Nov. 7, 1939. O. B. ANDERSON 2,179,316

DRILL STEM FEED

Filed Dec. 16, 1937 4 Sheets-Sheet 1

Fig. 1

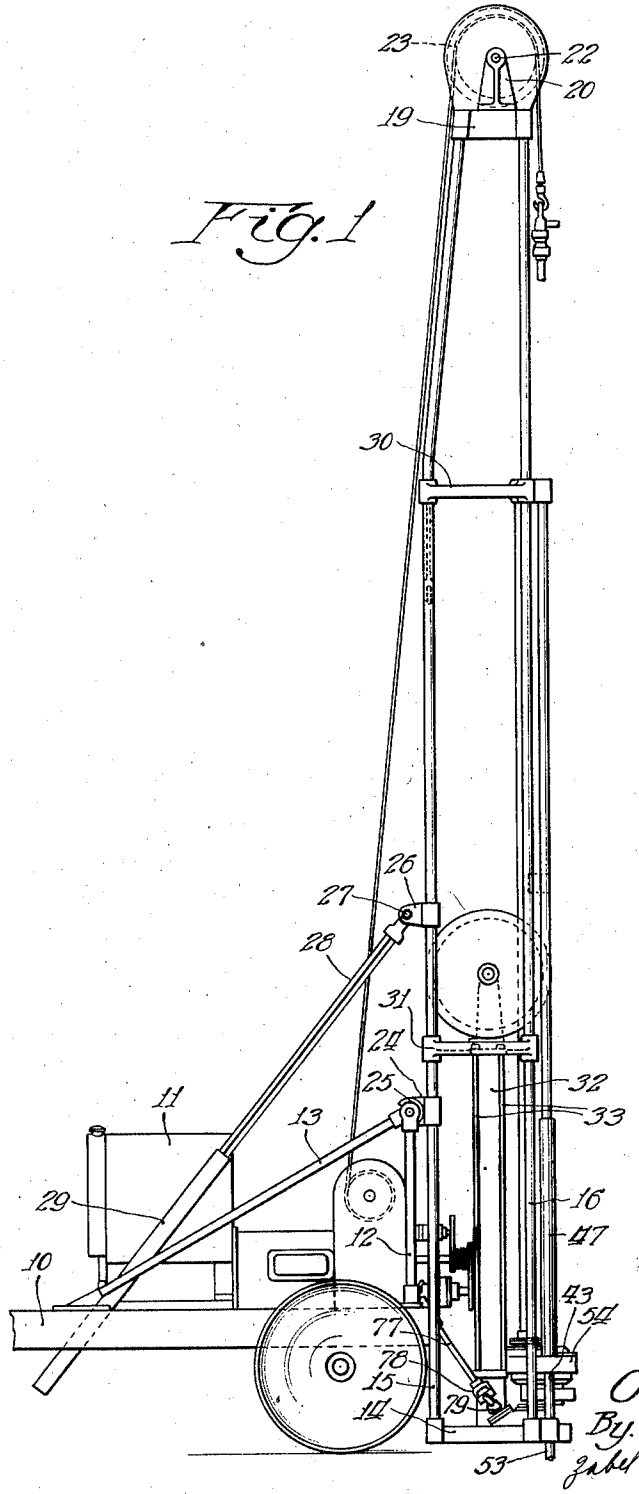
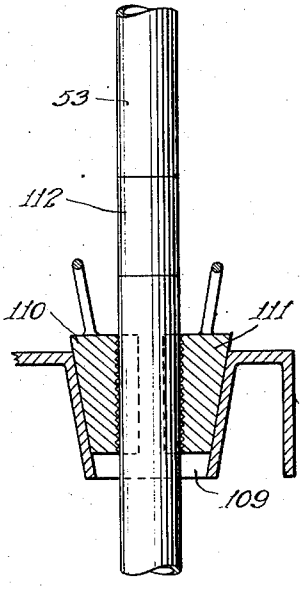


Fig. 7



Inventor
Olof B. Anderson
By: Gabel Carlson Kirkpatrick & Lewis
Attys.

Nov. 7, 1939. O. B. ANDERSON 2,179,316

DRILL STEM FEED

Filed Dec. 16, 1937 4 Sheets-Sheet 2

Fig. 2

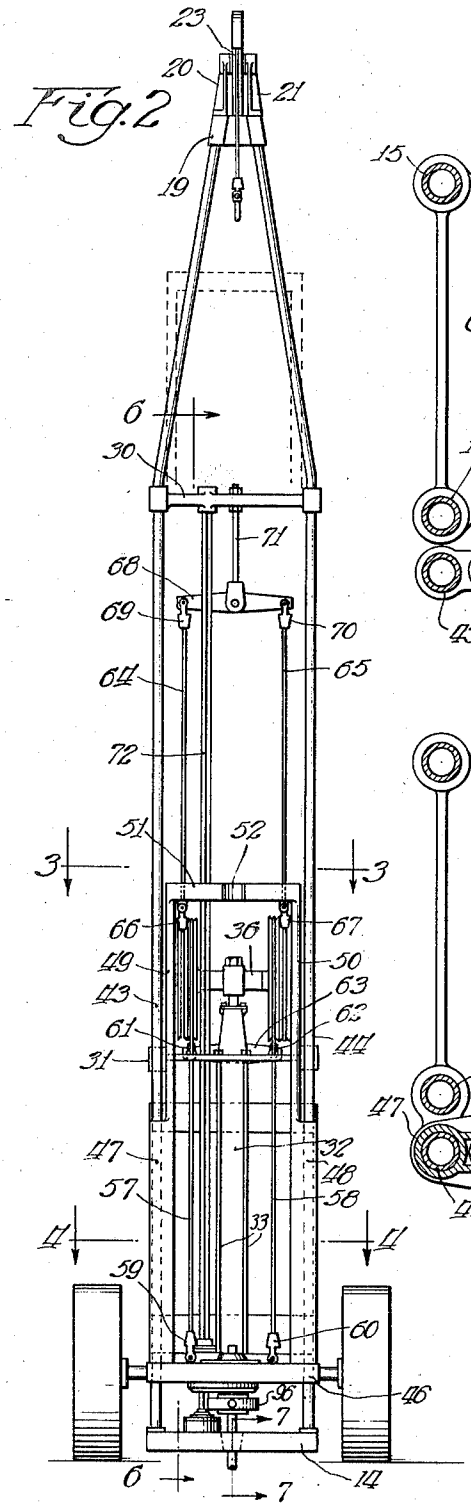


Fig. 3

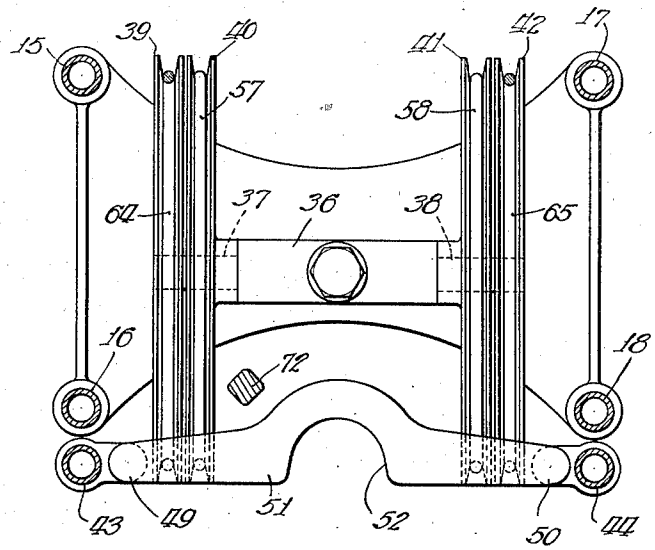
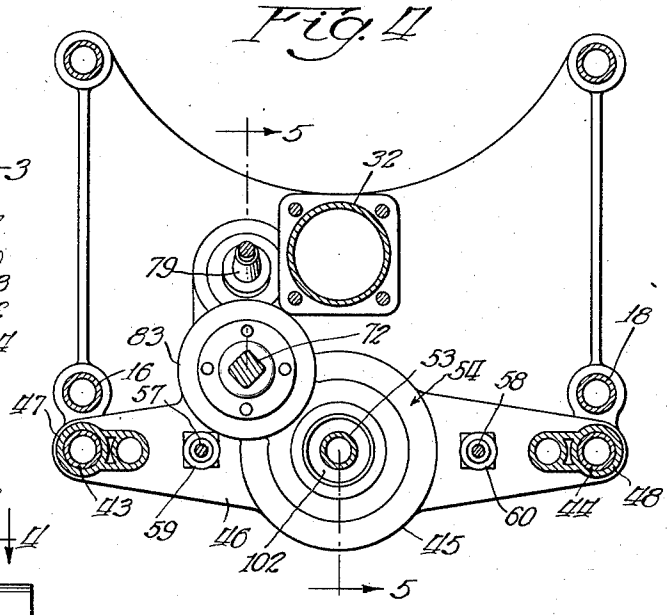


Fig. 4



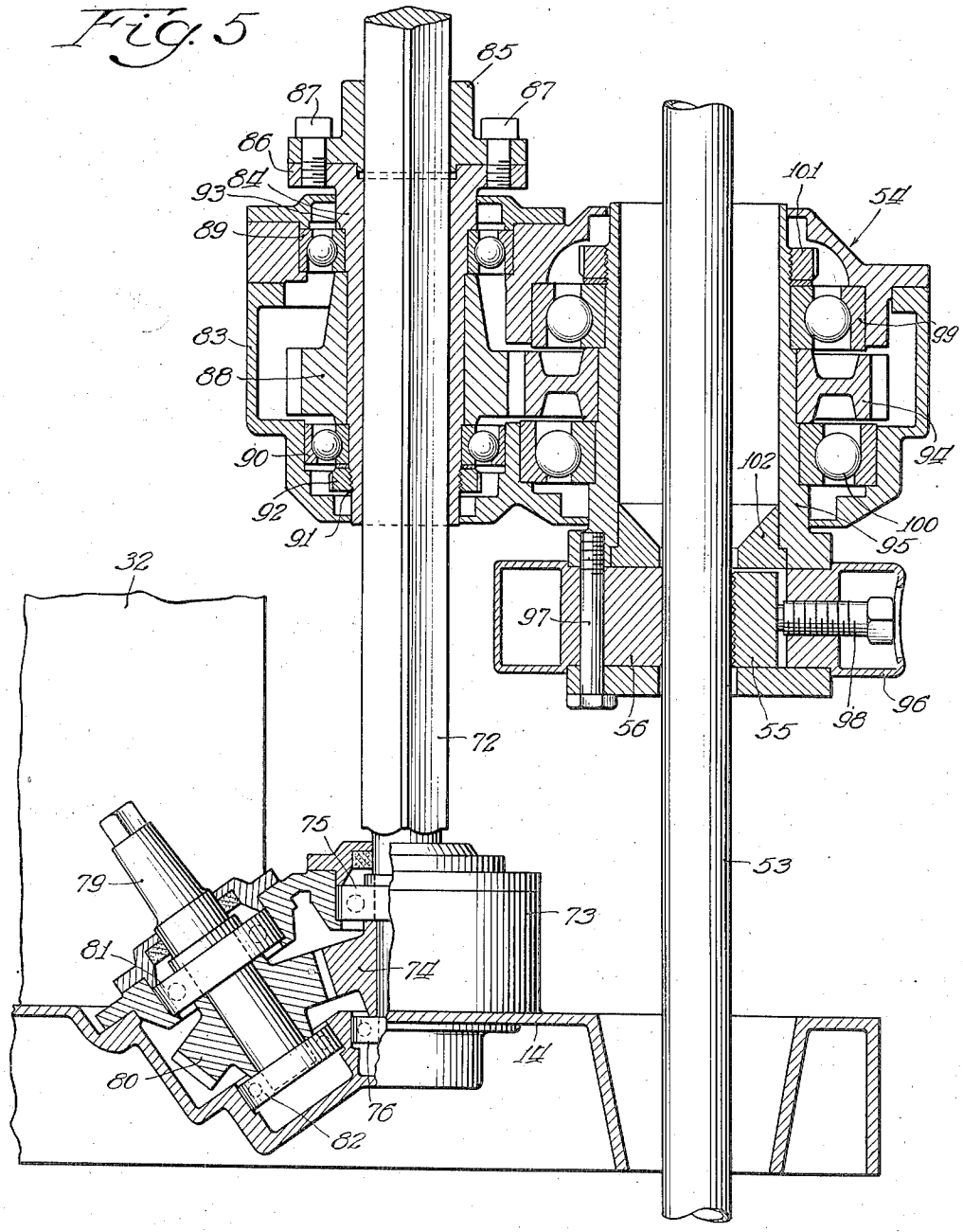
Inventor
Olof B. Anderson
By: Isabel Barbour Griffing & Wells
Attys.

Nov. 7, 1939. O. B. ANDERSON 2,179,316

DRILL STEM FEED

Filed Dec. 16, 1937 4 Sheets-Sheet 3

Fig. 5



Inventor.
Olof B. Anderson
By: Isabel Carlson Shipbaugh & Wells Attys

Nov. 7, 1939. O. B. ANDERSON 2,179,316

DRILL STEM FEED

Filed Dec. 16, 1937 4 Sheets-Sheet 4

Fig. 6

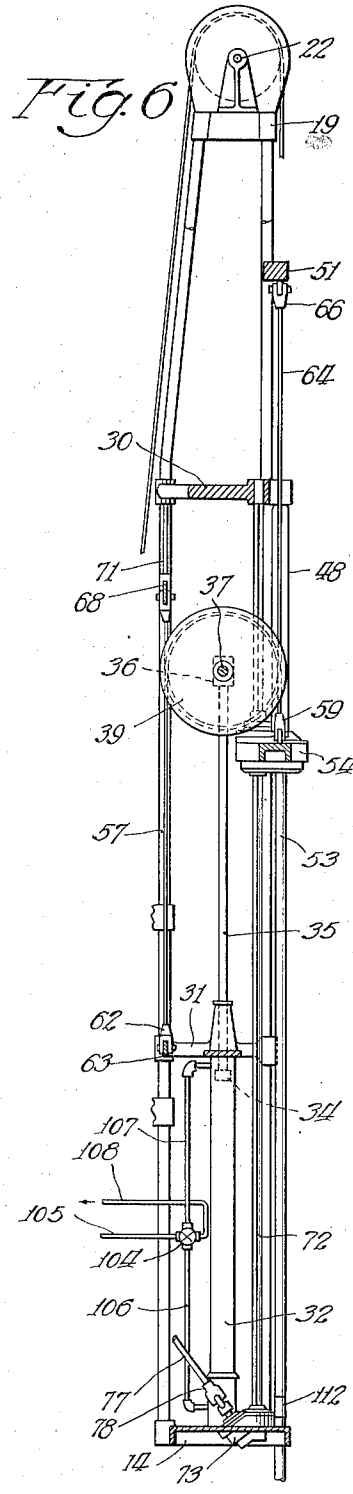


Fig. 8

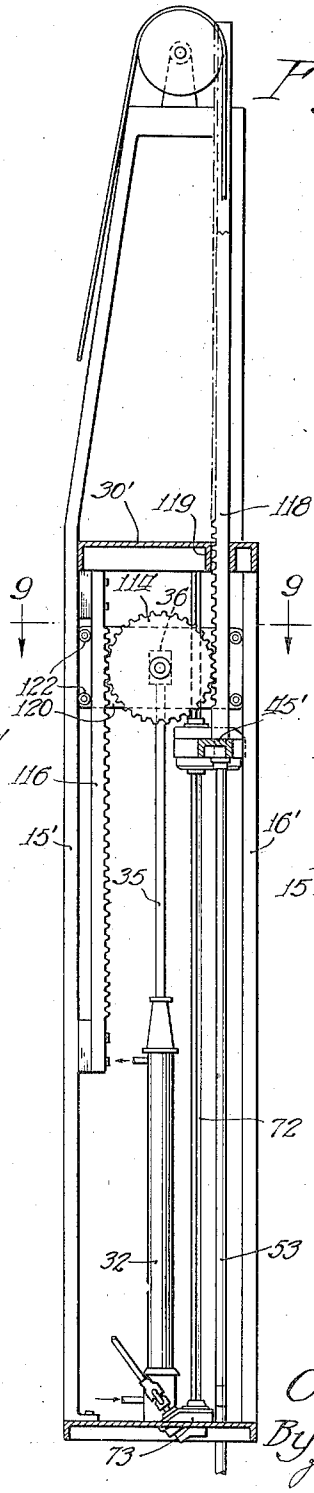
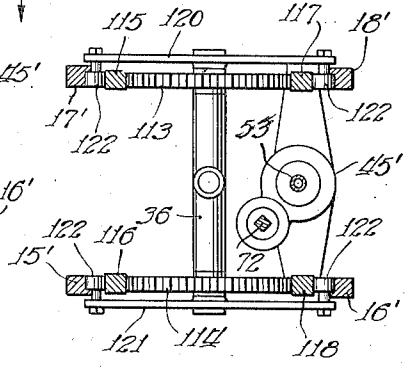


Fig. 9



Inventor
Olof B. Anderson
By Jas. Barker Shipstaugh & Wells
Attys.

Patented Nov. 7, 1939

2,179,316

UNITED STATES PATENT OFFICE

2,179,316

DRILL STEM FEED

Olof B. Anderson, Marquette, Mich., assignor to E. J. Longyear Company, Minneapolis, Minn., a corporation of Delaware

Application December 16, 1937, Serial No. 180,160

4 Claims. (Cl. 255—22)

The present invention relates to well drilling machines, and is particularly applicable to portable drills, although not limited thereto.

It is the principal purpose of this invention to provide a novel drill stem feed arrangement whereby a frame which has a chuck that grips the drill stem is adapted to be rotated from a suitable power drive, the frame being so mounted that it can be coupled to the drill stem and driven through a greater length of stroke than has heretofore been considered practical.

More particularly, it is the purpose of the present invention to provide in a drill of the character described a supporting and guide frame having means whereby a drill chuck can be lifted with its driving mechanism by means of a power lift such as a hydraulic lift a distance which is substantially double the stroke of the lifting piston. The invention contemplates the inclusion of a driving mechanism for rotating the chuck at any level.

The features and advantages of the invention will be apparent as the description proceeds in connection with the accompanying drawings, wherein a preferred form of the invention is shown. It is to be understood, however, that the drawings and description are illustrative only, and that they should not be taken as limiting the invention except insofar as it is limited by the claims.

In the drawings:

Fig. 1 is a view in side elevation of a well drilling machine embodying the present invention.

Fig. 2 is a view taken at right angles to Fig. 1, showing the machine in front elevation with the drill stem removed.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2.

Fig. 7 is an enlarged fragmentary section taken on the line 7—7 of Fig. 2.

Fig. 8 is a view similar to Fig. 6 showing a modified form of the invention, and

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8.

Referring now to the drawings, in Fig. 1 the well drilling machine is shown as mounted upon a truck 10 which has an engine 11 that furnishes power for the drill. The truck has a framework consisting of uprights 12 and braces 13 for mounting the drill frame upon the truck. The drill framework itself comprises a base 14 having four posts 15, 16, 17 and 18 fixed therein and projecting upwardly to a top frame 19 upon which a pair of standards 20 and 21 provide bearings for a shaft 22 upon which a pulley 23 is mounted. The posts 15, 16, 17 and 18 may be hollow pipes as shown by Fig. 3. The framework made up of the base 14 and the top 19 and the posts 15, 16, 17 and 18 is pivoted by means of a bracket 24 upon a bearing 25 which is carried by the uprights 12 and the braces 13 so that the entire framework may be folded down over the truck, as will be readily understood. For further bracing of the drill framework brackets 26 may be mounted upon the posts 15 and 17 and connected by a shaft 27 to which a diagonal brace 28 is secured. The brace 28 is slidable in a bearing 29 supported by the body 10 of the truck and may be locked in place after the drill frame is raised, as will be readily understood.

The drill framework includes, in addition to the base 14 and the top frame 19, an upper frame 30 which is fixed to the four vertical posts 15, 16, 17 and 18, and a similar lower frame 31 is also fixed to the vertical posts. The base 14 has mounted thereon a hydraulic cylinder 32 which extends up through the frame 31 and is bolted in place between the frame 31 and the base 14 by four bolts 33. The cylinder 32 has a piston 34 therein (see Fig. 6). A piston rod 35 projects upwardly from the piston 34 and carries at its upper end a support 36 for two shafts 37 and 38. The shaft 37 has two pulleys 39 and 40 journalled thereon and the shaft 38 has two pulleys 41 and 42 journalled thereon.

In front of the posts 16 and 18 two chuck frame guide posts 43 and 44 extend vertically from the base 14 to the upper frame 30. A chuck frame 45 is vertically slidable on the posts 43 and 44. The frame 45 consists of lower cross frame 46 and two uprights 47 and 48 which are bored to receive the posts 43 and 44. The uprights 47 and 48 have extensions 49 and 50 in the form of hollow rods. The extensions 49 and 50 are joined at their upper ends by an upper cross frame 51 which is recessed at 52 to allow a drill stem 53 to pass.

The chuck frame 45 carries a housing 54 which includes chuck jaws 55 and 56 (see Fig. 5) and means whereby these jaws may be rotated, as will be more fully explained hereafter.

The pulleys 40 and 41 have a pair of cables 57 and 58 trained over them. The cables 57 and 58 are fastened to the cross frame 46 by couplings

59 and 60. The opposite ends of the cables 57 and 58 are fastened to the back side of the frame 31 by suitable couplings 61 and 62, the frame 31 being provided with a flange 63 to which the couplings are secured in a suitable manner. The pulleys 39 and 42 have cables 64 and 65 riding in the grooves of the pulleys. The cables 64 and 65 are secured to the cross frame 51 by couplings 66 and 67. The opposite ends of the cables 64 and 65 are secured to a cross bar 68 by couplings 69 and 70. Cross bar 68 is suspended from the frame 30 by means of a rod 71.

It will be noted that a polygonal shaft 72 is journalled in the upper frame 30 and extends into a housing 73 on the base 14. This polygonal shaft is the drive means for rotating the drill stem 53. The shaft 72 has a gear 74 keyed to the lower end thereof and mounted between two bearings 75 and 76 within the housing 73. Drive connection is made from the power shaft (not shown) of the engine 11 to a shaft 77 which is provided with a suitable coupling 78 for connecting it with a shaft 79 that is also journalled in the housing 73. The shaft 79 has a gear 80 thereon which gear meshes with the gear 74 and is mounted between two bearings 81 and 82.

The housing 54 includes a portion 83 through which the shaft 72 extends. Around the shaft 72 and within the portion 83 there is a hub 84. The hub 84 has a round interior bore receiving the shaft 72, but is coupled to rotate with the shaft by means of a cap 85 that is fastened to a flange 86 on the hub 84 by suitable bolts 87. The hub 84 has a gear 88 fixed thereon. Suitable ball bearings 89 and 90 are provided within the housing 83 for the hub 84 and the gear 88. The lower end of the hub 84 is provided with a reduced screw threaded portion 91 on which a nut 92 is threaded to hold the bearing 90 in place. The upper portion of the hub 84 has a shoulder at 93 which holds the inner ring of the upper bearing 89 in place. The gear 88 meshes with a gear 94 that encircles the drill stem 53 and is fixed to a hub 95 in the housing 54. The hub 95 supports a housing 96 for the chuck jaws 55 and 56. The chuck jaw 56 is shown as a stationary jaw which is secured to the hub 95 by bolts 97 which also secure the chuck housing 96 in place. The chuck jaw 55 is adjustable within the housing 96 to cause it to grip the drill stem 53. A set screw 98 in the housing 96 is used for adjusting the jaw 55. The hub 95 and the gear 94 are rotatably mounted in the housing 54 by upper and lower ball bearings 99 and 100. A nut 101 is screw threaded onto the hub 95 to hold the bearings in position thereon. The hub 95 is hollow and within the interior of the hub there is a cone-shaped guide block 102 which guides a drill stem 53 between the chuck jaws 55 and 56.

The housing 54 is, of course, secured to the cross frame 46, the portion 83 thereof being offset as shown best by Fig. 4, so as to be vertically aligned with the shaft 72. It is evident, therefore, that the shaft 72 can drive the drill stem 53 by means of the gears 88 and 94 at any level between the upper and lower limits of the shaft 72. In the operation of the drilling machine, the entire frame 45 is raised by turning a power fluid into the cylinder 32 below the piston 34. The power fluid may be obtained from a pump driven by the engine 11 and is fed to a four-way valve 104 (see Fig. 6) through a pipe 105. This valve directs the power fluid to a pipe 106 to elevate piston 34. When the piston 34 is to be lowered, the valve 104 is turned to a position where it connects the pump to a pipe 107 that leads to the cylinder 32 above piston 34. When the valve is in this position it connects the pipe 106 with a discharge pipe 108 that leads to a reservoir tank carried by the truck 10. The details of the control equipment for supplying and withdrawing the motive fluid from the cylinder 32 are, however, not in themselves novel and may be of any suitable construction. Therefore, the pump, the reservoir tank and the details of the valve 104 have not been added to the drawings.

When the piston 34 is raised, the rod 35 lifts the pulleys 39, 40, 41 and 42, and this in turn causes the cables 57 and 58 to lift the frame 45, and with it the entire chuck rotating mechanism included in the housing 54, a distance which is equal to twice the distance that the pulleys are raised. The cables 64 and 65, owing to their coupling with the frame 51 and the cross bar 68, also remain tight around their respective pulleys. It this manner the frame 45 can be raised from the position shown in Figs. 1 and 2. The drill stem 53, which has been lowered through the chuck jaws 55 and 56, is secured by the jaws 55 and 56 so as to be rotated when the power is applied to the shaft 72.

In order to hold the drill stem 53 while the chuck jaws 55 and 56 are released and raised, the base 14 is provided with a cone-shaped opening 109 through which the drill stem extends. Two half-round manually removable jaws 110 and 111 are dropped into the cone-shaped opening 109 so as to grip the drill stem and hold it in place. After the drill stem has started and the first length of stem is down so that the chuck jaws are just above the frame 14, the drill stem is held in place by the half-round jaws 110 and 111, and a new length of drill stem is then threaded through the jaws 55 and 56 from above and coupled to the first length of drill stem by a suitable coupling such as is shown at 112 in Fig. 7. The piston rod 35 can then be raised to bring the chuck jaws 55 and 56 to their uppermost position where they are clamped upon the drill stem 53 and the rotation of the drill may then be continued until it is necessary to connect on a new length of drill stem.

In Figs. 8 and 9 there is shown a slightly modified form of mechanism for raising the drill chuck frame. In this form of the invention, the support 36, instead of having the pulleys thereon, has two gears 113 and 114 journalled thereon. These gears mesh at the back with two stationary racks 115 and 116 which are secured to the back posts 15' and 17' in spaced relation thereto. Similarly at the front, the gears 113 and 114 mesh with the vertically movable racks 117 and 118 which are fixed to the cross frame 45' that carries the drill chucks. The vertically movable racks 117 and 118 are slidable through suitable guide openings in the upper frame 30', as shown at 119 in Fig. 8.

Outside of the gears 113 and 114 suitable plates 120 and 121 are fixed to the ends of shafts 37 and 38 that project from the support 36. These plates 120 and 121 carry guide members 122 which are interposed between the frame posts and the racks.

The operation of the modification is substantially identical with that of the preferred form of the invention. It will be readily understood that by lifting the piston rod 35 the gears 113 and 114 will be caused to rotate by the stationary racks 115 and 116. This, in turn, will cause the movable racks 117 and 118 which carry the frame 45' to

be lifted twice as fast as the piston rod 35 is lifted.

From the above description it is believed that the construction and operation of this device will be readily apparent to those skilled in this art. Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a well drilling machine, a framework comprising a base, a top frame and an intermediate frame, frame posts extending vertically between said base and said top frame and fixed to the frames and base to provide a rigid framework, guide posts extending between the base and the top frame and secured thereto, a drill chuck frame having a chuck at the bottom thereof and having guides extending upwardly from the lower end of the chuck frame for receiving said guide posts, said frame having a portion extending above the intermediate frame when the chuck frame is in its lowermost position, a cable secured to the lower end of said chuck frame and projecting upwardly therefrom, a lifting member mounted in said framework and movable between the intermediate frame and the top frame, said cable extending over said lifting member and being anchored to said framework, a second cable having one end anchored to the framework adjacent the top thereof and the other end secured to the upper end of said portion of the chuck frame, said second cable extending beneath said lifting member, and means for raising and lowering said lifting member.

2. In a well drilling machine, a framework comprising a base, a top frame and frame posts extending between said base and frame and fixed thereto to provide a rigid framework, guide posts at one side of said framework extending between the base and the top frame and secured thereto, a lifting member mounted on said base, said lifting member comprising a cylinder, a piston therein projecting from said cylinder and cable sheaves mounted on said piston, a drill chuck frame having a chuck at the bottom thereof and having guides receiving said guide posts, said frame having a portion extending above said cable sheaves, a cable secured to the lower end of said chuck frame and extending over one of said sheaves, said cable being anchored to the framework, a second cable having one end anchored to the framework adjacent the top thereof and the other end secured to the upper end of said portion of the chuck frame, said second cable extending beneath the other of said sheaves, and means for supplying fluid to said cylinder to raise and lower said piston.

3. In a well drilling machine, a framework comprising a base, a top frame and frame posts extending between said base and frame and fixed thereto to provide a rigid framework, guide posts at one side of said framework extending between the base and the top frame and secured thereto, a lifting member mounted on said base, said lifting member comprising a cylinder, a piston therein projecting from said cylinder and cable sheaves mounted on said piston, a drill chuck frame having a chuck at the bottom thereof and having guides receiving said guide posts, said frame having a portion extending above said cable sheaves, a cable secured to the lower end of said chuck frame and extending over one of said sheaves, said cable being anchored to the framework, a second cable having one end anchored to the framework adjacent the top thereof and the other end secured to the upper end of said portion of the chuck frame, said second cable extending beneath the other of said sheaves, means for supplying fluid to said cylinder to raise and lower said piston, a polygonal shaft mounted in said framework, means on said base for connecting said shaft to a source of power to rotate the same, and means for rotating said chuck vertically slidable upon said shaft.

4. In a well drilling machine, a framework comprising a base, a top frame and frame posts extending between said base and frame and fixed thereto to provide a rigid framework, guide posts at one side of said framework extending between the base and the top frame and secured thereto, a lifting member mounted on said base, said lifting member comprising a cylinder, a piston therein projecting from said cylinder and cable sheaves mounted on said piston, a drill chuck frame having a chuck at the bottom thereof and having guides receiving said guide posts, said frame having a portion extending above said cable sheaves, a cable secured to the lower end of said chuck frame and extending over one of said sheaves, said cable being anchored to the framework, a second cable having one end anchored to the framework adjacent the top thereof and the other end secured to the upper end of said portion of the chuck frame, said second cable extending beneath the other of said sheaves, means for supplying fluid to said cylinder to raise and lower said piston, a drive shaft journalled in said framework and extending parallel to said guide posts, and means carried by said chuck frame for drivingly connecting said chuck to said shaft in all positions of the chuck frame.

OLOF B. ANDERSON.