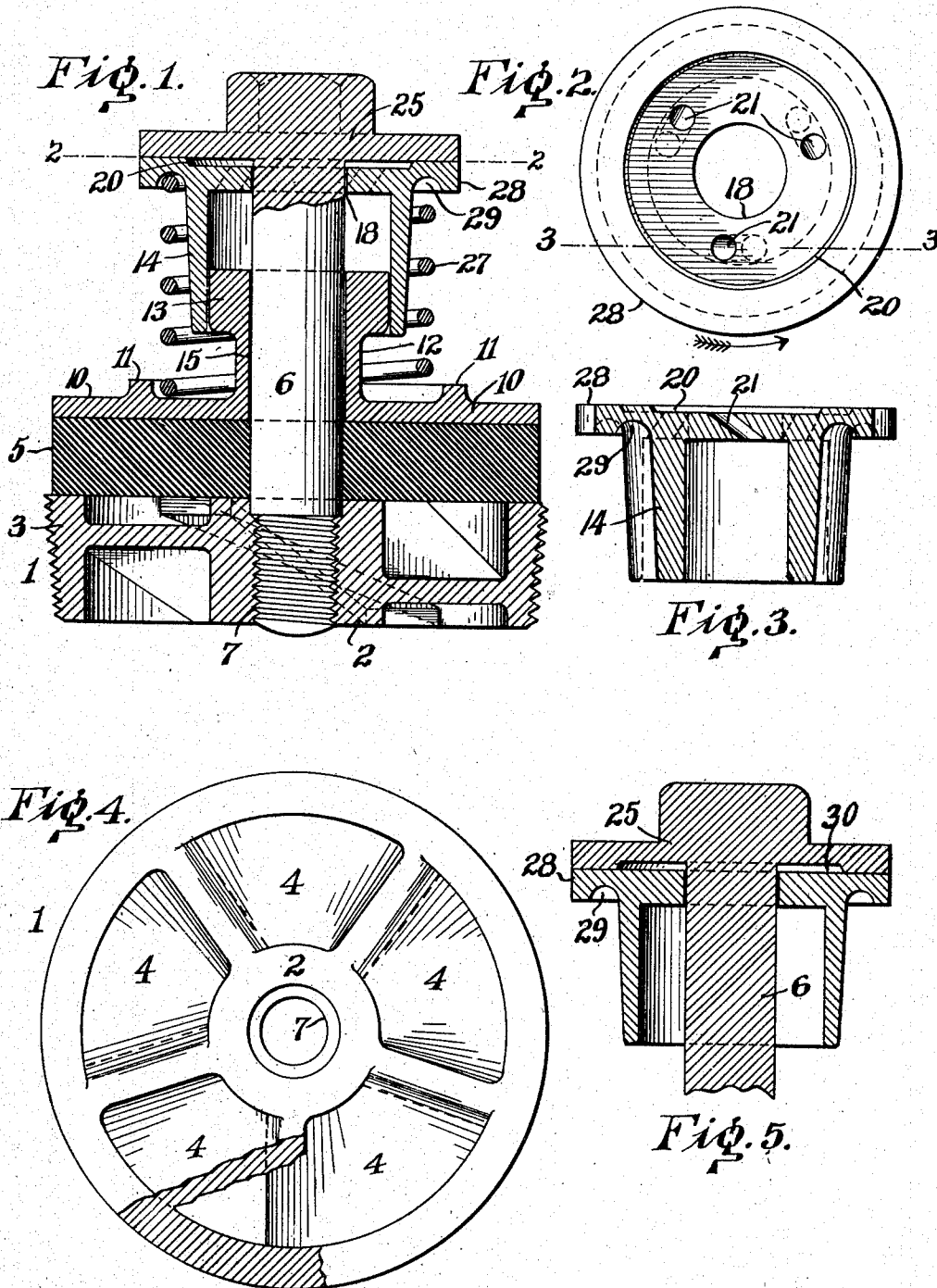


J. ROWBOTHAM.
VALVE MECHANISM.
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Patented Feb. 15, 1910.



WITNESSES
Barrie E. Kleinfelder
Daniel Webster, Jr.

INVENTOR
John Rowbotham
BY
Cyrus A. Anderson
his ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN ROWBOTHAM, OF MONTGOMERY COUNTY, PENNSYLVANIA, ASSIGNOR TO JAMES BOYD & BROTHER, INCORPORATED, OF PHILADELPHIA, PENNSYLVANIA.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN ROWBOTHAM, a citizen of the United States, residing in Montgomery county, State of Pennsylvania, have invented certain new and useful Improvements in Valve Mechanism, of which the following is a specification.

My invention relates to an improvement in valve mechanism and particularly to the valve construction and associated mechanism which is shown in the Letters Patent of the United States issued to me under date of April 23, 1907, No. 851,182.

The valve is particularly adapted for use in connection with pumps in which the water is discharged at successive intervals and the valve proper is adapted to be raised from its seat by the pressure or action of the water or other suitable liquid which is being discharged through the valve passage or passages. After a period of water discharge the valve is returned to its seat by the action of the water in the pumping apparatus assisted by a suitable device, such for instance as a spring. As the valve is lifted from its seat it is given a slight movement of rotation so that different portions thereof successively rest upon stationary portions or sections of the valve seat.

My construction is such that the action of the water or other liquid against the side of the valve adjacent to its seat and against which the water impinges occasions a slight movement of rotation of the said valve; and the object of my present invention is to provide means which will constitute an additional or supplemental means for occasioning rotation of the said valve and other parts of the mechanism associated therewith. The valve and the various parts of the mechanism rotate in the same direction.

A further object of my invention is to provide means which will economically and satisfactorily reduce the friction between certain relatively moving parts which enter into my construction.

A convenient embodiment of my invention is illustrated in the accompanying drawings forming a part of this specification. The novel features of this and all other embodiments which come within the scope of my invention, I have endeavored to point out with particularity in the appended

In the drawings:—Figure 1 is a central vertical section of a valve and its seat; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a section on the line 3—3 of Fig. 2; Fig. 4 is a top plan view of the valve seat a portion of which is broken away; and Fig. 5 is a sectional view corresponding to the upper portion of Fig. 1 and showing a modified construction.

Referring to the drawings:—1 designates a valve seat adapted to be secured in any known manner in a pumping apparatus. This valve seat is provided with what may be termed a hub 2 and a rim 3, the hub and the rim being connected together by means of plates 4 inclined to the general plane of the seat. These plates are of sufficient width and inclination that the upper edge of one extends over or overlaps the lower edge of the adjacent plate, as is indicated in Figs. 1 and 4 of the drawings. The purpose of so extending or overlapping the plates is to direct all of the water or other liquid which flows through the passage ways through the said seat at an angle so that it will strike or impinge against the lower side of the valve 5 at an angle and as the latter is raised occasion a slight movement of rotation about the bolt 6 which is securely fastened to the seat 1. As illustrated, the bolt 6 has left-handed screw-threaded engagement with the sides of the hole 7 in the seat 1. A certain component of the force due to the rapid flow of the water or other liquid acts to occasion movement of the valve in a direction opposite to that of the hands of a watch, as is clear, on the bolt 6 as a pivot. The valve 5 may be constructed of any suitable material as, for instance, rubber. What may be termed a washer 10 rests upon the valve 5. This washer is provided with a circular rib 11 located at some distance from its outer edge and the said washer is also provided at its central portion with a boss or projection 12, the upper end of which is enlarged to provide and constitute a piston 13 to operate in the lower end of a cylinder which consists of an inverted cup-shaped member 14. The washer is provided with a hole 15 which extends therethrough and through the boss or projection 12. This hole 15 forms an extended bearing for the bolt 6 which extends through the same. By providing such extended bearing, I prevent the tilting of the washer and the valve and thereby prevent

unnecessary wearing of the hole through the valve and through the washer.

The top of the member 14 is closed and is provided with a perforation or hole 18 through which the bolt 6 projects. The top of the member 14 is provided also with a depression or recess 20 and with one or more perforations 21 which are inclined at an angle to the plane of the top of the said member 14 as indicated most clearly in Figs. 2 and 3 of the drawings. Any number of perforations 21 may be employed, although in the specific construction illustrated, I have shown 3 perforations. The upper end of each of the perforations 21 is located entirely out of alinement with the lower end thereof so that no part of the water which passes through the said perforations will travel in lines at right angles to the plane of the top or closed end of the member 14. The member 14 is held upon the bolt 6 by means of a flanged head 25 thereon. It is desirable that the piston 13 shall fit snugly in the lower end of the cup-shaped member 14 and that the outer portion of the top of the member 14 shall fit closely against the under side of the flanged head 25, but there should be sufficient looseness and space between the parts mentioned to permit the space between the piston and the top of the said cup-shaped member to become filled with water or other liquid which surrounds the mechanism of the valve. As a means for assisting the action of the water in pressing the valve 5 firmly against its seat as indicated in Fig. 1 after a period of water discharge, I have provided a coiled spring 27 which surrounds the inverted cup-shaped member 14 and the projection 12. The lower end of the said spring rests upon and exerts pressure against the washer and is located in the circular depression formed between the said projection 12 and the rib 11. The upper end of the spring rests underneath and against the flange 28 which projects from the top of the member 14 in a groove 29 formed in the said flange.

In the modified construction shown in Fig. 5, the top surface of the inverted cup-shaped member 14 is smooth and the depression 30 corresponding to the depression 20 is formed in the lower side of the flanged head 25.

It will be understood that one of the uses to which my valve may be put, is in connection with pumps forming part of a water pumping station supplying water to a community, and also similar pumping stations for supplying water for other purposes, and that it is surrounded with water so that between the successive discharges of water through the valve seat the space in the member or cylinder 14 between its top and the piston is filled with water in the manner stated. When the water which is discharged

through the passages in the valve seat 1 between the inclined plates 4 strikes or impinges against the surface of the valve 5 the latter is elevated and as previously set forth is, during its initial upward movement, slightly turned about the bolt 6 in a direction opposite to the movement of the hands of a watch. The elevation of the valve 5 occasions simultaneously the elevation of the washer 10 together with the piston 13 with a consequent reduction of the space or volume between the piston 13 and the top of the cup-shaped member 14. This results in the forcing of the water from such space through the inclined holes or perforations 21. The water under pressure passing through the said perforations 21 into the space 20 or 30, as the case may be, occasions depression of the member 14 and at the same time the water passes from the said space 20 or 21 between the member 14 and the outer edge of the flanged head 25. The pressure exerted by the water downward upon the top of the member 14 is increased in the proportion of the area of the depression or space 20 or 30 to the area of the perforations 21. Upon the depression of the member 14 the water escapes from the space 20 or 30 between the adjacent surfaces of the outer edges of the said member 14 and the outer edge of the flanged head 25. The rotation of the washer 10 by reason of its frictional engagement with the valve 5, also occasions rotation of the member 14 through the frictional engagement therewith and with the washer 10 of the spring 27. The rotation of the member 14 takes place at the initial upward movement of the piston 13 and is facilitated by the presence of a layer or film of water between the members 14 and 25 whereby the friction between the said members is reduced to practically nothing. The water in passing through the inclined perforations 21 impinges or strikes against the lower side of the flanged head 25 and reacts against the member 14 to occasion its rotation.

By my invention, as will be seen, I utilize to the fullest extent the passage of the water through the valve mechanism to occasion the step by step rotation or revolution of the valve 5 and the elements or parts associated therewith. It has been found by actual use that a valve supported in accordance with my invention so as to rotate as above described, is worn evenly and that its under surface which rests against or upon the seat 1 is always smooth and that in consequence the valve may be used until it is worn quite thin at all points and that thereby the length of time which the valve may be used is greatly increased.

Having thus described my invention, I claim:—

1. In a valve mechanism, the combination

of a reciprocating valve constructed to be rotated by a fluid, a piston the movement of which is occasioned by movement of the said valve, a cylinder in which the said piston moves, and means to occasion movement of the said cylinder toward the said piston when movement of the latter into the said cylinder is occasioned.

2. In a valve mechanism, the combination of a reciprocating valve constructed to be rotated by a fluid, a piston the movement of which is occasioned by movement of the said valve, a cylinder having an open and a closed end, the said piston projecting into the said open end, an abutment against which the closed end of the said cylinder rests, perforations through the closed end of the said cylinder to permit movement of the piston into the said cylinder to occasion a flow of water from the said cylinder and laterally between the closed end of the cylinder and the said abutment.

3. In a valve mechanism, the combination of a reciprocating valve constructed to be rotated by a fluid, a movable cylinder having a closed end, a piston movable in the said cylinder, said movement being occasioned by movement of the said valve, and the said cylinder having perforations through the said closed end, means for limiting the movement of the said cylinder in one direction, means interposed between the said cylinder and the said valve tending to occasion separation of the said cylinder and valve, and movement of the said piston in one direction occasioning movement of the said cylinder toward the said valve.

4. In a valve mechanism, the combination of a reciprocating valve constructed to be rotated by a fluid, a piston having movement occasioned by movement of the said valve, a cylinder in which the said piston moves, the said cylinder having a space between the said piston and the opposing end of the cylinder which is adapted to be filled with water, and the said cylinder having perforations through the said opposing end, means for supporting the said valve, piston and cylinder, a member carried by the said supporting means and against which the said cylinder lies, the movement of the said piston into the said cylinder occasioning pressure of the water through the said perforations against the surface of the said member adjacent to the said cylinder to occasion movement of the latter on its support.

5. In a valve mechanism, the combination of a reciprocating valve constructed to be rotated by a fluid, a piston having movement occasioned by movement of the said valve, a cylinder in which the said piston is located and the end of which opposite the said piston is closed, a plate-like member against which the said cylinder lies, a hollow space being provided between the

said cylinder and the said member, perforations inclined to the plane of the closed end of said cylinder, the said perforations opening into the said hollow space and the space between the said piston and the opposing closed end of the said cylinder being adapted to be filled with water, and movement of the said piston into the said cylinder occasioning the discharge of the water from the said cylinder through the said perforations into the said hollow space and between the normally contacting portions of the said cylinder and the said plate-like member.

6. In a valve mechanism, the combination of a reciprocating valve constructed to be rotated by a fluid, a valve seat having passage ways therethrough separated by plates inclined at angles to the plane of the said seat, a bolt having a flanged head secured to the said seat, which bolt projects through a hole in the said valve, a piston supported upon the said bolt and adapted to have movement occasioned by movement of the said valve, a cylinder in which the said piston is located, the end of the said cylinder opposite the said piston being closed, and the said cylinder having a flanged projection substantially in the plane of the closed end of the said cylinder, the flange of the said cylinder being normally in contact with the flanged head upon the said bolt, perforations through the closed end of the said cylinder, the said perforations being inclined at angles to the plane of the said end, the inclination of the said perforations being in a direction opposite to that of the inclination of the plates in the said seat and the said perforations opening into a hollow space between the closed end of the said cylinder and the said flanged head whereby when movement of the piston into the cylinder is occasioned water is discharged through the said perforations and between the said cylinder and the said head whereby rectilinear and rotary movement of the said cylinder is occasioned.

7. In a device of the character described, the combination of a rectilinearly and rotatably movable valve, a support upon the same, a washer in contact with the said valve, a piston connected to the said washer, the said piston and the said washer being rectilinearly and rotatably supported, a cylinder into which the said piston extends, the said cylinder being rectilinearly and rotatably supported, and the end of the said cylinder opposite the said piston being closed and having perforations therethrough, the said perforations being inclined to the plane of the said end, means for supporting the parts named, a member carried by the said supporting means and in contact with which the closed end of the said cylinder lies, a hollow space being provided between the

said cylinder and the said member, a spring interposed between the said washer and the said cylinder and exerting pressure to separate the same, and the space in the said cylinder between its closed end and the said piston being adapted to be filled with water which is forced through the perforations when the piston is moved into the said cylinder and occasions rectilinear and rotary movement of the said cylinder.

8. In a valve mechanism, the combination of a valve, a valve seat having passage ways therethrough, the said passage ways being inclined at an angle to the said seat so that water passing therethrough occasions a movement of the said valve away from its seat and also a rotary movement, and means for facilitating and assisting the rotation of the said valve which are brought into operation by the movement of said valve away from its seat.

9. In a valve mechanism, the combination of a reciprocating valve constructed to be rotated by a fluid, a movable piston, a cylinder in which the said piston moves, the end of the said cylinder opposite the piston being closed and having inclined holes therethrough, a support for the parts named, means on the said support to secure said cylinder thereon, the said means being in contact with the closed end of the said cylinder when no water is passing through the

valve, and movement of the piston into the said cylinder forcing water therefrom through the said holes and outwardly between the said means and the closed end of the said cylinder to occasion downward and rotary movement of the latter.

10. In a valve mechanism, the combination of a valve, a support for the same, the said valve in its operation having a rectilinear movement and also a movement of rotation, means for retaining the said valve upon its support, means interposed between the said valve and the retaining means and having a movement of rotation simultaneously with said valve, the said means occasioning the formation of a film of water or other fluid which passes through the valve mechanism between the said retaining means and the adjacent portion of the said interposed means to reduce the friction between the said retaining means and the said adjacent portion of the said interposed means and thereby facilitating the rotation of said valve.

In testimony that I claim the foregoing as my invention, I have hereunto signed my name this 25th day of January A. D. 1909.

JOHN ROWBOTHAM.

In the presence of—

CYRUS N. ANDERSON,
JOHN H. HALL.