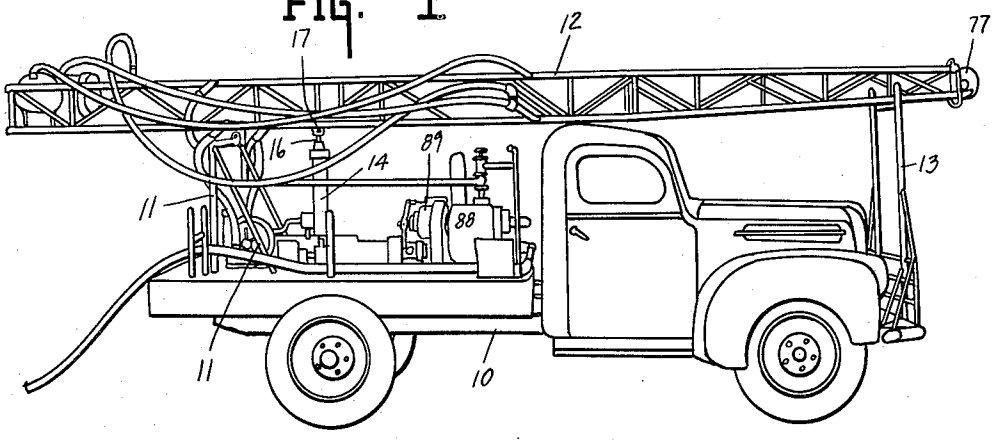
July 25, 1950 C. BURY 2,516,182

PORTABLE DRILLING RIG

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FIG. 1.



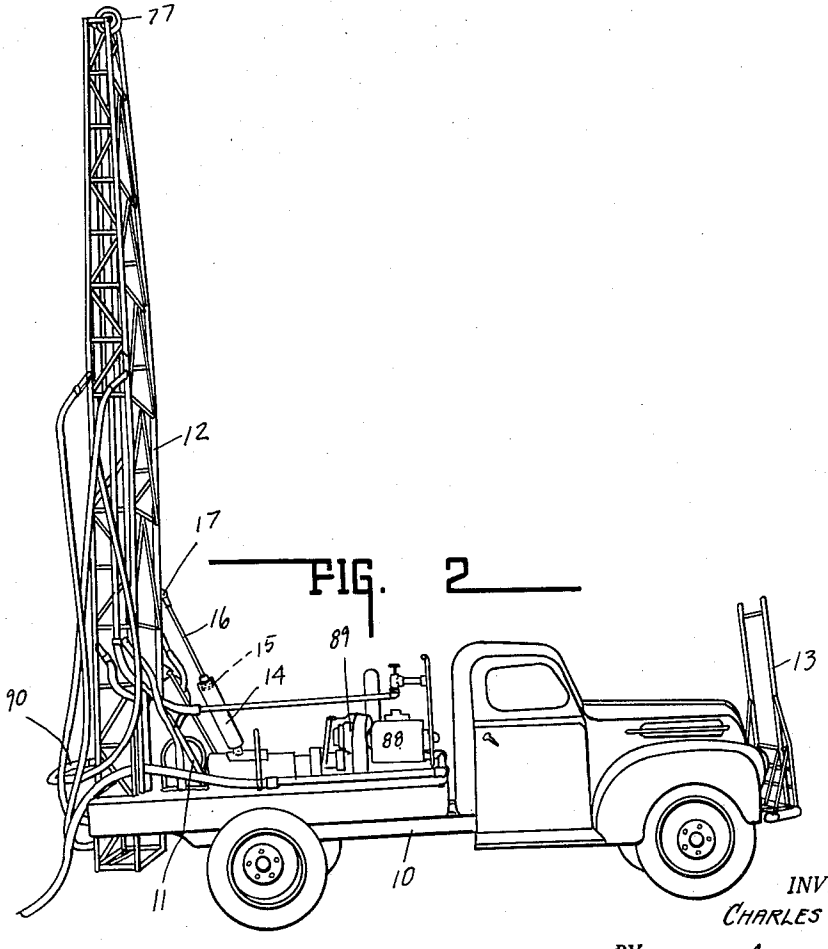


FIG. 2.

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PORTABLE DRILLING RIG

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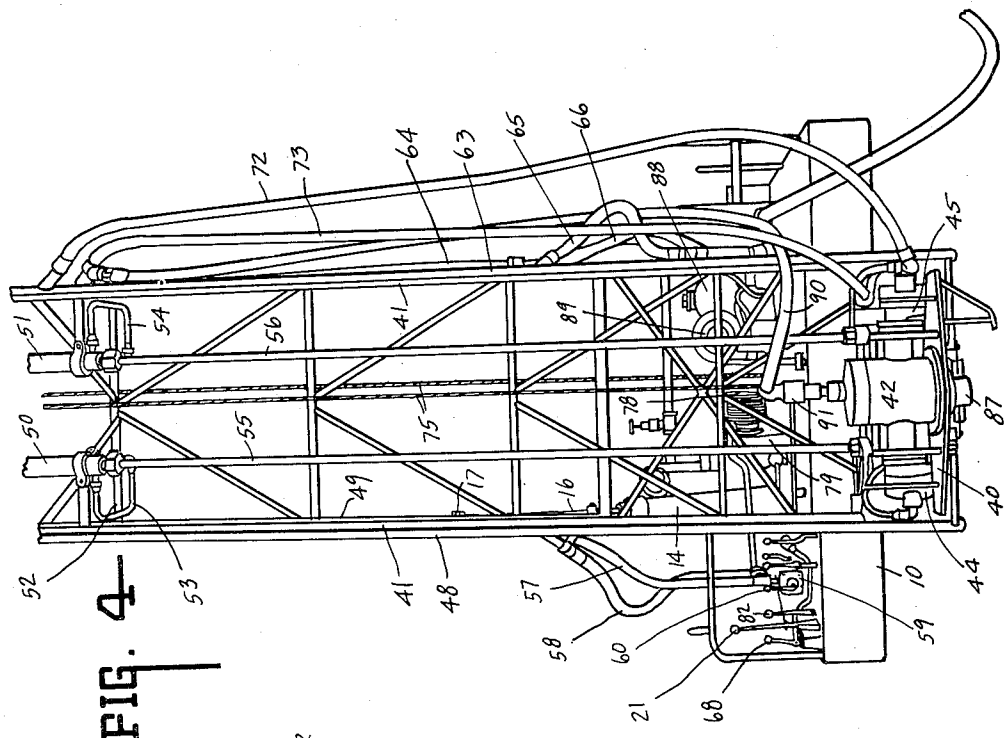


FIG. 4

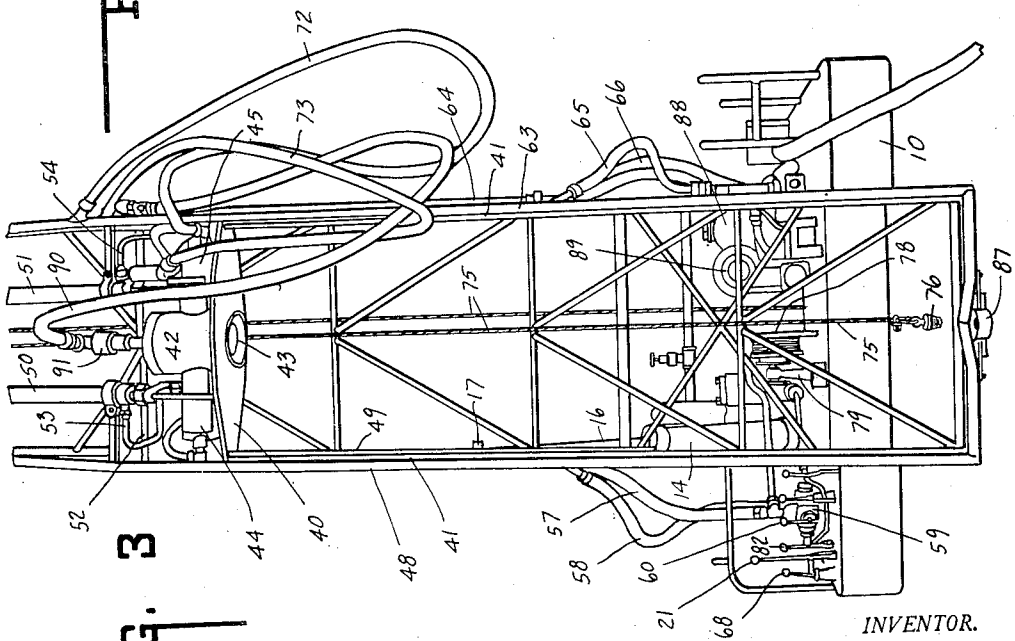


FIG. 3

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PORTABLE DRILLING RIG

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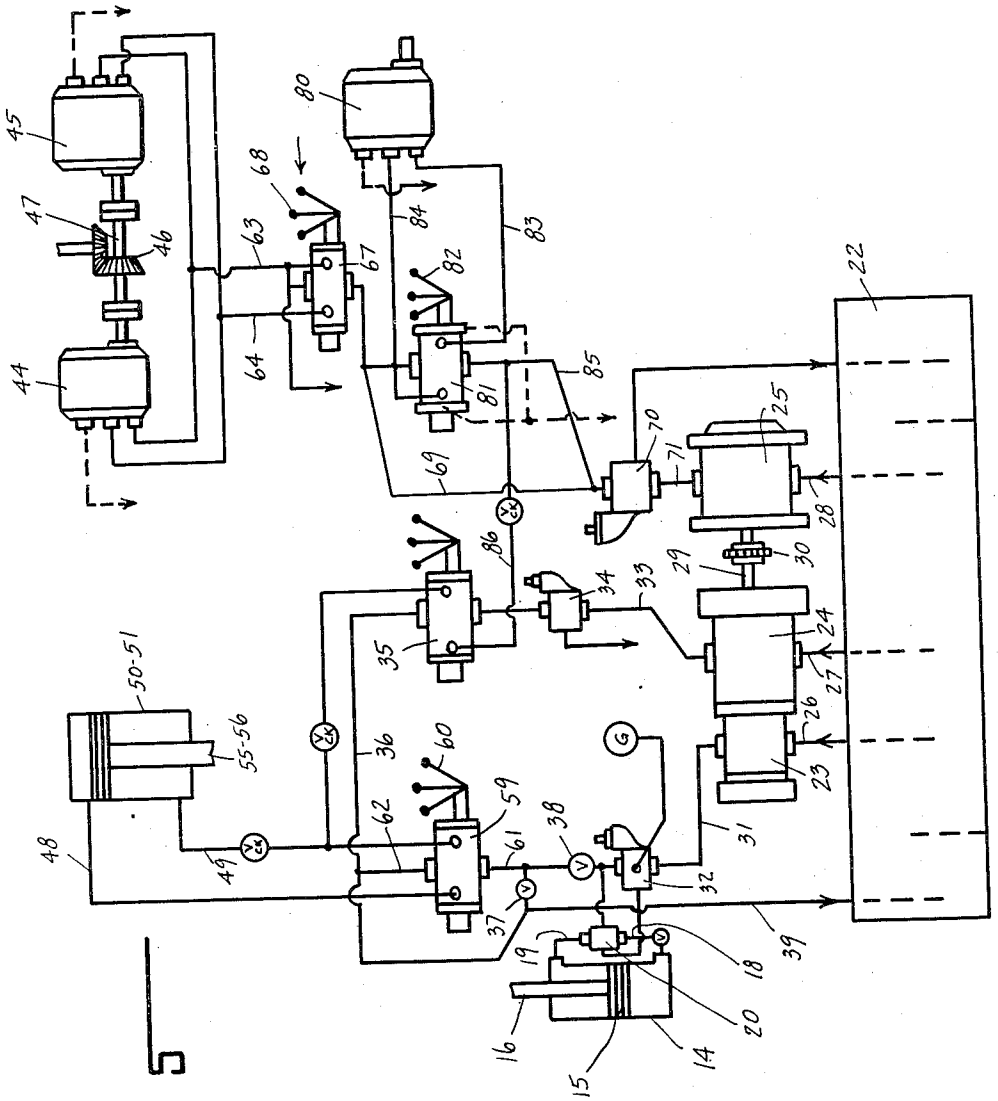


FIG. 5

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UNITED STATES PATENT OFFICE

2,516,182

PORTABLE DRILLING RIG

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Application September 20, 1947, Serial No. 775,227

2 Claims. (Cl. 255—22)

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This invention relates to a portable hydraulic drilling rig such as may be conveniently transported as by truck, and particularly adaptable for core or exploratory drilling as for oil or water wells, mineral deposits, and the like. It relates particularly to such rigs adaptable for mounting on a motor truck or similar vehicles for convenient transportaion in its entirety to and from the location.

The principal feature of the invention resides in the hydraulic power system and the control therefor, said hydraulic power system and control being conveniently built into or mounted upon a truck bed for operation from a control station through a group of valve control levers, all operations being hydraulically actuated.

One feature of the invention resides in the pivotal mounting of the drilling mast with all operative drilling parts being associated and pivotally supported therewith on the truck bed so that in transportation the mast and operative parts may be hydraulically raised and lowered to and from drilling position, and wherein the mast is so constructed as to provide the hydraulic lines for controlling the drilling operation such as the raising and lowering of the rotary table through as much as a ten foot stroke, as well as transmitting the hydraulic power to hydraulically operated motors carried by the table for rotating the drill.

Another feature of the invention resides in the hydraulic power carried through the upper portion of the mast for raising and lowering the rotary table by means of a piston and cylinder action conveniently controlled through valves actuated from the control station to not only elevate the rotary table but exert controlled hydraulic pressure for feeding the drill into the ground.

Another feature of the invention consists in providing a hydraulic lift for seating the mast whereby it may be raised to its vertical drilling position or lowered into its horizontal position for transporting from one location to another, said hydraulic lift being controlled from the control station on the truck.

A still further feature of the invention resides in providing a hydraulic control for the hoisting drum operating a hoisting cable passing over the top of the mast for raising the drill pipe after the drilling operation is completed.

A further feature of the invention resides in a multiple hydraulic power source for cutting in and out of the system a booster motor which, when operated will increase the power and speed of operation to rapidly raise the rotary table into position to install another drill section.

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Other features of the invention will be made apparent from the following specifications and the attached drawings.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 is a side elevation showing the drilling rig in its retracted or horizontal position carried by a truck for transportation.

Fig. 2 is the same as Fig. 1 showing the mast elevated to its vertical drilling position.

Fig. 3 is a front elevation showing the lower portion of the mast and rotary table in raised position.

Fig. 4 is the same as Fig. 3 showing the rotary table in its operative position.

Fig. 5 is a diagrammatical layout of the hydraulic control.

In the drawings there is shown a motor truck including a truck bed 10 upon which is mounted hydraulic power units and controls therefor as shown in Fig. 5, as will be more particularly described in detail. At the rear of the truck bed there is provided a supporting frame 11 for hingedly mounting a drill mast 12. At the forward end of the truck there is provided a cradle 13 for receiving the forward end of the mast when in its horizontal position. The rear end of the truck bed is recessed to permit the mast to stand in vertical position when raised by the hydraulic jack 14. Said jack includes a cylinder pivotally anchored at its lower end upon the truck bed in which the piston 15 is hydraulically actuated. Said piston is connected by the piston rod 16 to one of the legs of the mast as indicated at 17. Thus, upon the piston 15 being hydraulically actuated, as hereinafter described, the mast may be raised or lowered to and from its vertical drilling position through hydraulic control.

In raising the mast the cylinder 14 is charged with the hydraulic fluid entering its lower end through the line 18. It is lowered through said fluid entering its upper end through the line 19. Said lines are controlled by the four way valve 20 actuated by the operating valve control lever 21 mounted on the truck bed at the operating station. Supplying the hydraulic power there is a tank 22 containing hydraulic fluid such as oil carried beneath the truck bed 10.

Mounted on the truck bed there are a series of hydraulic pumps 23, 24, and 25 each having an intake 26, 27, and 28, respectively, extending into the tank. Said pumps are mounted in alignment to be driven by a common shaft 29 by a chain and sprocket drive indicated at 30, wherein the chain extends downwardly through the truck bed to be

driven by a power take-off from the vehicle motor, not shown. The pump 23 is connected by the line 31 through the relief valve 32 with the mast lift valve 20. The pump 24 acts as a booster pump to supplant both the pumps 23 and 25. It is connected by the line 33 through the relief valve 34 and booster control valve 35 with the mast lift valve 20 through the line 36, said line having a needle valve 37 and a gate valve 38 therein. Said line 36 is also provided with a return line 39 discharging back into the tank 22.

The mast carries a rotary table which includes the supporting plate 40 having its ends slidably engaged with the tracks 41 extending vertically of the mast to permit raising and lowering of the table while preventing rotation of the supporting plate. Mounted on the supporting plate there is a rotary table housing 42 in which the usual rotary table is housed to receive and interlock with the upper end of the drill section adapted to extend through the opening 43 in the plate 40. The rotary table is driven by a pair of hydraulic motors 44 and 45 which jointly drive the table through a beveled gear and pinion 46, the driving pinion being keyed to the shaft 47, Fig. 5.

Each of the four legs of the mast is in the form of a hollow cylinder or pipe for conveying the hydraulic fluid which operates to both raise and lower the rotary table and drive the motors 44, 45. The hydraulic fluid for raising and lowering the table is transmitted through the hollow mast legs 48 and 49. The mast leg 48 communicates with the top of a pair of cylinders 50, 51, supported in the upper portion of the mast, the legs 49 communicating with the lower ends of said cylinders 50, 51 through the cross pipe 52 and the respective connections therewith 53, 54. Operating in each of the cylinders 50, 51 there is a piston on the respective piston rods 55, 56. The hollow legs or hydraulic lines 48, 49 are connected through the flexible hose 57, 58, respectively, to the hydraulic lift valve 59. The valve 59 is a four way valve controlled by the control lever 60 mounted on the truck bed 10 at the control station. The valve 59 is connected with the hydraulic pump 23 through the line 31, relief valve 32, gate valve 38, and line 61 discharging back into the tank 22 through the line 39. The hydraulic fluid for accelerating the raising of the table is received from the booster pump 24 through the booster valve 35, line 36, and line 62.

For driving the hydraulic motors 44, 45 the other two hollow legs of the mast 63, 64 are connected by the flexible hose 65, 66, respectively, to the four way motor valve 67 which is controlled by the operating lever 68 mounted at the control station on the truck bed 10. The valve 67 is connected with the hydraulic liquid source or tank 22 through the line 69, the relief valve 70, and line 71 with the motor 25. The leg 63 is connected by the flexible hose 72 with the respective motors 44, 45, for driving them in one direction and the hose 73 connects the leg 64 with said motors for driving them in the opposite direction.

For pulling the drill section from the hole there is provided a hoisting line comprising the cable 75 having secured to its free end a hoisting plug as indicated at 76, said cable extending over the sheave 77 at the top of the mast. Said cable is wound upon the hoisting drum 78 rotatably supported by the brackets 79 on the truck bed 10. Said hoisting drum is driven by the hydraulic motor 80 controlled through the valve 81 which is operated by the lever 82. The valve 81 is connected with the motor 80 through the line 83

for driving the motor in one direction and the line 84 for driving it in the other direction. The source of the power for operating the motor 80 through the valve 81 is derived from the pump 25 through the relief valve 70 and line 85. Said valve is also connected by the line 86 to the booster valve 35 whereby the booster pump 24 may be thrown into the line for adding power and speed of operation to the motor 80.

In operation, the mast is normally transported in horizontal position. At the location, the first step is to raise the mast. For this purpose the control lever 21 is operated to direct fluid under pressure from pump 23 into the lower end of the cylinder 14. Upon completion of the job the mast is lowered by moving the control lever 21 to the opposite position introducing the liquid into the top of the cylinder. This movement may be speeded up through connecting in the booster pump 24 through the control valve 35. Suitable valve control is employed at the lower end of the cylinder 14 to resist the downward movement of the mast and act in a shock absorbing capacity.

Upon the mast having been raised the rotary table 42 is elevated to its uppermost position by actuating the lever 60 at the control station which, through the valve 59 causes the fluid to be forced by the pump 10 to the bottom of the respective cylinders 50, 51. This forces the pistons and piston rods 55, 56 upwardly, lifting the table. Thereupon, a drill section, which may comprise a ten foot drill pipe or auger, is inserted through the opening 43 in the rotary table plate 40 and secured to the rotary table by threading the pipe into a screw plug in the usual and well known manner. The lower end of the pipe is then locked in alignment by extending it through the collar 87 secured to the lower cross bars of the mast.

After the drill section is secured in place, it is rotated by the rotary table through the driving action of the hydraulic motors 44, 45. They are placed in operation through the valve 67 by operating the lever 68. However, in this operation, while the drill section is being rotated the rotary table is permitted to move slowly downwardly under control of the valve 59 until substantially resistance develops in the drilling operation. After such resistance develops the valve 28 is actuated through the operation of lever 60 to apply hydraulic pressure at the top of the cylinders to force the rotary table downwardly. At this stage both rotary movement and downward thrust is applied under hydraulic force upon the drill action.

At this point it may be necessary, where a line pipe is employed for wet or flush drilling, to use a slush pump shown at 88, and mounted upon the truck bed 10. Said slush pump is driven in any suitable manner from the power plant of the truck through the transmission indicated at 89. Water is fed there under pressure through the hose 90 to the top of the swivel connection 91 extending into the rotary table housing 42 for forcing water into the top of the drill pipe connected therein.

After a section of pipe has been drilled down, the next step is to raise it by reversing the motors 44, 45 through operation of the actuating lever 68 and valve 67. Thereupon the connection is backed off, disconnecting the drill pipe which stands at the bottom of the hole. The rotary table is then elevated by operating the valve 59 through the lever 60 to cause the piston rods 55, 56, to be elevated in the cylinders 50, 51, raising

the rotary table to its uppermost position as shown in Fig. 4 to receive a new section of drill pipe or auger.

After the hole has been drilled to the depth desired and for the purpose of removing the drill section, the swivel **97** is disconnected and set to one side; whereupon the hoisting plug **76** is threaded into the end of the pipe or auger. Thereupon, by operating the lever **82** the valve **81** is actuated to cause the hydraulic motor **80** and the hoisting drum **78** to be driven in a direction to pull the pipe or auger from the hole. To permit of an accelerated action in hoisting the pipe the booster motor **24** may be thrown into the system through the valve **35** increasing the power and speed of the motor **80**.

The invention claimed is:

1. A portable drilling rig including a mast pivotally supported on a motor driven truck bed adapted to be raised and lowered between horizontal and vertical positions, said mast being formed of tubular legs, a rotary table for receiving a drill section carried by said mast for movement thereon between raised and lowered positions, a pair of hydraulic motors operably connected with said table for rotating it, a hydraulic cylinder mounted on the upper portion of said mast having a reciprocating piston connected with said table, a hydraulic pump mounted on said truck bed connected with a source of hydraulic fluid, a four way control valve connecting said pump with opposite ends of said cylinder through a pair of said tubular legs, respectively, for raising said rotary table to its uppermost position upon directing fluid through one of said legs to the lower end of said cylinder and move said table downwardly to its lowermost position upon directing fluid to the upper end of said cylinder through the other of said legs, and a second control valve connecting said pump with said hydraulic motors through another pair of said tubular legs for driving said motors and table in one direction when moved to one position and in the other direction when moved to the other position.

2. A portable drilling rig including a mast pivotally supported on a motor truck bed, means on

said truck bed hydraulically operated to raise and lower said mast between horizontal and vertical positions, a rotary table for receiving a drill section, a supporting plate for said table slidably mounted on said mast for movement between raised and lowered positions, a pair of hydraulic motors mounted on said supporting plate operably connected with said table for rotating it, a pair of hydraulic cylinders mounted in the upper portion of said mast each having a piston connected with said supporting plate, a hydraulic pump mounted on said truck bed connected with a source of hydraulic fluid, a four way control valve connecting said pump with a pair of tubular sections of said mast through a flexible hose connection, one of said tubular mast sections being connected with the upper ends of said cylinders and the other mast section being connected with the lower ends of said cylinders, a second control valve connecting said pump with the second pair of tubular mast sections through flexible hose connections and flexible hose connections connecting said tubular mast sections, respectively, with opposite sides of said hydraulic motors for hydraulically rotating said table in a drilling direction while being moved downwardly during the drilling operation and rotating it in the opposite direction upon completion of the drilling operation.

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