(No Model.) 2 Sheets—Sheet 1.

J. R. NORFOLK.

PISTON WATER METER.

No. 319,992. Patented June 16, 1885.

Fig 1

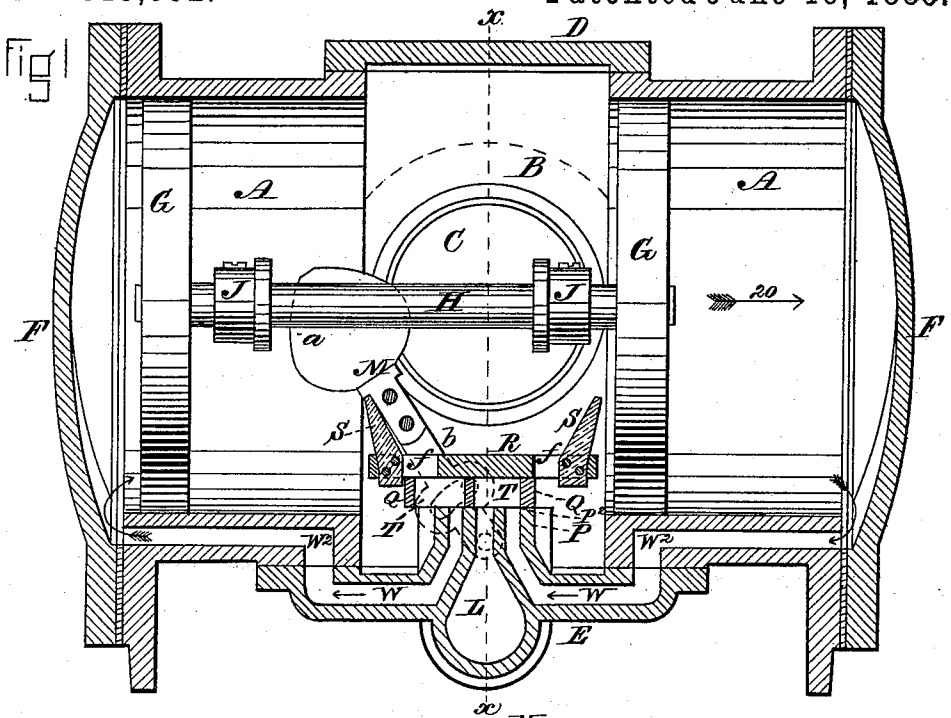
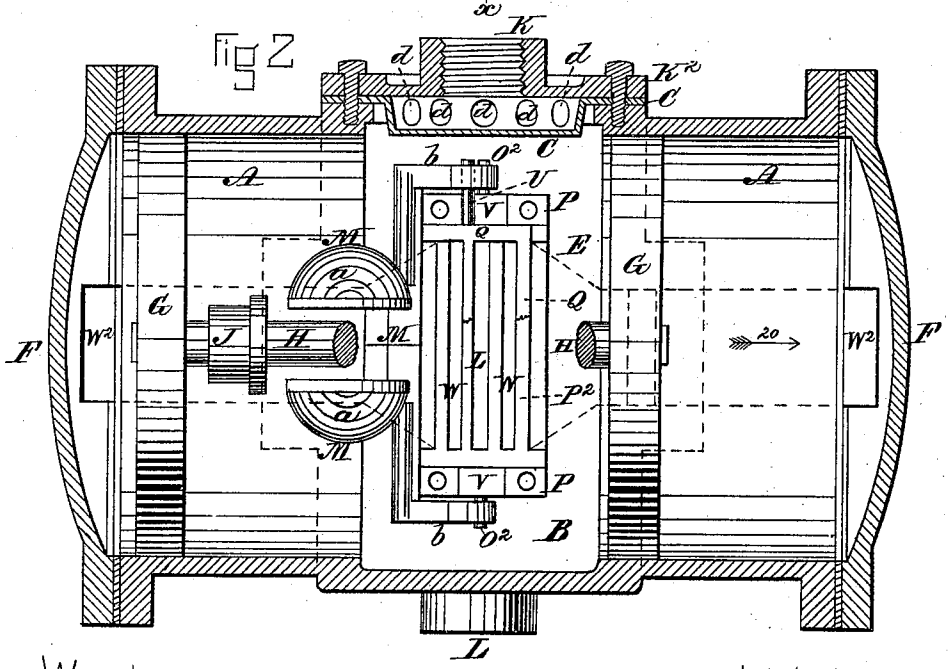


Fig 2



WITNESSES

W. J. Cambridge

H. A. Decatur

INVENTOR

John R. Norfolk

By P. E. Teschemacher

Atty

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

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Fig 3

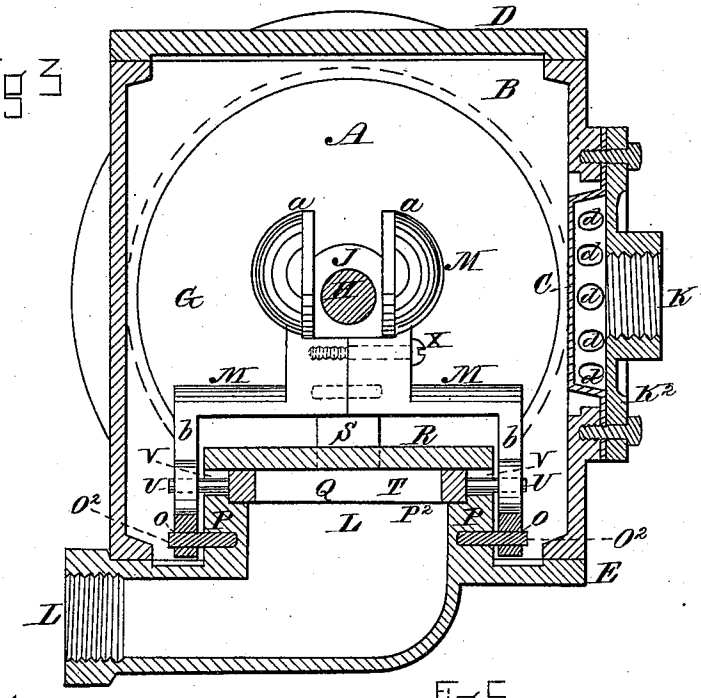


Fig 4

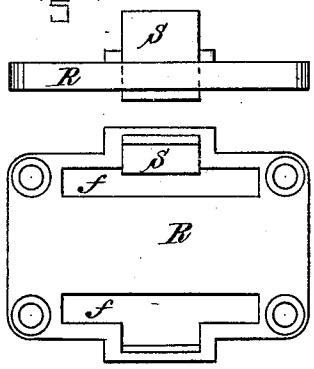


Fig 5

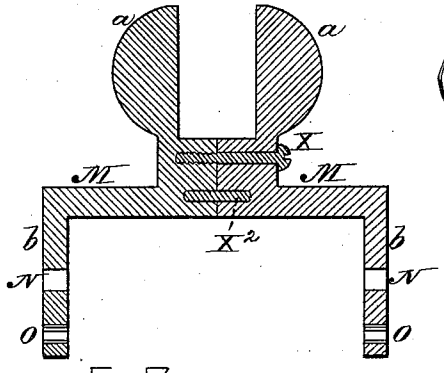


Fig 6

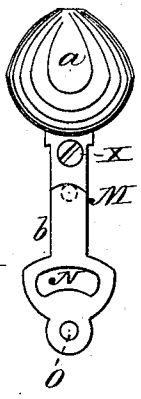


Fig 8

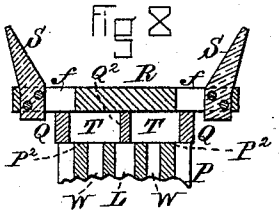
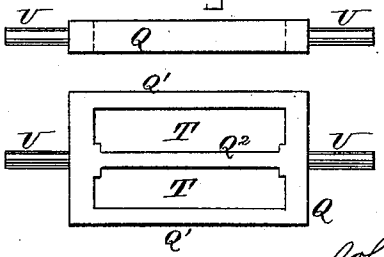


Fig 7



WITNESSES

W. J. Cambridge

H. A. Decatur

INVENTOR

John R. Norfolk

By R. E. Teschemacher

Atty

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN R. NORFOLK, OF BOSTON, MASSACHUSETTS.

PISTON WATER-METER.

SPECIFICATION forming part of Letters Patent No. 319,992, dated June 16, 1885.

Application filed March 28, 1885. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. NORFOLK, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Fluid Meters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a longitudinal vertical section through the center of a fluid meter constructed in accordance with my invention. Fig. 2 is a horizontal section of the same, some of the parts being removed and others broken away to show the interior construction. Fig. 3 is a transverse section on the line *x x* of Fig. 1. Fig. 4 is a plan and elevation of the cover of the valve-case. Fig. 5 is a section through the vibrating lever which operates the valve, and Fig. 6 is an end elevation of the same. Fig. 7 is a plan and elevation of the valve. Fig. 8 is a sectional detail of the valve and its casing.

My invention relates to certain improvements on that class of meters of the positive-displacement type known as "single-piston meters," with a reciprocating movement, and in which the valve is operated by a vibrating lever that is actuated by the movement of the piston.

The novelty of my invention consists in the form and construction of the valve, the valve-case, and the mechanism for operating the valve, and also in the employment of a current deflector or distributer for dividing the inflowing current into several streams, whereby the pressure of the fluid is equalized within all portions of the valve-chamber.

In the meter herein described and illustrated in the said drawings, the valve Q is alternately moved by the vibrating lever M, which lever is operated by the piston G, consisting of two heads connected by a piston-rod, H, the piston and rod being of the usual construction. The piston-rod H has a collar, J, on each end, inside the piston-heads G, which engages with the upper end of the lever M during a portion of the movement of the piston, carrying the lever in the direction the piston is moving until the said lever has passed the dead-center line, from which point the lever trips or falls over by its own gravitation. The valve does not have a continuous motion, but remains at rest at the end of the valve-case until the lever M has passed the dead-center line.

The meter consists of two cylinders, A A, having a valve-chamber, B, between them, in which the valve mechanism is placed, the cylinders being each provided at the outer end with a cover, F, and the valve-chamber and cyliders being made in a single casting.

The valve-chamber B is covered by two plates, D E. The bottom plate, E, to which the valve mechanism is attached and in which are formed the ports W L W, connecting with the passages W^2 in the cylinders, I term the "valve-plate." The top plate, D, I term the "cover," and to this cover any of the several well-known devices for registration can be attached.

The valve Q is a casting of brass or other suitable material, and is of the proper size and form to fit the valve-case P, so as to allow it to be easily moved therein. It has two central ports, T T, open from top to bottom, which are of proper length to correspond with the ports W L W in the valve-seat P^2 in plate E and with the openings *f* in the cover R.

The valve is provided with a stud, U, on each side, of proper length to pass through the sides of case P and the slot N in the lever M.

The ends Q′ Q′ and middle bar, Q^2, of the valve Q must be the proper width and distance apart to allow full opening or communication through ports T T in the valve with ports W L W in the valve-seat when the valve is at the end of its movement. The middle bar, Q^2, is of such width as to cover one-half the area of the outlet-port L in the valve-seat when the valve Q is in the center of its movement, as seen in Fig. 8, leaving one-quarter of the port L open at each side of the bar Q^2. When the valve is in this position, the outer edge of each of its ports T is beyond the outer edge of the valve-seat and the inner edge of the aperture *f* in the cover R, leaving a space equal to one-quarter of the width of a port W open to the chamber B on each side, thus allowing a free and direct passage of the fluid from the chamber B through the ports T T in each side of the valve to the outlet-port L without passing through either cylinder.

By this mode of construction of the valve

and valve-case and the arrangement of the ports, direct communication between the valve-chamber B and the outlet-port L is established when the piston is at the end of its stroke and its movement is being reversed, and the pressure of the fluid on each head of the piston is also equalized at this time, thus preventing all noise, water-hammer, or pulsation, which is a great objection to meters of this description as heretofore constructed.

The valve-case P and valve-plate E here shown form one casting; but the valve-case may, if preferred, consist of a separate casting secured to the plate E by proper bolts or screws. The bottom of the case P forms the valve-seat P^2, having the inlet-ports W W and outlet-port L therein. The case P is provided with the cover R, securely bolted to the top side and having the portion between the apertures *f f* of the same width as the valve-seat, and leaving the same width of opening on the upper side of valve Q through the ports T T as there is at the bottom, thus allowing the fluid to enter the ports T T both from top and bottom at the same time.

The cover R is provided with a pocket or aperture at each end, in which is secured a stop, S. These stops S are preferably formed of rubber, but may be of other suitable material, and are for the purpose of regulating or limiting the movement of the rocking or vibrating lever M in either direction.

The case P is provided on each side, at the center, with a recess, V, extending downward from the top and of the proper length and depth to allow the studs U of the valve Q to move freely therein.

The vibrating lever M is pivoted to the sides of the valve-case P, which latter is provided with studs O^2, fitting within bearings O in the side arms, *b*, of the lever, as seen in Figs. 2 and 3, and this lever actuates the valve Q as soon as it has been raised to a vertical position and carried just far enough beyond the center to enable it to fall over or trip by its own gravity, as before described. This lever M is composed of two halves or portions fastened securely together by the screw X and dowel-pin X^2, as seen in Fig. 5.

At the upper end of the lever M and formed integral therewith are two heavy weights or projections, *a a*, of the form shown, which are so arranged on either side of the center of the lever as to allow the piston-rod H to move freely between them, the edges of these projections being flattened to present a fair wearing-surface to the collars J; and these projections must be of sufficient weight to insure the quick dropping of the lever after it has passed the center, and the movement of the valve thereby. The lower ends of the lever M consist of two arms, *b b*, with sufficient space between them to span the valve-case P, each arm having the bearing O at its lower end, that fits over the stud O^2 on the side of the valve-case.

Above the bearing O each arm *b* is provided with an elongated slot, N, through which the stud U on the valve Q passes. This slot is of the proper length to allow the valve to remain at rest while the lever is being moved by the piston, and to cause one or the other of its ends to be brought into contact with the stud U of the valve as soon as the lever commences to fall, whereby the shifting of the valve is effected.

The current-deflector C consists of a thin metal disk having a dished center, preferably shaped as shown in Figs. 2 and 3. The walls or sides of this dished portion are of sufficient depth to allow a series of small holes, *d*, to be formed therein around its periphery, the aggregate of the areas of these apertures being fully equal to double the area of the inlet-pipe. The object and function of the deflector C is to separate the body of the inflowing current of fluid into several small streams and distribute them at different points in the valve-chamber, B, said streams entering at a right angle, or nearly so, to the direction in which the fluid enters the deflector, thereby preventing the compact body of the inflowing current from impinging directly on the lever M and valve Q, and by its pressure thereon retarding the action of the moving parts.

The deflector C may be attached to the valve-chamber B either on the inside or outside, and is directly opposite to or in line with the inlet-pipe. In the drawings the deflector is shown as attached on the outside of the valve-chamber, and over the deflector is placed a cover, K^2, having a threaded orifice at the center, to which the inlet-pipe is to be attached. If the deflector is attached to the inside of the valve-chamber the cover K^2 can be dispensed with and connection with the inlet-pipe made directly with the valve chamber outside the deflector.

The advantages of the above-described meter are that it has a balanced slide-valve, has no springs, and but few joints. It is durable, simple, and inexpensive, and operates positively and correctly under varying pressures with full opening or very small stream.

The operation of my meter may be thus described: Referring to the drawings, the piston G G is shown near the end of its stroke and moving in the direction of the arrow 20, the valve Q and lever M being at rest in the position shown. The fluid passes through the inlet K into and through the deflector C, filling the valve-chamber B, and thence passes through the ports and passages before described to and from the cylinders to the outlet L. The valve when in the position shown allows the fluid to pass from the chamber B through the port T, the port W in the valve-seat, and the water-way W^2 to the left-hand cylinder, when it will move the piston, if the outlet is open. As the piston moves, the left-hand collar, J, on the piston-rod H, engages with the projections *a a*, forming the upper end of the lever M, which is thus moved or rocked on its pivots until it reaches the cen-

ter, when it falls over or trips by its own weight, as before described, until it is arrested by striking one of the stops S. At the instant when it commences to fall over the ends of the slots N in the side bars of the lever M engage the studs U on the sides of the valve Q, which is then moved by the fall of the lever M to the other end of the valve-case, thereby changing the direction of the current of fluid, and causing it to enter the opposite cylinder, and reverse the movement of the piston. This operation is repeated at each reciprocation of the piston.

While the valve Q is in the position shown in Fig. 1, the port T on the right-hand side is closed to the chamber B and open to the ports W and L in the valve-seat, allowing the water to pass from the right-hand cylinder to the outlet.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a fluid-meter, the combination, with the cylinders A A, reciprocating piston G, and the valve-chamber B, of the valve Q, having the ports T T extending entirely through it, the valve-case P, having the inlet-ports W W and the outlet-port L, and the cover R, constructed and arranged, as described, to admit the fluid to the ports T T and allow a free passage of the fluid from the chamber B through the said ports T T to the outlet-port L while the valve is being shifted, and means, substantially as described, for moving the valve Q from one side of the valve-case to the other at the completion of each stroke of the piston, as set forth.

2. In a fluid-meter, the combination, with the valve Q, placed within the valve-chamber B and having the studs U, of the rocking weighted lever M, provided with slots N for the reception of the studs U, the reciprocating piston G, and the piston-rod H, having the collars J J, whereby the lever is carried up to a central vertical position by the movement of the piston and caused to trip or fall over by its own gravity to actuate the valve, substantially as described.

3. In a fluid-meter, the combination, with the valve Q, and its case P, and the cover R, of the rocking lever M, composed of two halves or portions suitably secured together, and having the side arms, *b b*, adapted to span the valve-case and pivoted thereto, and provided at its upper end with the weighted projections *a a*, arranged on opposite sides of the piston-rod, all operating substantially in the manner and for the purpose described.

4. In a fluid-meter, the combination, with the valve-chamber B, of the current-deflector C, having a dish-shaped central portion and walls or sides provided with peripheral holes *d*, whereby the inflowing current of fluid is divided and projected into the valve-chamber in small streams at a right angle, or nearly so, to the direction in which the fluid enters the deflector, substantially as described.

5. In a fluid-meter, the combination, with the valve-chamber B, of the current-deflector C, having a dish-shaped central portion provided with peripheral holes *d*, and the cover K^2, arranged on the outside of the deflector and having the inlet K, all constructed to operate substantially as set forth.

Witness my hand this 26th day of March, A. D. 1885.

JOHN R. NORFOLK.

In presence of—
P. E. TESCHEMACHER,
W. J. CAMBRIDGE.