

1,124,749.

Patented Jan. 12, 1915.



Mr. Fannie
H. G. Rueth

ਯੋਧਾ

Hammer, Attorney.

UNITED STATES PATENT OFFICE.

THOMAS A. KILLMAN, OF NASHVILLE, TENNESSEE, ASSIGNOR OF SIXTY-FIVE ONE-HUNDREDTHS TO EDWARD H. ROY, OF TULLAHOMA, TENNESSEE, AND TEN ONE-HUNDREDTHS TO WILLIAM L. DANLEY, OF NASHVILLE, TENNESSEE.

VALVE FOR HYDRAULIC PUMPS OR MOTORS.

1,124,749.

Specification of Letters Patent.

Patented Jan. 12, 1915.

Application filed September 24, 1913. Serial No. 791,560.

To all whom it may concern:

Be it known that I, THOMAS A. KILLMAN, a citizen of the United States, residing at Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Valves for Hydraulic Pumps or Motors, of which the following is a specification.

My invention relates to pumps or motors, and particularly a fluid-operated pump or motor of that type in which a rotary piston is used.

One object of my invention is the provision of a mechanism which may be used either as a pump or motor, of extremely simple construction, easily operated, and of a high degree of effectiveness.

A further object of the invention is the provision of a mechanism of the character described so formed as to reduce to a minimum friction between the parts and so formed that the rotary piston has rolling contact with the casing within which it is supported.

Other objects will appear in the course of the following description.

My invention is illustrated in the accompanying drawings wherein:—

Figure 1 is a section through a mechanism of the character described, the section being taken at right angles to the shaft. Fig. 2 is a section in a plane transverse to that of Fig. 1, the section being taken on the line 2—2 of Fig. 1. Fig. 3 is a transverse section of the valve casing 25, with the valve adjusted in one position. Fig. 4 is a like view to Fig. 3 but showing the valve reversely set. Fig. 5 is an enlarged detail view of the upper portion of the piston casing, the valve casing 30 being in section and the valve therein being set in a position to cause a direct circulation of the motive fluid from the outlet port of the piston chamber to the inlet port thereof. Fig. 6 is a perspective view of the valve in chamber 30. Fig. 7 is a sectional view of the valve chamber 30 with the valve therein set to cause a braking action of the piston. Fig. 8 is a like view to Fig. 7 but showing the valve in its speed controlling position.

Corresponding and like parts are referred to in the following description and indicated

in all the views of the accompanying drawing by the same reference characters.

Referring to these drawings it will be seen that my improved mechanism comprises a cylindrical casing 5, this casing being closed at its ends by heads 6 and 7 held against the peripheral wall of the casing in any suitable manner. The casing 5 is preferably divided into two sections by an intermediate wall 9 so as to provide parallel chambers on each side of the intermediate wall.

Extending into the head 7, and if desired, extending entirely through the casing is a crank-shaft 10 supported in suitable bearings. This shaft has two cranks disposed one in each of the chambers 11 and 12. This crank-shaft is adapted to form either a driven or a driving shaft, depending upon whether the mechanism is used as a pump or as a motor.

Disposed in each of the chambers 11 and 12 is a cylindrical piston 15, formed with a peripheral wall 16 and a middle web 17. This web is radially slotted as at 18. The wrist-pin 10^a of the crank corresponding to the piston passes through the center of the piston. The circumferential wall 16 of the piston is split at 19 and the peripheral wall is extended inward as at 20 on each side of the slot or opening so formed and curved so as to form an open bead or bearing for engagement with semi-cylindrical packing members 21.

The wall of the casing 5 has an inwardly projecting wing or plate 22 extending from end to end of the casing and this wing or plate extends through the slot 19 and between the packing members 21 and into the slot 18. The packing members 21 therefore, have sliding engagement with the faces of this wall 22 and rocking engagement with the bearings 20.

The casing 5 is formed with ports 23 and 24 located respectively on opposite sides of the wing 22. One of these ports always constitutes an inlet and the other an outlet or discharge port. It will be understood, of course, that there is one of these ports for each of the chambers 11 and 12.

It will be obvious now that as the crank 10^a is revolved, the piston 15 will be carried in a circular path and its periphery will

have a sliding and rolling contact with the inner face of the wall of the casing 5, the bearing 20 and the packing members 21 permitting the piston to rock upon the packing members.

In Fig. 1 the piston is shown at the beginning of its stroke. The space *a* below the piston is assumed to be filled with water, oil or other fluid. Now as the crank 10^a revolves in the direction of the arrow the piston will be carried laterally toward the left-hand end of the casing, then downward and laterally toward the right hand side of the casing, and then upward, and all of the fluid which is disposed in the space *a* will be forced out through the port 24. While the piston is moving downward and toward the left the space above the piston will increase in area and as the piston moves in the direction of the arrow fluid will be drawn in through the port 23. It will be noted that the piston on one side of the wall 9 is set opposite to the piston on the other side of the wall 9, and thus when the mechanism is being used as a pump one of the pistons is always drawing in fluid while the other is always forcing the fluid out. It will also be evident that if the crank-shaft 10 be turned in an opposite direction to that indicated by the arrow in Fig. 3 of the drawings and the device be used as a pump the port 24 will become the inlet port and the port 23 will become the outlet or discharge port.

Whenever the mechanism is being used as a motor the fluid under compression will be forced in through the port 23 into the motor chamber 5, or casing, and the pressure of fluid behind the piston will cause it to rotate precisely in the same manner as heretofore described for the pumping action, the exhaust fluid passing out through the port 24 and vice versa the port 24 may become the inlet port and the port 23 the outlet or exhaust port and the mechanism used as a motor in this instance and move reversely to the direction of the arrow in Fig. 1. Thus when the rotating piston is positively driven by means of the crank-shaft it will act as a pump, whereas if it is driven by means of fluid pressure, it will act as a motor and transmit the circular motion of the piston to the crank-shaft. In order to control the mechanism either as a motor or a pump I may use the valve mechanism illustrated in Figs. 1 and 2. This valve mechanism comprises a valve casing 25 having oppositely disposed pipes 26 and 27 which act either as inlet or outlet pipes.

Extending from one side of the valve casing and oppositely disposed to each other and in quartering relation to the openings of the pipes 26 and 27 are the pipes 28 and 29. The pipe 28 as illustrated extends directly downward to the ports 24 in the chambers 11 and 12, while the pipe 29 enters

the valve casing 30, the opposite wall of which has a branched pipe 31, the branches of which enter the ports 23 of both the chambers 11 and 12.

Disposed within the casing 30 is a shaft 32 preferably having disks 33 at its ends which snugly fit the chamber 30, and mounted upon this shaft is a segmental valve 34 having a face 35 which is adapted to intersect and close the entrance opening of the pipe 29. From the side of the valve casing 30 extends a by-pass 36 which enters the pipe 28. As illustrated in Fig. 2 the segmental valve 34 is disposed adjacent one of the end disks 33 so that it is in line with the outlet of pipe 29 and with the opening of the by-pass 36, but not in line with the pipe 39. Thus, when the valve is turned in the position shown in Fig. 8 the current will flow into the cutaway portion of the valve then laterally and then downward into the rotor chamber, but the outlet from the by-pass will be blanked. When the valve is turned in the position shown in Fig. 7 the outlet from the pipe 29 will be cut off but the by-pass will be operatively connected to the rotor chambers. When the valve is in the position shown in Fig. 5 the current will flow through the pipe 29 and through the by-pass and down through the pipe 39 and thus a portion of the power of the current will be lost. The end disks 33 carried on the valve shaft 32 form the walls of the valve chamber and act to balance the valve. Disposed within the valve casing 25 is the valve 37 which is mounted upon a shaft 38 and extends diametrically across the valve casing and is formed at opposite ends with relatively enlarged extremities. When this valve is turned in one direction, as in Fig. 3, the pipe 26 will be connected to the pipe 29 while the pipe 27 will be operatively connected to the pipe 28. When the valve is turned in the direction shown in Fig. 4, however, the pipe 26 will be connected to the pipe 28, while the pipe 27 will be connected with the pipe 29.

Assuming now that the mechanism is operated as a pump and it is desired that while the piston rotates there shall be no pumping action, the valve 37 is turned to close the ports 28 and 29 and the valve 35 is turned to the position shown in Fig. 7. Under these circumstances, the fluid forced out from the outlet ports 24 of the casing 5 will pass into the valve chamber 30 and pass transversely across said chamber and down through the pipe 39 which connects the valve casing to the inlet ports of the chambers 11 and 12. There will thus be a constant circulation of fluid through the pump. If now it is desired that the pump shall cause a flow of fluid in the direction indicated by the arrow in Fig. 1, the valve 37 is turned to the position shown in Fig. 4,

and the valve 35 is turned to the position shown in dotted lines in Fig. 1, whereupon fluid will be drawn in through the pipes 26 and 29 into the chambers 11 and 12 and forced outward through the pipes 28 and 27. If it is desired for any reason to reverse the movement of the pump the valve 37 is turned to the position shown in Fig. 4, and as a consequence the rotation of the piston will cause the liquid to be drawn through the pipes 27 and 29 and forced out through the pipes 28 and 26.

Where the mechanism is intended to be used as a motor operated by fluid under pressure entering the chambers 11 and 12 a like adjustment of the valves may be made so as to cause the rotation of the piston in one or the other direction or the stoppage of this rotation. By closing the outlet from the chambers 11 and 12 it is obvious that the piston will be caused to stop the compression of fluid on its outlet side of the chamber, and thus the piston will act as a brake.

It will further be seen that by properly adjusting the valve 34 the mechanism when used as a motor may be started at a relatively slow speed, and that by gradually turning the valve 34 to increase the area of the passage leading from the pumping chambers, the speed will be gradually increased. It will likewise be seen that the valve 37 is only used for reversing the action of the piston when used either as a pump or a motor piston, and that the valve 35 is used for controlling the speed of the mechanism, for stopping in its action or for causing it to operate without doing work.

My invention is very simple, can be applied to a large variety of purposes, is readily controlled, and has been found thoroughly effective in practice.

What I claim is:—

1. In a mechanism of the character described, the combination with a cylindrical casing and a rotary piston therein, the casing being formed with an abutment and having ports disposed one on each side of the abutment, of pipes each entering one of said ports, a valve casing disposed in one of said pipes and having a by-pass branch extending to the other of said pipes, and a rotary valve in said casing having a segmental valve disk less in thickness than the depth of the casing, the valve disk having a width equal to the diameter of the pipes extending into and out of said casing.

2. In a mechanism of the character de-

scribed, the combination with a cylindrical casing and a rotary piston therein, the casing being formed with an abutment and having ports disposed one on each side of the abutment, of pipes each entering one of said ports, a valve casing disposed in one of said pipes and having a by-pass branch extending to the other of said pipes, and a rotary valve in said casing comprising a transversely extending spindle, disks on the opposite ends of said spindle and snugly fitting the valve casing, and a segmental valve disposed on said spindle and spaced from said disks, said valve being less in width than the depth of the valve casing but having a width greater than that of the ports opening from the valve casing into said pipes.

3. In a mechanism of the character described, the combination with a cylindrical casing and a rotary piston therein, the casing being formed with an abutment and having ports disposed one on each side of the abutment, of pipes each entering one of said ports, a valve casing disposed in one of said pipes and having a by-pass branch extending to the other of said pipes, and a rotary valve in said casing having a segmental valve disk less in thickness than the depth of the casing, the working face of said valve disk having an area sufficient to close the pipes extending into and out of said casing.

4. In a mechanism of the character described, the combination with a cylindrical casing and a rotary piston therein, the casing being formed with an abutment and having ports disposed one on each side of the abutment, of pipes each entering one of said ports, a valve casing disposed in one of said pipes and having a by-pass branch extending to the other of said pipes, and a rotary valve in said casing comprising a transversely extending spindle, disks on the opposite ends of said spindle and snugly fitting the valve casing, and a segmental valve disposed on said spindle and spaced from said disks, said valve being less in width than the depth of the valve casing but having an area sufficient to cover the ports opening from the valve casing into said pipes.

In testimony whereof I affix my signature in presence of two witnesses.

THOMAS A. KILLMAN. [L.S.]

Witnesses:

ERNEST C. HARLAN,
W. C. HALL, JR.