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MOBILE DERRICK FOR SUPPORTING VERTICAL EARTH DRILLS

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3 Sheets-Sheet 1

FIG. 1.

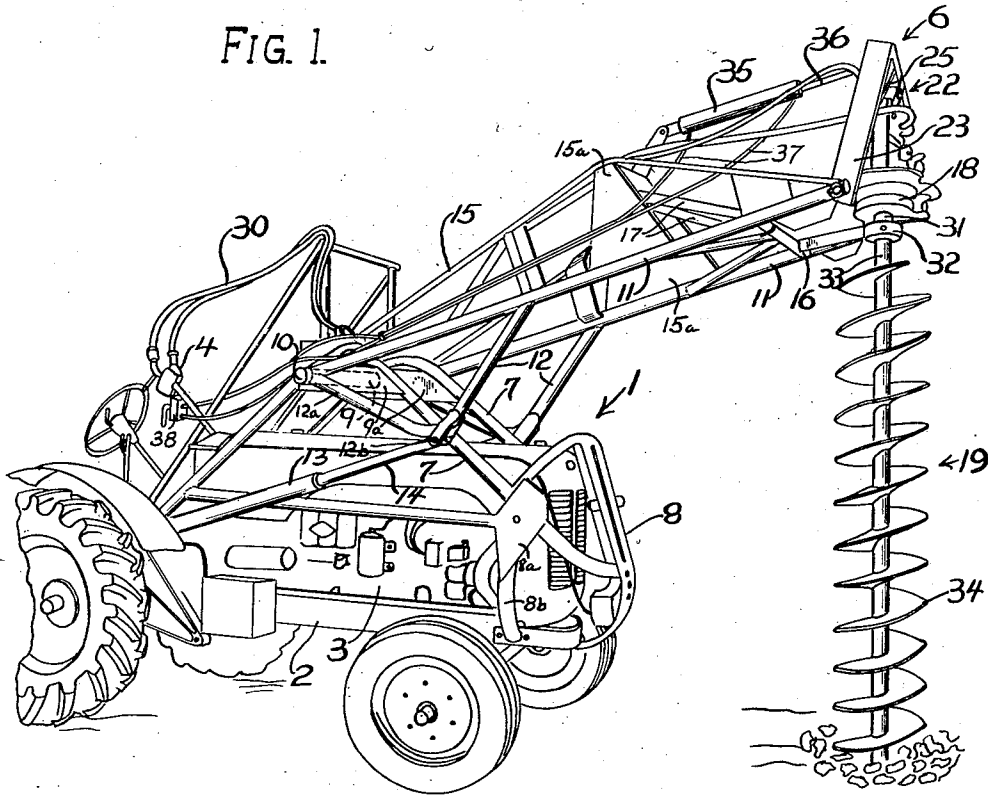
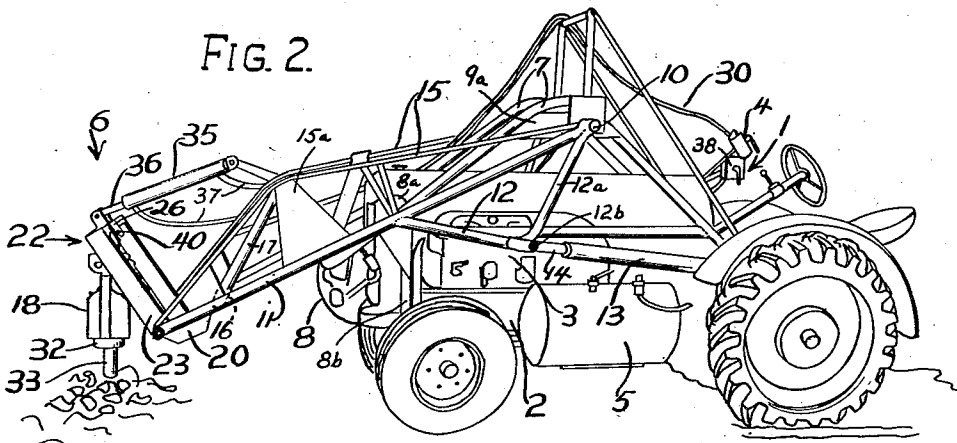


FIG. 2.



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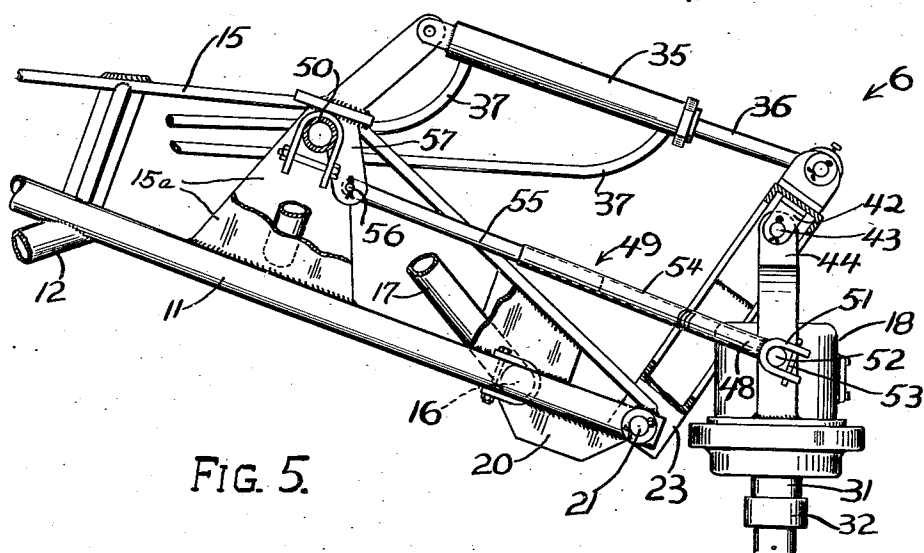
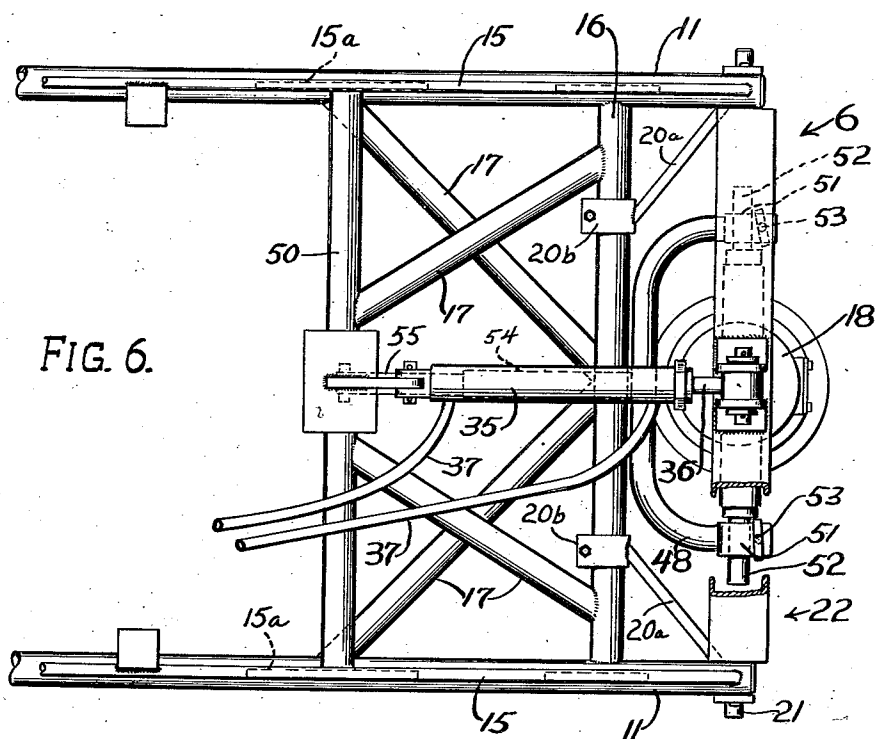
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MOBILE DERRICK FOR SUPPORTING VERTICAL EARTH DRILLS

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6 Claims. (Cl. 255—19)

This invention relates to mobile derricks for raising and lowering a vertical drill.

The invention provides a boom adapted to be carried by a tractor or the like and a bracket at the outer end of the boom which supports the motor head to suspend the drill in a vertical position as the same moves downwardly and the boom moves through an arc. A yoke connected to the head of the motor and the boom secures the drill against the torque reaction of the motor.

An object of the invention is to provide for support of the drill in a vertical position throughout the course of the drilling of a vertical hole.

Another object of the invention is to provide a more readily controlled drilling unit which does not require the tractor or mobile unit to be leveled.

Another object is to provide a more rigid boom capable of carrying the torque reaction forces of the drill motor while allowing otherwise the vertical and lateral adjustment of the motor for vertical drilling and withdrawing of the drill from the ground.

Another object is to provide a derrick boom which may be readily fitted with the drill motor.

These and other objects and advantages will be more fully set forth in the following description of a preferred embodiment of the invention as illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a perspective view of the tractor with the drill mounted at the forward end of the tractor boom and in the raised position;

Fig. 2 is a perspective view of the tractor with the drill in the lowermost position;

Fig. 3 is an enlarged side elevation of the outer end of the boom showing the drill motor carried thereby;

Fig. 4 is an enlarged front elevation of the drill motor and boom;

Fig. 5 is a view similar to Fig. 3 showing an alternate embodiment of the invention and with the drill in a lower position; and

Fig. 6 is an enlarged top plan view of the outer end of the boom embodying the invention as shown in Fig. 5.

The tractor 1, shown in the drawings, includes the frame 2 and the engine 3. Engine 3 is adapted to propel the tractor and includes suitable auxiliary drive means, not shown. Suitable hydraulic pressure-supply means driven by engine 3 is controlled by the manually operable valve unit 4. An air compressor, not shown, is driven by engine 3 and connected to the pressure supply tank 5 mounted on one side of the tractor unit as shown in Fig. 2. The tractor is adapted to be driven from the operator's position at the rear of the tractor so that the forward end of the boom 6 is directly above the location of the hole to be drilled in the ground.

The boom 6 is supported on a base provided by the two columns 7 disposed on each side of tractor 1 and removably secured at their rear ends, not shown, to the frame 2 of tractor 1. The base supporting boom 6 further includes the guard 8 which includes the plates 8a on each

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side of the tractor and supported by the columns 8b having their lower ends removably secured to the corresponding sides of frame 2 at the forward end of the tractor. The forward ends of columns 7 are secured to the corresponding plates 8a of the guard 8 at the front of the tractor. Columns 7 have an upper arched center portion to carry the cross head 9 above the tractor forwardly of the operator's position. Each end of cross head 9 projects through a plate 9a welded to and within the arched portion of each column 7 to form a trunnion 10 on each corresponding side of the tractor. Each trunnion pivotally supports the corresponding end of the two parallel longitudinal members 11 of boom 6 which extend forwardly of the tractor. Each longitudinal member 11 is provided with a brace 12 which has a rear section 12a connected to the end of the boom carried by the trunnion 10. The forward end of each brace 12 is connected to the respective member 11. Boom 6 is supported on each side by the hydraulic cylinder 13 on the corresponding side of the tractor and connected to the rear portion of frame 2 of the tractor. The actuating or piston rod 14 is connected to the point 12b of the brace 12 which is located so that fluid under pressure supplied to both cylinders 13 will effect the raising and lowering of boom 6.

Each member 11 is reinforced against vertical loads by the upper rods 15 and vertical plates 15a forming trusses. The crosspieces 16 and lateral braces 17 secure members 11 in parallel rigid relation against lateral deflection to provide for the rigidity of the boom while allowing the same to be lowered so that the forward end is below the height of the tractor.

The forward ends of members 11 reinforced by the gusset plates 20 are spaced to receive the motor head 18 of the drill 19 and are provided with holes to receive the pins 21 which pivotally support the frame 22 carrying the motor head 18. The braces 20a connect the forward ends of members 11 and the clamps 20b fixed to cross-member 16 to further reinforce the forward ends of the members.

Frame 22 comprises a channel member in the form of an inverted yoke which includes a center section and the two downwardly extending arms 23. The lower end of each arm 23 is provided with the bearing means 24 to receive the corresponding pin 21 which secures the same pivotally to the end of the corresponding longitudinal member 11 of boom 6. The corner braces 25 connecting arms 23 and the center section of frame 22 are provided for the rigidity of the frame against lateral stresses arising from the torque reaction of motor head 18 as will be described.

The depending brackets 26 welded to the center of frame 22 are spaced to receive therebetween the swivel member 27 which supports the inverted U-shaped bracket 28. The upper end of hanger member 29 is joined to bracket 28 and the lower ends of member 29 are fixed to the opposite sides of the motor head 18 of drill 19 to support the same.

Drill 19 which includes motor head 18 is adapted for the drilling of relatively large holes in the earth. The motor may be of various types and in the embodiment of the invention shown in the drawings is operated by compressed air supplied by the hoses 30 from tank 5 on tractor 1. The shank 31 of the motor extends downwardly and is connected by the coupling 32 to the shank 33 of the drill. The lower end of the drill is provided with a suitable cutting head and the flight 34 extends from the head around the shank upwardly to motor 18.

By supplying hydraulic fluid under pressure to cylinders 13, the boom and drill 19 may be raised to the uppermost position whereby the drill will be suspended from hanger member 29 located generally directly above

the drill. As motor 18 operates drill 19, the control of hydraulic fluid to cylinders 13 may be utilized to control the feed of the drill into the ground. After the drill has reached the desired depth the drill may be withdrawn by actuating cylinders 13 to raise the outer end of the boom.

In drilling, frame 22 may be pivoted on pins 21 by actuation of the cylinder 35 which connects the boom 6 and the frame. The cylinder 35 is connected at one end to one of the crosspieces 16 of boom 6 and the piston rod 36 of cylinder 35 is connected to the center section of frame 22. The cylinder 35 is controlled by suitable lines including hydraulic lines 37 connected to the cylinder and which are regulated by the valve 38 located at the rear of the tractor for control by the operator of the tractor.

In the drilling operation, the arc described by the end of boom 6 causes a lateral shifting of the upper end of the drill 19. Cylinder 35 as controlled by valve 38 serves to pivot frame 22 on pins 21 to shift the center section and motor head 18 towards or away from the tractor so that the drill may be maintained vertically throughout the travel of the boom upwardly or downwardly on the axis of the trunnion 10 supporting the boom. Shifting of the drill laterally in order to allow the drill to overcome obstructions in the ground or to dislodge the same, may be accomplished by actuating cylinder 35 and oscillating the motor head 18 and the drill until the obstructions are overcome.

In the embodiment of the invention shown in Figs. 1 to 4, the frame 22 is reinforced by the plate 39 which is welded to the underside of frame 22 between corner braces 25 to form a box beam therebetween capable of withstanding the torque reaction of motor 18 of the drill. The pin 40 extending through brackets 26 and swivel member 27 allows the drill to hang vertically notwithstanding a considerable sideward tilt of tractor 1. Pin 41 connects swivel member 27 and bracket 28 and allows the drill to swing freely from the end of the boom as the same moves up and down.

Pins 40 and 41 provide for the universal angular movement of the drill while securing the drill against counter-rotation. The weight of the drill serves to maintain the same vertically as desired in starting a hole.

In the embodiment of the invention shown in Figs. 5 and 6, the brackets 42 are secured within the U-section of frame 22 between corner braces 25 and carry the pin 43. Brackets 42 are spaced to loosely receive the upper end of the hanger member 44 and the pin 43 extends loosely therethrough to pivotally support the same. The lower end of hanger member 44 is bifurcated to provide two downwardly extending arms which are fixed to opposite sides of motor 18 to support the same and the drill.

The torque reaction of motor head 18 is carried by the yoke 48 which is pivotally connected to each side of the motor head 18 and the telescoping arm 49 which connects yoke 48 and the boom 6. Cross-member 50 is located between plates 15a of boom 6 and with frame 22 receives the torque of the motor head 18. Each end of yoke 48 is provided with the clevis 51 which fits the projecting bars 52 of the motor hanger member 44. The pins 53 extending through the two parts of each clevis 51 allow the yoke member to be readily removed from the bars 52 of the motor head whereby the drill including the motor head may be readily removed and dismantled from the outer end of boom 6.

The telescoping arm 49 includes the tube 54 which is welded at one end to the center section of yoke 48, and the rod 55 which is slidable within the other end of the tube. The free end of rod 55 is loosely carried by the bolt 56 between the bracket arms 57 carried by cross-member 50 and located opposite motor head 18 and centrally of the boom.

The yoke 48 allows motor head 18 and the drill to hang or be suspended freely from pin 43 so that the drill plumbs automatically to a fore and aft vertical position.

In the embodiment shown in Figs. 1 through 4, motor head 18 and thus the drill are secured against torque forces about a vertical axis by member 27, bracket 28 and pins 40 and 41, which suspend the drill head from frame 22 on the end of boom 6. In the embodiment shown in Figs. 5 and 6, the torque reaction of motor head 18 is resisted by yoke 48 and its telescoping arm 49 connected at one end to cross arm 50 on the boom 6.

Various embodiments of the invention may be employed within the scope of the following claims.

I claim:

1. A mobile drill unit having a drill motor and comprising, a base adapted to be fixed to the chassis of a vehicle, a rigid boom including spaced longitudinal members pivoted to said base at corresponding inner ends of said members, said members being generally parallel and spaced to receive the drill motor between the corresponding outer ends thereof, a rigid inverted U-shaped frame supported at opposite ends thereof by the respective outer ends of said members for pivotal movement, manually controllable linear adjustment means connected to said boom and the upper part of the frame and operative to effect said relative pivotal movement, and a hanger member pivotally suspending the motor between the arms of said frame and secured to the frame adjacent to said adjustment means.

2. A mobile drill unit comprising a base, a pair of boom members pivotally secured at corresponding inner ends to said base and supported thereby, reinforcement cross-pieces securing said boom members in spaced relation and against lateral deflection, a vertical drill, a motor for turning said drill and having an outer housing adapted to be disposed between the outer ends of said boom members, a rigid frame having downwardly extending arms pivotally secured at their lower ends respectively to said outer ends of said boom members and having a center section extending crosswise of the boom and thereabove and over the motor disposed between the outer ends of the boom members, a pivotal supporting bracket connecting said motor housing and said center section of the frame to suspend the drill vertically generally between the pivotal securement of said arms and members, and adjustment means connecting said frame and one of said crosspieces for the pivotal adjustment of the frame with respect to the boom members whereby the drill may be lowered vertically in all positions of the boom within the range thereof.

3. The invention of claim 2 wherein the pivotal supporting bracket comprises a universal joint allowing the adjustment of the frame within the range of said adjustment means.

4. A mobile drill unit comprising a base frame, a pair of boom members pivotally secured at corresponding inner ends to said base frame and supported thereby, reinforcement crosspieces securing said boom members in spaced relation and against lateral deflection, a vertical drill, a motor for turning said drill and having an outer housing adapted to be disposed between the outer ends of said boom members, a rigid frame having downwardly extending arms pivotally secured at their lower ends respectively to said outer ends of said boom members and having a center section extending crosswise of the boom and thereabove and over the motor disposed between the outer ends of the boom members, a pivotal supporting bracket connecting said motor housing and said center section of the frame to suspend the drill vertically generally between the pivotal securement of said arms and members, adjustment means connecting said frame and one of said crosspieces for the pivotal adjustment of the frame with respect to the boom members whereby the drill may be lowered vertically in all positions of the boom within the range thereof, a yoke pivotally secured to each side of said motor for relative movement parallel to that of said members, and a telescoping arm including relatively rotatable parts, one of said parts being rigidly fixed to said yoke

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and the other part being connected to a cross-piece between said boom members for relatively free pivotal movement fore and aft and laterally allowing the full adjustment of the drill by said adjustment means and securing the drill against the torque of the motor without substantial deflection of the drill from a vertical position.

5. In a mobile drill unit having a drill with a motor head at the upper end thereof adapted to be suspended from a boom, a base adapted to be fixed to the chassis of a vehicle, a boom comprising a rigid framework including longitudinal members pivotally supported by said base at the corresponding inner ends of said members, said members being generally parallel and spaced to receive the motor head between the corresponding outer ends thereof, a rigid inverted U-shaped bracket secured at opposite ends thereof to the respective outer ends of said members for pivotal movement, manually controlled power operable linear adjustment means connected to said boom and the upper part of the bracket, a hanger member pivotally suspending the motor head between the arms of said bracket and secured to the bracket adjacent to said adjustment means, and telescoping members, one of which telescoping members is pivotally secured to said hanger member on an axis extending crosswise of the boom to provide for vertical pivoting between it and the motor head, and the other of which telescoping members is pivotally secured to said boom, said telescoping members extending substantially parallel to the boom members and said adjustment

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means to thereby secure the motor head against rotation while allowing the free suspension thereof including the drill.

6. A mobile earth drill, comprising a boom, means pivotally supporting said boom at one end, means to raise and lower the free end of said boom, a frame extending upwardly from the free end of said boom and pivotally carried thereby on an axis extending crosswise thereof, a drill unit having a motor head at its upper end, means pivotally suspending said motor head from the upper portion of said frame to provide for free lateral and fore and aft pivoting of the drill unit relative to said frame, means to secure said motor head against drilling torque forces, and power means to pivotally adjust said frame on said boom to compensate for the arcuate movement of the free end of the boom as the latter lowers with the drill unit during a drilling operation.

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