

March 26, 1935.

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1,995,756

CONSTANT SPEED VARIABLE DELIVERY ROTARY PUMP

Filed Oct. 23, 1933

4 Sheets-Sheet 1

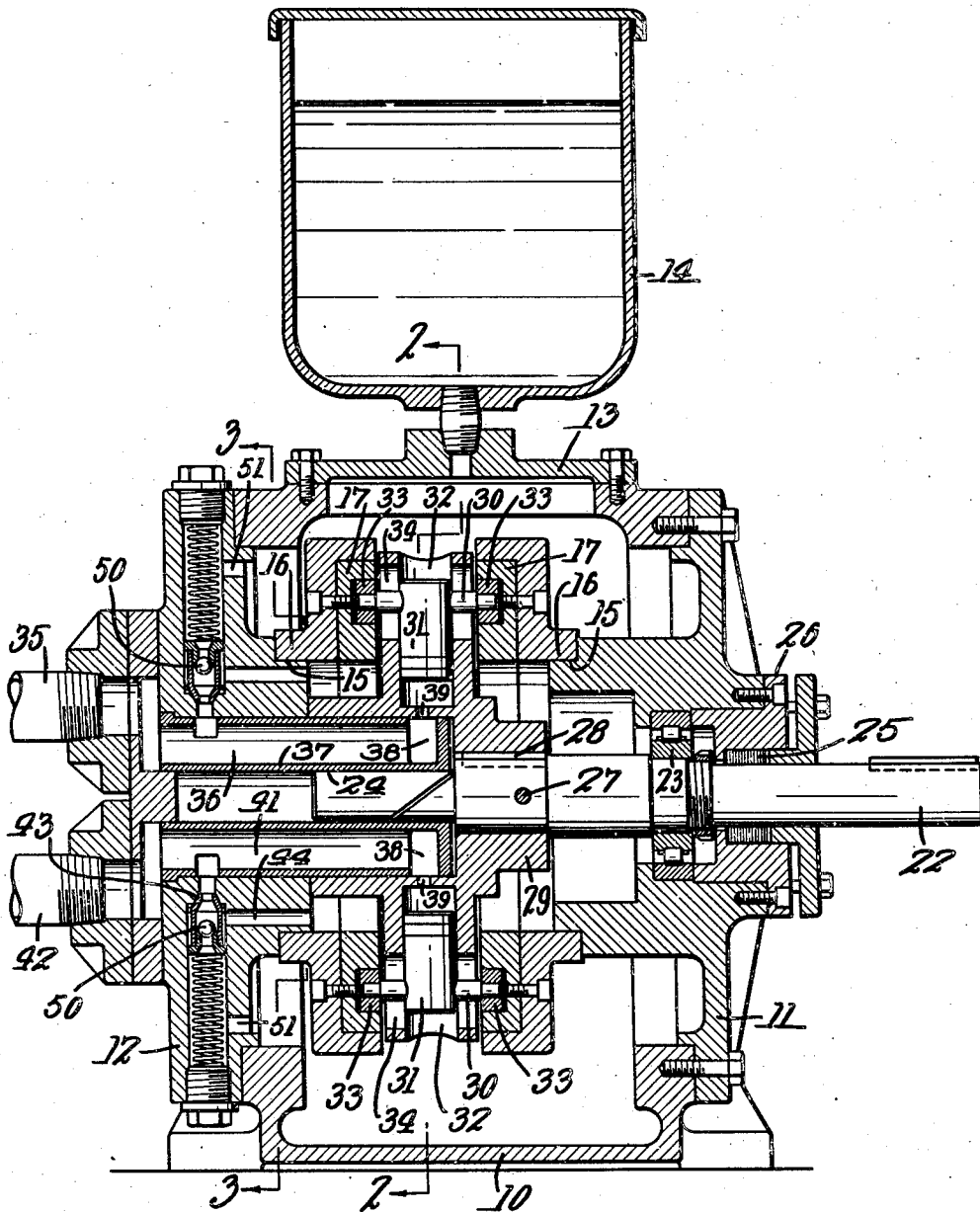


Fig. 1.

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4 Sheets-Sheet 2

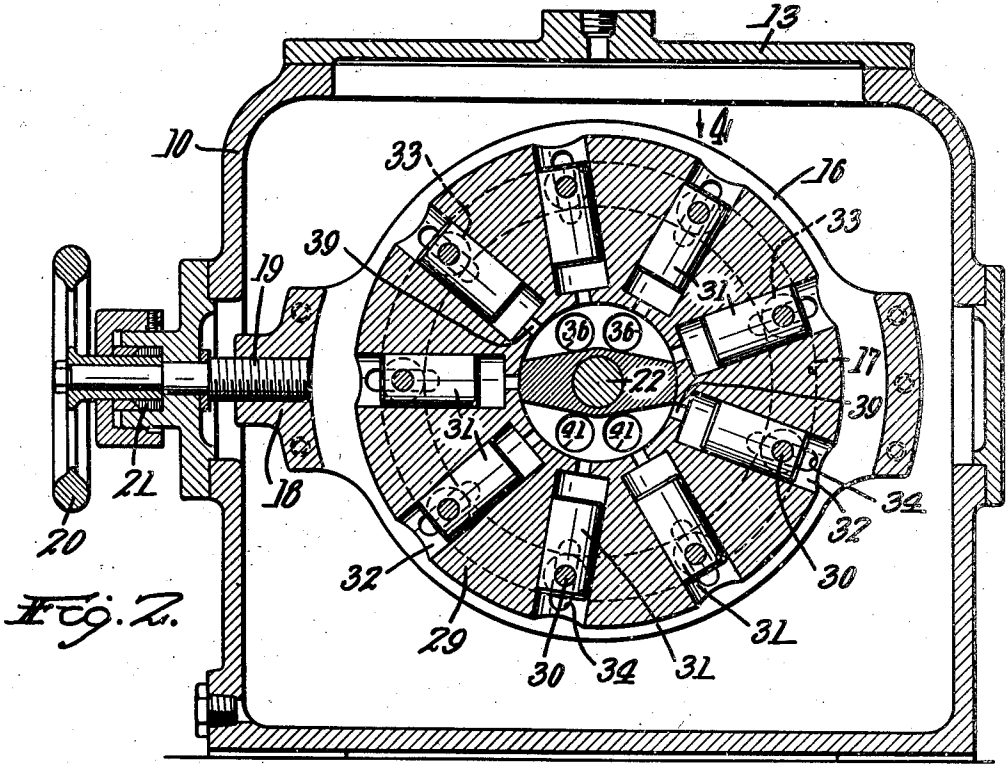


Fig. 2.

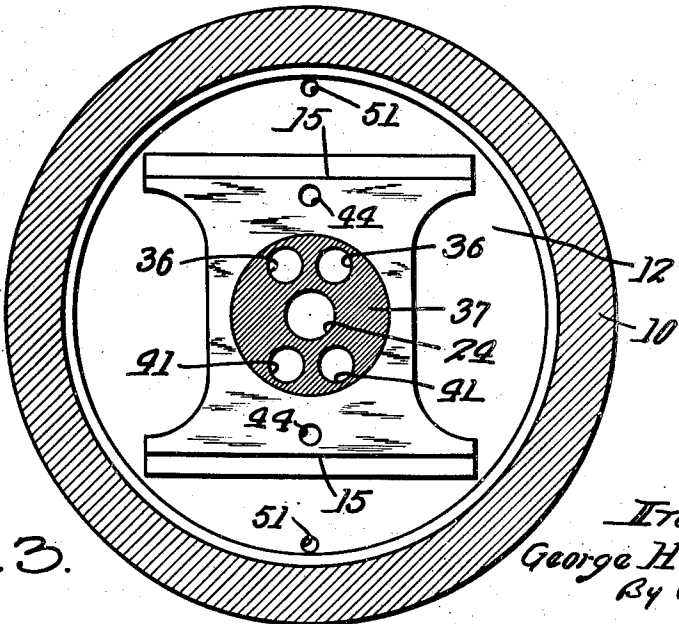


Fig. 3.

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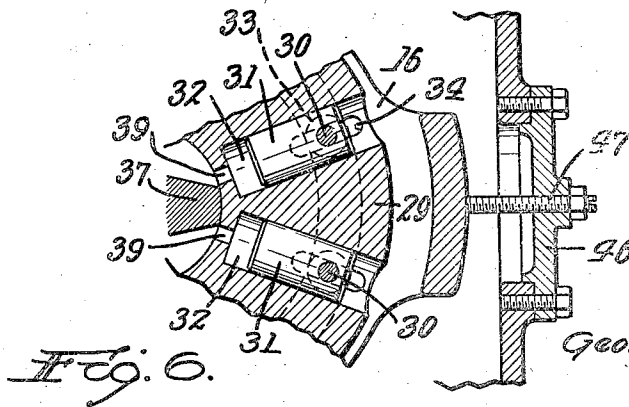
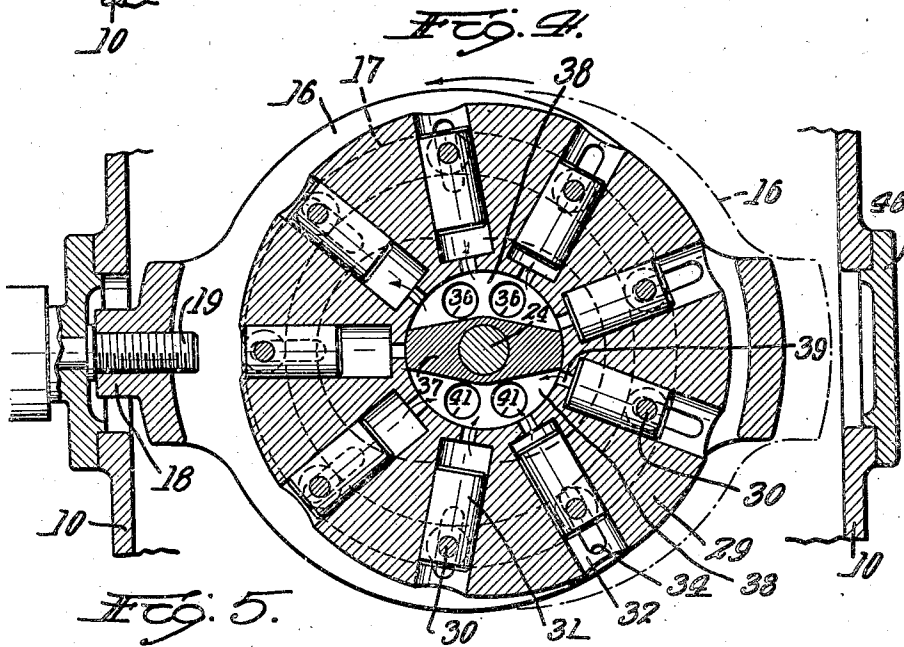
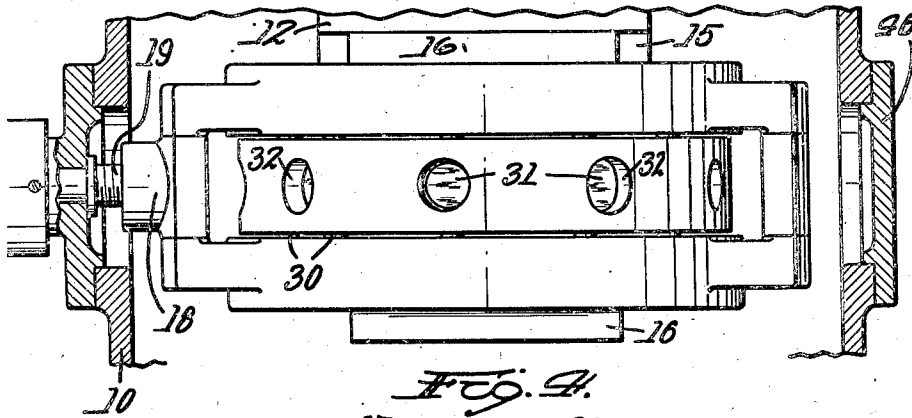
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4 Sheets-Sheet 4

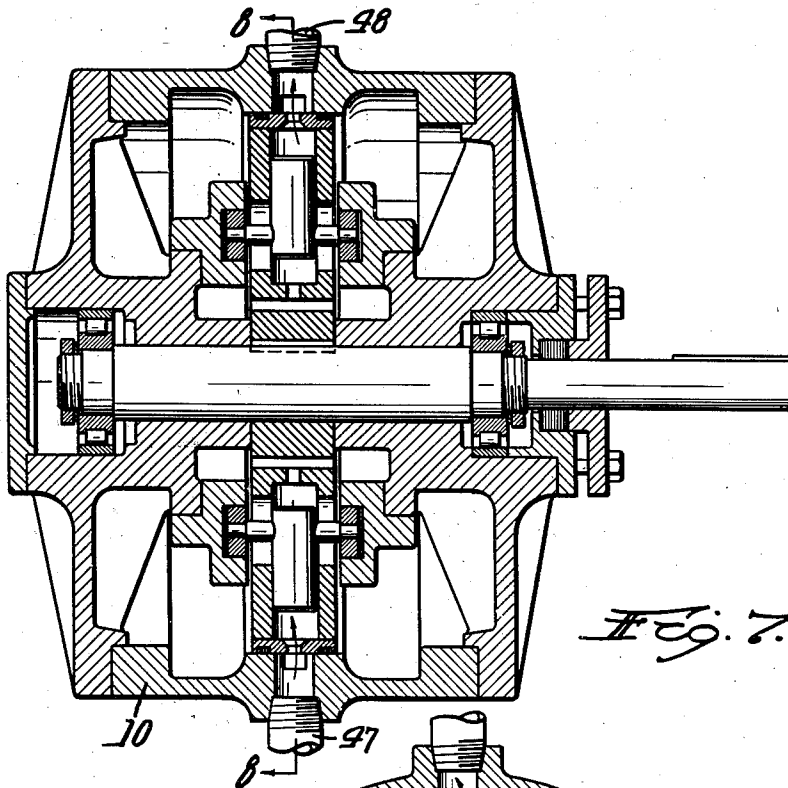


Fig. 7.

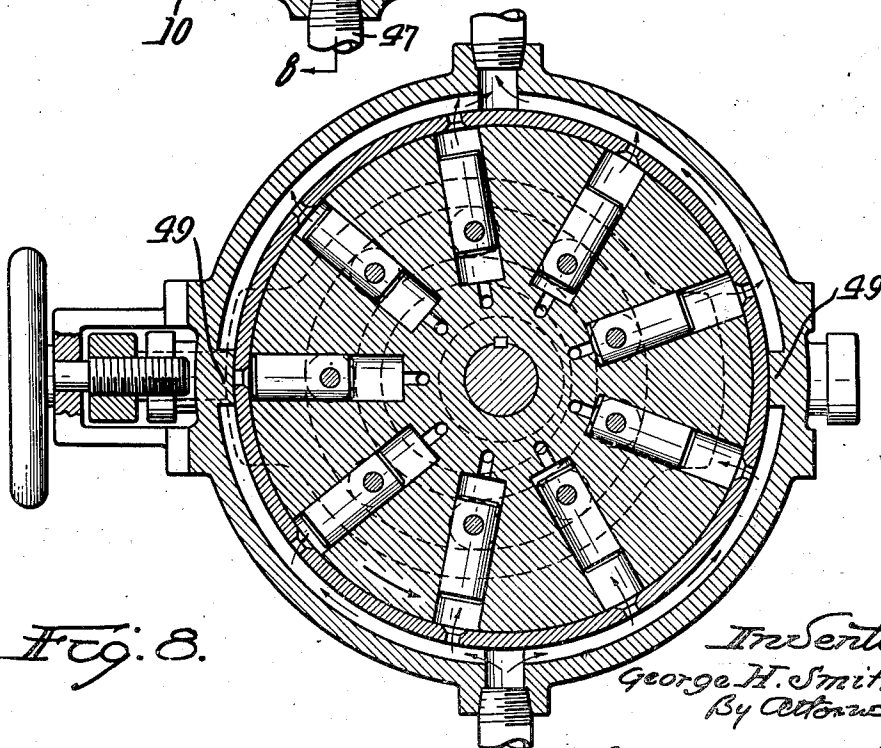


Fig. 8.

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UNITED STATES PATENT OFFICE

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CONSTANT SPEED VARIABLE DELIVERY
ROTARY PUMP

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Application October 23, 1933, Serial No. 694,805

2. Claims. (Cl. 103—161)

This invention relates primarily to a pump but a motor can be made on the same principle. The type of pump to which it relates is one of the radial multiple piston type using oil preferably as a fluid and having a variable fluid flow in either direction or in one direction only.

The principal objects of the invention are to simplify and improve the construction of the above mentioned type of pump; to provide means for allowing greater capacity, at either high or low pressure, than is usual and increased efficiency; to provide means for directing the fluid from and to the cylinders in a direct manner so as to avoid loss of efficiency due to the diversion of the fluid through a plurality of valves and ports; to provide means for keeping all passages and the casing always full of oil so as to exclude air and eliminate hydraulic shocks and noises; to provide means for controlling the pistons in alignment in one revolving part so as to allow for greater capacity, higher speed and longer stroke by reason of the fact that the machine is not limited by revolving outer rings, rollers and sliding shoes for piston alignment; to avoid the use of valves for the radial pistons and cylinders; to provide for controlling the pistons in one revolving part so that only two bearings are required for the rotor, thereby simplifying and reducing the friction to a minimum and keeping the cylinder ports always in correct line with the valve chambers, giving a constant flow without pulsations; to provide an eccentric movement of actuating rings for operating the pistons in such a way that the high and low position is always in a straight horizontal line; to provide means whereby the casing is always filled with oil and all rotating and moving parts are separated from the stationary parts by a film or body of oil so that no other lubrication is necessary and there will be no danger of the machine running dry, thus providing a minimum of friction and a maximum of efficiency; to provide an efficient and constantly acting cooling system by reason of the fact that the casing is full of inactive oil ready at all times for replenishing the working oil passages, thus immediately reducing any heat generated or friction of oil through the ports and the plungers, and to provide a construction whereby the inactive oil in the casing is never under pressure, the active oil only being subjected to pressure.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

Fig. 1 is a diametrical section of a preferred embodiment of this invention used as a pump;

Fig. 2 is a transverse sectional view on the line 2—2 of Fig. 1 showing the parts adjusted to neutral position in which no pumping action can take place;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a plan of the parts shown inside the casing in Fig. 2 as indicated by the arrow 4 in that figure;

Fig. 5 is a view similar to Fig. 2 showing the parts adjusted so that a pumping action takes place;

Fig. 6 is a view of one end of the pump as shown in Fig. 5 with a feature added which prevents the adjustment of the pump to pump in more than one direction;

Fig. 7 is a view similar to Fig. 1 showing a modification, and

Fig. 8 is a sectional view of the same on the line 8—8 of Fig. 7.

Referring to the first six figures, it will be seen that the pump is shown mounted in a stationary casing 10 which has end plates 11 and 12 bolted thereto to complete the casing. At the top is a removable bolted plate 13 which supports the oil supply tank 14. This tank 14 is open at the top or vented and feeds oil at all times into the interior of the casing and also will receive any air bubbles that may be produced therein and dispose of them by gravity.

The end plates 11 and 12 are provided with a pair of horizontal straight tracks 15 on which is guided horizontally a slide 16. Secured by screws or the like to this slide is a cam track 17.

The slide 16 is provided with a head 18 into which a screw 19 extends having a hand wheel 20 for operating it to move the slide back and forth on the guiding surfaces or tracks 15 on the two sides of the pump. The stem of the screw 19 is provided with a stuffing box 21 outside to prevent the escape of oil. These parts are designed for the purpose of controlling and of varying the flow of the fluid which the pump is designed to carry.

The pump is operated through a shaft 22 run by a motor or other means. This shaft has an inside bearing 23 on the end plate 11 and at the other end has a bearing end 24 which will be described later. The shaft is provided with a stuffing box 25 and a cap 26 is screwed to the end plate 11 against which the bearing 23 abuts. The usual screw adjustment is shown. This shaft is pinned by a pin 27 and keyed at 28 to a rotor

29. Cross head pins 30 are attached to pistons 31 in a series of radial cylinders 32 in the rotor. Each cross head pin is provided with two rollers 33 which operate in the cam 17. This cam is circular and in the normal position shown in Fig. 2 is concentric with the center of the shaft 22. By turning the hand wheel 20, the slides 16 can be moved so that the cam groove is off center, as shown in Fig. 5, which will cause the pistons to reciprocate as the rotor rotates. The cross head pins are mounted in slots 34 in the rotor so as to allow for the necessary motion.

As stated, the pump is designed to take in the liquid to be pumped through a stationary inlet 35 into a pair of longitudinal passages 36 in a valve 37. These passages are provided with radial outlet ports 38 communicating as the rotor rotates with the inner ends of the cylinders 32, these pistons and cylinders being single acting. As the rotor rotates, referring particularly to Fig. 5, the outlets 38 come into registration with the rotating inlets 39 to the cylinders. These pistons, being moved outwardly gradually during a half of a rotation, draw a certain amount of liquid into their cylinders. During the other half of the rotation, the same outlets 39 come into registration with the same ports 38 radially fixed in a pair of outlet passages 41 and the inwardly moving pistons 31 force the liquid out through the outlet pipe 42.

Valves 43 are provided which are spring-pressed safety valves. If the pressure gets too high, the springs will yield and the liquid will leak through these valves out through ports 44 into the body of the casing, which, as stated, is always filled with oil not under pressure and can receive this escaping oil at any time. If the pressure gets too low in the passage 36 or 41 the ball 50 will stop acting as a check and allow the oil to flow into them from the casing through the passage 51. It is the central passage of the valve 37 that constitutes the bearing for the end 24 of the shaft 22.

The valve 37 can be made in one piece with the cover 12, if desired, as it is perfectly stationary. It has two chambers, one at each side, separated by two opposite solid sections, one being used for the inlet and one for the discharge. The inner ends of the passages 36 terminate in a circumferential groove extending around the valve. Therefore, in this case, in which nine cylinders are used, there will at any instant be four cylinders under discharge and four under suction and only one of them out of operation at any time.

It will be noticed that the outlets and inlets are direct. It will be understood that if the screw 19 is moved so as to bring the rotor to one side

of the center of the pump, the pump will discharge in one direction whereas if the screw is turned far enough in the other direction so that the rotor is on the other side of the center the oil will circulate in the opposite direction. This control, of course, can be placed at either end. If it is desired that the pump shall not be reversed but shall always discharge in one direction, the cap 46 can be provided with a screw 47, as shown in Fig. 6, which can be adjusted up to the end of the head 18 on that side so as to prevent the rotor being adjusted beyond the center.

In the form shown in Figs. 7 and 8, the inlet 47 and outlet 48 are shown on the outside of the cylinder block in the casing 10. It will be obvious that the oil can be caused to circulate around the outside of the rotor as well as the inside. These figures show the partitions 49 which separate the two chambers of the pump from each other. It is thought that no further description of these figures is necessary.

Although I have illustrated and described only two forms of the invention I am aware of the fact that other modifications can be made therein by any person skilled in the art without departing from the scope of the invention as expressed in the claims. Therefore, I do not wish to be limited in this respect otherwise than as set forth in the claims but what I claim is:—

1. In a pump, the combination with a casing, means for constantly supplying the casing with oil without pressure to keep it entirely filled at all times, of a rotor enclosed therein, said rotor having radial cylinders, pistons in said cylinders, means for causing said cylinders to reciprocate as the rotor rotates, a stationary valve at one end of the casing having a central cylindrical bearing, and a shaft on which said rotor is fixed having an end supported by said bearing, said valve having a valveless passage for receiving liquid open to the ends of said cylinders and an outlet.

2. In a pump, the combination with a casing, means for constantly supplying the casing with oil without pressure to keep it entirely filled at all times, of a rotor enclosed therein, said rotor having cylinders, pistons in said cylinders, means for causing said cylinders to reciprocate as the rotor rotates, a stationary valve at one end of the casing having a central cylindrical bearing, a shaft on which said rotor is fixed having an end supported by said bearing, said valve having a valveless passage for receiving liquid open to the ends of said cylinders and an outlet, and means for varying the stroke of the pistons to vary the flow.

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