June 23, 1936. H. F. MacMILLIN 2,045,330

RADIAL PLUNGER PUMP

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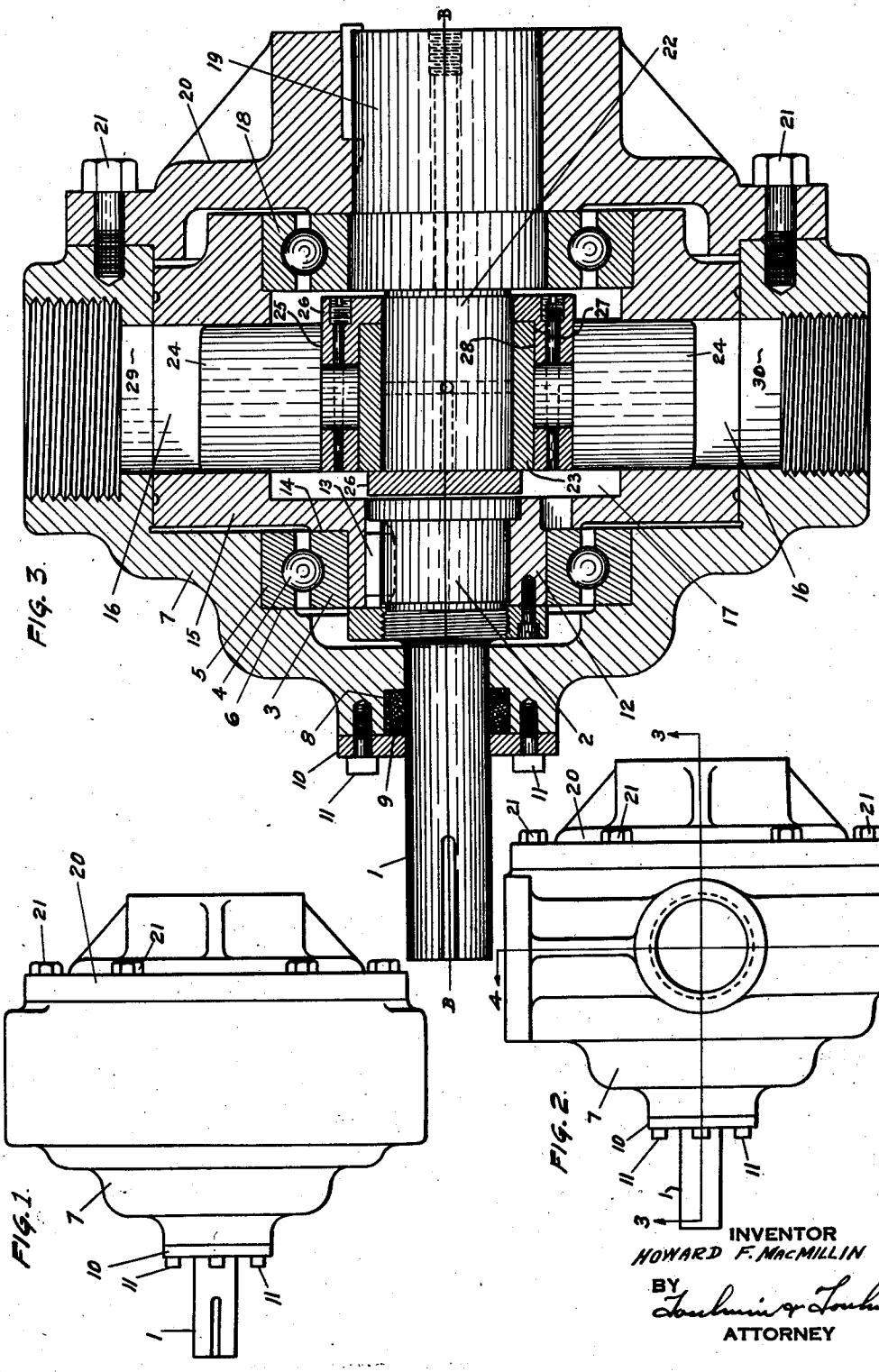


FIG. 3.

FIG. 1.

FIG. 2.

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RADIAL PLUNGER PUMP

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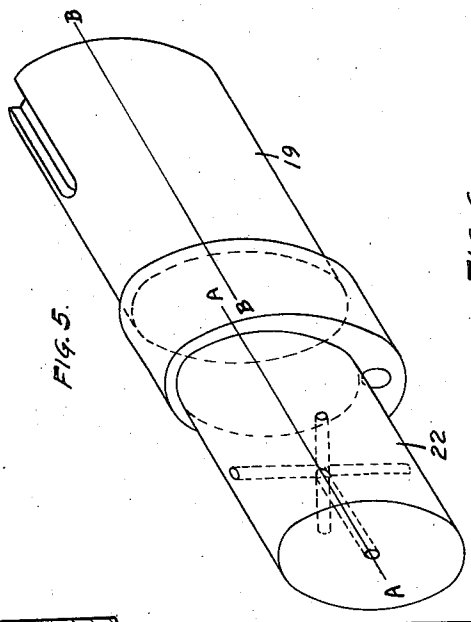


FIG. 5.

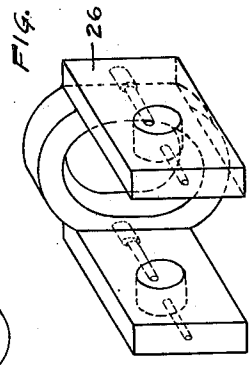


FIG. 6.

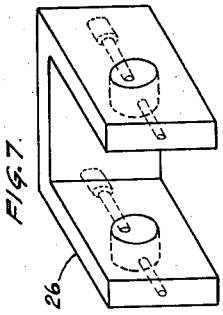


FIG. 7.

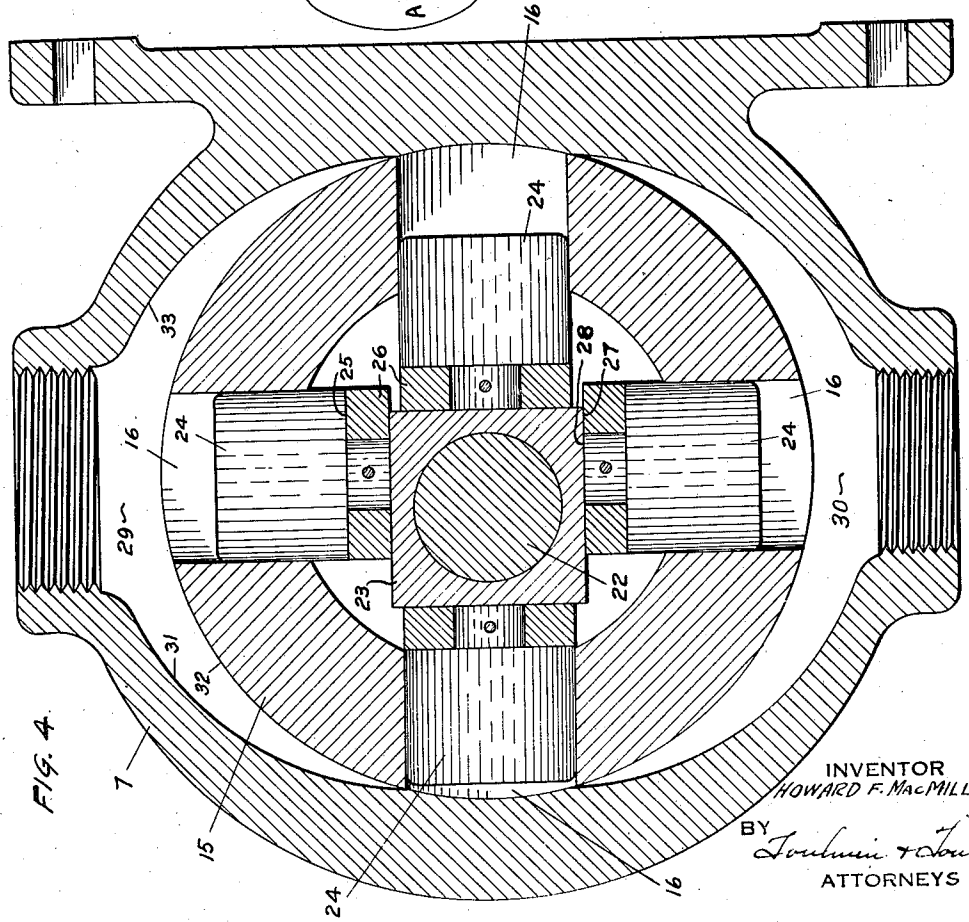


FIG. 4.

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FIG. 9.

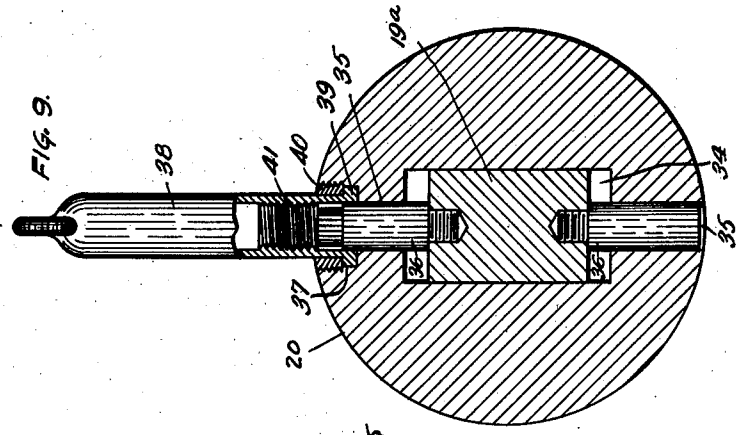
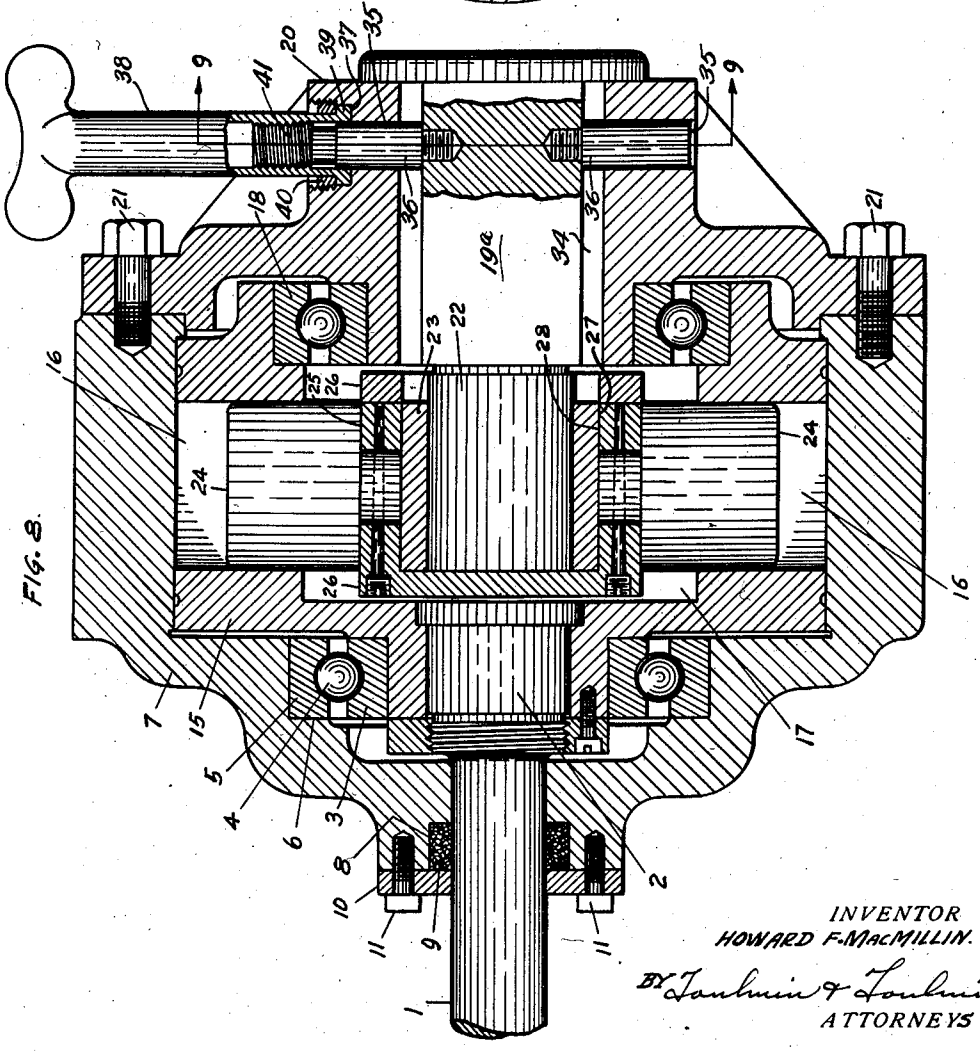


FIG. 8.



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2,045,330

RADIAL PLUNGER PUMP

Howard F. MacMillin, Mount Gilead, Ohio, assignor, by mesne assignments, to The Hydraulic Press Corporation, Inc., Wilmington, Del., a corporation of Delaware

Application February 1, 1933, Serial No. 654,691

4 Claims. (Cl. 103—161)

My invention relates to pumps and in particular to radial plunger pumps.

It is the object of my invention to provide a radial plunger pump having cylindrical plungers or pistons operating at an angle to one another, preferably right angles.

In particular it is my object to provide for the actuation of the pump piston or plunger in such a manner that it cannot rock, turn or twist within its cylinder; and to provide means such as a square cross-head block engaging with a flat base or piston and maintained in a constant engagement therewith so that the thrust on the piston is uniform throughout its diameter in order to prevent the rocking, turning and twisting of the piston within the cylinder.

It is a further object to provide in this combination a rotary cylinder which moves the cross-head block and piston with it while they reciprocate with respect to the cylinder, at the same time rotating bodily with it.

It is a further object of my invention to provide a pump in which the suction and the area of the fluid on which the suction is operated, progressively increase together.

It is a further object to provide means of progressively increasing the pressure of the given charge while bodily transporting it and progressively releasing the compressed charge as the pressure on the charge is increased so that the maximum movement of the piston is at the time where there is a maximum space for the discharge of the fluid so compressed.

It is a further object to provide a pump which may be varied as to its stroke and reversed; and such variation and stroke may be effected while the pump is running.

It is a further object to provide for the support of the rotor bodily carrying the cylinders at spaced points.

Referring to the drawings, Figure 1 is a plan view of the pump.

Figure 2 is a side elevation thereof.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 is a perspective of the eccentric shaft.

Figure 6 is a perspective of one of the thrust shoes.

Figure 7 is a perspective of the other thrust shoe.

Figure 8 is a section on the line B—B of Figure 3 showing a modified construction.

Figure 9 is a section on the line 9—9 of Figure 8.

Referring to the drawings in detail, 1 is a driving shaft driven from a suitable source of power and is provided with a shoulder 2. The inner ball race 3 carrying the balls 4 engages with the outer ball race 5 mounted within a shoulder 6 of the casing 7. This casing is provided with a packing chamber 8 containing packing 9 around the shaft 1. The packing is retained by the retaining plate 10 and bolts 11.

The inner race 3 rests on a collar 12 keyed to the shaft 1 at 13 and abuts a shoulder 14 on the rotor 15 having a plurality of angularly disposed cylinders 16 radially disposed therein communicating with a chamber 17 on the interior of the rotor 15 (Figure 3).

The outer end of this rotor 15 is mounted upon the ball bearing 18 which in turn is supported upon the stationary shaft 19. The inner race of the ball bearing 18 abuts with the removable casing head 20, which is retained on the main casing 7 by the bolts 21.

The stationary member 19 carries an eccentrically disposed shaft member 22. The axis A—A of this shaft member 22 is eccentric to the major longitudinal axis of the pump B—B, which is the axis of the shaft 1 and of the shaft 19 and also the axis of the rotor 15.

Mounted upon this eccentric member 22 is a square cross-head block 23 which rotates thereon. This block is caused to rotate by reason of the fact that the cylindrical pistons 24 have their inner flat ends 25 resting upon the flat thrust shoes 26, which in turn have their flat surfaces 27 resting upon the flat surfaces 28 of the cross-head block 23. As the rotor 15 rotates, it carries with it the pistons 24, the thrust shoes 26 and the cross head block 23, and due to the eccentric mounting of the cross-head block 23 on the eccentric shaft 22, these pistons are caused to reciprocate within the cylinders 16 of the rotor 15 while the rotor and the pistons with the cross-head block bodily rotate about the axis B—B. The cross-head block 23 moves laterally of the pistons.

It will be observed that the shaft 19 is stationary, but by changing the axis A—A of the eccentric projection 22 with regard to the axis B—B the relative position of the eccentricity of the axis A—A of the projection 22 may be varied, with the consequence that the degree of throw of the pump and the direction of the pump may be controlled. The pump may be run in either direction.

It will be noted that this rotor 15 is cylindrical but the chamber in which it operates in the castings 7 and 20 is enlarged to form valve slot passageways 29 and 30, being respectively the intake and discharge passageways for suction and discharge. The inner wall 31 progressively diverges from the surface 32 of the rotor 15 while the wall 33 progressively converges towards the surface 32 of the rotor 15.

As the piston 24 passes opposite to the slot 29, it is being moved inwardly to draw the fluid

into the cylinder 16 on the suction side of the pump, and as the piston continues in its movement, it will trap the fluid in the cylinder 16 as the end of that cylinder is covered by the side wall of the casing with the result that the entrapped fluid is placed under compression as the slot 30 is approached and then progressively released as the compression continues due to the expanding area 30 between the inner wall of the casing adjacent the slot and the exterior wall of the rotor.

It will be understood that I desire to comprehend within my invention such modifications as may be clearly embraced within the scope of my claims and invention.

In Figures 8 and 9 will be seen means for varying the eccentric position of the member 22 without rotation by rotating the screw and actuating the square end of the shaft 19.

In the form shown in Figures 8 and 9 instead of a stationary shaft 19 there is provided a rectangular block 19a located in and adapted to move in a slot 34 formed in the head 20. In this head and extending from the slot 34 are two aligned holes 35, one at each edge of the slot. Extending into these holes and moving therein are pins 36, threaded into the block 19a. One of the holes 35 is provided with an enlargement 37 to receive one end of a key 38, which has thereon a head 39 engaged by a ring 40 threaded into the enlargement 37 for holding the key against longitudinal movement, but permitting a rotary movement thereof.

Into this key is threaded at 41 one end of one of the pins 36 so that a rotation of the key 38 will cause a longitudinal movement of the pin 36 engaging the key and a corresponding movement of the other key and the block 19a in the slot 34. The movement of the block which supports the eccentrically disposed shaft 22 causes an adjustment of the eccentric shaft with relation to the pistons 24, thereby varying the extent of movement of the pistons.

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

1. In a pump, the combination of a rotor, means for driving the rotor, said rotor having oppositely-disposed cylinders, a separate piston in each cylinder, each piston having a reduced portion at one end, an eccentric stator, a square crosshead on said stator engaging said pistons while rotating on the stator, and a shoe interposed between the unreduced portions of said pistons and the surface of said square crosshead and arranged to interconnect said oppositely-disposed separate pistons, the reduced portions of the pistons engaging the crosshead block and the unreduced portions abutting the shoe.

2. In a pump, the combination of a rotor, means for driving the rotor, said rotor having cylinders, a separate piston in each cylinder, each piston having a reduced portion at one end, an eccentric stator, a square crosshead on said stator engaging said piston while rotating on the stator, and a shoe interposed between the unreduced portions of said pistons and the surface of said square crosshead and arranged to interconnect said oppositely-disposed separate pistons, said crosshead shoe and the ends of said pistons having flat surfaces for equal application of thrust.

3. In combination in a pump, a casing, a rotor having a plurality of oppositely-disposed cylinders, a stator eccentrically disposed with respect to said rotor, a square crosshead block rotatably mounted on said eccentric stator, a separate piston in each cylinder, each piston having a reduced portion at one end and a U-shaped thrust shoe having a bore in each lateral arm for receiving said reduced end portion and arranged to interconnect said oppositely-disposed separate pistons and engage said crosshead block, the reduced portions of the pistons engaging the crosshead block and the unreduced portions abutting the shoe.

4. In combination in a pump, a casing, a rotor having a plurality of oppositely-disposed cylinders, a stator eccentrically disposed with respect to said rotor, a square crosshead block rotatably mounted on said eccentric stator, a separate piston in each cylinder, each piston having a reduced portion at one end and a U-shaped thrust shoe having a bore in each lateral arm for receiving said reduced end portion and forming a flat end shoulder arranged to interconnect oppositely-disposed separate pistons, said lateral arms of said thrust shoe being interposed between the inner flat ends of the enlarged portions of said cylindrical pistons and the flat surfaces of the crosshead block.

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