No. 850,583. PATENTED APR. 16, 1907.

J. C. HOWARD.

PISTON HEAD.

APPLICATION FILED DEC. 16, 1905.

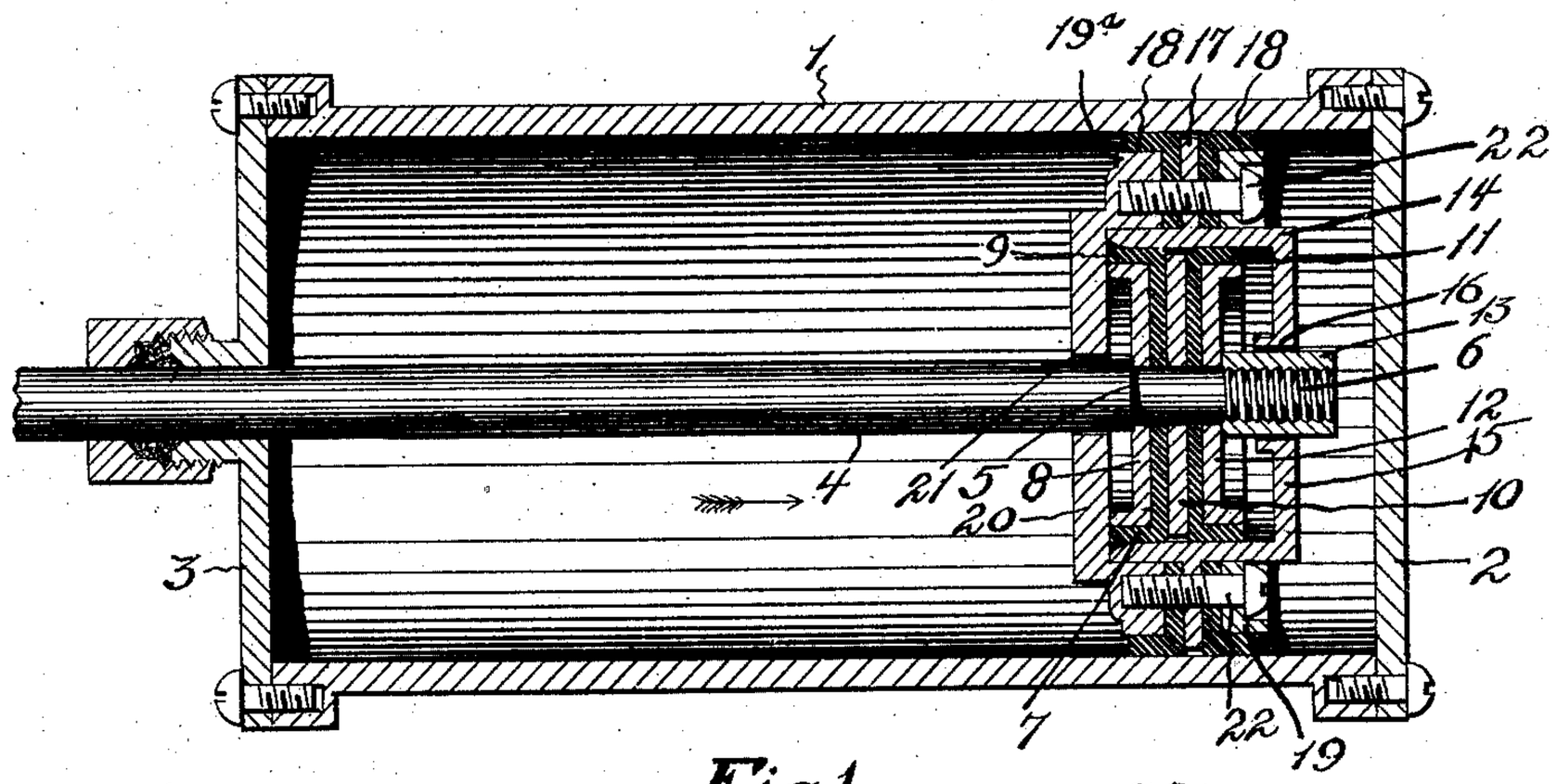


Fig. 1

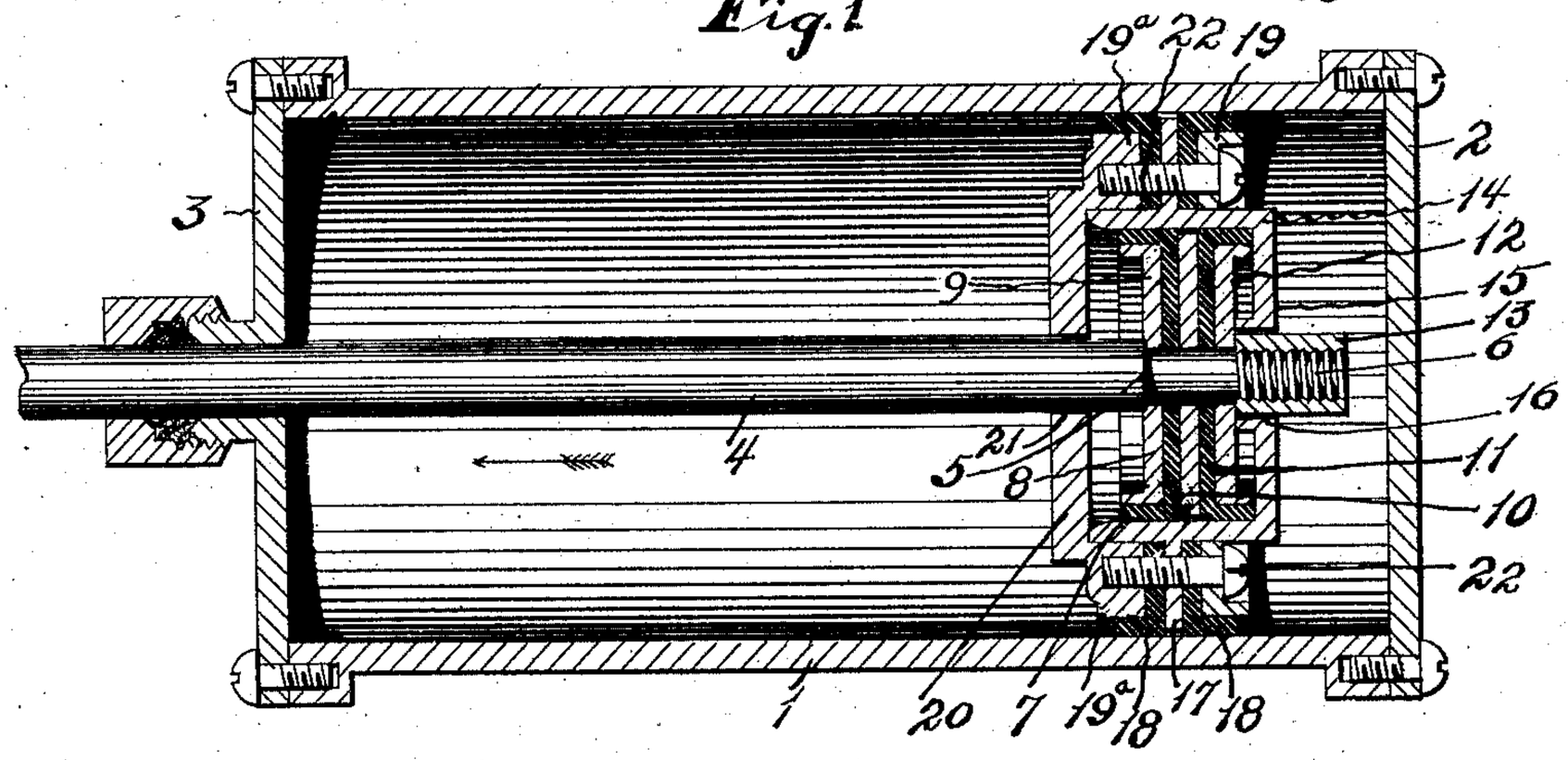


Fig. 2.

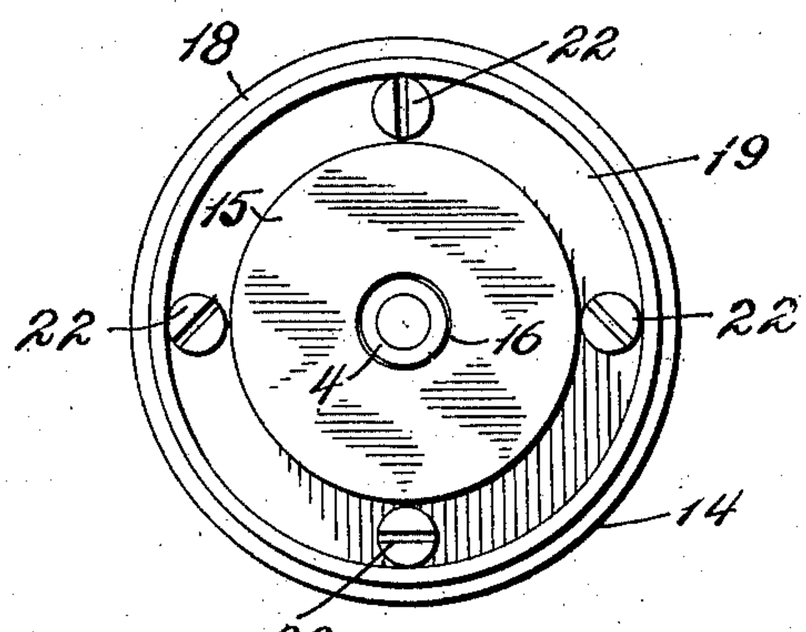


Fig. 3.

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## PISTON-HEAD.

No. 850,583. Specification of Letters Patent. Patented April 16, 1907.

Application filed December 16, 1905. Serial No. 291,975.

*To all whom it may concern:*

Be it known that I, JESSE C. HOWARD, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Piston-Heads, of which the following is a specification.

My invention relates to new and useful improvements in piston-heads, and more particularly to piston-heads for water-lifts.

Heretofore considerable annoyance has been occasioned in the operation of water-lifts by pounding and other objectionable noises, which are greatly intensified by the water-pipes, which act as conductors, thus causing the noise to be heard in all parts of the building in which the lift is arranged. This pounding is caused by the sudden change in the flow of the water when the valves are shifted at the changing-point of the stroke of the piston. The shock resulting is so great as to vibrate the water-lift and produce the noise referred to. Various expedients have been resorted to to overcome this difficulty, such as the placing of springs and other resilient cushioning means at the ends of the cylinders to be engaged by the piston-head at the end of its strokes to receive the impact and gradually start the piston-head on its return stroke. These have proved unsatisfactory, however, as the pounding is more often caused by the impact of the water against the piston-head at the beginning of the return stroke. Domes have likewise been used; but after having been in use a short time they fill with water and tend to make the conditions worse rather than better. A stop and waste must also be provided for the dome, which requires a great deal of attention.

After many experiments I have found that by arranging the piston-head in either the motor-cylinder or the pump-cylinder so as to yield to the first impact of the water on the change of the stroke and to employ the water to cushion the piston-head all shock and jar is absorbed and a smooth-running noiseless lift is had.

It is therefore the object of my invention to provide a piston-head constructed along these lines which will be strong, durable, and efficient, simple of construction, inexpensive to produce, and not likely to get out of working order.

With the above and other objects in view the invention consists of the novel details of construction and operation, a preferable embodiment of which is described in the specification and illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal vertical sectional view of the motor-cylinder of a water-lift, showing my improved piston-head therein in vertical section and at the end of its stroke just prior to the shifting of the valves. Fig. 2 is a like view showing the piston-head shifted after having received the impact of the water and the piston about to start on its return stroke; and Fig. 3 is an end elevation of the piston-head.

In the drawings the numeral 1 designates a cylinder, which may be either the motor-cylinder or the pump-cylinder. At its ends it is provided with the usual caps 2 and 3, and for purposes of illustration we will designate the end closed by the cap 2 as the "outer" end and that closed by the cap 3 as the "inner" end. The piston-rod 4 projects through the cap 3 into the cylinder in the usual manner and is reduced near its outer end to form a shoulder 5, while at its extreme end it is threaded, as indicated at 6. On the reduced portion and abutting the shoulder 5 I provide an inner piston-head 7, which comprises a cup-washer 8, abutting the shoulder 5 and fitting within a cup-leather 9. A flat washer or disk 10 is placed against the cup-leather 9 and separates the same from a second cup-leather 11, the cup-leathers extending in opposite directions and having their vertical portions adjacent. A second cup-washer 12 is placed in the cup 11, the said washers like the leathers having their flanged portions extending in opposite directions. The parts described are clamped together and held in position against the shoulder 5 by a thimble 13, screwed on the threads 6 and abutting the cup-leather 12. The inner piston-head 7 thus being securely fastened on the piston-rod 4 is caused to move therewith. About this inner piston-head an outer piston-head 14 is arranged so as to have a limited sliding movement thereon. The outer piston-head comprises a cup-shaped portion 15, having a central opening 16, through which the thimble 13 projects. The opening 16 is slightly larger than the diameter of the thimble, so as to permit the water or fluid to enter the cup, as will be hereinafter described. The cup is provided intermediate its ends with an annular outstanding flange-ring 17, the said flange being slightly smaller than the bore of the

cylinder 1, as will be apparent from the drawings. On each side of the flange inverted cup-leathers 18 are engaged about the cup portion 15. These cup-leathers are of such size and thickness as to snugly engage with the bore of the cylinder and to form therewith water-tight joints. The cup-leathers receive an inverted flanged ring 19 and the flanged portion 19ª of a cap 20, which snugly engage over the cup portion 15. The cap 20 is of considerable less depth than the cup portion 15 and is arranged to snugly receive the open end of the latter, as shown in the drawings. From this it will be apparent that the cup portion 15 and the cap 20 form a small chamber or cylinder in which the inner piston-head is confined. The cap 20 is likewise formed with a central opening 21, through which the piston-rod 4 passes and of a larger diameter than the piston-rod, so as to permit the water or fluid to enter therethrough. The parts of the piston-head and the cap 20 are secured together by screws 22, which are passed through the flanged rings 19, the cup-leathers 18 and the flange 17, and threaded into the cap 20, so that while the parts are readily accessible and the small piston may at any time be inspected by simply removing the screws 22 the parts are securely held together.

The operation is as follows: Referring to Fig. 1 and assuming that the piston is at the end of its outer stroke and near the outer end of the cylinder, the water between the piston-head—that is, the large piston-head 14—and the outer cap 2 is being forced out of the cylinder, while water is entering under pressure between the piston-head and the cap 3. The parts will be in this position when the piston-head is used in the motor-cylinder. However, when the piston-head is used in the pump-cylinder the water entering between the piston-head and the inner end 3 will be drawn in, and consequently the suction will tend to hold the large piston-head back so that its cup portion 15 will be in engagement with the side of the small piston-head, as shown in Fig. 2, the operation being practically the same, but the position of the parts reversed. In describing the operation we will assume that the cylinder 1 represents a motor-cylinder, the piston having traveled to the end of its outer stroke and the valves (not shown) about to shift. During the travel of the piston-head water has entered through the openings 21 and 16, so as to stand in a solid body on each side of the small piston. Consequently when the valves are shifted and the water enters between the piston-head and the outer cap 2 the initial impact will shift the large piston-head 14 or slide the same on the small piston-head. The water which has entered through the opening 16 provides a cushion between the cup portion 15 and the cup-washer 12. As soon as the cup portion abuts the said washer the piston will begin its return stroke, the parts remaining in the position shown in Fig. 2. However, the large piston-head yielding to the initial impact of the inflowing water absorbs the jar and prevents vibration. It is obvious that the shifting of the large piston-head on the small piston-head is gradual and easy as the water which has entered through the opening 16 is forced out therethrough, so as to prevent a quick movement and a sudden stop when the cup portion 15 contacts with the washer 12 and the cup-leather 11. As above referred to, the piston continues on its inward stroke with the heads in the position shown in Fig. 2. However, during this inward stroke water enters through the opening 21 and fills the chamber formed by the cup portion 15 and the cap 20, thus standing in a solid body between the said cap and the washer 8 and cup-leather 9. Upon arriving at the end of the stroke and the valves having shifted, water enters between the piston-head and the cap 3, the first impact shifting the piston-head 14 on the piston-head 7 and the water confined escaping through the opening 21, thus producing the gradual cushioning action, and thereby providing a noiseless and easy action. The operation will continue the same during the working of the piston.

While I have shown and described my invention in connection with water-lifts, it is to be understood that it could be used with various other types of fluid-operated motors and pumps.

What I claim is—

1. In a device of the character described, the combination with a cylinder, of a piston-rod, a small piston, means for clamping said small piston upon one end of the piston-rod, a cup-like sleeve in which said small piston is slidably disposed, a second cup-like sleeve which partially incloses the first-named cup-like sleeve, means for clamping said sleeves together, and packing members also clamped in position by said means, there being ports formed in both of the cup-like sleeves adapted to admit fluid to one side of the small piston when said piston is moving in one direction and to admit fluid to the opposite side of said piston when said piston is moving in the opposite direction.

2. In a device of the character described, the combination with a cylinder, of a piston-rod, a piston comprising a plurality of metallic washers and cup-leathers, means for clamping said washers and cup-leathers upon the end of the piston-rod, a cup-like sleeve in which said piston is slidably disposed, said cup-leathers bearing against the inner periphery of said sleeve to form a fluid-tight packing therebetween, a second cup-like sleeve partially inclosing the first cup-like sleeve, each of said cup-like sleeves having

outstanding flanges, and cup-leathers clamped between said outstanding flanges and forming a fluid-tight packing between said sleeves and the inner periphery of the piston, there being ports formed in both of the cup-like sleeves adapted to admit fluid to one side of the piston when said piston is moving in one direction and to admit fluid to the opposite side of said piston when said piston is moving in the opposite direction.

3. In a device of the character described, the combination with a cylinder, of a piston-rod, a small piston, means for clamping said small piston upon one end of the piston-rod, a cup-like sleeve in which said small piston is slidably disposed, a second cup-like sleeve which partially incloses the first cup-like sleeve, means for clamping said sleeves together, packing members between the sleeves and the inner periphery of the piston, and packing members between the small piston and the inner periphery of the first-named cup-like sleeve, there being ports formed in both of the cup-like sleeves adapted to admit fluid to one side of the small piston when said piston is moving in one direction and to admit fluid to the opposite side of said piston when said piston is moving in the opposite direction.

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

JESSE C. HOWARD.

Witnesses:
A. L. PHELPS,
M. B. SCHLEY.