

July 19, 1938.

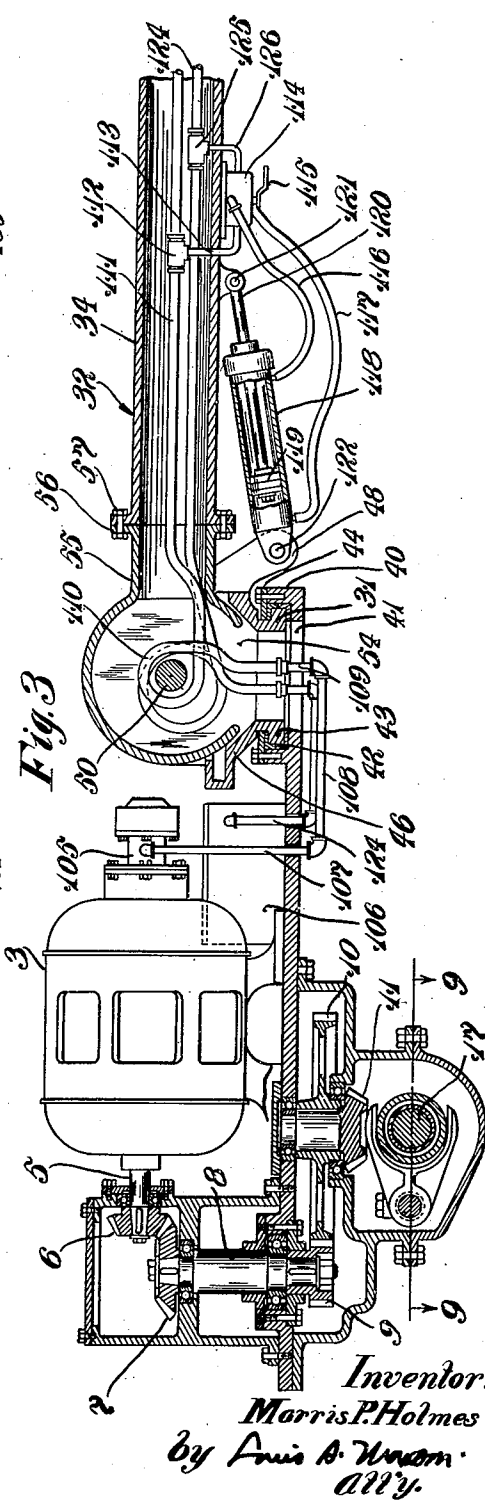
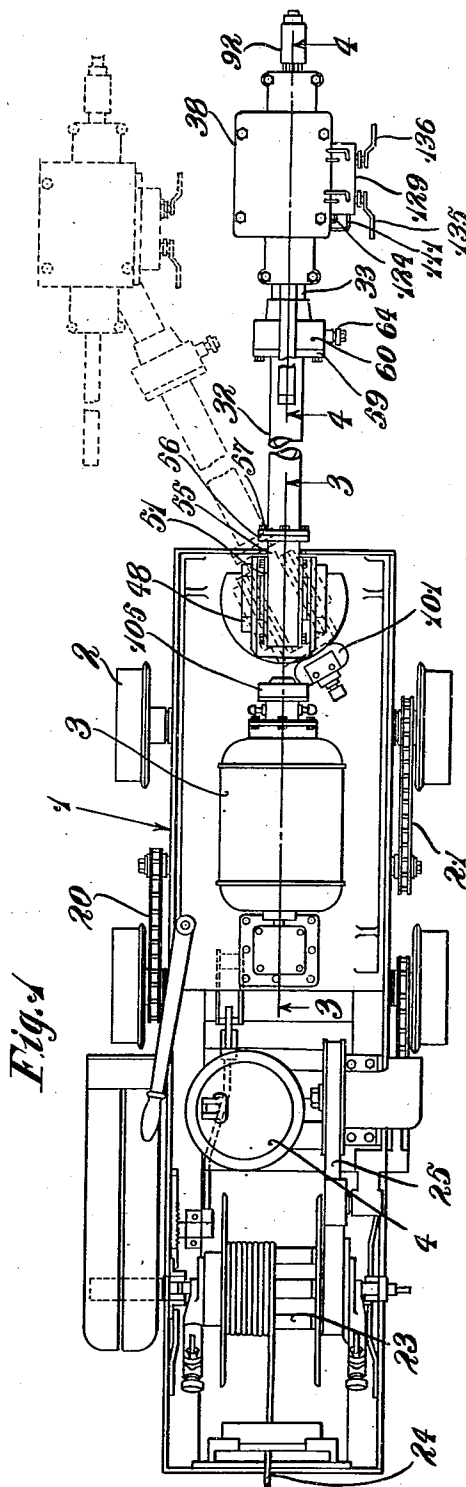
M. P. HOLMES

2,123,897

DRILLING APPARATUS

Filed June 18, 1935

4 Sheets-Sheet 1



July 19, 1938.

M. P. HOLMES

2,123,897

DRILLING APPARATUS

Filed June 18, 1935

4 Sheets-Sheet 2

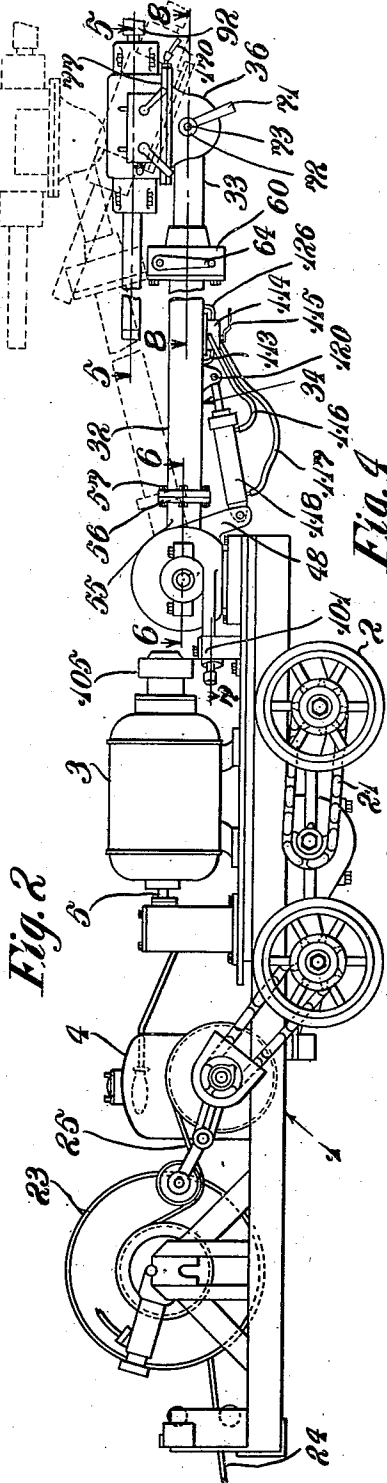


Fig. 2

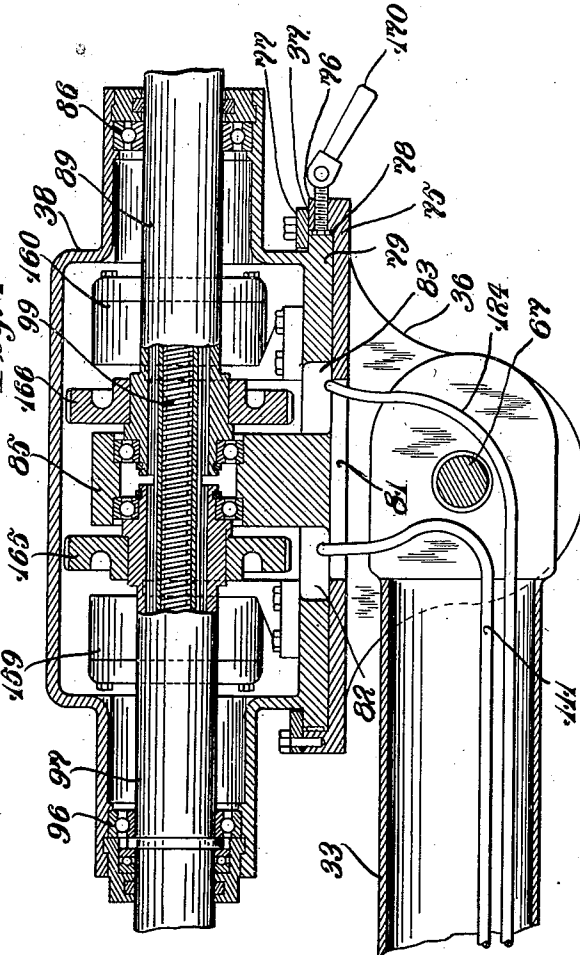


Fig. 4

Inventor
Morris P. Holmes
by Louis A. Maxson
Att'y.

July 19, 1938.

M. P. HOLMES

2,123,897

DRILLING APPARATUS

Filed June 18, 1935

4 Sheets-Sheet 3

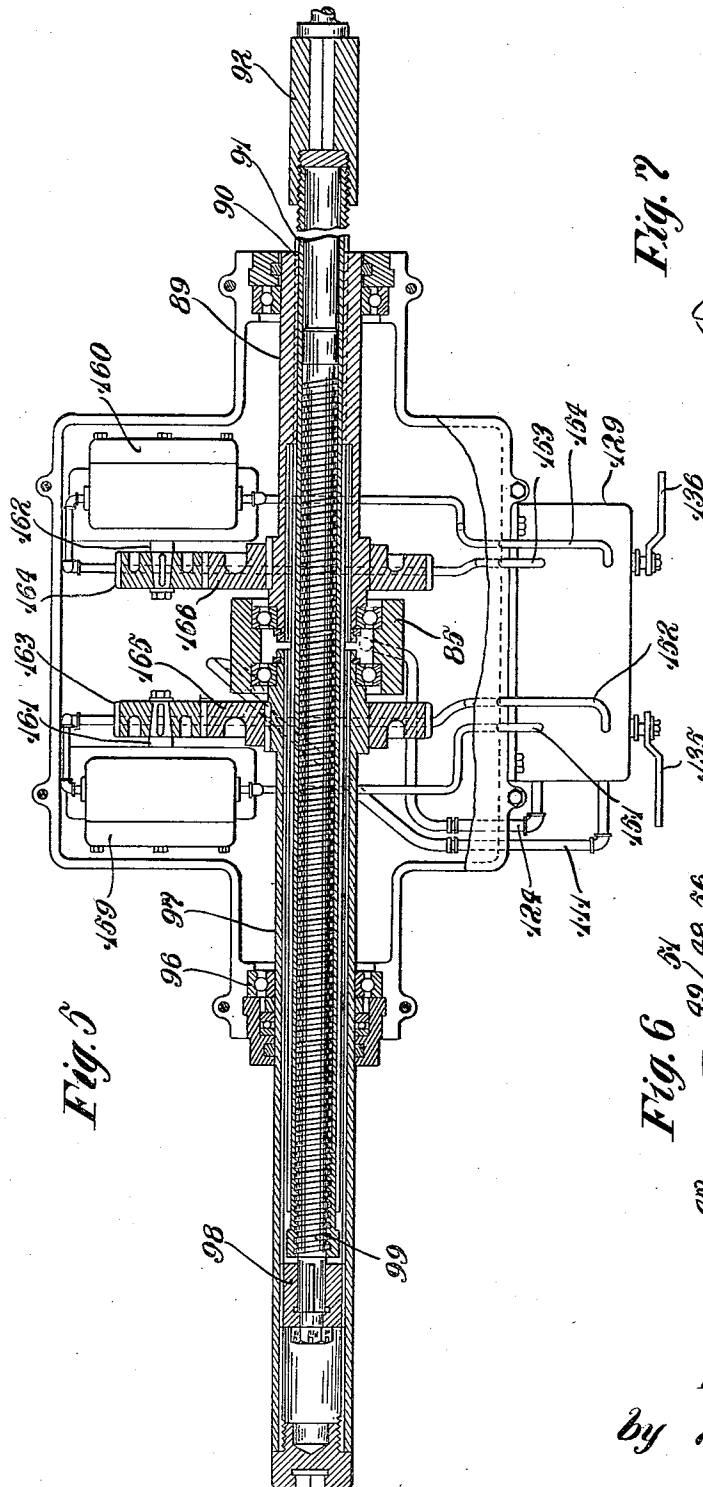


Fig. 5

Fig. 2

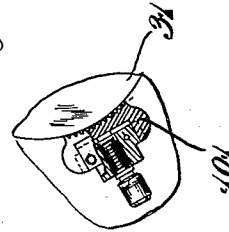
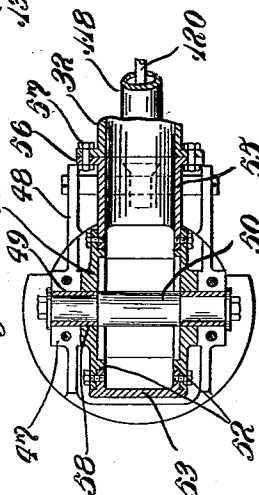


Fig. 6



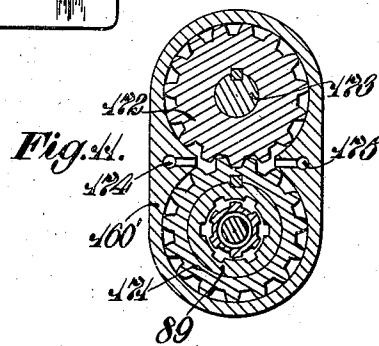
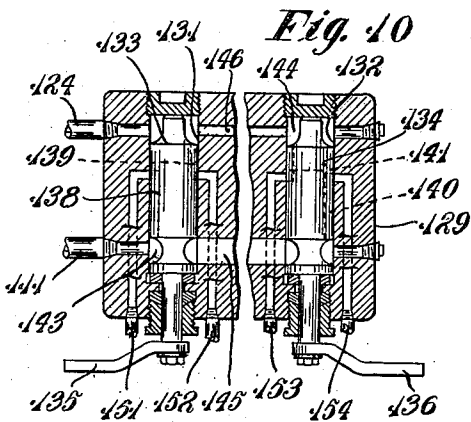
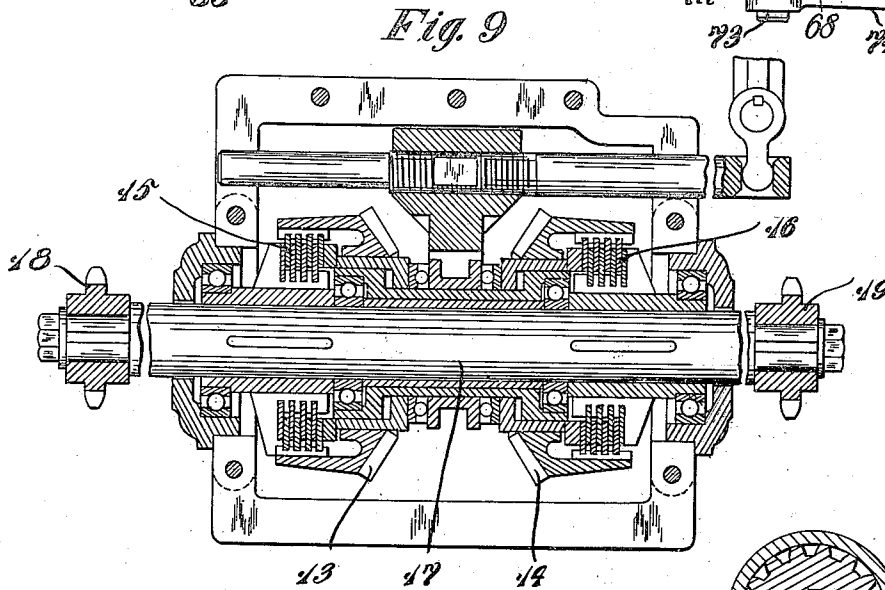
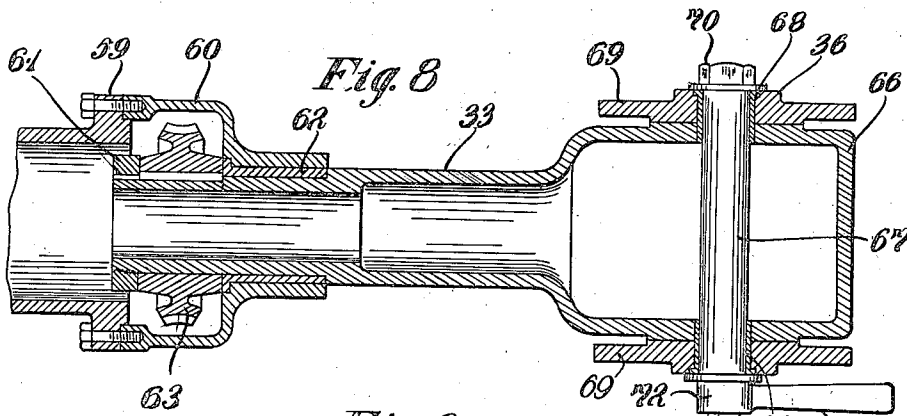
Inventor:
Morris P. Holmes
by Louis A. Wexler.
Att'y.

July 19, 1938.

M. P. HOLMES
DRILLING APPARATUS
Filed June 18, 1935

2,123,897

4 Sheets-Sheet 4



Inventor
Morris P. Holmes
by Louis A. Maxson
Atty.

UNITED STATES PATENT OFFICE

2,123,897

DRILLING APPARATUS

Morris P. Holmes, Claremont, N. H., assignor to
Sullivan Machinery Company, a corporation of
Massachusetts

Application June 18, 1935, Serial No. 27,213

2 Claims. (Cl. 255-47)

My invention relates to drilling apparatus, and, more particularly, to a drilling apparatus of the hydraulic type especially adapted to use in drilling coal or similar materials in mines, and in certain embodiments thereof especially adapted to operate from mine trackways.

An object of my invention is to provide an improved drilling apparatus. Another object of my invention is to provide an improved drilling apparatus particularly adapted for drilling holes in coal or similar materials and having provision for permitting the insertion of a plurality of shot holes at different locations in the face while the machine remains on the trackway. A further object of my invention is to provide an improved drilling apparatus having improved hydraulically actuated feeding and rotating means. Other objects and advantages of the invention will hereinafter more fully appear.

In the accompanying drawings, in which for purposes of illustration one embodiment and a modification which the invention may assume in practice has been shown,

Fig. 1 is a plan view of the illustrative embodiment of the invention, with parts omitted.

Fig. 2 is a side elevation thereof, with parts omitted.

Fig. 3 is a fragmentary view with parts in elevation, but with the parts mainly shown in section on a plane corresponding to the line 3-3 of Fig. 1.

Fig. 4 is a section through a portion of the feeding and rotating mechanism, the section being taken on the plane corresponding to the line 4-4 of Fig. 1.

Fig. 5 is a section taken on a plane corresponding to the line 5-5 of Fig. 2.

Fig. 6 is a detail horizontal section on a plane corresponding to the line 6-6 of Fig. 2, showing a portion of the boom mounting.

Fig. 7 is a fragmentary detail sectional view on a plane corresponding to the line 7-7 of Fig. 2, showing a locking device for maintaining the boom in a desired position.

Fig. 8 is a sectional view on a plane corresponding to the line 8-8 of Fig. 2, showing a portion of the boom and of the drill mounting on the latter.

Fig. 9 is a horizontal sectional view on a plane corresponding to the line 9-9 of Fig. 3, showing a portion of the truck driving apparatus.

Fig. 10 is a detail of the hydraulic control valve means, and

Fig. 11 is a fragmentary sectional view of a modification.

While many of the features of my invention may, with equal advantage, be incorporated in a drilling device other than a truck-supported one, I have shown the illustrative embodiment incorporated in a truck mounted drill. A truck frame 1 supported on suitable wheels 2 supports a motor 3 which provides power for the propulsion of the truck and also for actuating the drill and effecting feeding and certain adjustments of the latter. The motor 3 is provided with suitable controlling apparatus located in a housing 4, and the truck is propelled through gearing driven from one end of the motor shaft 5 and including a bevel driving pinion 6, a cooperating driven bevel gear 7, a vertical shaft 8 on which the bevel gear 7 is mounted, a spur driving pinion 9 rotated by the shaft 8, a larger driven gear 10 meshing with and driven by the spur gear 9, a bevel pinion 11 coaxial with and driven by the spur gear 10, and one or the other of a pair of bevel gears 13 and 14 meshing with and driven by the bevel pinion 11 and selectively connectible under the control of suitable apparatus (not shown) through friction clutch devices 15 and 16 with a transverse shaft 17 whose opposite ends carry drive sprockets 18 and 19 respectively connected by chains 20 and 21 with the rear and forward axles of the truck. A reel 23 having an electrical cable 24 wound thereon is driven through suitable driving connections 25 from one of the axles.

The drilling apparatus proper comprises a vertical swivel mounting generally designated 31, a boom 32 pivotable about a horizontal axis supported by the swivel mounting 31 and having a forward portion 33 rotatable relative to the main body portion 34 of the boom, means generally designated 36 and providing a pivotal mounting transverse to the boom axis at the outer end of the boom, apparatus generally designated 37 for providing a pivot axis at right angles to the transverse pivot axis at the outer end of the boom, and drill feeding and driving mechanism 38 supported by the apparatus 37. The forward end of the truck frame 1 provides an annular upstanding flange 40 coaxial with which there is provided an opening 41 through the platform of the truck. Within the upstanding flange 40 in suitable bearing members 42 is rotatably mounted the annular base flange 43 of the, so-to-speak, turntable support of the boom, the flange 43 being held in position for rotation and against tipping by arcuate flange means 44 secured to the top of the flange 40. The base flange 43 supports a rotatable base portion 46 having lateral upstand-

ing side portions 47 spaced apart and also providing forwardly and downwardly extending arm portions 48 laterally spaced apart. The side portions 47 provide bearings 49 for a transverse pivot pin 50 on which there is mounted for vertical tilting movement the side frame portions 51 which are received in openings 52 in a nearly circular supporting member 53 at the lower end of the boom. The member 53 is open at its lower side 54 and provides a projecting portion 55 having a flange 56 to which the boom body 34 is secured by bolts at 57. The side plates 51 are journaled at 58 on suitable bearing sleeves surrounding the pivot pin 50. The boom body portion 34 is, desirably, cylindrical, and at its forward end is provided with a mounting flange 59 to which is secured a casing 60 which provides spaced bearings 61 and 62 for the forward boom portion 33. A worm wheel 63 is secured to the rearward end of the forward boom portion 33 between the bearings 61 and 62 and is rotatable by a handle 64 and a worm (not shown), the latter journaled in the casing 60. The forward end of the boom member 33 carries an enlarged housing portion 66 transversely of which a pivot pin 67 extends. The pivot pin is surrounded at its outer end by bearing sleeves 68 upon which plates 69 are journaled at the opposite ends of 67. The pin 67 is provided with a head 70 at one end and a handle 71 having a nut portion 72 cooperating with the opposite threaded end 73 of the pin member 67. The plates 69 are formed upon or connected with, as may be desired, a plate 75 having upstanding edges 76 upon which an inwardly directed flange member 77 is mounted, the plate 75 and the edges 76 and flange portion 77 cooperating to provide a bearing 78 for the base plate 79 of the casing 38 by which the drill feeding and guiding apparatus is housed. The plate 75 is traversed by a central opening 81 and the plate 79 is traversed by other openings 82 and 83 which communicate with the opening 81.

Within the casing 38 and journaled in an upstanding pedestal or bearing support 85 therein and in a bearing 86 arranged in the forward portion of the casing 38 is a sleeve member 89 having an internally splined connection 90 with a hollow cylindrical, elongated, internally threaded drill rotating element 91, the latter supporting a chuck 92, of any suitable construction, at its outer end. Journaled also in a bearing in the pedestal portion 85 and in a bearing 96 at the rear end of the casing portion 38 is an elongated tubular member 97 having an internally splined connection with a slidable block 98 to which there is secured in non-rotatable relation a screw member 99 extending forwardly within the member 91 and threadedly engaging the internal threads of the latter.

It will be obvious that upon rotation of the member 89 a drill mounted in the chuck 92 will be rotated, and that depending upon the direction of the threaded connection between the member 91 and the thread bar 99, there will, if the member 98 and thread bar 99 are held against rotation, be also longitudinal movement of the drill in one direction. If the member 97 is also rotated, there will be, dependent upon the relative speed and direction of rotation of the member 97 as compared with those of the member 91, fast forward feed, slow forward feed, or retraction. It is therefore evident that by controlling the directions and rates of rotations of members

89 and 97, any desired mode of operation of the drill mounted in the chuck 92 will be possible.

The adjusting mechanism for the boom and the driving devices for the members 89 and 97 will now be described. The rotatable base 31 is not power-adjustable with the apparatus shown, although hydraulic devices for effecting such adjustment might be provided if desired. Instead, there is simply provided a releasable clamping device 101 cooperating with the peripheral edge of the base flange 31 for locking the boom in any desired position after the boom has been swung thereto by the drill runner.

The end of the motor shaft 5 opposite from the truck wheel driving gearing drives a hydraulic pump 105, which may be of any suitable type and whose construction is therefore not shown. The pump draws a suitable fluid, preferably oil, from a reservoir tank 106 mounted on the bed 1 of the truck, and delivers it downwardly through a connection 107 to a connection 108 beneath the truck body and forward through a connection 109 through the opening 41 and into the interior of the member 55. The supply line is there arranged in an open coil 110 passing around the transverse pivot member 50 and extends forwardly at 111 through the boom. Within the body portion of the boom is a T 112 from which there branches a connection 113 entering a four-way valve casing 114 housing a four-way valve device (not shown) controlled by a handle 115. The manipulation of the handle will effect connection of the supply branch 113 either with a connection 116 leading to the forward end or with a connection 117 leading to the rearward end of a pivoted boom elevating cylinder 118, in which a piston 119 is reciprocable, which piston is connected by a piston rod 120 to a pivot pin 121 carried by the boom. The rear end of the cylinder 118 is pivotally supported at 122 between the forwardly extending arms 48. The return connection to the supply tank 106 may now be described in part, and it will be noted that this includes portions, all of which are generally designated 124, generally paralleling the connections 107, 108, 109, 110 and 111. Within the boom body there is a T 125 connected in the return line 124 and connected by a connection 126 with the four-way valve apparatus 114, so that when either end of the tilt cylinder 118 is supplied with pressure, the other end may be vented back to the tank.

The connections 111 and 124 extend forwardly and at opposite sides of the transverse pivot pin 67, turn upwardly into the interior of the casing 38, where they pass laterally, and enter a valve box 129 secured to the casing 38. Within the valve box there is a pair of valve-receiving bores 131 and 132 each housing a rotary valve, which valves are respectively numbered 133 and 134. The valves 133 and 134 have operating handles 135 and 136 and peripheral grooves 138 and 139, 140 and 141 respectively, the peripheral grooves 138 and 140 opening into grooves 143 adjacent the one end of the valve members, while the grooves 139 and 141 open into the two spaces 144 at the opposite ends of the valve-receiving bores. Grooves 143 are connected together through the valve chest, as at 145, and communicate with the supply line 111, while at the opposite ends of the bores the spaces 144 are connected by a passage 146 communicating with the return line 124. Passages 151 and 152 communicate with the valve-receiving bore 131 in the same transverse plane with the nearer ends of the grooves 138 and 139. Similar passages 153 and 154 communicate with

the valve bore 132 in the same transverse plane with the nearer ends of the valve grooves 140 and 141. This groove and passage arrangement is such that in one position of valve 133, passage 151 may be connected through groove 138 to supply, while passage 152 is connected to discharge through groove 139, and reverse connections are established in a different position of the valve 133. Similarly, valve 134 in one position may connect passage 153 through groove 141 to discharge and passage 154 through groove 140 to supply, and upon movement to another position reverse the connections.

Within the casing 38 and adjacent the opposite ends thereof there are mounted reversible hydraulic motors 159 and 160 respectively, having drive shafts 161 and 162 reversely rotatable in accordance with the direction of rotation of the respective motors. The drive shafts 161 and 162 carry drive pinions 163 and 164 respectively, and these drive pinions respectively mesh with driving gears 165 and 166 respectively mounted on and driving the cylindrical members 89 and 97.

The connections 151 and 152 extend to the reversible driving motor 159, and, depending upon whether supply is through 152 and exhaust through 151 or supply is through 151 and exhaust through 152, the motor 159 may be driven in either direction. Similarly, motor 160 is connected with the passages 153 and 154, and, depending upon which of these passages is connected to supply and which to exhaust, motor 160 may be driven in either direction. Since motor 160 effects rotation through the gearing and sleeve member described of the chuck carrying member 91, and at any desired speed depending upon the degree of communication established by the adjustment of the valve 134, and since the motor 159 can drive in either direction and at any desired speed, depending on the adjustment of the valve 133, the thread bar 99, it will be evident that the drill can be rotated in either direction at any desired speed and concurrently feed in either direction at substantially any desired speed.

Due to the loops in the supply and discharge connections, upward and downward tilting of the boom can be effected by the boom-tilting cylinder 118 without undue strain upon the supply and return tubes. Similarly, due to the slack in the connections, the boom may be swung about its vertical turntable support device without unduly tensioning the supply and return connections, or limiting the range of movement materially. Due to the slack provided in the connections where the supply and return connections pass from the forward end of the boom through the opening 81 and into the casing 38, tilting of the support 75 about the pivot pin 67 is easily possible, and, moreover, the lateral pivotal adjustment of the entire casing 38 and supported parts within the bearing 78 is easily possible. Manually controllable holding means 170 is provided to lock the casing 38 in any desired position of adjustment. Rotation through the necessary angle of the forward boom portion 33 relative to the rearward boom portion 34 is also possible without undue strain upon the supply and return conduits.

In Fig. 11 there is illustrated a modified arrangement. Obviously the motors 159 and 160 may be arranged with one of their respective rotors coaxial with and driving the members which their driving pinions drive in the form so far described. Fig. 11 shows a motor 160' having rotors 171 and 172, and the rotor 171 surrounds and is keyed to and drives the sleeve member 89, which is journaled in the motor housing in a suitable manner. Rotor 172 has a shaft 173. Fluid conducting passages, each operative as a supply or exhaust passage, are arranged at 174 and 175; and to these the connections 153 and 154 may be brought. A similar motor, having one rotor surrounding and driving the member 97, may replace motor 159 and be controlled by handle 135 and valve 133. The mode of operation of this modification will be obvious, and needs no explanation.

From the foregoing description it will be evident that I have provided an improved drilling apparatus having practically unrestricted freedom of adjustment, having power adjustment where a relatively large amount of power is required, having an extremely wide range of rotary speeds and of feeding speeds as well as complete control of direction of drive irrespective of direction of feed and complete control of direction of feed irrespective of direction of rotation, in which very simple parts are employed, and in which a great deal of power is available because of the very high pressures possible with hydraulic apparatus.

While there is in this application specifically described one form and a modification which the invention may assume in practice, it will be understood that these are shown for purposes of illustration, and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a drilling apparatus, a base, a motor driven pump thereon, drilling apparatus including members rotatable independently to effect drill rotation and drill feeding and together to effect drill rotation and variable drill feeding, driving motors for said members each having a rotor coaxial with one of said members, and fluid connections from said pump to said motors.

2. In a drilling apparatus, a drill, means for feeding and rotating said drill including coaxial relatively rotatable drill feeding and drill rotating elements, and independent motors one operatively connected to said drill rotating element and the other to said drill feeding element and each motor including a rotor coaxial with said rotating and feeding elements.

MORRIS P. HOLMES.