Feb. 14, 1956 S. S. POKORNY 2,734,722

POST HOLE DRILLER

Filed Aug. 11, 1952 2 Sheets-Sheet 1

Fig. 1.

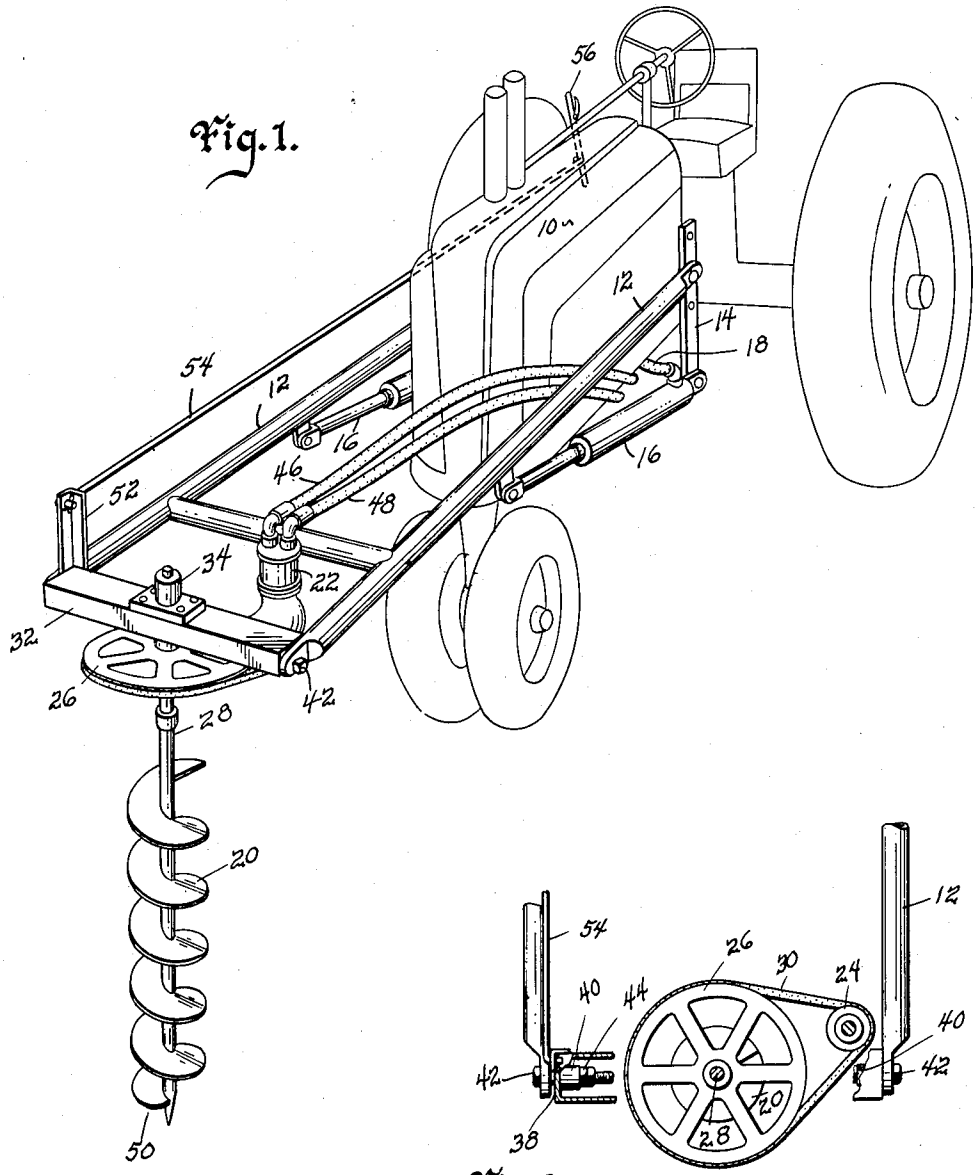


Fig. 2.

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Fig. 3.

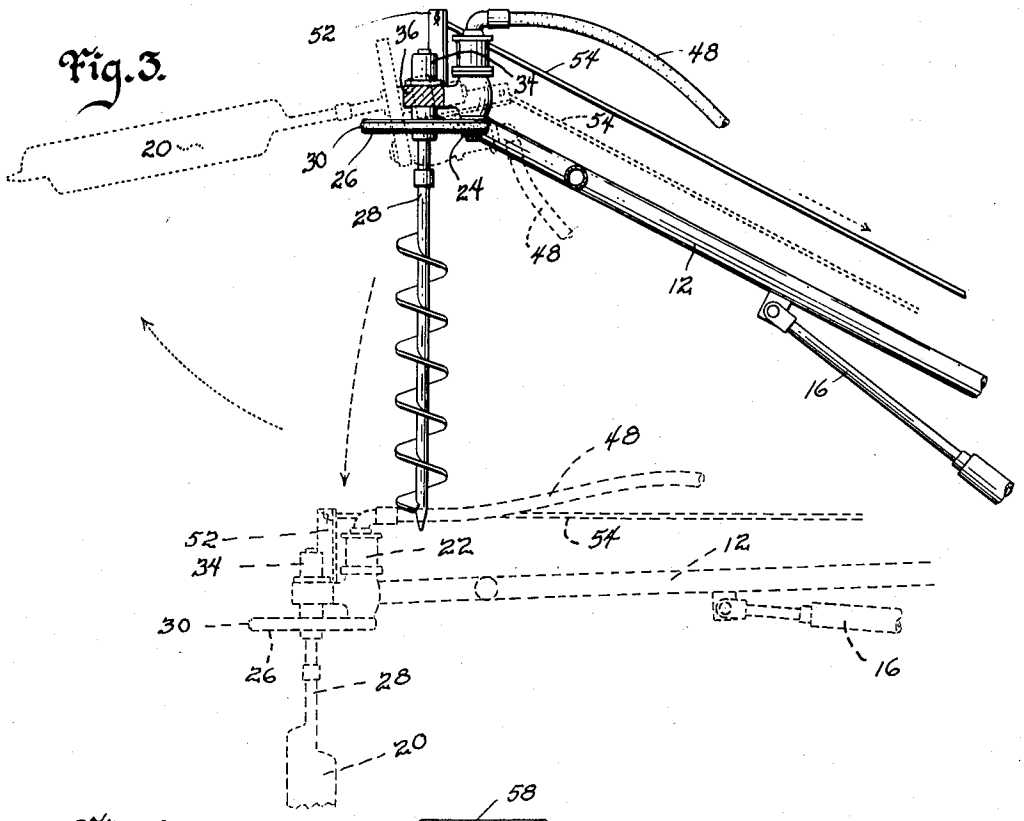
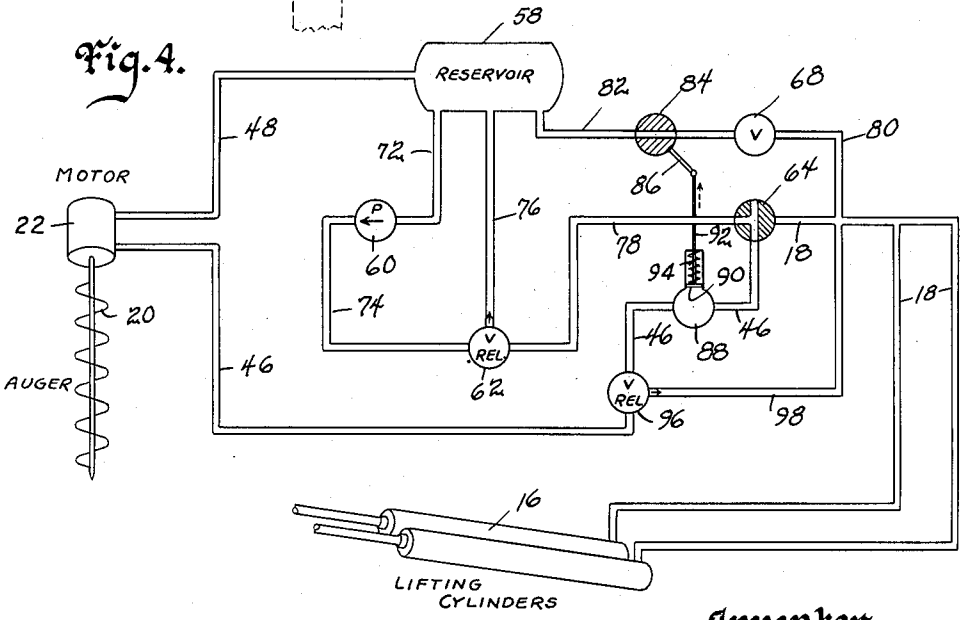


Fig. 4.



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POST HOLE DRILLER

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Application August 11, 1952, Serial No. 303,739

13 Claims. (Cl. 255—19)

My invention is a hydraulic driven post hole driller which has a novel hydraulic circuit which prevents serious damage to the unit as a result of the auger striking unyielding objects such as stones and the like.

There are numerous powered post hole diggers or drillers on the market. Most of these units are mounted on tractors or other vehicles. Generally the means for driving the auger and raising or lowering the auger mechanism are controlled entirely independently of each other. Most of the post hole diggers with which I am familiar are mechanically driven usually from the power take-off of a tractor or truck. The raising and lowering means is frequently a manually driven windlass or one that can be connected into the power take-off system by means of a clutch or the like. Since the auger of these units is driven directly by mechanical linkage of some nature any sudden stopping of the auger as a result of striking a large rock or other unyielding object is apt to cause damage to the unit or extensive delay in operations when the unit is provided with a shear pin or some other technique for avoiding damage to the mechanism generally. Furthermore, considerable skill is required in using the unit since the rate at which the auger is lowered into the ground is controlled by means that are completely independent of the force driving the auger. Most of these structures also require several universal joints and telescoping connections to accommodate the various attitudes that the auger might take in respect to the frame work supporting it and the vehicle on which it is mounted. Those units which are raised and lowered by means of a manually operated windlass also have the shortcoming of being rather limited in the amount of drilling which can be done between periods of clearing the hole and auger of loose earth already drilled. Most of the windlass raised machines where the windlass is powered by a manual handcrank are not provided with sufficient leverage to permit the average person to extend the auger into the earth to its full depth and then withdraw the auger bearing the loose earth with it. It is necessary with these units to drill a portion of a post hole, withdraw and clear the auger and then return to the drilling operation again. This cycle is repeated until the hole is as deep as desired. Also because most of these units are driven from the power take-off of the tractor, they are mounted at the rear of the vehicle; and an entirely separate structure for supporting the auger is necessary. Even though those units which are driven by belts and the like from the tractor pulley when they are mounted on the forward end of the tractor usually require special equipment other than the auger mechanism itself, and, there, make it highly desirable, if not altogether necessary, to provide an entirely separate frame for the auger itself. Because most of these post hole diggers require separate frames and the like even the simplest of them become rather complex pieces of machinery involving considerable expense. Furthermore, the least expensive units

known to me are not entirely satisfactory for the purposes for which they are intended.

In view of the foregoing, therefore, it is the primary object of my invention to provide a post hole driller that has an auger height controlling mechanism interconnected with the mechanism for driving the auger which automatically stops auger feed or even withdraws the auger when it strikes an unyielding object.

It is a further object of my invention to provide a post hole driller that requires no universal joints.

It is a further object of my invention to provide a post hole driller that can be mounted on the lifting arms of any hydraulically operated loader.

It is a further object of my invention to provide a post hole driller that is provided with adequate power for raising it to permit drilling to the maximum depth of the auger in a single operation.

A still further object of my invention is to provide a post hole driller that is economical to manufacture and maintain.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangement, and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, and specifically pointed out in my claims, and illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of my post hole driller shown mounted on a tractor. Broken lines illustrate some hidden parts.

Fig. 2 is a fragmentary plan view of my post hole driller with portions of the device broken away to illustrate its construction in full.

Fig. 3 is a fragmentary view of my post hole driller shown partly in longitudinal section. Broken lines illustrate an adjustment of the mechanism for height while dotted lines show an adjusted angular position of the auger.

Fig. 4 is a schematic diagram of the hydraulic system or circuit for operating my post hole driller.

Referring to the drawings I have used the numeral 10 to designate an ordinary farm tractor which is one type of vehicle on which my post hole driller is mounted conveniently. Secured to the tractor is the elongated frame lifting arm structure designated 12 which is merely the lifting arm structure of a type frequently used in hydraulic loaders. The particular structure of this lifting arm including the upright elements 14 only one of which is visible in Fig. 1 and the hydraulic cylinders 16 are obviously not inventive except perhaps in connection with the balance of my structure. The elongated movable frame element 12 must, of course, be pivotally secured to the uprights 14 while the hydraulic cylinders are necessarily pivotally secured both to the uprights and to the frame 12. Hydraulic fluid under pressure is applied to the cylinders 16 by any suitable conduit such as the one designated 18 in Fig. 1.

At the outer end of frame 12 which extends beyond the tractor longitudinally, the auger assembly is pivotally secured. The auger assembly consists of the auger 20 and its supporting and driving mechanism.

The driving mechanism comprises a hydraulic motor designated 22 which has a V-pulley 24 secured to the motor shaft. A much larger V-type pulley designated 26 is secured to the auger shaft 28. A V-belt 30 reeved around the pulleys serves to transmit power from one to the other in the usual manner. The motor and the auger are secured to the channel element or bearing support beam 32 in any suitable manner. The bearing block 34 extends the bearing surface for the auger to give the

auger stability with reference to the bearing support 32. The center portion of the channel bearing support 32 is solid and adds its bearing surface to that of bearing block 34. This structure is most clearly understood by comparing the broken away fragment of the bearing support shown in Fig. 2 with the longitudinal sectional showing in Fig. 3 at 36 where the solid nature of the center portion of bearing support 32 is clearly disclosed. At the ends of the support element 32, the structure is a true channel however with end members as at 38 in Fig. 2 rigidly secured thereto in any suitable manner. A mounting bearing designated 40 is rigidly secured in the channel to provide mounting bolts 42 a broad bearing surface. This broad bearing surface permits the mounting bolt 42 to extend several inches beyond support element in 38 without causing the bolt to wobble. A pair of nuts designated 44 are used to determine the amount of mounting bolt 42 that extends beyond the support member 32 and provide a means for locking the bolt in the proper mounting position. This mounting bolt structure is important since it permits the use of a single size of supporting channel member 32 to be adjusted to numerous different loader frame structures.

The element 32 is constructed of a size which permits it to be mounted on the smallest standard size of loader frame while the rigidly extendible bolts permit its adaptation to all of the larger commonly used sizes. This mounting bolt structure is used on both ends of element 32 and together provide an adjustment of several inches. As the elements on both ends are identical the same numerals have been used. Hydraulic conduits of a well-known type such as those designated 46 and 48 carry hydraulic fluid under pressure to the motor and provide a return line to the hydraulic reservoir. The auger is a well-known type with the possible exception of the cutting edge which is curved rather than straight as shown in Fig. 1 in numeral 50. This curved leading edge aids the auger in avoiding sudden stoppages as a result of encountering extremely hard earth or unyielding objects such as rocks and the like. As becomes apparent in the discussion of the hydraulic circuit any slight delay or retarding of the speed of the auger before a complete stoppage of the unit occurs will permit sufficient time for the machine to react to protect itself against serious damage. At one side of the bearing support 32 an arm is extended a short distance above the bearing support 32. This arm may be formed from any suitable material and the one shown in Figs. 1, 2 and 3 and designated 52 is formed from a piece of angle iron. An elongated rod 54 that is pivotally secured to the arm 52 extends rearwardly to a control lever 56. The lower end of lever 56 is pivotally secured to some suitable tractor structure and the operator may raise the point of the auger by exerting a pull on lever 56. This action is clearly disclosed by the dotted lines shown in Fig. 3.

This description completes the major mechanical structure of my device as distinguished from the hydraulic circuits.

The hydraulic circuit as disclosed in Fig. 4 has the necessary and well-known elements of the usual hydraulic circuit and in addition some novel interrelated parts. A catalogue of obvious and well-known parts includes the reservoir 58, the pump 60, the normal pressure relief valve 62, a manually operated control valve 64, the hydraulic lifting cylinders 16, the cylinder bleeder valve 68, and the hydraulic motor 22. These units are connected by the usual type of hydraulic conduits which are designated by the following numerals: The conduit on the pump inlet 72, the conduit on the pump outlet to the relief valve inlet 74, the return line from the relief valve to the reservoir 76, the line from the relief valve to the control valve inlet 78. The pressure lines to the cylinders have already been designated by the numeral 18 (the numeral 18 is also used to designate the conduit from the control valve to the junction of the two separate lines leading to the lifting cylinders), the line leading from the lifting cylinder line 18 to the bleeder valve 68 is designated 80, the line from the bleeder valve to the reservoir 82, the line from the control valve to the motor 46 and the return line from the motor to the reservoir 48. The control valve 64 is a well known three port unit which has a mechanism inside of it permitting the line 78 from the relief valve to be connected to either the pressure line 46 to the motor or the pressure line 18 to the lifting cylinders or to completely block the flow of hydraulic fluid from the pump and relief valve.

In the bleeder or lifting cylinder return line 82 is imposed a plug type valve designated 84. The plug of the valve 84 has arm 86 connected to it rigidly. In the line extending to the motor from the control valve 64 is a pressure responsive unit 88 which changes hydraulic pressure into mechanical movement. The unit consists of a short element of conduit inserted in line 46 with a portion of one of its sides formed by a movable piston designated 90. A rod or other mechanical linkage 92 is connected to the piston and extends through the case of unit 88. The rod 92 is pivotaliy connected to the rod 86. A spring or other resilient means 94 constantly urges the piston 90 toward the hydraulic fluid flowing in line 46. A second relief valve designated 96 is also imposed in line 46. The return line from the second relief valve is connected to the cylinder pressure line 18. This completes the description of the operation and advantages of my post hole driller.

In order to drill a post hole with my machine the operator after first having raised the movable frame 12 to a position that causes the auger to clear the ground merely drives the vehicle on which the machine is mounted to the location at which the hole is to be drilled. The auger is raised, of course, by positioning the control valve 64 so that pump 60 can apply hydraulic fluid under pressure to the lifting cylinder pressure conduits 18. While the machine is being transported, bleeder valve 68 and control valve 64 are both positioned so as to prevent any flow of hydraulic fluid. Hydraulic fluid trapped in the lifting cylinders holds the auger in an elevated position. When the location at which it is intended to drill a hole is reached bleeder valve 68 is opened a sufficient amount to permit the gradual descent of the auger by permitting hydraulic fluid to escape from the cylinders into the reservoir by means of lines 80 and 82.

If the post hole is a normal one that is to be perpendicular, the operator merely permits gravity to hold the auger in a vertical position as it is lowered. If for any reason the post hole is to be drilled at an angle, the auger can be placed in almost any angular position by means of lever 56. When the guide point of the auger is properly positioned at the approximate center of a proposed post location, control valve 64 is positioned as shown in Fig. 4 so that hydraulic pump pressure is applied to the pump pressure line 46 of motor 22. As the motor rotates under the influence of hydraulic pressure, the pulleys 24 and 26 are rotated, the former by the pump and the latter by the V-belt which connects the two pulleys together. Bleeder valve 68 is then opened a sufficient amount to produce what the operator estimates will be a proper rate of feed or descent for the auger. As the auger rotates and its weight applies pressure on the auger it will drill into the ground in a well known fashion causing earth to be removed from the hole. In the event, however, that the auger is feeding too rapidly or for any other reason, resistance to the auger is such that the motor is slowed, then a hydraulic pressure begins to build up in line 46, pressure is applied to the end of piston 90. Spring 94 is set to resist pressures below a predetermined value. In my working structure this value was arbitrarily set at eight hundred (800) pounds per square inch, which will be abbreviated p. s. i. hereafter. Whenever the pressure in

line 46 exceeds eight hundred pounds, piston 90 will be moved in a direction of the broken line arrow shown adjacent rod 92 in Fig. 4. This movement will be transmitted to the plug type valve 84 which will tend to close it, thereby further restricting the flow of fluid in the lifting cylinder line 80—82.

If the flow of fluid in this return line is stopped altogether the remaining fluid in cylinder 16 will be trapped thereby preventing any further descent of the auger until its normal operating speed is resumed. If the auger can not free itself and resume normal operating speed the second relief valve 96 will open at some predetermined value and apply this excess pressure to the cylinder lifting lines 18. When pressure is applied to lines 18, the cylinders 16 extend and raise the auger away from the obstruction, whatever it may be. As soon as the auger is raised, however, away from whatever obstacle was reducing its speed, and, thereby, causing the increasing pressure; the speed of the auger will immediately increase to normal R. P. M. As soon as the normal speed of the auger can be established the excess pressure in line 46 will be dissipated rapidly causing relief valve 96 to close and allowing piston 90 under the influence of spring 94 to return to the normal position shown in Fig. 4. The cylinder bleeder line is reopened as a result of the movement of piston 90 back to its normal position and the cylinders immediately begin to collapse and lower the auger again. Obviously my interconnected auger drive and height control will automatically prevent any major damage to the machine resulting from stoppage of the auger. The curved leading cutting edge designated 50 in Fig. 1 prevents any sudden complete stoppage of the unit, and, therefore, permits the automatic system momentarily a period of increasing pressure that causes action to relieve the situation which is causing the difficulty.

If the automatic raising mechanism is constantly slowing or even raising the auger the operator should either reduce the feeding speed of the unit by closing bleeder valve 68 somewhat or he should remove the auger from the proposed post hole entirely and examine the hole to determine whether there is some obstacle in the path of the hole which would completely prevent any possibility of completing the hole at that exact location. If for any reason it is impossible for the lifting cylinders to raise the auger away from the snag which prevents its rotation, the first relief valve 62 will prevent any serious damage by merely by-passing pump measures back to the reservoir. From this description of operation it should be obvious that my novel hydraulic system has numerous advantages over many of the post hole drillers now on the market. Although it is a relatively simple device the only new portions being the unit 88, relief valve 96 and the motor and auger assembly; this driller can be constructed for a price roughly equivalent to the least expensive units now on the market and of which I have knowledge. On the other hand this device is a full-sized adequately powered post hole driller that will perform in a manner equal to many of the most expensive drilling machines known to me. It is also clear by this time that my post hole driller will accomplish at least my principal object of invention.

Some changes may be made in the construction and arrangement of my post hole driller without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. A hydraulic circuit comprising, a reservoir, a pump having an inlet and an outlet, a conduit communicating between the inlet of said pump and said reservoir, a three port relief valve, a conduit connecting the outlet of said pump to the inlet of said relief valve, a conduit connecting said relief valve to said reservoir, a three port control valve, a conduit connecting the first port of said three port control valve to said relief valve, at least one hydraulic cylinder, a conduit connecting the second of the ports of said control valve to said hydraulic cylinder, a hydraulic motor, a conduit connecting said hydraulic motor to the third port of said three port control valve, a conduit connecting said hydraulic motor to said reservoir, a hydraulic cylinder return conduit connecting said reservoir to said conduit that connects said control valve to said hydraulic cylinder, a shut-off valve in said hydraulic cylinder return line, a pressure responsive means that converts fluid pressure into mechanical movement tapped into said conduit connecting said three port control valve to said hydraulic motor, linkage connecting the mechanical movement portion of said pressure responsive means to said shut-off valve, a resilient means yieldingly holding said pressure responsive means in a position that causes said shut-off valve to be open when pressures applied to said hydraulic motor are below a predetermined value, and a bleeder valve in said hydraulic cylinder return conduit in series with said shut-off valve; said three port control valve having means therein for selectively connecting said first port to said second port and said third port.

2. A hydraulic circuit comprising, a reservoir, a pump having an inlet and an outlet, a conduit communicating between the inlet of said pump and said reservoir, a three port relief valve, a conduit connecting the outlet of said pump to the inlet of said relief valve, a conduit connecting said relief valve to said reservoir, a three port control valve, a conduit connecting the first port of said three port control valve to said relief valve, at least one hydraulic cylinder, a conduit connecting a second of the ports of said control valve to said hydraulic cylinder, a hydraulic motor, a conduit connecting said hydraulic motor to the third port of said three port control valve, a second relief valve; said second relief valve interposed in said conduit connecting said third port of said three port control valve to said hydraulic motor, a conduit connecting said second relief valve to the conduit connecting said second port of three port control valve to said hydraulic cylinder, a conduit connecting said hydraulic motor to said reservoir, a hydraulic cylinder return conduit connecting sad reservoir to said conduit that connects said control valve to said hydraulic cylinder, a shut-off valve in said hydraulic cylinder return line, a pressure responsive means that converts fluid pressure into mechanical movement tapped into said conduit connecting the third port of said three port control valve to said hydraulic motor, linkage connecting the mechanical movement portion of said pressure responsive means to said shut-off valve, a resilient means yieldingly holding said pressure responsive means in a position that causes said shut-off valve to be open when pressures applied to said hydraulic motor are below a predetermined value, and a bleeder valve in said hydraulic cylinder return conduit in series with said shut-off valve; said three port control valve having means therein for selectively connecting said first port to said second port and said third port.

3. A hydraulic circuit comprising, a reservoir, a pump having an inlet and an outlet, a conduit communicating between the inlet of said pump and said reservoir, a three port relief valve, a conduit connecting the outlet of said pump to the inlet of said relief valve, a conduit connecting said relief valve to said reservoir, a three port control valve, a conduit connecting the first port of said three port control valve to said relief valve, at least one hydraulic cylinder, a conduit connecting the second of the ports of said control valve to said hydraulic cylinder, a hydraulic motor, a conduit connecting said hydraulic motor to the third port of said three port control valve, a conduit connecting said hydraulic motor to said reservoir, a hydraulic cylinder return conduit connecting said reservoir to said conduit that connects said control

valve to said hydraulic cylinder, a shut-off valve in said hydraulic cylinder return line, a pressure responsive means that converts fluid pressure into mechanical movement tapped into said conduit connecting said three port control valve to said hydraulic motor, means connecting the mechanical movement portion of said pressure responsive means to said shut-off valve, a resilient means yieldingly holding said pressure responsive means in a position that causes said shut-off valve to be open when pressures applied to said hydraulic motor are below a predetermined value, and a bleeder valve in said hydraulic cylinder return conduit in series with said shut-off valve; said three port control valve having means therein for selectively connecting said first port to said second port and said third port.

4. A hydraulic circuit comprising, a reservoir, a pump having an inlet and an outlet, a conduit communicating between the inlet of said pump and said reservoir, a three port relief valve, a conduit connecting the outlet of said pump to the inlet of said relief valve, a conduit connecting said relief valve to said reservoir, a three port control valve, a conduit connecting the first port of said three port control valve to said relief valve, at least one hydraulic cylinder, a conduit connecting the second of the ports of said control valve to said hydraulic cylinder, a hydraulic motor, a conduit connecting said hydraulic motor to the third port of said three port control valve, a conduit connecting said hydraulic motor to said reservoir, a hydraulic cylinder return conduit connecting said reservoir to said conduit that connects said control valve to said hydraulic cylinder, a shut-off valve in said hydraulic cylinder return line, a pressure responsive means that converts fluid pressure into mechanical movement tapped into said conduit connecting said three port control valve to said hydraulic motor, linkage connecting the mechanical movement portion of said pressure responsive means to said shut-off valve, a resilient means yieldingly holding said pressure responsive means in one direction when pressures applied to said hydraulic motor are below a predetermined value, and a bleeder valve in said hydraulic cylinder return conduit in series with said shut-off valve; said three port control valve having means therein for selectively connecting said first port to said second port and said third port.

5. A hydraulic circuit comprising, a reservoir, a pump having an inlet and an outlet, a conduit communicating between the inlet of said pump and said reservoir, a three port relief valve, a conduit connecting the outlet of said pump to the inlet of said relief valve, a conduit connecting said relief valve to said reservoir, a three port control valve, a conduit connecting the first port of said three port control valve to said relief valve, at least one hydraulic cylinder, a conduit connecting a second of the ports of said control valve to said hydraulic cylinder, a hydraulic motor, a conduit connecting said hydraulic motor to the third port of said three port control valve, a second relief valve; said second relief valve interposed in said conduit connecting said third port of said three port control valve to said hydraulic motor, a conduit connecting said second relief valve to the conduit connecting said second port of said three port control valve to said hydraulic cylinder, a conduit connecting said hydraulic motor to said reservoir, a hydraulic cylinder return conduit connecting said reservoir to said conduit that connects said control valve to said hydraulic cylinder, a shut-off valve in said hydraulic cylinder return line, a pressure responsive means that converts fluid pressure into mechanical movement tapped into said conduit connecting the third port of said three port control valve to said hydraulic motor, linkage connecting the mechanical movement portion of said pressure responsive means to said shut-off valve, a resilient means yieldingly holding said pressure responsive means in one direction when pressures applied to said hydraulic motor are below a predetermined value, and a bleeder valve in said hydraulic cylinder return conduit in series with said valve; said three port control valve having means therein for selectively connecting said first port to said second port and said third port.

6. In a vehicle mounted post hole driller, an elongated frame adapted to be movably secured to a vehicle, hydraulic means secured to said frame and adapted to being secured to said vehicle to move said frame in relation to said vehicle, a bearing support member pivotally secured to said elongated frame, bearings secured to said bearing support, an auger journalled in said bearings, a V-pulley secured to said auger, a hydraulic motor secured to said bearing support member, a V-pulley secured to and driven by said motor, a V-belt reeved over said pulleys, a source of hydraulic pressure, a valve connected to said source of hydraulic pressure, pressure lines connecting said valve to said motor and said hydraulic means; said valve selectively connecting said source of hydraulic pressure to said motor and said hydraulic means, means for controllably releasing pressure from the one of said pressure lines connected to said hydraulic means, and a relief valve connected to both of said pressure lines for connecting the said pressure lines together when pressure in said motor reaches a predetermined value.

7. In a vehicle mounted post hole driller, an elongated frame adapted to being movably secured to a vehicle, hydraulic means secured to said frame and adapted to being secured to said vehicle to move said frame in relation to said vehicle, a bearing support member pivotally secured to said elongated frame, bearings secured to said bearing support, an auger journalled in said bearings, a V-pulley secured to said auger, a hydraulic motor secured to said bearing support member, a V-pulley secured to and driven by said motor a V-belt reeved over said pulleys, a source of hydraulic pressure, a valve connected to said source of hydraulic pressure, pressure lines connecting said valve to said motor and said hydraulic means; said valve selectively connecting said source of hydraulic pressure to said motor and said hydraulic means, means for controllably releasing pressure from the one of said pressure lines connected to said hydraulic means, a pressure responsive unit that transforms hydraulic pressure into mechanical movement connected to the one of said pressure lines that connects to said motor, a rod on said pressure responsive unit which is activated when mechanical movement occurs, a valve in the one of said pressure lines that connects to said hydraulic means, an arm on said valve connected to the rod on said pressure responsive unit, and a relief valve connected to both of said pressure lines for connecting the said pressure lines together when pressure in said motor reaches a predetermined value.

8. In a mounted post hole driller, an elongated frame hingedly mounted on a vehicle, a hydraulic piston-operated cylinder hingedly secured to said elongated frame and the vehicle, an earth auger hingedly and rotatably secured to said elongated frame, a hydraulic motor mechanically connected to said earth auger, a source of hydraulic power, a control valve, a conduit connecting said control valve to said source of hydraulic power, a motor pressure line connecting said motor to said control valve, a cylinder pressure line connecting said cylinder to said control valve, a cylinder return conduit connecting said cylinder to said source of hydraulic power, a bleeder valve in said cylinder return conduit, a normally open valve in said cylinder return conduit, a cylinder vented to said motor pressure line, a spring loaded piston in said cylinder, and linkage connecting said piston to said normally open valve.

9. In a mounted post hole driller, an elongated frame hingedly mounted on a vehicle, a hydraulic piston-operated cylinder hingedly secured to said elongated frame and the vehicle, an earth auger hingedly and rotatably secured to said elongated frame, a hydraulic motor mechanically connected to said earth auger, a source of hydraulic power, a control valve, a conduit connecting said control valve to said source of hydraulic power, a motor pressure line connecting said motor to said control valve,

a cylinder pressure line connecting said cylinder to said control valve, a cylinder return conduit connecting said cylinder to said source of hydraulic power, a bleeder valve in said cylinder return conduit, a normally open valve in said cylinder return conduit, a cylinder vented to said motor pressure line, a spring loaded piston in said cylinder, a relief valve having a by-pass port mounted in said motor pressure line, a conduit connecting said by-pass port to said cylinder pressure line, and linkage connecting said piston to said normally open valve.

10. In a mounted post hole driller, an elongated frame hingedly mounted on a vehicle, a hydraulic piston-operated cylinder hingedly secured to said elongated frame and the vehicle, an earth auger hingedly and rotatably secured to said elongated frame, a hydraulic motor mechanically connected to said earth auger, a source of hydraulic power, a control valve, a conduit connecting said control valve to said source of hydraulic power, a motor pressure line connecting said motor to said control valve, a cylinder pressure line connecting said cylinder to said control valve, a cylinder return conduit connecting said cylinder to said source of hydraulic power, a bleeder valve in said cylinder return conduit, a relief valve having a by-pass port mounted in said motor pressure line, and a conduit connecting said by-pass port to said cylinder pressure line.

11. In a mechanism for driving and feeding a rotating cutting tool, a rotating cutting tool, a means connected to said tool for movably and rotatably supporting it, a fluid pressure responsive means connected to said tool supporting means for moving said tool supporting means in one direction, a source of fluid pressure, means connected to said source of fluid pressure and said fluid pressure responsive means for conducting fluid under pressure from said source of fluid pressure to said fluid pressure responsive means, a means connected to said fluid pressure responsive means for trapping fluid under pressure in said fluid pressure responsive means; said trapping means also incorporating means for controllably releasing pressure from said fluid pressure responsive means, said source of fluid pressure connected to said rotating cutting tool, a spring-loaded piston means operatively associated with and actuated by said source of fluid pressure, said source of fluid pressure containing a control valve, an arm secured to said control valve, said spring loaded piston means actuating the arm of said control valve to increase fluid pressure applied to said fluid pressure responsive means when resistance to said rotating cutting tool exceeds a predetermined value.

12. In a mechanism for driving and feeding a rotating cutting tool, a rotating cutting tool, a means connected to said tool for movably and rotatably supporting it, a fluid pressure responsive means connected to said tool supporting means for moving said tool supporting means in one direction, a source of fluid pressure, means connected to said source of fluid pressure and said fluid pressure responsive means for conducting fluid under pressure from said source of fluid pressure to said fluid pressure responsive means, a means connected to said fluid pressure responsive means for trapping fluid under pressure in said fluid pressure responsive means; said trapping means also incorporating means for controllably releasing pressure from said fluid pressure responsive means, said source of fluid pressure connected to said rotating cutting tool, spring-loaded piston means connected in series with said trapping means and operatively associated with and actuated by said source of fluid pressure, said source of fluid pressure containing a control valve, an arm secured to said control valve, said spring loaded piston means actuating the arm of said control valve to render ineffective said means for controllably releasing trapped fluid from said fluid pressure responsive means at times, and a means operatively associated with and actuated by said source of rotating power that increases fluid pressure applied to said fluid pressure responsive means when resistance to said rotating cutting tool exceeds a predetermined value.

13. In a mechanism for driving and feeding a rotating cutting tool, a rotating cutting tool, a means connected to said tool for movably and rotatably supporting it, a fluid pressure responsive means connected to said tool supporting means for moving said tool supporting means in one direction, a source of fluid pressure, means connected to said source of fluid pressure and said fluid pressure responsive means for conducting fluid under pressure from said source of fluid pressure to said fluid pressure responsive means, a means connected to said fluid pressure responsive means for trapping fluid under pressure in said fluid pressure responsive means; said trapping means also incorporating means for controllably releasing pressure from said fluid pressure responsive means, said source of fluid pressure connected to said rotating cutting tool, a spring-loaded piston means operatively associated with and actuated by said source of fluid pressure, said source of fluid pressure containing a control valve, an arm secured to said control valve, said spring loaded piston means actuating the arm of said control valve to render ineffective said means for controllably releasing trapped fluid from said fluid pressure responsive means at times.

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