

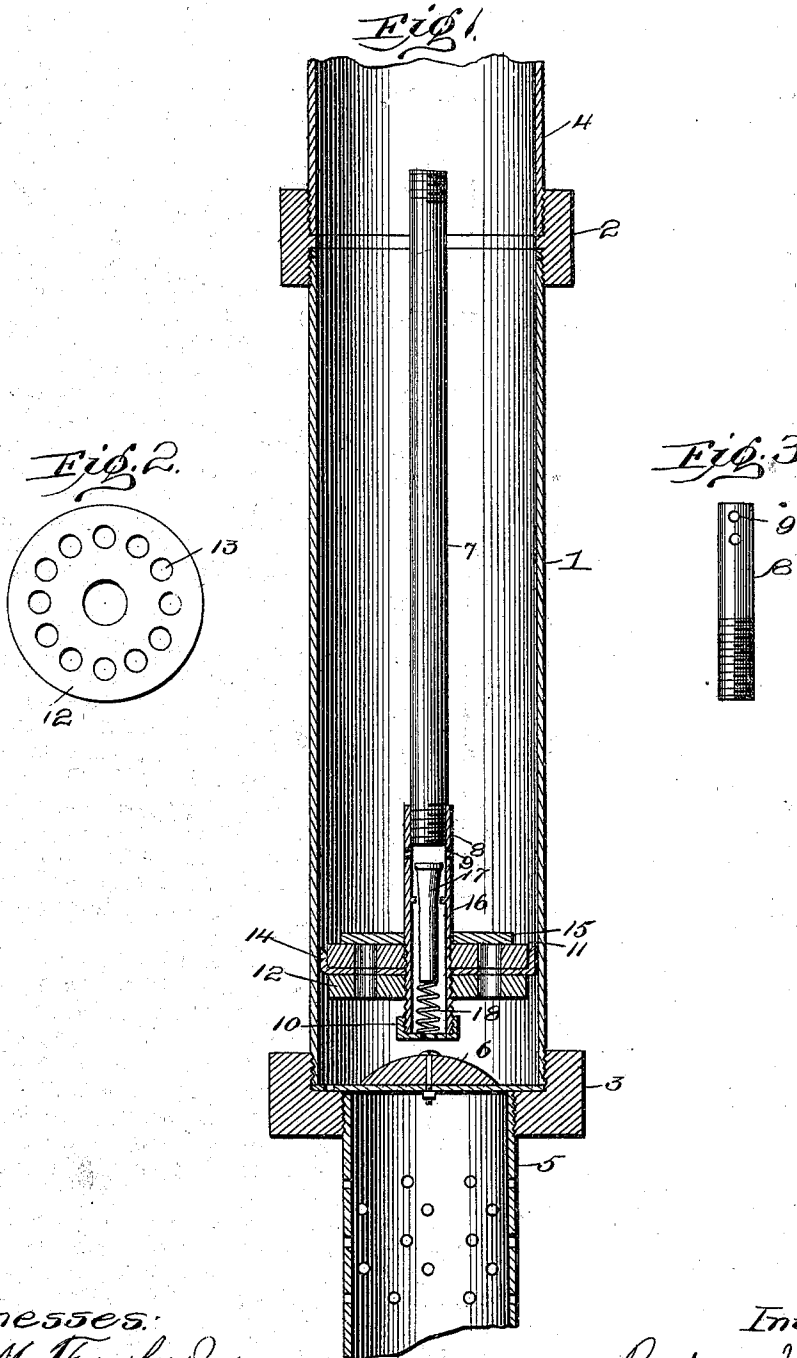
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Patented Sept. 16, 1902.

R. H. YALE.
PUMP.

(Application filed July 29, 1901.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

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PUMP.

SPECIFICATION forming part of Letters Patent No. 709,288, dated September 16, 1902.

Application filed July 29, 1901. Serial No. 70,139. (No model.)

To all whom it may concern:

Be it known that I, RODNEY H. YALE, a citizen of the United States, residing at Beatrice, in the county of Gage and State of Nebraska, have invented new and useful Improvements in Pumps, of which the following is a specification.

My invention relates to improvements in the construction of pistons for pumps or other similar implements in which a reciprocating piston is arranged to act upon a body of liquid contained within a cylinder, barrel, casing, or other similar inclosing receptacle for such liquid; and the special object of my improvements is to provide means for automatically regulating the quantity of liquid which shall be lifted or moved by the piston in accordance with and proportionately to the quickness or power of the stroke of the reciprocating rod or other means of operating the piston.

My improvement is especially designed for use in connection with windmill-pumps or with other motors in which the power is variable or changeable, the result being that the work performed by the piston is made automatic to correspond at all times with the power available to effect it.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of a windmill-pump containing a piston constructed according to my invention. Fig. 2 is a plan view of one of the plates in the piston of the pump-cylinder, showing the ports therein. Fig. 3 is an elevation of the pipe forming the central chamber or passage-way through the piston.

1 indicates the cylinder or barrel of the pump, which is supposed to be submerged in the well or liquid to be pumped, 2 and 3 the threaded caps to which the discharge-pipe 4 and inlet-strainer 5 are respectively connected, and 6 the usual check-valve in the bottom of the cylinder.

7 indicates the lower end of the reciprocating pump-rod leading up to the windmill or other source of power. To the lower end of the pump-rod is secured the cylindrical pipe or valve-chamber 8, provided near its upper end with perforations or openings 9 in its side wall to permit the passage of liquid and at the bottom with a removable cap 10, also hav-

ing suitable openings for the same purpose. Upon said pipe 8 as a center and support are arranged the usual parts of a pump-piston— viz., upper and lower plates 11 12, drilled with holes 13, as shown in Fig. 2, to permit free passage of liquid, the cupped piston-leather 14 lying between them and the valve 15 covering the ports in plates 11 and 12. Within the passage-way or valve-chamber 8 is formed the circular valve-seat 16, within which is loosely mounted the regulating-valve 17, having a head of slightly-less diameter than that of the valve-chamber 8 and a tapering stem extending downward through the valve-seat and bearing at its lower end against a retarding-spring 18, interposed between it and the cap 10 in such a manner that the head of said valve 17 will be held normally elevated somewhat above the valve-seat. It will be seen that if the valve 17 descends from such normal position the space between it and the valve-seat 16, forming a passage-way for the liquid, will gradually become more restricted, and when the head rests on the seat said passage-way will be entirely closed. The removable cap 10 permits the adjustment of the spring and valve in such normal positions as may be desired, so that a greater or less force will be required to close the valve.

The apparatus described, aside from the valve-chamber 8 and its contents, is essentially an ordinary pump-cylinder of the single-acting reciprocating type submerged in the liquid to be pumped, and the operation of the parts will therefore need to be explained only in so far as it is affected by the special features of construction herein referred to.

It is to be understood that the valve-chamber 8 is constantly filled with liquid admitted through the described openings in the top and bottom of said chamber and free to pass through said chamber from one side of the piston to the other unless prevented by the closing of the valve. The piston being at the bottom of the cylinder, as in Fig. 1, if its upward stroke is made quickly the valve 17 will be instantly forced to its seat against the stress of spring 18, and the passage-way being thus entirely closed the piston will carry its full load of liquid and will discharge at the pump-spout an amount of liquid equal to

the full capacity of cylinder 1 from the starting-point of the piston to the limit of its upward movement. If, however, the upward stroke is made very slowly, the pressure on the valve will not be sufficient to overcome the stress of spring 18, the valve will remain open to its fullest extent, and the quantity of liquid discharged will be lessened by the amount passed downward under valve 17 during the stroke. If the stroke is made at medium speed, a proportionate quantity of liquid will pass the valve, the quantity so passed depending partly on the speed of the piston movement and partly on the degree of stress of spring 18 against the valve.

It has been stated that the quantity of liquid passing the valve, and consequently the quantity delivered at the pump-spout, depends partly on the speed of the piston; and it is to be observed that when there is a fixed length of stroke and a variation in piston speed an automatic result will be obtained, even if valve 17 be held permanently open or in any fixed position or omitted altogether, provided that a passage-way of suitable proportions is maintained through or around the piston to permit the passage of liquid from the side of the piston where it is being subjected to pressure—that is, the side between the piston and the spout, or, in other words, the loaded side—to the opposite side or to any part of the apparatus where the pressure is less or merely nominal or entirely absent. Opportunity is thus given to the loaded piston to relieve itself when the speed and power of the motor are diminished, and thus the work to be done is made to some extent proportionate to the available power, even without the valve. The preferred form of my device, however, includes the valve and spring in some form, thus giving greater facility of adjustment to varying conditions, as well as providing for complete closure of the valve when circumstances require it.

It is obvious that the details of the valve and the means of retarding it may vary considerably without departing from the spirit and principle of my invention, the essential aim of which is to provide a passage-way leading out of the cylinder through or around the piston, preferably controlled by a valve and spring, whereby liquid may be passed automatically from the pressure side of the piston to the opposite side during the working stroke.

I have shown my device as applied to a windmill-pump; but it is of course applicable to pumps operated by any motive power, also to any machine or device in which a reciprocating piston is arranged to lift or move a

body of liquid contained within a chamber, casing, or the like, and it is desired to make the work done proportionate to the speed of the motor. The invention is also capable of use in devices of analogous character to the present, in which instead of the piston acting on or moving the liquid the liquid is made to press against and move the piston, thus actuating mechanism connected with the outer end of the piston-rod. In such case as in that herein described sudden or strong pressure against the piston closes the valved passage-way and secures the full working effect of the impact of the liquid against the piston, while under moderate pressure the effect is lessened.

Having described my invention, I claim as new and desire to secure by Letters Patent—

1. In a pump for moving liquids, the combination of a piston-chamber, a reciprocating piston therein adapted to move the liquid, a passage-way extending through the piston, a valve controlling said passage-way, and means for holding said valve open against the pressure of the liquid during the working stroke of the piston when said pressure is relatively light, and permitting it to close during said stroke when said pressure is heavier, substantially as set forth.

2. In a reciprocating pump, a piston-chamber and a piston working therein, a tube extending longitudinally from one side of said piston to the other, said tube having an opening at each end, a valve-seat within said tube between said openings, a valve adapted to engage said seat, and a spring adapted to hold said valve open against the pressure of the liquid during the working stroke of the piston when said pressure is relatively light, and permitting it to close during said stroke when said pressure is heavier, substantially as set forth.

3. In a pump, a cylinder and a piston working therein, said piston comprising a central tube carried by the piston-rod, having openings at the top and bottom for the passage of liquid, and having the usual piston-plates and valve mounted thereon, a valve-seat within said tube, between said openings, and a valve having a head adapted to engage said seat and a tapering stem extending through the seat and bearing against a spring tending to hold said valve normally open, substantially as set forth.

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

RODNEY H. YALE.

Witnesses:

HENRY M. HILL,
A. W. KING.