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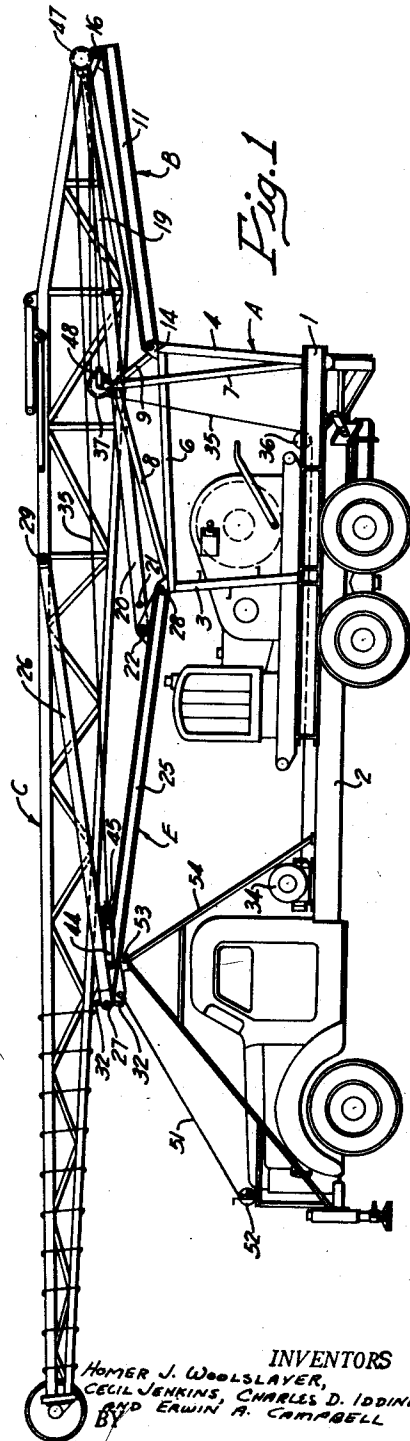
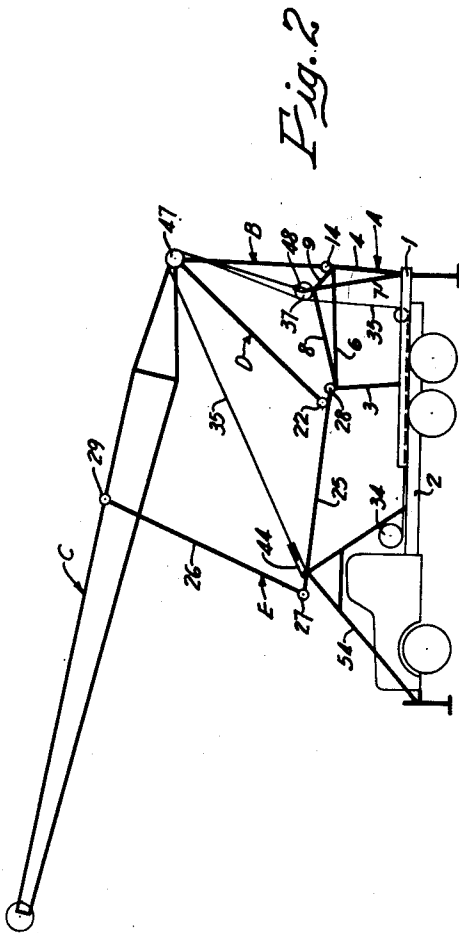
H. J. WOOLSLAYER ET AL

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PORTABLE WELL SERVICING EQUIPMENT

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2 Sheets-Sheet 1



INVENTORS
HOMER J. WOOLSLAYER,
CECIL JENKINS, CHARLES D. IDDINGS
AND ERWIN A. CAMPBELL
BY
Brown, Critchlow, Flick & Leckham
THEIR ATTORNEYS

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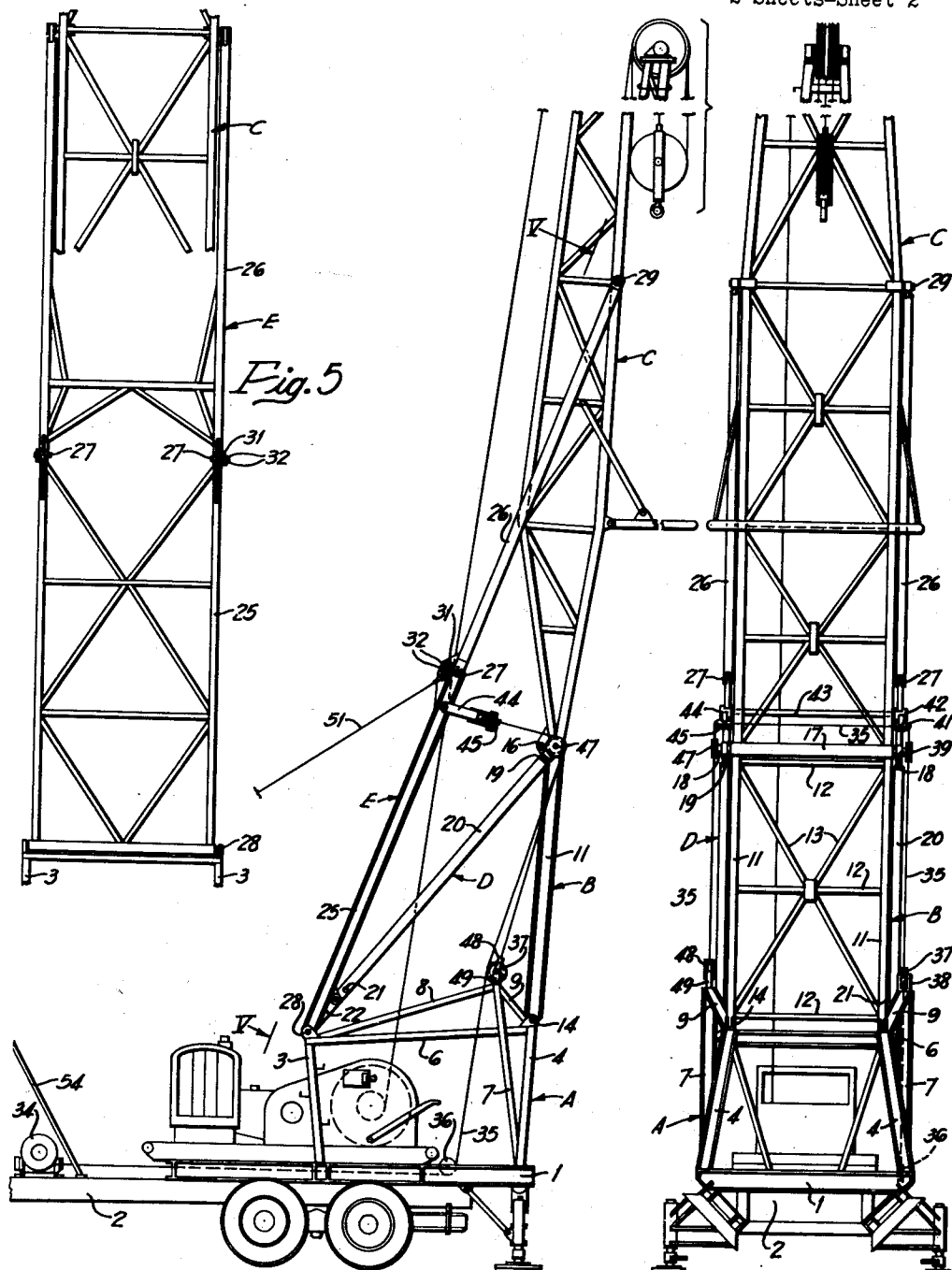


Fig. 3

Fig. 4

INVENTORS.
HOMER J. WOOLSLAYER,
Cecil Jenkins,
Charles D. Iddings, and
Erwin A. Campbell
BY
Brown, Oitchlaw, Flick & Leckham
THEIR ATTORNEYS

UNITED STATES PATENT OFFICE

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PORTABLE WELL SERVICING EQUIPMENT

Homer J. Woolslayer, Cecil Jenkins, and Charles D. Iddings, Tulsa, Okla., and Erwin A. Campbell, Wexford, Pa., assignors to Lee C. Moore Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

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6 Claims. (Cl. 189—11)

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This invention relates to a well servicing mast mounted on a vehicle, and more particularly to a mast that can be raised and lowered.

It is highly desirable to be able to transport well servicing masts easily from one location to another and to readily raise and lower them with a minimum of time and effort. Although it also is desirable to make the mast as tall as possible, the height is restricted by the distance that the mast, when collapsed and reclining on a truck, can safely project endways from the truck. In the past it has often been the practice to hinge the lower end of the mast to the rear end of the vehicle so that the other end of the mast, when reclining, will project ahead of the truck. The length of the mast thus has been limited to the length of the vehicle plus the distance that it has been feasible for the mast to project ahead of it.

It is among the objects of this invention to provide portable well servicing equipment in which the reclining mast can project from both ends of the vehicle, with the result that considerably taller masts can be used than heretofore or masts can be carried with less projection, and in which the mast can be raised and lowered quickly and easily by means of a utility winch. Another object is to provide a new method of raising and lowering such a mast.

In accordance with this invention the mast is formed from two sections that are hinged together end to end. The lower section is much shorter than the taller section. When the mast is reclining on the vehicle that supports it the two sections of the mast are folded, one on top of the other and extend lengthwise of the vehicle. The upper mast section projects several feet from both ends of the vehicle, and the lower section is below the projecting rear end of the upper section and has its front end pivotally supported on the rear end of the vehicle. A reclining telescoping brace has its rear end pivotally connected to the rear end of either of the mast sections. A folded lifting toggle brace reclines above the vehicle and is formed from two super-imposed links having their front ends connected by hinging means. Means mounted on the vehicle in front of the lower mast section pivotally support the rear end of the lower link as well as the front end of the telescoping brace. The rear end of the upper link is pivotally connected to the upper mast section. A sheave is carried by the rear end of one of the mast sections, and a winch is mounted on the vehicle. A raising line is connected with the toggle brace near its hinge connection and extends rearwardly around the sheave and then forward to the winch. Consequently, when the line is reeled in by the winch it will swing the lower mast section and the upper toggle link forward and upward to raise the reclining upper section to a higher elevation while simultaneously telescoping the telescoping brace, and then will straighten

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the toggle brace in order to swing the upper section of the mast upward and rearward to upright position on the lower section. Preferably, a pair of parallel abutting plates are fastened to the adjoining link ends of the straightened toggle brace and project forward from them. These plates limit the rearward movement of the brace and can be bolted together to lock the brace in straight position.

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

Fig. 1 is a side view of our well servicing equipment ready for the road;

Fig. 2 is a schematic side view showing the mast partly raised;

Fig. 3 is a fragmentary side view showing the raised mast;

Fig. 4 is a rear view of the vehicle showing the raised mast; and

Fig. 5 is a view taken on the line V—V of Fig. 3.

Referring to the drawings, a platform 1 is rigidly mounted on the frame of a truck 2 over its rear wheels. Mounted on this platform is a superstructure A having front posts 3 near the middle of the platform and rear posts 4 at its outer or rear end. All references herein to "front" and "rear" relate to the front and rear ends of the truck. The front and rear posts of the superstructure are connected by substantially horizontal spreaders 6. The superstructure also includes intermediate posts 7 that extend above the spreaders and have their upper ends braced by inclined braces 8 and 9.

This superstructure supports a collapsible or folding mast formed from a rather short lower section B and a much longer upper section C. Referring to Figs. 3 and 4, where the mast is shown upright, the lower section is formed from a pair of parallel legs 11 connected by horizontal and diagonal braces 12 and 13. The lower ends of the legs are pivotally mounted in shoes 14 on top of rear superstructure posts 4. The upper ends of these legs are connected by hinges 16 to the lower ends of the opposite sides of the upper section of the mast. Behind these hinges there is a heavy cross member 17 (Fig. 4), from the opposite ends of which trunnions 18 project. The cross member preferably is connected to the upper mast section. Pivotally mounted on each of the trunnions 18 is the upper end of the inner member 19 of a telescoping brace D that has a tubular lower member 20 in which the upper member can slide when the brace is not fully telescoped and locked by a pin 21 extending through the lower ends of the two brace members. The lower end of the tubular member is pivotally connected to a bracket 22, preferably mounted on the lower portion of a lifting toggle brace E. The locked telescoped braces D hold the lower section B of the mast upright on superstructure A.

Toggle brace E holds the upper section C of the mast upright on its upright lower section. This brace is formed from a pair of frame-like links 25 and 26, as shown in Fig. 5, that have their adjoining ends connected by hinges 27. The lower end of the lower link 25 is pivotally supported in brackets 28 mounted on the front end of superstructure A. The upper link 26 straddles the upper section of the mast and has its upper end pivotally connected to opposite sides of the mast by pins 29. The toggle brace can be locked in straight position by bolts 31 extending through abutting plates 32 projecting forward from hinges 27. These plates also keep the connected ends of the links from moving toward the mast from the straight line position shown in Fig. 3.

Mounted on the truck is a conventional utility winch 34, by which the mast is lowered and raised. The winch is connected to one end of a line or light cable 35 that extends back most of the way through platform 1 and then up around a sheave 36 journaled in the platform near one side. Above the platform the cable extends up across the front of a sheave 37 (Fig. 4) journaled in a bracket 38 mounted on the upper end of one of the superstructure intermediate posts 7, and then up around the back of a sheave 39 journaled on the trunnion 18 above. From this sheave the cable extends forward and around a sheave 41 carried by a bracket 42 that is pivotally supported by one side of the lower toggle link 25. This bracket is spaced by a horizontal strut 43 from a similar bracket 44 pivotally connected to the other side of the same toggle link and carrying a sheave 45. The cable extends along the strut and around this last sheave, and then backward and down over a sheave 47 mounted on the other trunnion 18. From there the cable extends down to a clevis 48 pivotally connected to an anchor member 49 on top of intermediate post 7 below sheave 47.

When it is desired to lower the mast, bolts 31 are removed, cable 35 is slacked off a little and then a line 51 connected with the upper end of the lower toggle link 25 is pulled by a small hand winch 52 mounted on the front end of the truck as shown in Fig. 1. This pulls toggle hinges 27 forward to break the toggle joint, whereupon the weight of the upper section of the mast tensions cable 35 by which the mast is kept from falling. The winch 34 then is operated to pay out the cable in order to permit the upper section C of the mast to swing downward on hinges 16 to a reclining position, such as shown in Fig. 2. In this position the upper section of the mast is supported by the lower section B and by the upper link 26 of the partly folded toggle brace. The lower link 25 has swung forward and down until it rests on a cross bar 53 supported above the cab frame by an A-frame 54, as shown in Fig. 1.

The telescoping brace locking pins 21 then are removed from the lower ends of braces D, after which cable 35 is let out still more. The distribution of weight of the mast is such that the lower section of the mast will swing backward and down in shoes 14 and will lengthen the telescoping braces. This lowers the rear end of the reclining upper section of the mast and simultaneously permits upper link 26 of the toggle brace to swing backward and down on hinges 27 so that the upper section of the mast is lowered into substantially horizontal position as shown in Fig. 1. The mast and the toggle brace are fully folded and do not extend above a safe height for transportation. It will be seen that the entire

lower section B of the mast projects from the rear end of the truck, and that a corresponding length of the upper section C likewise projects in the same direction. The other end of the upper section projects from the front end of the truck. Consequently, the mast can be made considerably longer than the truck and yet not project an undesirable distance from either end.

When it is desired to raise the mast from the transportation position of Fig. 1, the lowering procedure just described is reversed, except that the toggle-breaking line 51 and hand winch 52 are not used. Thus, when winch 34 reels in the lifting cable 35, the reclining lower section B of the mast is swung upward and forward to upright position, as shown in Fig. 2. This raises the lower or rear end of the reclining upper section of the mast to a higher level and simultaneously swings the upper link 26 of toggle brace E upward and forward to likewise raise the front end of the upper section to approximately the same higher elevation. During this initial movement the telescoping braces D are telescoped together, and then locking pins 21 are inserted to hold them telescoped so that they will brace the upright lower mast section rigidly. Further reeling in of the cable pulls the hinged central portion of the toggle brace upward and rearward and thereby straightens the brace. Straightening of this brace causes it to swing the upper section of the mast upward and rearward to upright position on top of the upright lower section, as shown in Fig. 3. Movement of the toggle brace hinges toward the mast is limited by the coming together of abutment plates 32, which then can be bolted together as an additional precaution against the brace swinging away from the mast in case there is slack in cable 35.

An advantage of raising the mast in this manner is that a small winch can be used because the mast is raised a section at a time.

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 well servicing equipment comprising a vehicle, a reclining upper mast section above the vehicle extending lengthwise thereof and projecting from both ends of it, the rear end of said section being adjacent the rear end of the vehicle, a reclining lower mast section below the projecting rear end of said upper section with the rear ends of said sections hinged together, means mounted on the rear end of the vehicle pivotally supporting the front end of said lower section, a reclining telescoping brace having its rear end pivotally connected to the rear end of one of said mast sections, a folded lifting toggle brace reclining above the vehicle and formed from two superimposed links having their front ends connected by hinging means, means mounted on the vehicle in front of said first supporting means pivotally supporting the rear end of the lower link and the front end of the telescoping brace, the rear end of the upper link being pivotally connected to the upper mast section, a sheave carried by the rear end of one of said sections, a winch on the vehicle, and a raising line connected with the toggle brace near its hinging means and extending rearwardly around said sheave and

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then forward to said winch, whereby when the line is reeled in by the winch it will swing said lower mast section and the upper toggle link forward and upward to raise the reclining upper mast section to a higher elevation and simultaneously telescope the telescoping brace and then will straighten the toggle brace in order to swing said upper section upward and rearward to upright position on said lower section.

2. Portable well servicing equipment in accordance with claim 1, wherein detachable means is provided for holding the telescoped telescoping brace telescoped.

3. Portable well servicing equipment in accordance with claim 1, wherein said links are wide, the upper link straddles the upper mast section, and the pivotal connection of the upper link to the upper mast section is at opposite sides of that section.

4. Portable well servicing equipment comprising a vehicle, a reclining upper mast section above the vehicle extending lengthwise thereof and projecting from both ends of it, the rear end of said section being adjacent the rear end of the vehicle, a reclining lower mast section below the projecting rear end of said upper section with the rear ends of said sections hinged together, means mounted on the rear end of the vehicle pivotally supporting the front end of said lower section, a reclining telescoping brace having its rear end pivotally connected to the rear end of one of said mast sections, a folded lifting toggle brace reclining above the vehicle and formed from two superimposed links having their front ends connected by hinging means, means mounted on the vehicle in front of said first supporting means pivotally supporting the rear end of the lower link and the front end of the telescoping brace, the rear end of the upper link being pivotally connected to the upper mast section, a sheave carried by the rear end of one of said sections, a second sheave located adjacent the front end of said lower section, means mounted on the vehicle supporting said second sheave, a winch on the vehicle, and a raising line connected with the toggle brace near its hinging means and extending rearwardly around the first sheave and then forward and down around said second sheave to said winch, whereby when the line is reeled in by the winch it will swing said lower mast section and the upper toggle link forward and upward to raise the reclining upper mast section to a higher elevation and simultaneously telescope the telescoping brace and then will straighten the toggle brace in order to swing said upper section upward and rearward to upright position on said lower section.

5. Portable well servicing equipment comprising a vehicle, a reclining upper mast section above the vehicle extending lengthwise thereof and projecting from both ends of it, the rear end of said section being adjacent the rear end of the vehicle, a reclining lower mast section below the projecting rear end of said upper section with the rear ends of said sections hinged together, means mounted on the rear end of the vehicle pivotally supporting the front end of said lower section, a reclining telescoping brace having its rear end pivotally connected to the rear end of one of said mast sections, a folded lifting toggle brace reclining above the vehicle and formed from two superimposed links having their front ends connected by hinging means, means mounted on the vehicle in front of said first support-

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ing means pivotally supporting the rear end of the lower link and the front end of the telescoping brace, the rear end of the upper link being pivotally connected to the upper mast section, a pair of sheaves mounted at the rear ends of said mast sections, a sheave carried by the toggle brace near its hinging means, an anchor member mounted on the vehicle, a winch on the vehicle, and a raising line anchored to said anchor member and extending rearwardly around one of said mast sheaves and then forward around said brace sheave and back around the other mast sheave to the winch, whereby when the line is reeled in by the winch it will swing said lower mast section and the upper toggle link forward and upward to raise the reclining upper mast section to a higher elevation and simultaneously telescope the telescoping brace and then will straighten the toggle brace in order to swing said upper section upward and rearward to upright position on said lower section.

6. Portable well servicing equipment comprising a vehicle, a reclining upper mast section above the vehicle extending lengthwise thereof and projecting from both ends of it, the rear end of said section being adjacent the rear end of the vehicle, a reclining lower mast section below the projecting rear end of said upper section with the rear ends of said sections hinged together, means mounted on the rear end of the vehicle pivotally supporting the front end of said lower section, a reclining telescoping brace having its rear end pivotally connected to the rear end of one of said mast sections, a folded lifting toggle brace reclining above the vehicle and formed from two superimposed wide links having their front ends connected by hinging means, means mounted on the vehicle in front of said first supporting means pivotally supporting the rear end of the lower link and the front end of the telescoping brace, the upper link straddling the upper mast section and having its rear end pivotally connected to the opposite sides of that section, a pair of brackets pivotally connected to the opposite sides of the front end of one of said links, a sheave journaled in each bracket, a pair of sheaves mounted at the opposite sides of the rear end of a mast section, an anchor member on the vehicle, a winch on the vehicle, and a raising line fastened to said anchor member and extending rearwardly around one of said mast sheaves and then forward along one side of the mast and around both brace sheaves and back along the opposite side of the mast and around the other mast sheave and forward again to the winch, whereby when the line is reeled in by the winch it will swing said lower mast section and the upper toggle link forward and upward to raise the reclining upper mast section to a higher elevation and simultaneously telescope the telescoping brace and then will straighten the toggle brace in order to swing said upper section upward and rearward to upright position on said lower section.

HOMER J. WOOLSLAYER.

CECIL JENKINS.

CHARLES D. IDDINGS.

ERWIN A. CAMPBELL.

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