No. 862,489. PATENTED AUG. 6, 1907.

L. C. LEWIS.

PUMP CYLINDER FOR WATER LIFTS.

APPLICATION FILED JAN. 5, 1906.

3 SHEETS—SHEET 1.

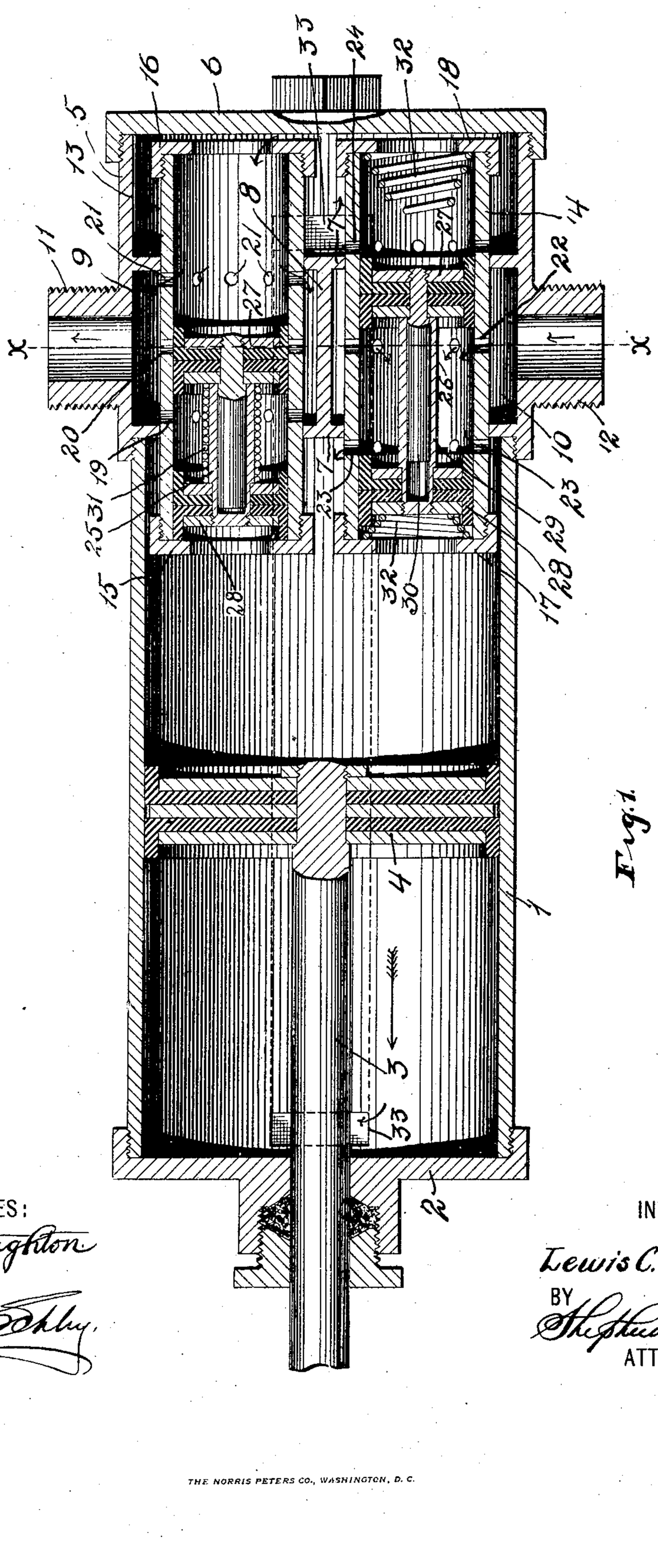

Fig. 1.

WITNESSES:

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W. B. Tibby.

INVENTOR

Lewis C. Lewis

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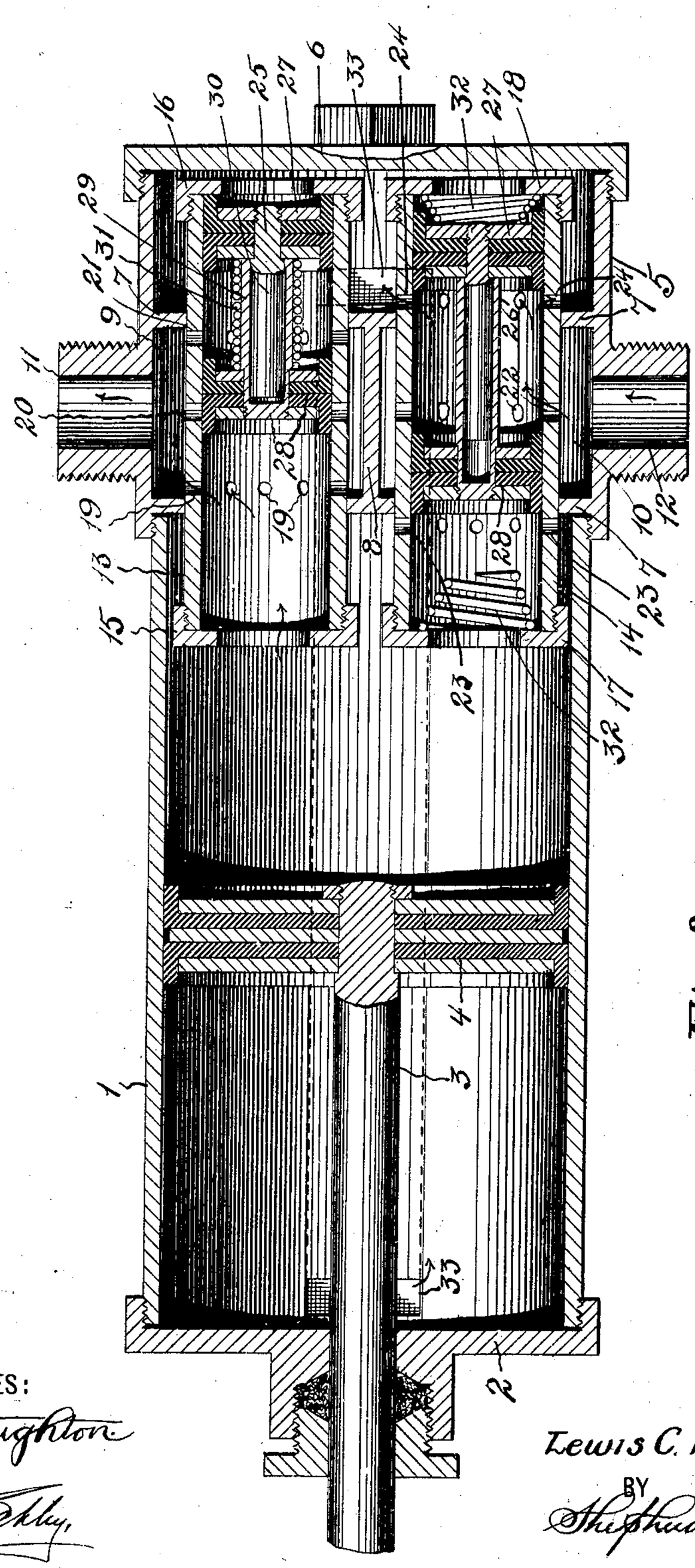

Fig. 2.

WITNESSES:

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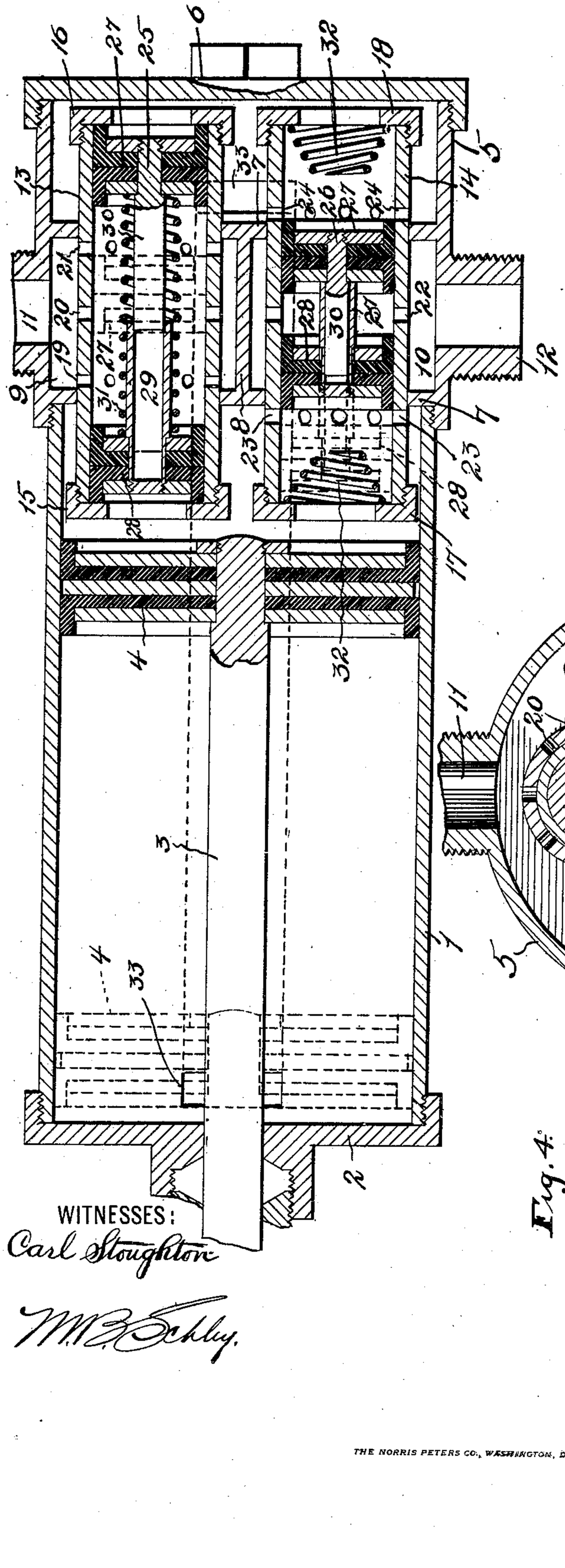

Fig. 3.

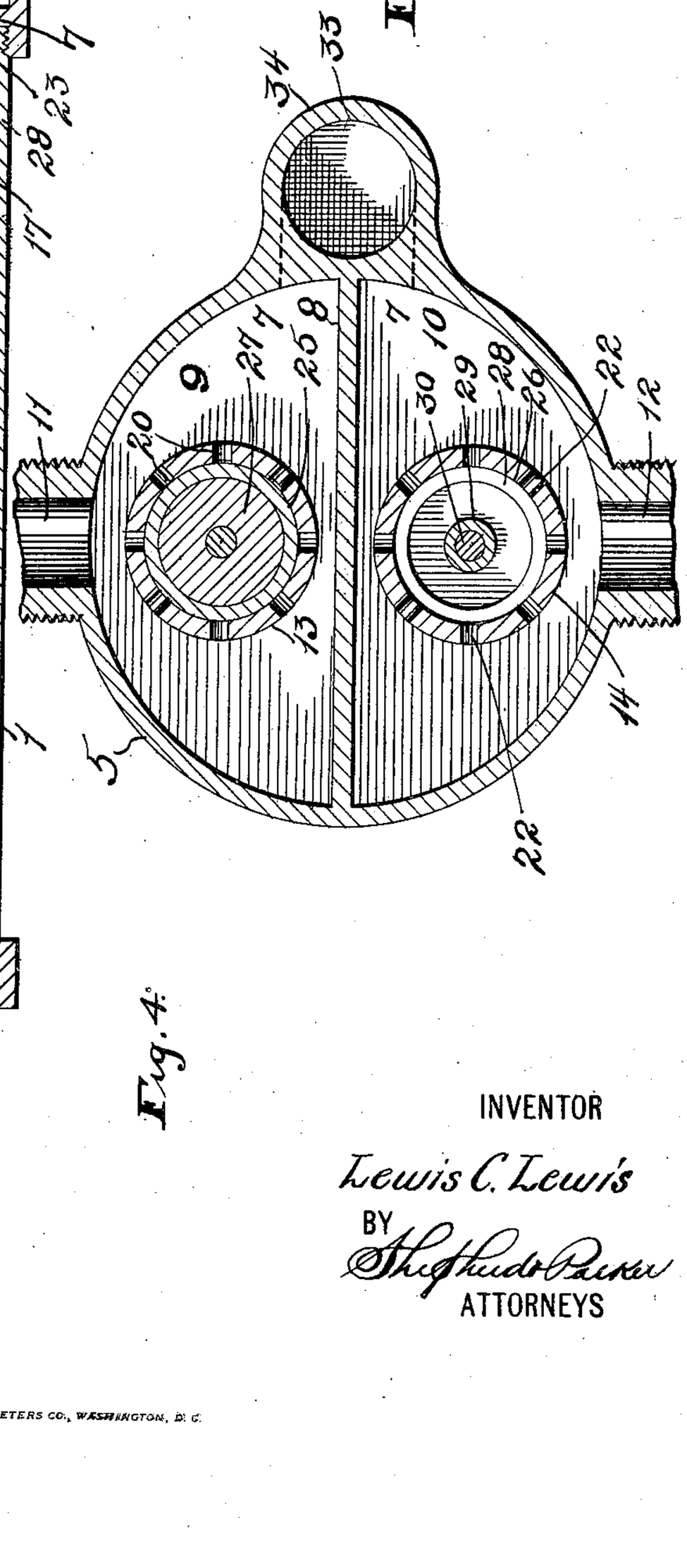

Fig. 4.

WITNESSES:

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ATTORNEYS

UNITED STATES PATENT OFFICE.

LEWIS C. LEWIS, OF COLUMBUS, OHIO, ASSIGNOR TO THE MONARCH MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

PUMP-CYLINDER FOR WATER-LIFTS.

No. 862,489. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed January 5, 1906. Serial No. 294,697.

To all whom it may concern:

Be it known that I, LEWIS C. LEWIS, 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 Pump-Cylinders for Water-Lifts, of which the following is a specification.

My invention relates to new and useful improvements in pump cylinders for water lifts and more particularly to the valve mechanism.

The object of the invention is to provide a quick acting valve mechanism of simple construction which will prevent back pressure and obviate creeping of the piston head when the pump is not in use.

Another object of the invention is to provide a device of the character described that will be strong, durable and efficient and one in which the several parts will not be liable 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 pump cylinder and valve mechanism, illustrating the position of the valves during the inward stroke of the piston. Fig. 2 is a like view illustrating the position of the valves during the outward stroke of the piston. Fig. 3 is a transverse vertical sectional view taken on the line *x x* of Fig. 1, and, Fig. 4 is a longitudinal vertical sectional view of the pump and valve mechanism, showing the parts in their initial position before the pumping operation is begun and illustrating in dotted lines the position of the parts during the initial stroke of the piston head.

In the drawings, the numeral 1 designates the pump cylinder which is closed at its inner end by a cap 2, through which passes the piston rod 3 carrying on its end a suitable piston head 4. A cylindrical valve casing 5 is screwed on the outer end of the pump cylinder 1 and is itself closed at its outer end by a cap 6 screw threaded thereon.

The valve casing is divided by vertical walls 7 one of which abuts the outer end of the cylinder 1. The walls 7 are separated and provide a chamber therebetween which is divided centrally by a transverse partition 8 preferably formed integral with the walls 7. The chamber is thus divided into an upper chamber 9 and a lower chamber 10 more clearly illustrated in Fig. 3. Between the walls 7 the valve casing 5 is provided on opposite sides or above and below with an outlet nipple 11 and an inlet nipple 12, the said nipple 11 communicating with the upper chamber 9 and the nipple 12 communicating with the lower chamber 10. Through the walls 7 and the upper chamber 9 an elongated valve sleeve 13 is passed and secured, the said valve sleeve projecting some distance on each side of the walls, while through the walls and the lower chamber 10 a similar valve sleeve 14 is arranged in a like manner. The sleeves at each end carry caps 15, 16, 17 and 18 each having enlarged central openings as shown in the drawings; the openings, however, are smaller in diameter than the inner bore of each of the sleeves so as to retain the valves hereinafter described therein.

The upper sleeve 13 is provided with three annular rows of ports 19, 20 and 21 respectively, all of said ports being located in the sleeve between the walls 7 and having communication with the upper chamber 9. The lower valve sleeve 14 is provided with a central annular row of ports 22 located between the walls 7 and having communication with the lower chamber 10. Like ports 23 and 24 are provided in the sleeve just outside of the walls 7, the ports 23 communicating with the pump cylinder 1 and the ports 24 communicating with the valve casing between the cap 6 and the outermost wall 7. Within the sleeves I provide double valves 25 and 26, each of said valves being composed of double cup leathers 27 and 28 suitably secured together and fitted to slide snugly in the sleeves. The leathers 28 each carry a hollow stem 29 which projects towards and receives a solid stem 30 projecting from the cup leather 27, so that the leathers may move toward each other by a telescoping of the valve stems. The valve 26 comprises a coiled spring 31 which surrounds the valve stems and tends to spread the leathers apart; while at each end of the lower valve sleeve 14 conical springs 32 are provided which when compressed by either of the cup leathers, tend to assist in the shifting of the valve 26 as will be hereinafter described.

Communication is established between the valve casing and the pump cylinder near its inner end by a passage 33 formed in a longitudinal enlargement 34 provided along one side of the cylinder. This passage enters the valve casing adjacent the outermost wall 7 and between the said wall and the cap 6.

I will now proceed to describe the operation of my pump and valve mechanism.

The piston rod 3 having been attached to a water motor or other operating means and the nipple 12 connected to a pipe leading from the source of supply from which the water is to be pumped, we will suppose that the parts are in the position shown in Fig. 4. It is of course to be understood that when the pump is first installed there is no water in the cylinder or any of the chambers, but in lieu thereof air which is forced out on the first inward and outward strokes of the piston head. Referring to Fig. 4, it will be apparent that the first stroke of the piston head 4 is the inward stroke and as the head moves inward, the suction created draws

the cup leather 28 away from the cup leather 27 and over and past the ports 23, where it engages with the spring 32 and compresses the same. After the cup leather passes the ports 23, the continued movement of the piston head draws in water through the nipple 12 into the chamber 10 through the ports 22 into the valve casing 14 between the cup leathers 27 and 28 and out through the ports 23 into the pump cylinder. In this manner the chamber 10 is filled with water as is also the pump cylinder 1 between the piston head 4 and the innermost wall 7. During this movement the cup leather 27 has remained in its original position owing to the telescoping valve stems and the suction created on the cup leather 28 of the upper valve 25 tends to hold it in position. However, during this inward stroke of the piston head, the air lying between the said head and the inner cap 2 is forced out through the passage 33 to the valve casing 5 and into the valve sleeve 13. The pressure of the air against the cup leather 27 of the valve 25 forces the same inward, compressing the spring 31 and telescoping the valve stems until the said cup leather passes the ports 21 and the air passes out therethrough into the chamber 9 and escapes through the outlet nipple 11. By this arrangement when the piston head reaches the end of its inward stroke, practically all the air carried before it has been forced from the cylinder as described. When the piston head reaches the end of its stroke, the pressure is relieved on the cup leather 27 which is returned to its original position by the expanding of the spring 31. The piston head immediately begins its outward stroke and forces the water which has been drawn in as described against the cup leathers 28 of the valves 25 and 26. The spring 32 which has been compressed as shown in Fig. 1, will assist in moving the cup leather 28 of the valve 26 inward, so that the cup leathers 28 and 27 of the said valve are forced back and both moved to the position shown in Fig. 2, the cup leather 27 compressing the spring 32. By observing the said figure, it will be seen that communication between the ports 23 and 22 is interrupted by the cup leather 27 which stands therebetween, while communication has been established between the ports 22, the ports 24 and the valve casing, the said cup leather 27 having been moved beyond the ports 24. Also the pressure of the water against the cup leather 28 of the valve 25 has forced the same inward, so that the spring 31 is compressed and communication established between the cylinder 1, the port 19 and the upper chamber 9, the cup leathers standing on each side of the ports 21 and cutting off communication between the same and the valve casing. The valve in this position the water is forced into the sleeve 13 and the chamber 9 by way of the ports 19 and finally passes out through the outlet nipple 11 which is connected to the pipe leading to the tank or other destination. Some of the water which passes into the chamber 9 also passes through the port 21 into the sleeve 13 between the cup leathers, thus causing a solid body of water to stand therebetween. This of course only happens on the first inward stroke of the piston and should the cup leathers for any reason cover the ports 21, the water will enter therebetween to the ports 20. While this operation has been going on the piston has been drawing water from the chamber 10 through the ports 24 into the valve casing 5 and by way of the passage 33 to the cylinder 1 between the piston head and the cap 2. Any air standing between the piston head 4 and the wall 7 will be forced out through the ports 19 with the water, and thus by the first two strokes of the piston head, the pump cylinder and valve casing are practically freed thereof. The parts remain in this position until the piston reaches the end of its outward stroke. It will be observed that water now stands between the cup leathers and on each side thereof so that the spring 31 is held in its compressed state and the valves maintained in their relative positions throughout the operation of the pump. When the piston head starts on its inward stroke, the suction together with the expansion of the compressed spring 32 shifts the lower valve 26 so that the cup leather 27 covers the ports 24. The water entering the valve sleeve 14 from the valve casing through the open cap 18 moves the valve to the position shown in Fig. 1, so that the ports 23 are opened and the piston head is permitted to draw water into the pump casing 1 as during the first stroke. The water which is entering the valve casing 5 by way of the passage 33 besides shifting the lower valve 26 enters the upper valve sleeve 13 through the cap 16 and forces the valve 25 over beyond the ports 21 to the position shown in Fig. 1. The said ports 21 thus being opened, permit the water to pass into the chamber 9 and out through the nipple 11 communication between the pump cylinder and the ports 19 being cut off by the cup leather 28. When the valve head reaches the end of its inward stroke, the valves are again shifted and so on throughout the operation of the pump.

It is to be noted that while I have designated the cylinder 1 and valve casing 5 as separate parts, and specified the walls 7 as being formed in the valve casing, the cylinder 1 and the valve casing 5 could be formed in one piece and the entire structure termed a cylinder, so that the walls 7 would divide the same into two parts, the same standing on each side of the upper and lower chambers 9 and 10. However, it has been found that the construction set forth in the drawings is more practical.

What I claim, is:

1. In a pump cylinder for water lifts, a piston head working in the cylinder, provision for establishing an upper and a lower chamber within the cylinder and dividing the cylinder into two parts, provision for establishing communication between the parts of the cylinder on each side of the chambers independent of said chambers, provision for conducting water to the lower chamber and conducting water from the upper chamber, a valve sleeve extending through the upper chamber and having ports communicating therewith, a valve sleeve extending through the lower chamber having a plurality of ports, some communicating with the lower chamber and others communicating with the parts of the cylinder on each side of the chamber, a valve working in the upper sleeve and coacting with the ports thereof to alternately cut off and establish communication with the upper chamber and the cylinder on each side thereof, and a valve working in the lower sleeve and coacting with the ports thereof to alternately cut off and establish communication between the lower chamber and the parts of the cylinder on each side thereof.

2. In a pump cylinder for water lifts, a piston head working in the cylinder, provision for establishing an upper and a lower chamber within the cylinder and dividing the cylinder into two parts, provision for establishing communication between the parts of the cylinder on each side of the chamber independent of said chambers, provision for conducting water to the lower chamber and for conducting water from the upper chamber, a valve sleeve extending

through the upper chamber and having ports communicating therewith, a valve sleeve extending through the lower chamber having a plurality of ports, some communicating with the lower chamber and others communicating with the parts of the cylinder on each side of the chamber, a valve working in the upper sleeve and coacting with the ports thereof to alternately cut off and establish communication with the upper chamber and the cylinder on each side thereof, a valve working in the lower sleeve and coacting with the ports thereof to alternately cut off and establish communication between the lower chamber and the parts of the cylinder on each side thereof, and resilient means for imparting a partial movement to the said lower valve.

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

LEWIS C. LEWIS.

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