

Dec. 2, 1941.

V. N. ALBERTSON

2,264,560

POWER LIFT

Filed June 10, 1939

4 Sheets-Sheet 1

Fig. 1.

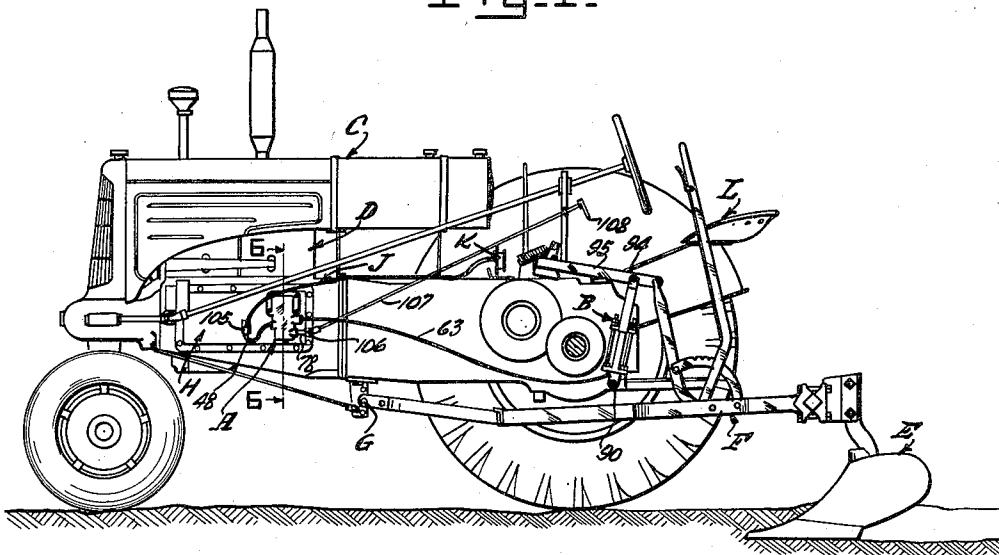


Fig. 3.

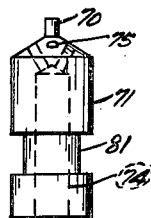


Fig. 5.

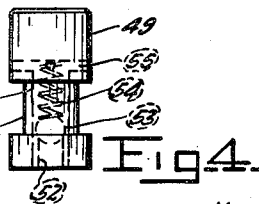
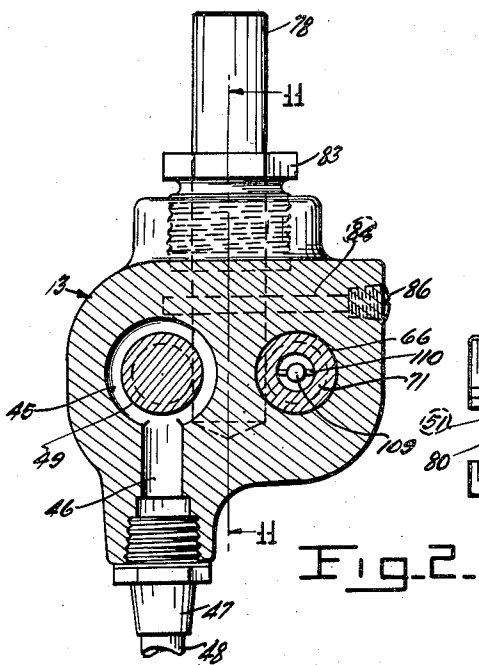
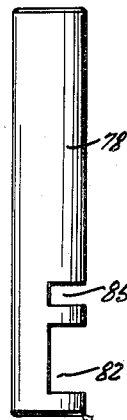


Fig. 4.

Fig. 2.

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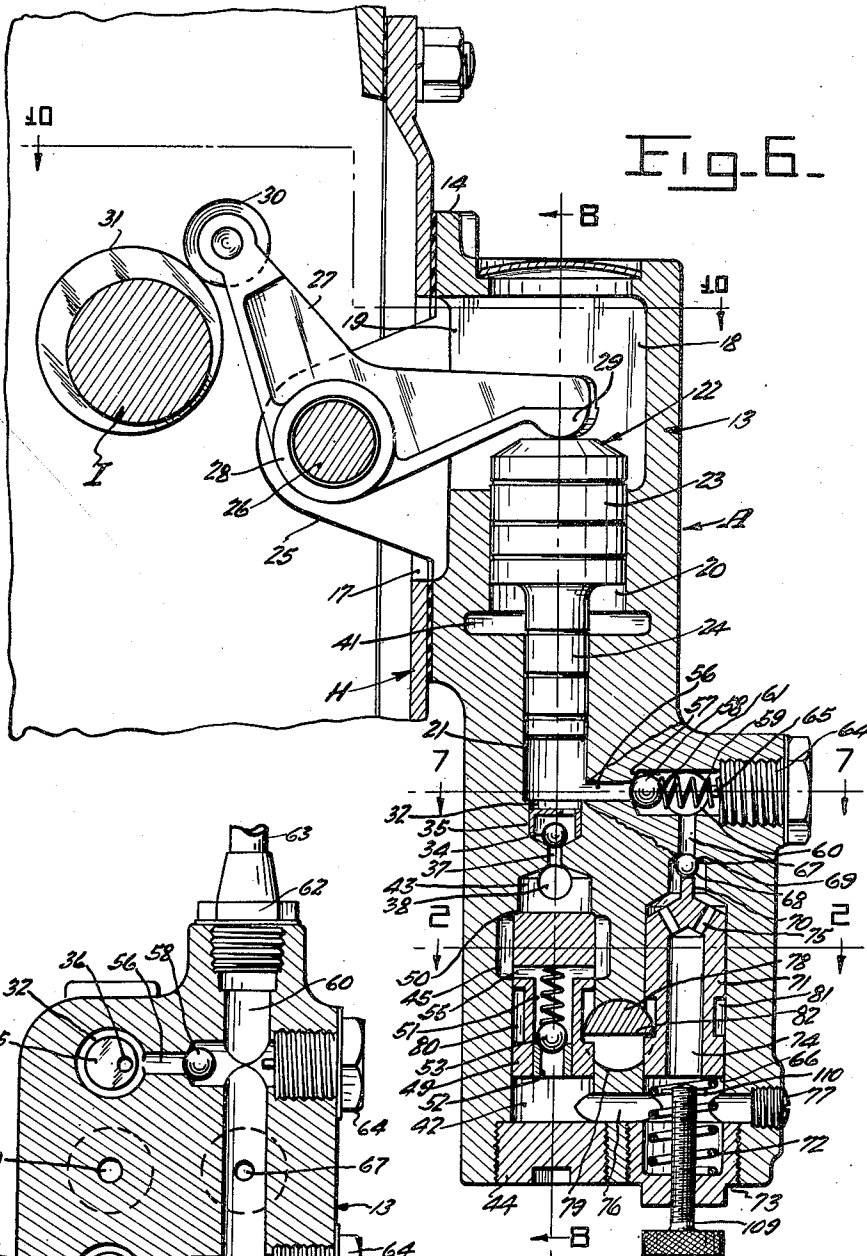


Fig. 6.

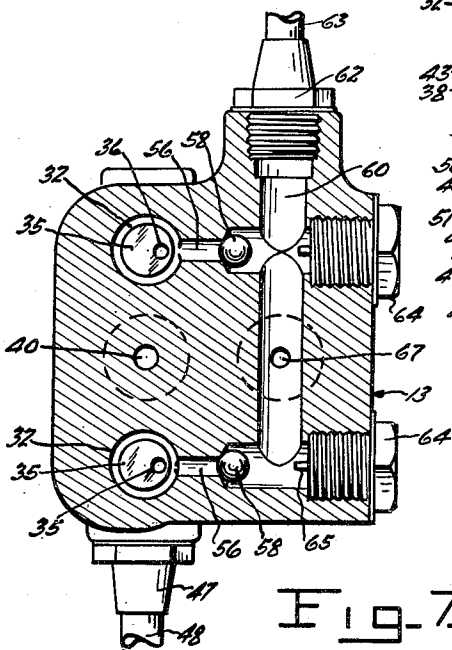


Fig. 7.

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4 Sheets-Sheet 3

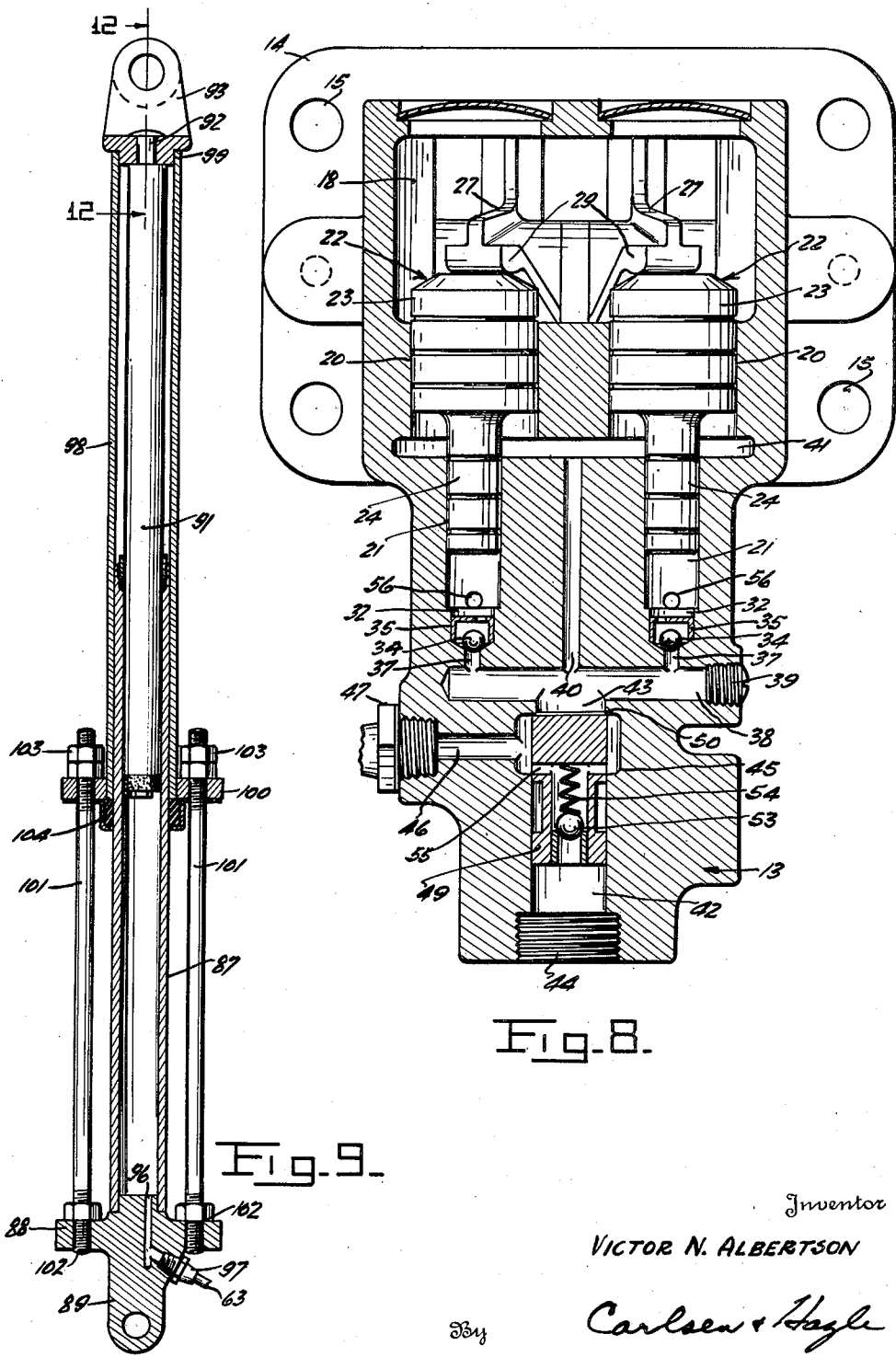


Fig. 8.

Fig. 9.

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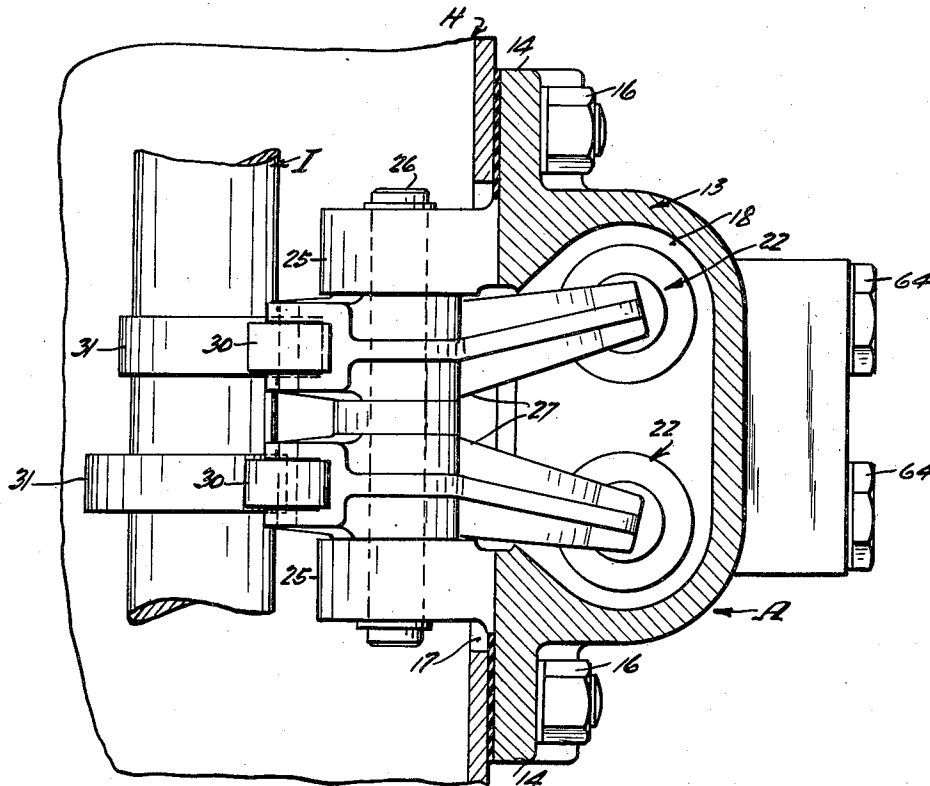


Fig. 10.

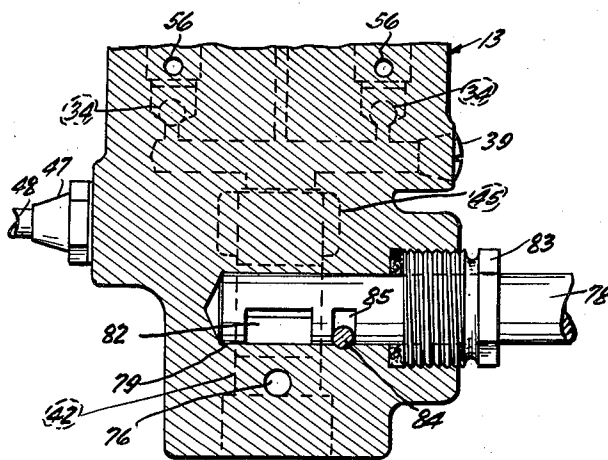
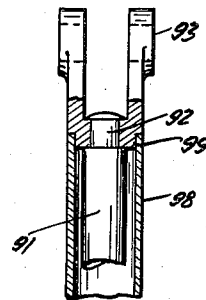


Fig. 11.

By

Fig. 12.



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UNITED STATES PATENT OFFICE

2,264,560

POWER LIFT

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Application June 10, 1939, Serial No. 278,476

30 Claims. (Cl. 103—42)

This invention relates to improvements in power lift mechanisms for tractor propelled implements.

The primary object of the invention is to provide a power lift mechanism of the hydraulic or fluid operated type which is simple, compact, inexpensive and capable of wide variation in position and arrangement on the tractor according to the nature and type of implement or implements to be raised and lowered. Another object is to provide a hydraulic lift using oil from the engine as the operating fluid and in which the normal engine oil pressure is employed in novel fashion to cause the working parts of the mechanism to operate only when an implement is to be raised. Another object is to provide a lift capable of manipulation by a single control from a remote point and which includes means for automatically shutting off the operation when the implement reaches the top of its upward movement. A further object is to provide a hydraulic lift of this kind having an adequate safety factor under all conditions and with means for varying the effective hydraulic pressure on the lift as well as for adjusting the rate of descent of the implement as it is lowered, according to the weight of the implement.

Still a further object of the invention is to provide a novel and advantageous assembly of an actuating unit or pump arranged on the engine in position for operation by cams on the usual cam shaft of the engine and hydraulically actuating one, or more, lift units or jacks which may be arranged at any remote point for most convenient connection to the implement or implements.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a side elevation of a tractor and attached implement showing my power lift mechanism in operative assembly therewith, the rear traction wheel of the tractor being removed to better disclose the assembly.

Fig. 2 is a horizontal cross sectional view through a lower portion of the actuating unit or pump, the plane at which this view is taken being identified by the line 2—2 in Fig. 6.

Fig. 3 is an elevation of the pressure relief valve member alone.

Fig. 4 is an elevation of the intake valve alone.

Fig. 5 is an elevation of the throttle or operating rod for controlling the relief and intake valves.

Fig. 6 is an enlarged vertical cross sectional view through the actuating unit and adjacent portions of the engine taken along the line 6—6 in Fig. 1.

Fig. 7 is a horizontal section along the line 7—7 in Fig. 6.

Fig. 8 is a vertical section along the line 8—8 in Fig. 6.

Fig. 9 is an enlarged, vertical and longitudinal sectional view of the lift unit alone.

Fig. 10 is a horizontal sectional view through the actuating unit taken along the line 10—10 in Fig. 6.

Fig. 11 is a fragmentary vertical section through the lower portion of the actuating unit along the line 11—11 in Fig. 2.

Fig. 12 is a sectional view along the line 12—12 in Fig. 9, showing the coupling member of the lift unit.

Referring now with more particularity and by reference characters to the drawings, A designates generally the actuating unit and B the lift unit making up my improved lift mechanism. These units are supported in any suitable manner upon the tractor C, the former being arranged on the tractor engine D and the latter at any point convenient to the implement E which is connected to the tractor. In the assembly shown in Fig. 1 the implement E is arranged at the rear of the tractor and is connected thereto by a well known type of draft connection which includes the frame F pivotally connected at G to the tractor and extended rearwardly for movement in a vertical plane and for adjusting the elevation of the implement. Further details as to this structure will be pointed out hereinafter in the description of the lift unit.

The tractor C here shown is of a well known type, and the power plant or engine D thereof includes a removable crankcase side cover H inwardly of which extends the usual valve actuating cam shaft I. The actuating unit A of my invention is mounted on this cover H and is accordingly located convenient to said cam shaft I for operation thereby as will hereinafter appear.

Turning now to the details of construction of the actuating unit or pump A, the same is shown to comprise as its main supporting element a cast housing 13 of generally vertically elongated shape provided at its inner and upper side (with respect to its position on the engine D) with marginal flanges 14 which are apertured at 15 to pass mounting screws 16 by which the housing is removably secured to the cover H. An opening 17 is formed in this cover H substantially at the

level of the camshaft I and the flanged face of the housing 13 fits over and closes this opening with access therethrough to said camshaft as clearly shown in Figs. 6 and 10.

The upper end portion of the housing has a recess 18 which opens at 19 through its inner side in registry with the upper portion of the aforesaid cover opening 17, and the housing further has spaced and parallel upper and lower chambers or cylinders 20—21 which open upwardly into the lower side of this recess 18. These are spaced in front to rear alignment in the housing as shown, and the upper cylinders 20 are considerably larger in diameter than the lower pressure cylinders 21. Pump plungers or pistons 22 are slidably mounted in the chambers and have large upper head portions 23 and diametrically reduced lower stem portions or pressure ends 24 which fit the corresponding cylinders 20—21.

Rocker mounting lugs or ears 25 are extended inwardly from front and rear edges of the housing 13 to project through the cover opening 17 and they are apertured to receive a rocker shaft 26 which is thus supported parallel to and adjacent the cam shaft I. Piston actuating rocker arms 27 are pivotally mounted by intermediate hub portions 28 on the shaft 26 and their outer ends extend over the upper ends of the pistons 22 with rounded knuckles 29 to engage the head portions 23 thereof. The inner ends of the rocker arms extend adjacent to the cam shaft I at right angles to the axis thereof and are provided with rollers 30 which are adapted to ride suitable cams 31 secured to said shaft. The entire assembly is of course so located with respect to the camshaft that these cams 31 may be mounted thereon without interference with the usual valve actuating cams (not shown) thereon. The arrangement is such that as the cam shaft rotates the cams 31 will rock the rocker arms 27 on the shaft 26 and in turn vertically reciprocate the pistons 22 in the cylinders 20—21, it being noted, however, that these pistons will normally, of their own weight, drop to the lower limits of their movement, thus allowing the rocker arms to swing downward at their outer ends and move the rollers 30 out of engagement with the cams 31. Thus it will be seen that the rocker arm and piston mechanism will normally remain inoperative, saving wear on these parts, but as the pistons are raised slightly (by a means to be described) the parts will be put in operation and the reciprocation of the pistons may then be employed to build up a pressure in the lower ends of the cylinders 21.

The cams 31 are so arranged that one piston 22 will be urged downwardly as the other is moved upwardly, and this sequence of operation is important as will be hereinafter pointed out.

The lower ends of the cylinders 21 communicate with valve chambers 32 which have valve seats 33 for intake ball check valves 34 which are retained in place by small cages 35 pressed into the chambers and apertured eccentrically at 36 to pass fluid when the same is admitted by the valves. Said valves 34 control passage through inlet ducts 37 which communicate with a cross bore 38 formed in through the rear side of the housing 13 and plugged at its outer end at 39. A passage 40 leads from a central portion of the bore 38 upwardly between the cylinders 21 and enters a flat recess 41 formed in the housing around, between, and in communication

with the upper chamber 20. The check valves 34 of course permit free upward movement of fluid into the lower ends of the cylinders 21 while preventing downward escape of the fluid back through the ducts 37.

Formed in the housing 13 near the inner side thereof is the vertically axised and extended intake valve recess or bore 42 communicating upwardly at 43 with the bore 38 connecting the ducts 37. The lower end of this chamber is closed by a threaded plug 44 and the upper portion has a diametrically enlarged inlet chamber 45 into which fluid may flow through a duct 46 leading out forwardly through the housing and having a conventional connection at 47 with the fluid intake tubing or feed line 48. An intake or admission valve member 49 is slidably fitted in the bore 42 and at its upper end is marginally beveled to fit a seat 50 formed at the upper margin of the chamber 45 so that the valve in its uppermost position will shut off the flow of fluid from the line 48 to the bore 38. The valve 49 has an axial, downwardly opening passageway 51 provided with a valve seating bushing 52 which forms a seat for the return check valve ball 53 which is yieldably pressed to the seat by the spring 54. At the upper end the passageway 51 communicates with the inlet chamber 45 through ports 55 radially and outwardly opening through the head portion of the valve.

The lower ends of the cylinders 21 also communicate with outwardly extending outlet ducts 56 terminating in seats 57 for outlet check valve balls 58 opening outwardly to pressure flowing from the cylinders but spring pressed by the springs 59 to prevent pressure from working back into the cylinders. An outlet bore or passage 60 is formed in the housing in communication with diametrically enlarged outer portions 61 of the ducts 56 so that the fluid under pressure passed by the valves 58 may flow from the housing through a coupling 62 in the rear end of the passage 60 and thence into the supply or outlet line or conduit 63 running to the lift unit B, as will hereinafter appear. Outer ends of the enlarged duct portions 61 are closed by threaded plugs 64 which carry pins 65 at their inner ends for seating and centering the valve springs 59. In the showing of Fig. 6, one outlet check valve 58 and associated parts are shown for convenience and clarity as if the adjacent portions of the housing 13, outwardly of the irregular line, were cut through on a plane further removed from the eye than the plane at which the remainder of the section is taken. Fig. 7 further illustrates the structure but in this view, also for purposes of clarity, the valve springs 59 are not shown.

A relief valve bore 66 is formed in the housing in spaced parallel relationship with the aforesaid intake valve bore 42 and communicates upwardly with the outlet passage 60 through a duct 67. A relief check valve ball 68 is normally seated at 69 in said duct to close off the flow therethrough and is urged upwardly to closed position by an end extension or pin 70 formed at the upper end of the relief valve actuating member or plunger 71 slidably mounted in the bore 66 and urged upwardly therein by an expansion coil spring 72 braced between the lower end of said member and a plug 73 threaded in the lower end of the bore. The said plunger 71 is hollow and has a downwardly opening axially extending passageway 74 which opens also through the upper end, at the sides of the pin 70, through small

ports 75 so that fluid passed when the relief valve 68 is forced open may flow downwardly into the bore 66. A relief port or passageway 76 connects the two valve bores 42 and 66 below the respective valve members 49 and 71, and the outwardly opening hole necessary in drilling this port may be plugged as shown at 77.

For actuating the two valve members 49 and 71 under single control, I provide a control or throttle rod 78 which is journaled in a suitable bore 79 in the housing midway between and at right angles to the bores 42 and 66. This rod is of greater diameter than the space, or wall thickness, between these bores and said bore 79 accordingly merges, cuts into or communicates with the valve bores. The valve members 49 and 71 are therefore each provided with circumferential grooves 80-81 of such depth and vertical width as to nicely clear the control rod, and the rod is notched out along a diametrical line at 82 where it passes through these grooves so as to present thereat a half-round section, the margins of which may engage lower edges of the grooves to move either valve member downwardly when the control rod is turned toward said valve member. Such action, however, due to the clearance afforded by the grooves 80-81 will not disturb the setting of either valve member when the other member is urged downwardly, as will be evident.

The outer end of the control rod 78 is journaled through a packing nut 83 screwed in the rearwardly opening end of the bore 79 and is therefore exposed for manipulation exteriorly of the housing, as will hereinafter appear. The control rod is held against axial displacement by a retainer pin 84 which is placed in the housing and passes through a notch 85 in the rod at right angles thereto. The pin is held in place by a plug 86 and is of course so located that the control rod may have sufficient freedom of movement about its axis to manipulate the valves.

The lift unit or jack B in the preferred form shown comprises an elongated tubular cylinder 87 secured at its lower end to a mounting member or casting 88 which has an apertured lug 89 by which it may be pivotally mounted upon the tractor, as indicated at 90 in Fig. 1. A rod-like piston 91 of elongated form is slidably mounted in the cylinder 87 and at its free or upper end is secured at 92 to a fork 93 by which pivotal connection is made at 94 with a lifting arm or frame member 95 forming a part of the implement mounting and connecting assembly. Fluid under pressure is admitted to the cylinder 87 below the piston 91 through a duct 96 and a coupling 97 which connects the feed line 63 to the lift unit, and it will be obvious that such pressure will cause the piston 91 to rise and therefore lift the implement.

A sleeve 98 is secured at its upper end at 99 to the fork 93 and slidably encloses the cylinder 87 to protect the working surfaces of the piston and cylinder from the dust and similar foreign matter which is so commonly met with in such machinery. This sleeve 98 also carries a guide member 100 which slidably engages long stay bolts 101 secured at 102 to the mounting member 88 and extended parallel to the cylinder in order to maintain the parts in alignment. Nuts 103 at the upper ends of the bolts limit the upward movement of the piston. A sealing washer 104 is carried by the sleeve 98 at its lower end in wiping contact with the outer surface of the cylinder 87 to further aid in excluding dust.

In the actual assembly and installation of the lift mechanism upon the particular tractor and implement shown in the drawings, the actuating unit A is mounted as described upon the cover plate H and the feed line 48 carrying oil to the unit is connected by a T-coupling 105 to the usual outlet provided for the connection of the oil line J running to the oil pressure gauge K. Oil under engine pressure (usually on the order of twenty to thirty-five pounds) may thus enter the actuating unit. The lift unit B is located at the rear of the tractor in any suitable position so that connection of the fork 93, as described, to the lifting mechanism will result in lifting of the implement E when oil under high pressure enters the lift unit. This arrangement will of course vary widely according to the type of implement, the type of lifting and draft frame used, and the location (front, rear, or both) of the implement or implements on the tractor. However, due to the single hole mounting of the lift unit the assembly may obviously be readily made to meet any conditions.

For remote control of the actuating unit A the control rod 78 may be connected through a flexible or universal joint 106 to a shaft 107 running rearwardly to a point convenient to the operator's station L, and there provided with a handle 108. Here again the arrangement may vary widely as will be evident.

In accordance with the foregoing assembly and arrangement of the parts it will be evident that oil from the tractor engine D, under normal pressure, will stand in the inlet chamber 45. The camshaft I will of course be operating in its normal control of the engine admission and exhaust valves but the cams 31 will be cleared by the rockers 27 so that normally the unit A will remain inoperative and no wear will take place on the parts.

Assuming now that it is desired to lift the implement E, the operator manipulates the control rod 78 (by handle 108 if used), turning the same in counter-clockwise direction as viewed in Fig. 6, and the valve member 49 is thus moved downwardly until it clears the seat 50. The oil under engine pressure then flows upwardly into the bore 38 and thence through the check valves 34 into the lower ends of the cylinders 21 and simultaneously through the bore 40 upwardly into the recess 41 and into the upper chambers 20. The pressure of the oil, particularly as impressed on the large heads 23 of the pistons 22, is sufficient to overcome the weight of these pistons and elevate the same until the rocker arms 27 are swung into position for operation by the cams 31. The action of these cams thus causes one of the pistons to move forcibly downward, putting the oil in the lower end of the associated cylinder 21 under high pressure and expelling it through the outlet check valve 58 into the outlet passage 60. This oil thus flows through the supply line 63 to the lift cylinder 87 where it exerts a pressure sufficient to gradually lift the piston 91 and the implement E. The action is of course continuous resulting in repeated pumping of oil from the unit A and in this operation the oil beneath the piston heads 23, which serves to elevate them to operative positions, is circulated back and forth between the chambers 20 as the pistons alternately rise and fall. The intake check valves 34 prevent the high pressure oil from working back into the intake system, and the outlet check valves 58

pass this pressure but prevent backing up into the cylinders.

When the lift plunger 91 reaches the top of its upward stroke the pressure has a tendency to build up to a point where, the spring 72 being of proper selected strength, the oil may unseat the relief valve 68, whereupon the oil will in part flow through the ports 75, downwardly through the passage 74, crosswise through the port 76 and thence into the intake valve bore 42 beneath the (lowered) valve member 49. This pressure urges the valve member 49 upwardly returning it to the seat 50 and shutting off the admission of engine oil to the cylinders 21, any excess of the high pressure oil serving to unseat the ball 53 and thus flow through the passage 51 and ports 55 back to the engine. The last of the oil in the cylinders 21 is thus thus expelled by the last downstroke of the pistons 22 and the reduced pressure of oil beneath the pistons thus resulting, allows them to fall to inoperative positions so that the rocker arms 27 clear the cams 31 and the operation of unit A automatically ceases.

As soon as the excess oil pressure is thus relieved, and utilized to shut off operation of unit A, the spring 72 returns the ball 69 to its seat and the pressure remaining in the lift unit B holds the implement E in raised position.

To now return the implement to its lowered operative position the operator turns the control rod 78 in the opposite direction (clockwise as viewed in Fig. 6), thus forcibly unseating the valve plunger 71, and the ball 68 then clears its seat 69 and the oil returns from the lift cylinder 87 through the ports 75, passage 74, ports 76 and through the unseated valve 53 to the chamber 45, from which it flows back into the engine's lubricating system.

The rate at which this relief of the pressure is made, and accordingly the rate at which the implement E descends, may be varied by adjustment of the regulating screw 109 upwardly through the plug 73 so that the cross pin 110 in said screw limits the downward movement of the valve plunger 71 (without closing passage 74) and varies the amount to which the valve 68 is opened. The screw 109 may be readily adjusted according to the weight and type of implement used.

The lift unit B may, as stated, be located in any desired position and the connection to the actuating unit A made by a line 63 of any reasonable length. Where the lift unit B is necessarily rocked considerably on its pivotal mounting 90 as it operates the line 63 may be flexible at least adjacent to said lift unit. Under some circumstances it may be desirable to employ more than one lift unit and connect them in parallel and in such arrangements it may further be of advantage to employ a separate valve (in the line 63 but not shown) to control the admission of fluid to any selected lift unit.

The valve members 49 and 71 may be shortened if desired so that oil pressure may be relieved through the space in bore 79 beneath the notched portion 82 of the control pin 78 instead of through the port 76 if so desired.

From the foregoing it will be apparent that I have provided an extremely efficient, compact and practical lift mechanism and one which may be readily assembled on the tractor and implement. Wear on parts is greatly reduced, and safety is increased by the automatic shutting off of operation when the lift limit is reached,

and the spring 72 may be selected according to the desired maximum pressure to give a further safety factor. All parts are readily accessible for servicing, and the use of single control greatly facilitates the operation.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. The combination with an engine, of a pump for supplying fluid under pressure, said pump comprising normally inoperative pumping pistons adapted to be actuated by the engine, and means connecting the engine and pump for supplying lubricating oil from the oil supply of the engine under normal engine pressure to the pump for higher compression thereby, and manually controlled means for conducting said oil under engine pressure to the pistons to render them subject to actuation by the engine.

2. The combination with an engine, of a pump for delivering fluid under pressure, the said pump including a cylinder and a piston movable therein, means operable by the engine for moving the piston and compressing a fluid in the cylinder, means supplying lubricating oil from the engine oil supply system under normal engine pressure to the cylinder for compression therein, and the said piston being normally movable out of operative engagement with its operating means but movable to operative position in response to the admission of oil from the engine to the cylinder.

3. The combination with an engine, of a pump for supplying fluid under pressure to a fluid pressure responsive unit, the said pump having cylinders, pistons movable in the cylinders, means operable by the engine for urging each of the said pistons in a direction to exert pressure on fluid in the cylinders, the said pistons normally being adapted to rest in a position clear of the said urging means, and means for admitting oil from the engine lubricating system under relatively low pressure to the cylinders for compression to a higher pressure therein and for moving the said pistons to operative engagement with their urging means.

4. The combination with an engine, of a pump for supplying fluid under pressure to a fluid operated unit, the said pump having cylinders, pistons movable in the cylinders, means operable by the engine for operating the said pistons to exert pressure on fluid in the cylinders, the said pistons having diametrically enlarged portions and being normally adapted to move in the cylinders to inactive positions clear of the operating means, means under manual control for admitting oil under relatively low pressure to the cylinders for compression to a higher pressure therein and for simultaneously conducting the oil under said low pressure to certain portions of the pistons for urging the pistons into operative engagement with their operating means.

5. The combination with an engine and a rotatable shaft thereof, of a hydraulic pump unit mounted on the engine and having cylinders, pistons movable in the cylinders, rocker arms supported on the pump unit over the pistons, cams on the shaft for actuating the rocker arms and reciprocating the piston in the cylinders, the said pistons and rocker arms being arranged to normally move clear of operative engagement

with the cams on the shaft, means for admitting oil under normal engine pressure to the cylinders beneath the pistons for moving the pistons and rocker arms into operative engagement with each other and with the cams on the shaft, and outlet means for the oil put under pressure by the pistons.

6. The combination with an engine, of a hydraulic pump comprising a pair of cylinders and a piston movable in each cylinder, means operable by the engine for alternately urging the pistons in one direction, the said cylinders and pistons having diametrically enlarged portions and means establishing communication therebetween, means for admitting oil under a relatively low pressure to the cylinders for compression to a higher pressure therein, and means for simultaneously admitting oil at said low pressure to the enlarged portions of the cylinders for alternately exerting pressure against the enlarged portions of the pistons and moving the same in a direction opposite to that in which they are moved by said operating means.

7. The combination with an engine, of a pump for delivering fluid under pressure, the said pump including pumping elements, means operable by the engine for actuating the pumping elements, valve means for admitting fluid to the pump for compression by said pumping elements and subsequent delivery, means for manually operating the valve, and means responsive to predetermined pressure resistance in the delivered fluid for automatically adjusting the said valve means and shutting off the admission of fluid to the pump.

8. The combination with an engine, of a pump for delivering fluid under pressure, the said pump including pumping elements, means operable by the engine for actuating the pumping elements, means conducting lubricating oil to the pump for compression by the said pumping elements and for delivery from the pump under pressure, manually controlled valve means for admitting the oil to the pump, and relief means responsive to predetermined pressure in the oil being delivered for closing the said valve means and shutting off the admission of oil to the pumping elements.

9. The combination with an engine, of a pump the said pump including pumping elements, means operable by the engine for actuating the pumping elements, means conducting lubricating oil from the engine to the pump for compression by the said pumping elements, valve means for initially admitting oil to the pumping elements, adjustable relief means responsive to predetermined pressure in the discharge side of the pump for closing the said valve means and returning excess oil to the engine.

10. The combination with an engine, of a pump for delivering fluid at relatively high pressure, the said pump including pumping means operable by the engine and normally adapted to move clear of operative engagement with the engine, means for admitting oil from the engine under relatively low pressure to the pump for moving the pumping means to operative positions wherein said pumping means will compress the oil to a high pressure, means delivering the oil under high pressure, and means responsive to predetermined pressure resistance in such delivered oil for shutting off the admission of low pressure oil to the pump and restoring the pumping means to inoperative conditions.

11. The combination with an engine, of a

pump for delivering fluid at relatively high pressure, the said pump including pumping means operable by the engine, means for admitting fluid to the intake side of the pump unit for compression by the pumping means and subsequent delivery, manually controlled intake valve means for initiating the said admission of fluid, relief valve means for relieving pressure beyond a predetermined degree in fluid under delivery and by-passing said pressure to the intake side of the pump and simultaneously moving the intake valve means to closed position.

12. The combination with an engine, of a pump for delivering fluid at relatively high pressure, the said pump including pumping means driven by the engine, means for admitting engine oil to the pump for compression therein, an intake valve controlling this admission of oil, outlet means for conducting the delivered oil under pressure, a relief valve communicating with the said outlet means and spring set to normally remain closed against a predetermined pressure in said delivered oil, means connecting the relief valve with the intake valve in such manner that oil under excess pressure passed by the relief valve may act against the intake valve to close the same, and means in connection with said intake valve for passing the excess pressure oil back to the engine.

13. The combination with an engine, of a pump comprising pumping means operable by the engine, an intake valve and means for admitting oil from the engine under control of said valve to the pumping means for compression and delivery thereby to supply the working unit, a relief valve communicating with the delivery side of the pump, an actuating member normally maintaining the relief valve in closed position but yieldable in response to preselected pressure in the discharge side of the pump, means for returning oil thus released by the relief valve to the engine, and a single means under manual control for selectively controlling the intake valve and forcibly adjusting the relief valve actuating member to open the relief valve.

14. The combination with an engine, of a pump for delivering fluid under pressure and comprising pumping means operable by the engine, an intake valve and means for admitting oil from the engine under control of said valve to the pumping means for compression thereby and delivery under pressure, a relief valve communicating with the delivery side of the pump, an actuating member normally maintaining the relief valve in closed position but yieldable in response to preselected pressure in the delivered oil, means for returning oil thus released by the relief valve to the engine and simultaneously closing the intake valve, and a control rod operatively engaged with the intake valve and relief valve actuating member for selectively adjusting the same to valve opening positions.

15. The combination with an engine, of a pump for discharging fluid under pressure comprising pumping means operable by the engine, an intake valve and means for admitting oil from the engine under control of said valve to the pumping means for discharge under compression thereby, a relief valve communicating with the discharge side of the pump, an actuating member normally maintaining the relief valve in closed position but yieldable in response to preselected pressure resistance in the said working unit, means for returning oil thus released by the relief valve to the engine, means

for controlling the position of the intake and relief valves, and adjustable means for limiting the extent to which the relief valve is opened and thereby regulating the rate at which the oil is returned to the engine.

16. In combination with an engine having a pressure lubricating system, a pump connected to said lubricating system so as to receive oil under pressure therefrom and having an outlet adapted to discharge oil under pressure substantially greater than that normally prevailing in the engine lubricating system, and manually controlled check valve means in the connection between the pump and engine lubricating system.

17. In combination with an engine and the pressure lubricating system thereof, a pump arranged to be driven by the engine and connecting with said system so as to receive oil under initial pressure therefrom and discharge it at increased pressure.

18. In combination with an engine and the pressure lubricating system thereof, a pump arranged to be driven by the engine and connecting with said system so as to receive oil under initial pressure therefrom and discharge it at increased pressure, and check valve means to prevent a return flow of oil from the pump to said system under such increased pressure.

19. In combination with an engine and the pressure lubricating system thereof, a pump of the cylinder-piston type, the cylinder having a valved connection with said lubricating system, and having an outlet for the discharge of oil under pressure greater than that of the lubricating system, means driven by the engine for actuating the piston when the pump is to be operated, and means responsive to the pressure of oil received in the cylinder from the lubricating system to move the piston from an idle position into operative engagement with the actuating means.

20. In combination with an engine and the pressure lubricating system thereof, a pump connected for receiving oil under pressure from said system and to discharge such oil under increased pressure to a hydraulic unit, a manually operative valve controlling the flow of oil from the lubricating system to the pump, and means responsive to a predetermined maximum of said increased oil pressure for closing said valve.

21. In combination with an engine and the pressure lubricating system thereof, a pump connected for receiving oil under pressure from said system and to discharge such oil under increased pressure to a hydraulic unit, a valve controlling the flow of oil from the lubricating system to the pump, and a pressure responsive valve operated by an excess of pressure in the discharge side of the pump for returning surplus oil under such excess pressure into the engine lubricating system.

22. In combination with an engine and the pressure lubricating system thereof, a pump connected for receiving oil under pressure from said system and to discharge such oil under increased pressure to a hydraulic unit, a valve controlling the flow of oil from the lubricating system to the pump, means responsive to a predetermined maximum pressure in the oil discharged by the pump for closing said valve, and a check valve through which oil under pressure in excess of said maximum pressure may be returned to the engine lubricating system.

23. In combination with an engine and the pressure lubricating system thereof, a pump connected for receiving oil under pressure from said

system and to discharge such oil under increased pressure to a hydraulic unit, a valve controlling the flow of oil from the lubricating system to the pump, means responsive to a predetermined maximum pressure in the oil discharged by the pump for closing said valve, and a check valve through which oil under pressure in excess of said maximum pressure may be returned to the engine lubricating system, said check valve being operatively associated with the first mentioned valve.

24. In combination with an engine having a pressure lubricating system, a pump driven by the engine and receiving oil under pressure from said system for further compression before being discharged from the pump, a valve controlling the flow of oil to the pump, means for manually opening said valve, and means responsive to pressure of oil at the discharge side of the pump for closing the valve.

25. In combination with an engine having a pressure lubricating system, a pump driven by the engine and receiving oil under pressure from said system for further compression before being discharged from the pump, a valve controlling the flow of oil to the pump, means for manually opening said valve, means responsive to predetermined pressure of oil at the discharge side of the pump to close the valve, and a second normally closed valve, through which oil may return to the engine lubrication system in response to pressure in excess of said predetermined pressure at the discharge side of the pump.

26. A hydraulic pump comprising a compression chamber having a fluid inlet passage and a fluid outlet passage, a connecting passage between the inlet and outlet passages, a valve member for controlling the flow of fluid through the inlet passage, a valve member in the connecting passage, and manually operative means for selectively actuating either of the valve members.

27. A hydraulic pump comprising a compression chamber having a fluid inlet passage and a fluid outlet passage, a connecting passage between the inlet and outlet passages, a valve member in the inlet passage to control the flow of fluid therethrough, a check valve yieldably closing the connecting passage, means for manually opening said check valve, and a second check valve controlling a flow from the connecting passage to the said fluid inlet passage.

28. In combination with an engine having a cam shaft, a pump body mounted on the engine and being of the piston cylinder type, a lever fulcrumed in a position to be operated by the cam shaft and to actuate the piston, said piston being movable, when idle, to a position where it will render the lever ineffectual as a driving connection from the cam shaft to the piston.

29. A pump having an inlet connected with a source of fluid under pressure and an outlet through which such fluid may be discharged under greater pressure, a valve controlling the inlet, a passage connecting the pump outlet with the fluid source, the fluid pressure in said connecting passage being operative to close said valve, a yieldably closed valve in the connecting passage, and means for manually opening said yieldably closed valve.

30. The combination with an engine having a pressure lubricating system, of a pump connected with said system to receive oil under pressure therefrom and being operative to deliver such oil under increased pressure to a pressure respon-

sive device, said pump having normally inactive pumping elements adapted to be mechanically operated by the engine, means responsive to the oil received by the pump under pressure from said lubricating system for establishing operative connection between the engine and pumping elements so as to render the latter active in creating the aforesaid increased pressure, and

5 a manually operative valve positively controlling the flow of oil from said lubricating system to the pump and thereby being operative to control the starting and stopping of the pump in producing the said increased pressure in the oil delivered to the pressure responsive device.

VICTOR N. ALBERTSON.

CERTIFICATE OF CORRECTION.

Patent No. 2,264,560.

December 2, 1941.

VICTOR N. ALBERTSON.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, second column, line 35, claim 13, strike out the words "to supply the working unit"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of January, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.