of sheaves 49. In this specification the front and back of the different elements are described relative to the front and back of the trailer.

Resting on the central part of the trailer frame during transportation is a drawworks unit 51, which includes a drawworks 52 and its operating engine 53 mounted on a floor 54 secured to a framework 55. As shown in FIGS. 10 and 11, the front end of the framework is pivotally connected by transverse pins 57 to the front or upper ends of a pair of links 58 that extend backward along the outside of the trailer frame and have their rear ends pivotally mounted on the projecting ends of a trunnion 59 extending through the frame. The rear end of the drawworks framework supports upwardly extending bars 61, the upper ends of which are connected by pivot pins 62 to the front or upper ends of a pair of links 63 that extend back over the trailer and have their rear ends pivotally connected to brackets 64 mounted on the trailer frame over the wheels. These two rear links are braced by suitable cross braces 65 and diagonal braces 66 to form a rigid unit as shown in FIGS. 12 and 13.

In FIG. 1 of the drawings the complete drilling rig is mounted on the trailer, which is attached to the dolly. The dolly is connected to the tractor for pulling the dolly and trailer as a unit. The parts shown in full lines are ready for transportation as a single load or, if the outfit has just arrived at a new drilling site, it is ready to be connected to a substructure. Before that is done, the jacks 41 at the back of the trailer are run down onto the pads 40 on the ground to take the load off the back wheels as shown in FIG. 2, and another jacking mechanism 68 directly in front of the drawworks unit is operated to press against the ground and thereby raise the trailer slightly to bear the weight of its front end. The rotary table support then is connected by pins 37 to substructure 38, which is also connected by links 39 to the rear pads 40.

The next step is to extend the mast forward, which may be done in any conventional manner. With the drilling line 70 strung on the crown block 71 and the traveling block 72, and with the fast line connected to drawworks 52, the traveling block is hooked onto a sling 73 that extends back and down around sheaves 49 at the rear end of the gin pole and then forward to the heel of the mast. By operating the drawworks, the traveling block will pull the sling and swing the gin pole up to its

upper position after it has been pushed up above horizontal position, as shown in dotted lines in FIG. 1. The pole will be stopped in correct elevated position by a tension member 74. Continued operation of the drawworks will therefore cause the sling to swing the mast up in a well known manner toward and past the gin pole to an upright position, where it will be rigidly connected to the gin pole for support as shown in FIG. 2. If the effort required to raise the mast tends to lift the drawworks unit from the trailer frame, the drawworks should be bolted down to the trailer temporarily.

After the mast has been erected, the traveling block is lowered in the mast and sling 73 is disconnected from the mast and directed down around the back of a pair of sheaves 76 mounted on top of cross beam 28 of superstructure 21 on the trailer. From there the sling is extended forward and connected with the drawworks unit, preferably to front links 58 a short distance from their front ends. Upon operating the drawworks again, the traveling block is elevated to pull the sling up into the mast and thereby swing links 58 and 63 upward and back toward the superstructure as shown in FIG. 2. Of course, this will lift the drawworks unit. At the same time the pull of the drawworks on the fast line will help to lift the unit. The links are of such length and so arranged relative to each other that when the drawworks unit reaches its upper position its framework 55 will be horizontal. The rear end of the framework then is connected to brackets 77 projecting from inclined columns 24 as shown in FIGS. 10 and 12. This will hold the drawworks unit up, but to brace it there a brace is inserted between the front end of its framework and the front portion of the trailer. A stairway 78 (FIG. 2) that is used for reaching the floor of the drawworks unit can be used as this brace. In its upper position, the drawworks floor is at the level of the superstructure and substructure floors (not shown), in a position suitable for driving the rotary table.

Following completion of drilling, the erection steps recited above are reversed to lower the drawworks unit onto the trailer and to swing the mast and gin pole back down to their reclining positions. The rig is now ready to be taken to another location by tractor 10. However, if the weight of the load is too great for a single load on the road that must be traveled, the load can be split up between the dolly and the trailer. This is done, as shown in FIG. 3, by first disconnecting the feet of the mast from shoes 36, and then tilting down the front end of the reclining mast to rock it on central support 46 and shift it therefrom to a support on the dolly 3. The tilting can be accomplished by a short line 80 connected to the mast above the tractor and extending down to a winch 81 on the tractor.

As shown in detail in FIGS. 6, 7 and 8, the mast support on the dolly consists of two upwardly and rearwardly curved arms 82, the upper ends of which support rollers 83 that receive the lower legs of the mast. The reclining mast is provided with a pair of downwardly extending supports 85 that are pinned to brackets 86 on the opposite ends of the dolly crosstree 7 after the mast has been tilted onto rollers 83. After making this connection the gooseneck of the dolly is disconnected from the crosstree and the tractor is driven ahead to extend tongue 13 and simultaneously pull the mast forward on its supporting rollers so that it will be balanced better on the tractor and dolly and not project too far from the back of the dolly. The gooseneck then is fastened to the extended tongue by pin 18, and the mast is clamped onto roller 83 by links 87 pivoted to supporting arms 82 as indicated in FIG. 8. Then the dolly can be pulled forward to remove it from the trailer so that the tractor and dolly can carry the mast alone to a new location, as shown in FIG. 4. As shown in FIG. 5, another tractor 88 is connected to the front end of the trailer, which likewise is hauled to the new location. Since the trailer

carries only the drawworks unit and not the mast, it will not be too heavy for the road. At the new drilling site the transfer steps just recited may be reversed in order to disconnect the mast from the tractor and dolly and reconnect it to shoes 36 at the back of the trailer. The mast then can be erected as previously described.

It will be seen that with this apparatus a great deal of time and expense can be saved in rigging-up, taking down, and transportation from one location to another. The costs of such operations often are a major expense in oil well drilling today, so the industry is greatly interested in anything that will reduce that expense. The apparatus disclosed herein can effect large savings.

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. Portable oil well drilling apparatus comprising a semi-trailer frame having wheels at its rear end and a king pin at its front end, a dolly supporting the front end of the frame and provided with means detachably receiving said pin, means for detachably connecting the front end of the dolly to the fifth wheel of a tractor for pulling the dolly and trailer, a mast support mounted on the rear end of said frame, a reclining mast extending lengthwise of the trailer and projecting from its front end, means detachably hinging the rear end of the mast to said support, the trailer frame having a drawworks-receiving area in front of said support, a central support mounted on said frame in front of said area to support the reclining mast, a front support in front of the trailer frame for detachably connecting the reclining mast with said fifth wheel when it is desired to pull the dolly and mast without the trailer, and means on the dolly for supporting the mast when the mast is detached from said rear mast support.

2. Portable oil well drilling apparatus according to claim 1, including a tongue for increasing the length of the dolly when the mast is being carried by the dolly.

3. Portable oil well drilling apparatus according to claim 1, in which last-mentioned means extend upward past opposite sides of the overlying trailer frame in spaced lateral relation therewith.

4. Portable oil well drilling apparatus according to claim 1, in which said central support is high enough to space the reclining mast from said last-mentioned means while the mast is hinged to said rear support.

5. Portable oil well drilling apparatus comprising a semi-trailer frame having wheels at its rear end and a king pin at its front end, a dolly supporting the front end of the frame and provided with means detachably receiving said pin, means including a cross beam for detachably connecting the front end of the dolly to the fifth wheel of a tractor for pulling the dolly and trailer, a mast support mounted on the rear end of said frame, a reclining mast extending lengthwise of the trailer and projecting from its front end, means detachably hinging the rear end of the mast to said support, the trailer frame having a drawworks-receiving area in front of said support, a central support mounted on said frame in front of said area to support the reclining mast, a front support secured to the reclining mast in front of the trailer frame and extending downward from the mast, brackets mounted on the opposite ends of said cross beam, means for detachably connecting said front support to said brackets when the mast is detached from said rear mast support, and means on the dolly for supporting the mast when the mast is detached from said rear support.

6. Portable oil well drilling apparatus comprising a semi-trailer frame having wheels at its rear end and a king pin at its front end, a dolly supporting the front

end of the frame and provided with means detachably receiving said pin, a tongue telescoped in the dolly, a connecting member secured to the front end of the tongue for detachably connecting it to the fifth wheel of a tractor, means detachably connecting the front end of the dolly to said member, means for securing the dolly to the tongue when the dolly is disconnected from said member, a mast support mounted on the rear end of said frame, a reclining mast extending lengthwise of the trailer and projecting from its front end, means detachably hinging the rear end of the mast to said support, the trailer frame having a drawworks-receiving area in front of said support, a central support mounted on said frame in front of said area to support the reclining mast, a front support in front of the trailer frame for detachably connecting the reclining mast with said connecting member when it is desired to pull the dolly and mast without the trailer, and means on the dolly for supporting the mast when the mast is detached from said rear mast support.

7. Portable oil well drilling apparatus according to claim 6, in which said connecting member is a cross beam provided with a central king pin on its bottom and brackets on its top for receiving said front supports.

8. Portable oil well drilling apparatus comprising a semi-trailer frame having wheels at its rear end and a king pin at its front end, a dolly supporting the front end of the frame and provided with means detachably receiving said pin, means for detachably connecting the front end of the dolly to the fifth wheel of a tractor for pulling the dolly and trailer, a mast support mounted on the rear end of said frame, a reclining mast extending lengthwise of the trailer and projecting from its front end, means detachably hinging the rear end of the mast to said support, the trailer frame having a drawworks-receiving area in front of said support, a central support mounted on said frame in front of said area to support the reclining mast, a front support in front of the trailer frame for detachably connecting the reclining mast with said fifth wheel when it is desired to pull the dolly and mast without the trailer, and means on the dolly for supporting the mast when it is detached from said rear mast support, said last-mentioned means including mast-supporting rollers and means for detachably connecting a mast resting on said rollers to the underlying supporting means.

9. Portable oil well drilling apparatus comprising a semi-trailer frame having wheels at its rear end and a king pin at its front end, a dolly supporting the front end of the frame and provided with means detachably receiving said pin, means for detachably connecting the front end of the dolly to the fifth wheel of a tractor for pulling the dolly and trailer, a mast support mounted on the rear end of said frame, a reclining mast extending lengthwise of the trailer and projecting from its front end, means detachably hinging the rear end of the mast to said support, a central support mounted on the forward part of said frame to support the reclining mast, a drawworks unit resting on the frame beneath the mast between said mast supports for swinging the mast up to upright position, front and rear links extending lengthwise of the trailer, means pivotally connecting the front ends of the links on a transverse axis to the front and rear ends of said unit respectively, means pivotally connecting the rear ends of the links on a transverse axis to the trailer at longitudinally spaced points, means for swinging said unit upward on the links to an elevated position after the mast has been raised, the links being of a length to hold the elevated unit substantially horizontal, means for locking the unit in said elevated position, a front support in front of the trailer frame for detachably connecting the reclining mast with said fifth wheel when it is desired to pull the dolly and mast without the trailer and drawworks unit, and means on the dolly for supporting the mast when the mast is detached from said rear mast support.

(References on following page)

7

References Cited in the file of this patent

UNITED STATES PATENTS

2,128,712	Neff -----	Aug. 30, 1938
2,153,468	Heyn -----	Apr. 4, 1939
2,249,907	Perkowski -----	July 22, 1941
2,595,307	Selberg -----	May 6, 1952

2,787,342
2,847,097
2,919,928
2,964,117
2,982,563
2,993,570

5

8

Jenkins et al. -----	Apr. 2, 1957
Moore -----	Aug. 12, 1958
Hoffer -----	June 5, 1960
Bender -----	Dec. 13, 1960
Gregg -----	May 2, 1961
Bender -----	July 25, 1961