

Dec. 18, 1928.

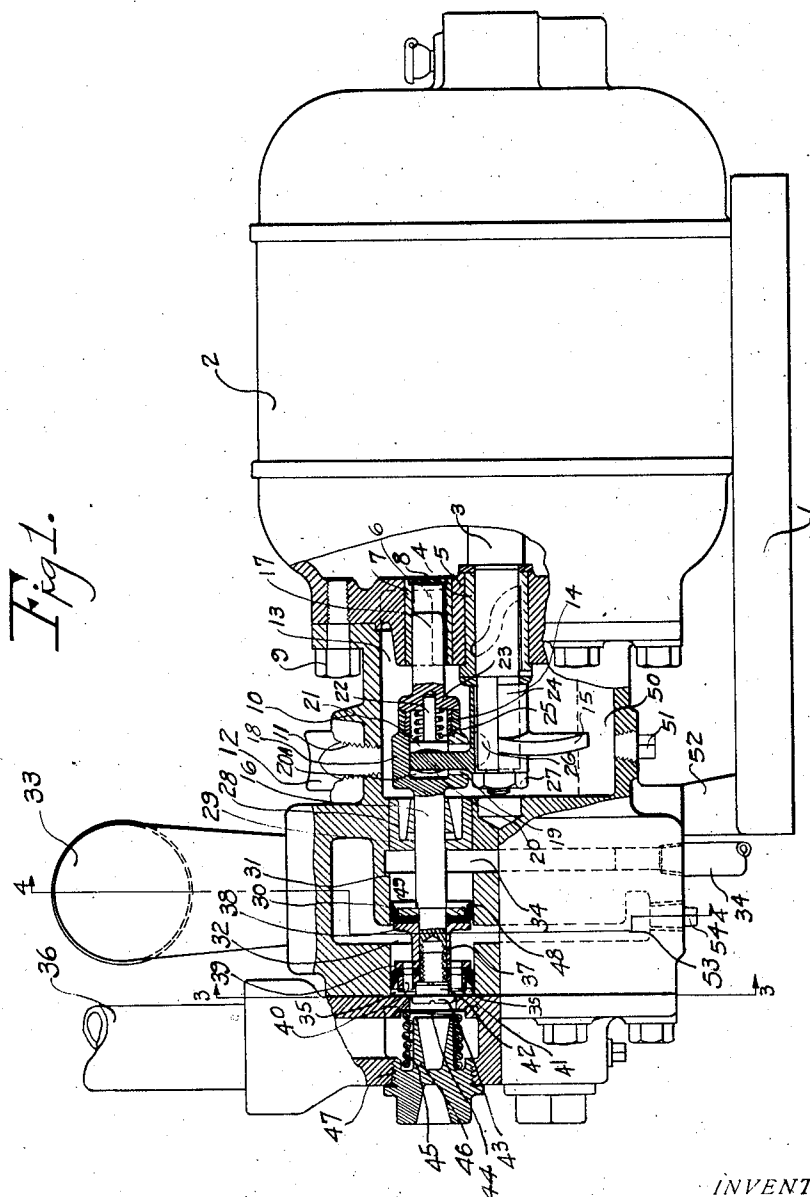
1,695,543

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PUMP

Filed Feb. 25, 1926

5 Sheets-Sheet 1



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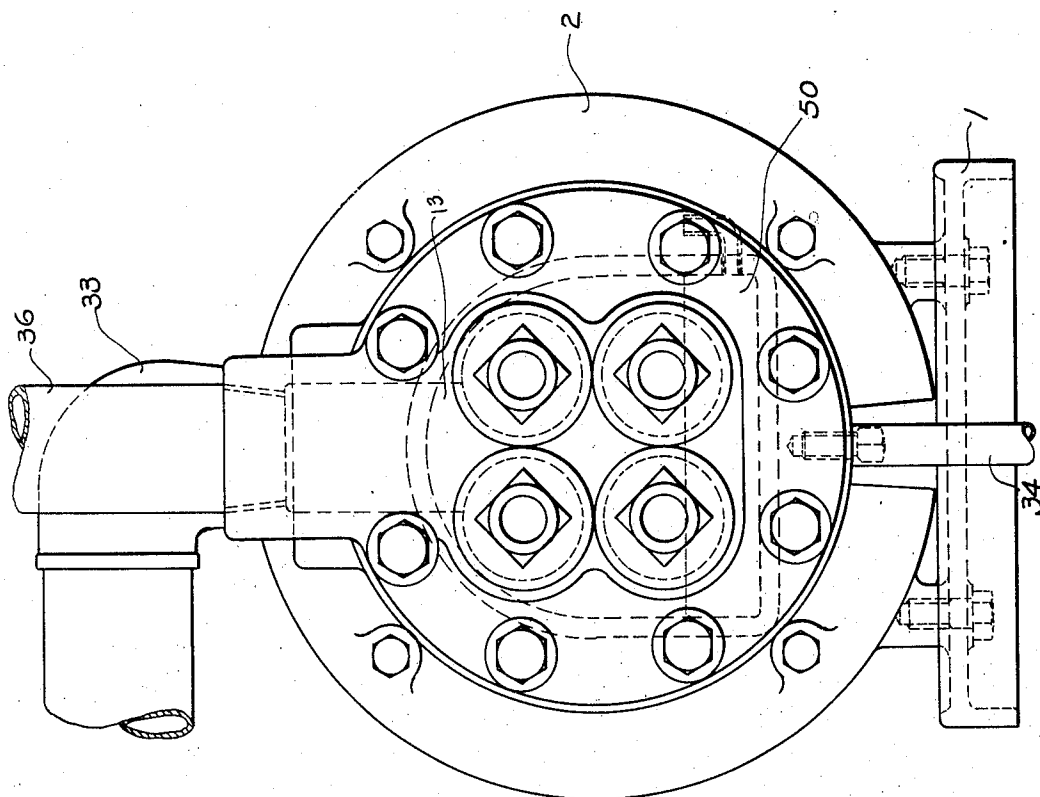


Fig. 2.

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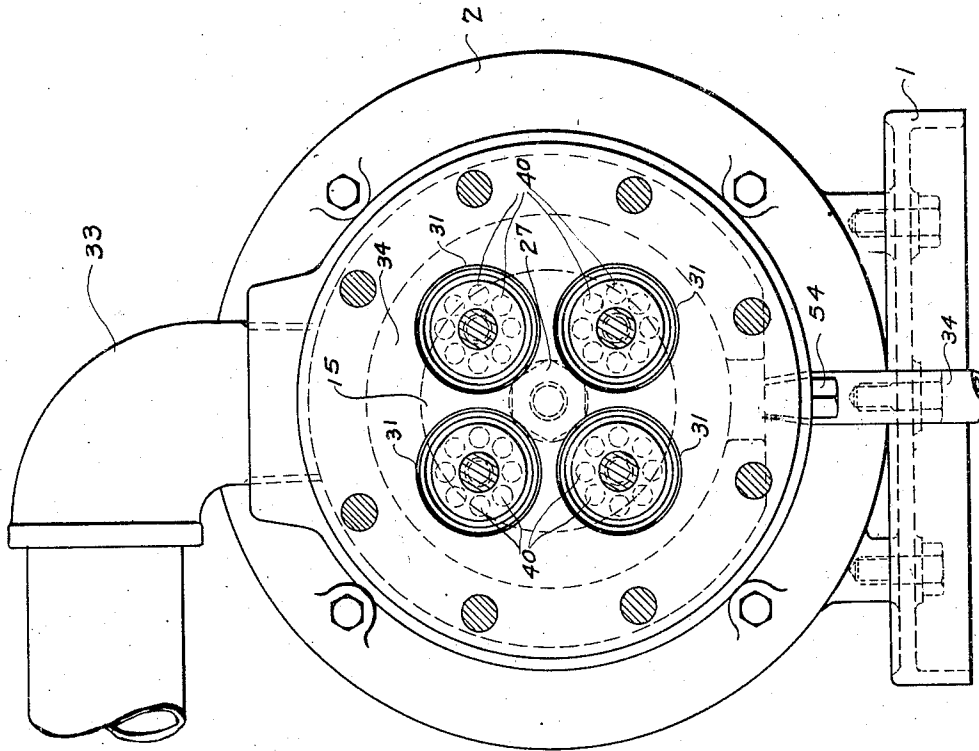


Fig. 3.

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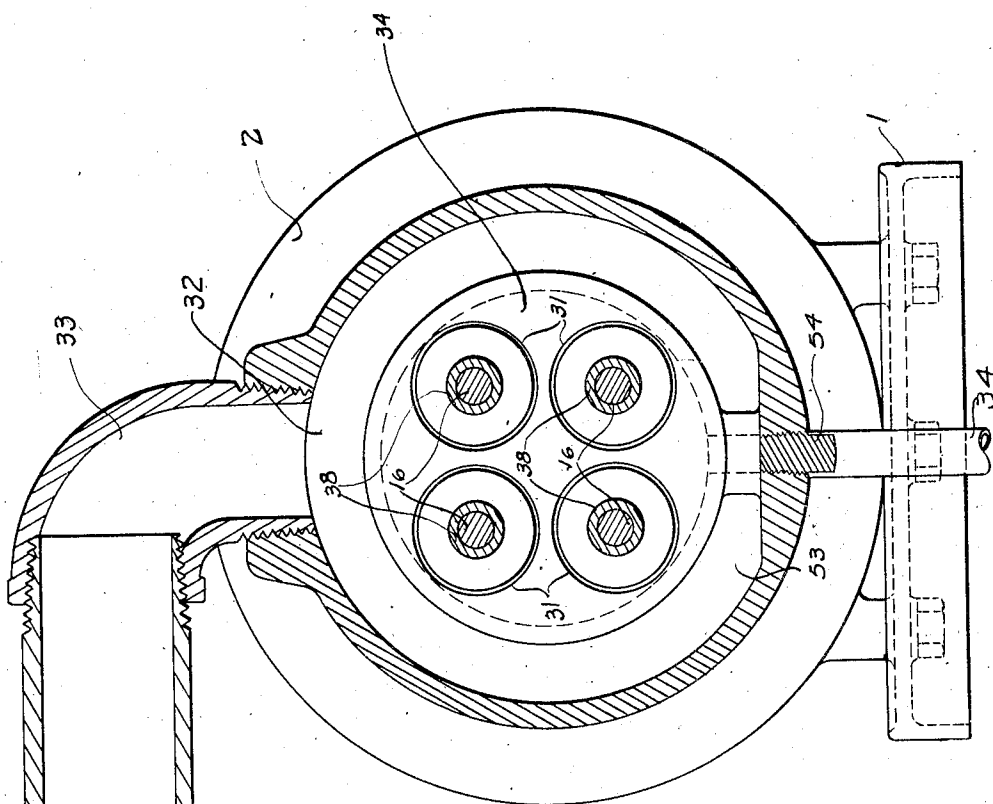


Fig. 4.

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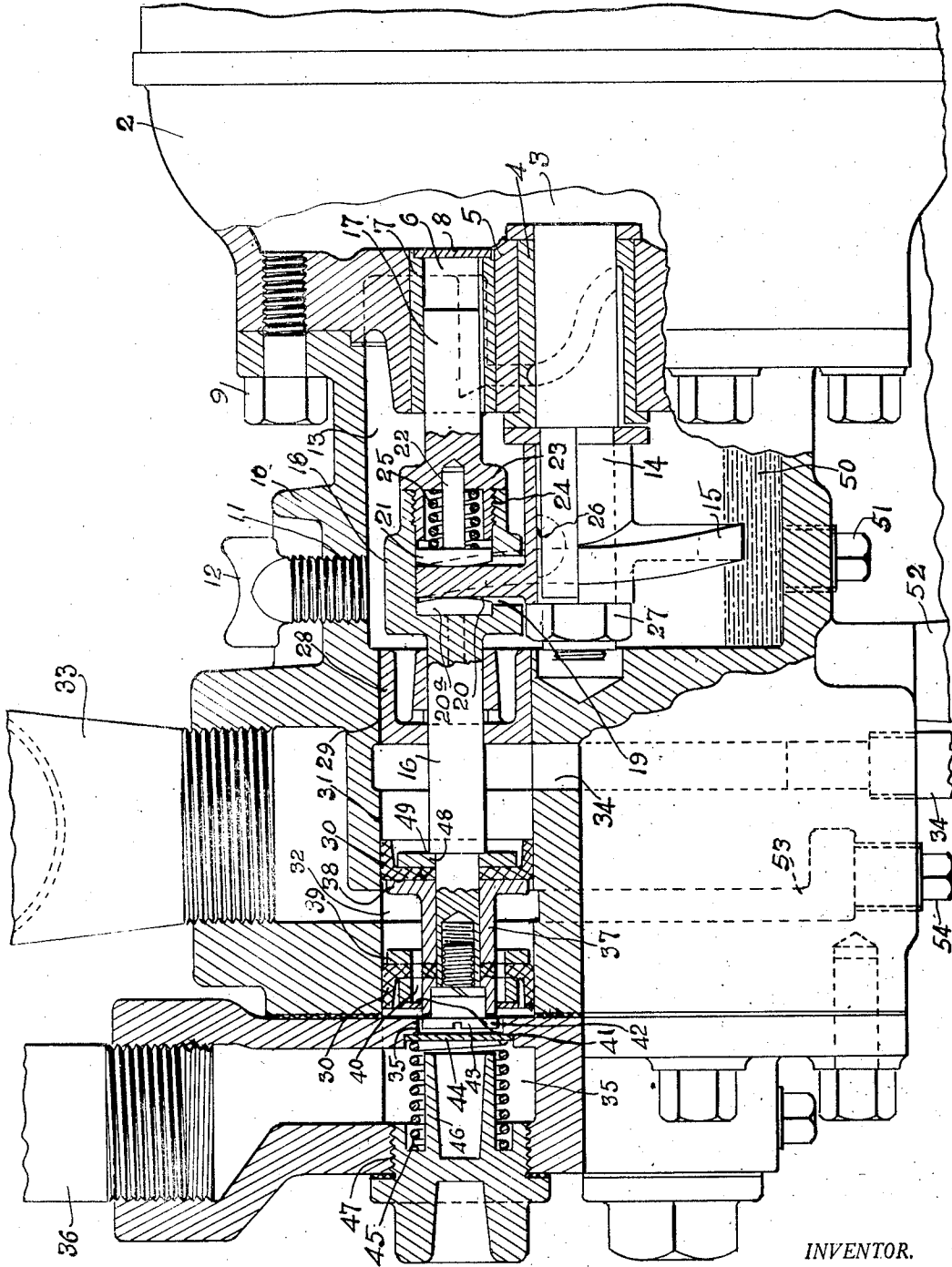


Fig. 5.

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UNITED STATES PATENT OFFICE

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PUMP.

Application filed February 25, 1926. Serial No. 90,636.

My invention relates to pumps.

It is the object of my invention to provide a pump which can be directly connected to the driving elements, such as an electric motor.

It is my object to provide a pump which will deliver a flow of fluid continuously under constant pressure.

It is my object to provide a pump with a continuous suction and a continuous discharge.

It is my object to provide a pump directly connected to an electric motor having a plurality of reciprocating pistons operating in a plurality of adjacent cylinders, the cylinders being connected to a common suction line and a common discharge line and actuated by a common actuating element, lubricated from a common source, and drained by a common drain line, the whole construction being mounted as a unit on a common base, but being detachably held together in separate units, such as the power unit, the pump unit and the discharge unit.

Referring to the drawings:

Figure 1 is a side elevation of the pump and driving mechanism partially in section; Figure 2 is an end elevation thereof;

Figure 3 is a section on the line 3—3 looking in the direction of the arrows of Figure 1;

Figure 4 is a section on the line 4—4 looking in the direction of the arrows in Figure 1;

Figure 5 is an enlarged section of the piston and valve mechanism shown in Figure 1.

Referring to the drawings in detail, 1 is a common base for the entire mechanism, the motor 2 being supported thereon having an armature shaft 3. This armature shaft is journaled in the bearing 4 in the end of the motor housing or cage 5, in which housing there are a plurality of apertures 6 around the armature shaft line with bushings 7, sealed from the interior of the motor by the plates 8.

To this end of the cage of the motor there is bolted by the bolts 9 the pump housing 10. Access to the interior of this housing for lubrication purposes may be had through the aperture 11 closed by the oil filling plug 12. Within one part of this housing 10 is an actuating mechanism chamber 13.

The armature shaft 3 has mounted on the outer end thereof a worm sleeve 14 carrying a screw or worm 15 which transverses the

major axis of the piston rods 16 and piston rod guides 17, the guides reciprocating in the apertures 6 within the bearing sleeve 7.

The piston rod on its inner end is provided with a sleeve 18 having a slot cut in one side as at 19 through which the worm 15 rotates and in doing so engages within the chamber 20 inside of the head 18 with a piston rod 21 with a spring pressed piston having a plunger rod 22 which is guided in the forward end 23 of the piston rod guide, which is threaded within the head at 24 forming a cup within which seats the spring 25 which engages the under side of the piston 21, thus insuring a constant yielding engagement of the piston rod 16 and its associated parts with the actuating worm 15. 20^a is a bearing plate in the chamber 20 engaging the other side of the worm.

It will be noted that the sleeve 14 is connected to the armature shaft 3 by a key 26 and a nut 27 on the end of the shaft. Thus the worm is detachable for replacement and repair. The piston rod 16 is guided in its reciprocatory movement by the sleeve 28 mounted within the tubular passageway 29 which is the main cylinder for the piston on the piston rod 16. This piston consists of a pair of spaced washers 30, cup-shaped in section with their cups oppositely disposed, the rear cup engaging with the walls 31 of the cylinder, which are bounded on either side by the inlet passageway 32 of the suction line 33 and the drain line 34. The forward cup engages with the walls of the cylinder which are bounded on one side by the inlet suction line 32 and on the other side by the outlet chamber 35 leading to the outlet or discharge line 36.

These cup-shaped washers are spaced from one another by the sleeve 37 having the plate-like shoulders 38 and 39, the latter being provided with passageways 40 which are closed in one direction by the valve plate 41 which is loosely mounted on the screw 42 and retained in position by the head 43 thereof.

The head of this screw projects in an exit passageway 35, the mouth of which is sealed by a discharge valve plate 44 held in position normally by a spring 45 carried on a sleeve 46 threaded at 47 within the discharge line.

The rear washer 30 is embraced between the plate 38 and the plate 48 which plate 48 engages a shoulder 49 on the piston rod 16.

The chamber 13 at its lower side carries lubricant 50 above the drain plug 51. The pump casing is supported by the bracket 52 on the common base 1. A suction drain line 53 is provided which can be drained by the plug 54 at the bottom of the pump casing.

The two pistons are used in order that there shall be a seal between the driving chamber 13 and the inlet passage way 32. The piston 49 accomplishes this purpose in conjunction with the piston ring or washer 38.

When the piston rod 16 is withdrawn towards the right hand of the view, as in Figure 1, the fluid or gas in the chamber 32 passes beneath the valve plate 41 and accumulates to the left hand side of the piston 39. Upon the return of the piston rod 16 the gas or fluid in front of the piston 39 is compressed, and, as a result, depresses the valve plate 44 discharging into the discharge line 36. The second piston 38 serves to assist in forcing the fluid or gas in the chamber 32 out of that chamber.

The motor shaft rotates while the pistons and piston rods reciprocate.

Method of operation.

As the electric motor rotates its armature shaft, the worm 15 will rotate and in doing so will reciprocate the respective piston rods and pistons in succession. In doing so, as it drives the piston to the right hand, the fluid behind the piston will pass through the openings 40 as the pressure of the fluid will lift the valve plate 41. When the piston starts to return, the pressure of the confined fluid will seat the valve plate 41 and lift the valve plate 44 against the spring 45 discharging the fluid into the discharge line.

It will be noted that I have shown four of these pistons, piston rods and cylinders, but any number may be employed. I find that four is sufficient in such an installation and by using a sufficient number of such pumping elements, I am enabled to have one delivering fluid all of the time so that the flow is continuous and the suction is likewise continuous. Thus, every turn of the motor is fruitful of results, the consumption of power is steady and there is no pounding or jerking of the system to rack the joints and wear the machinery.

The apparatus is self lubricated and takes up the wear due to its spring pressed engaging parts.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a pump, a common base, a motor and a pump mounted thereon, said pump structure carrying suction and discharge lines,

said motor having its armature shaft directly connected to a plurality of pistons working in a plurality of cylinders communicating with a common suction line and a common discharge line delivering fluid from one to the other by the successive operation of the successive pistons in the successive cylinders and independent valves for each cylinder operated independently of each other by the fluid pressure in each cylinder.

2. In a pump, a motor, an operating shaft therein, a worm thereon, a plurality of piston rods engaged by said worm so that the rotary movement of the worm is converted into the reciprocatory movement of the piston rods, pistons thereon, hydrostatically operated valves carried thereby, a common suction line communicating with respective cylinders of said pistons, cylinders therefor parallel to the armature shaft, a common discharge line, valves for each of said cylinders in said discharge line, whereby a continuous suction and discharge is effected.

3. In a pump, a motor, an operating shaft therein, a worm thereon, a plurality of piston rods engaged by said worm so that the rotary movement of the worm is converted into the reciprocatory movement of the piston rods, pistons thereon, hydrostatically operated valves carried thereby, a common suction line communicating with respective cylinders of said pistons, cylinders therefor, a common discharge line, valves for each of said cylinders in said discharge line, whereby a continuous suction and discharge is effected, and means to guide the rear end of said piston rods remote from the piston.

4. In a pump, a motor, an operating shaft therein, a single flight worm thereon, a plurality of piston rods engaged by said worm so that the rotary movement of the worm is converted into the reciprocatory movement of the piston rods, pistons thereon, valves carried thereby, a common suction line communicating with respective cylinders of said pistons, cylinders therefor, a common discharge line, valves for each of said cylinders in said discharge line, whereby a continuous suction and discharge is effected, and means to guide the rear end of said piston rods remote from the piston, and yielding means for engaging said piston rods with said worm to maintain the relative position thereof.

5. In a pump, a motor, an operating shaft therein, a worm thereon, a plurality of piston rods engaged by said worm so that the rotary movement of the worm is converted into the reciprocatory movement of the piston rods, pistons thereon, valves carried thereby, a common suction line communicating with respective cylinders of said pistons, cylinders therefor, a common discharge line, whereby a continuous suction and discharge is effected, and means to guide the rear end of said piston rods remote from the piston, and

yielding means for engaging said piston rods with said worm to maintain the relative position thereof, said piston rod guides being mounted in the end frame of the motor.

5 6. In a pump, a source of power, an element rotated thereby, a plurality of pistons reciprocated thereby, a plurality of cylinders therefor, a common suction line connected to said cylinders, a common discharge line connected to said cylinders and a common drain line connected to said cylinders.

15 7. In a pump, a source of power, an element rotated thereby, a plurality of pistons reciprocated thereby, a plurality of cylinders therefor, a common suction line connected to said cylinders, a common discharge line connected to said cylinders and a common drain line connected to said cylinders, and a common suction line drain connected to said cylinders.

25 8. In combination, a cylinder having a drain port at the rear end thereof and a suction port midway thereof dividing the cylinder into a rear portion and a forward portion, and a discharge port at the forward end thereof into a discharge line.

35 9. In combination, a cylinder having a drain port at the rear end thereof and a suction port midway thereof dividing the cylinder into a rear portion and a forward portion, and a discharge port at the forward end thereof into a discharge line, a piston rod and piston working therein, said piston having spaced heads, one of which engages with a rear portion of the cylinder and the other of which engages with the forward portion of the cylinder.

40 10. In combination, a cylinder having a drain port at the rear end thereof and a suction port midway thereof dividing the cylinder into a rear portion and a forward portion, and a discharge port at the forward end thereof into a discharge line, a piston rod and piston working therein, said piston having spaced heads, one of which engages with a rear portion of the cylinder and the other of which engages with the forward portion of the cylinder, and valve mechanism adapted to regulate ports carried in the head working in the forward portion of the cylinder, and associated valve mechanism adapted to operate alternately therewith carried in a discharge line associated with the forward end of the cylinder.

55 11. In combination, a cylinder having a drain port at the rear end thereof and a suction port midway thereof dividing the cylinder into a rear portion and a forward portion, and a discharge port at the forward end thereof into a discharge line, a piston rod and piston working therein, said piston having spaced heads, one of which engages with a rear portion of the cylinder and the other of which engages with the forward portion of the cylinder, and valve mechanism adapted to

regulate ports carried in the head working in the forward portion of the cylinder, and associated valve mechanism adapted to operate alternately therewith carried in a discharge line associated with the forward end of the cylinder, and a guide for the rear end of the piston rod, so arranged that the drain port lies between the rear portion of the cylinder and the guide.

70 12. In combination, a piston rod, a collar carrying spaced plates mounted thereon, oppositely disposed washers engaging with said sleeves and the walls of a cylinder in which the piston rod operates, retaining plates for each of said washers, one of said washers and its retaining plates having valve apertures therethrough, a plate adapted to seal said apertures, and means for limiting the movement of said plate.

85 13. In combination, a rotary driving element, a plurality of reciprocating pumping elements driven thereby and located parallel thereto, a common suction line connected to said pumping elements, a common discharge line connected thereto and a common drain line.

90 14. In a pump, a rotating driving element, a worm thereon, a reciprocating pumping element engaged by said worm, a suction line and a discharge line, a valve hydrostatically operated, and yielding means to seat the valve.

95 15. In a pump, a rotating driving element, a worm thereon, a reciprocating pumping element engaged thereby, a suction line, a discharge line, a valve hydrostatically operated, yielding means to seat said valve, a valve carried by the reciprocating pumping element adapted to be moved solely by the hydrostatic pressure associated therewith.

100 16. In a pump, a rotating driving element, a worm thereon, a reciprocating pumping element engaged thereby, a suction line, a discharge line, a valve member stationarily supported in said discharge line adapted to be moved in one direction hydrostatically and in the other direction mechanically, yielding means for moving said valve mechanically and a moving valve element adapted to be operated solely hydrostatically.

105 17. In combination, a motor unit having a rotating driving element, a pump unit having a ported piston and a piston rod, a cylinder, a discharge line connected to said cylinder having a valve for controlling the discharge from the cylinder, said valve being operated by fluid pressure in the cylinder, a valve in the piston adapted to regulate the flow through the ports in the piston, a suction line connected to the pump unit, said motor unit and pump unit being mounted on a common base adapted to support said units, the discharge line and the suction line.

110 18. In combination, a motor unit, a plurality of reciprocating pump elements con-

sisting of piston rods and ported pistons, a plurality of parallel cylinders therefor disposed about the axis of the motor unit, a suction line, a discharge line, a plurality of
5 hydrostatically operated valves, a portion of which are located in the discharge line and a portion of which are carried by the pistons

to control the ports therethrough, yielding means for controlling a portion of said valve members, the remainder of the valve members 10 being operated hydrostatically.

In testimony whereof, I affix my signature.

CHARLES P. EISENHAUER.