

No. 675,943.

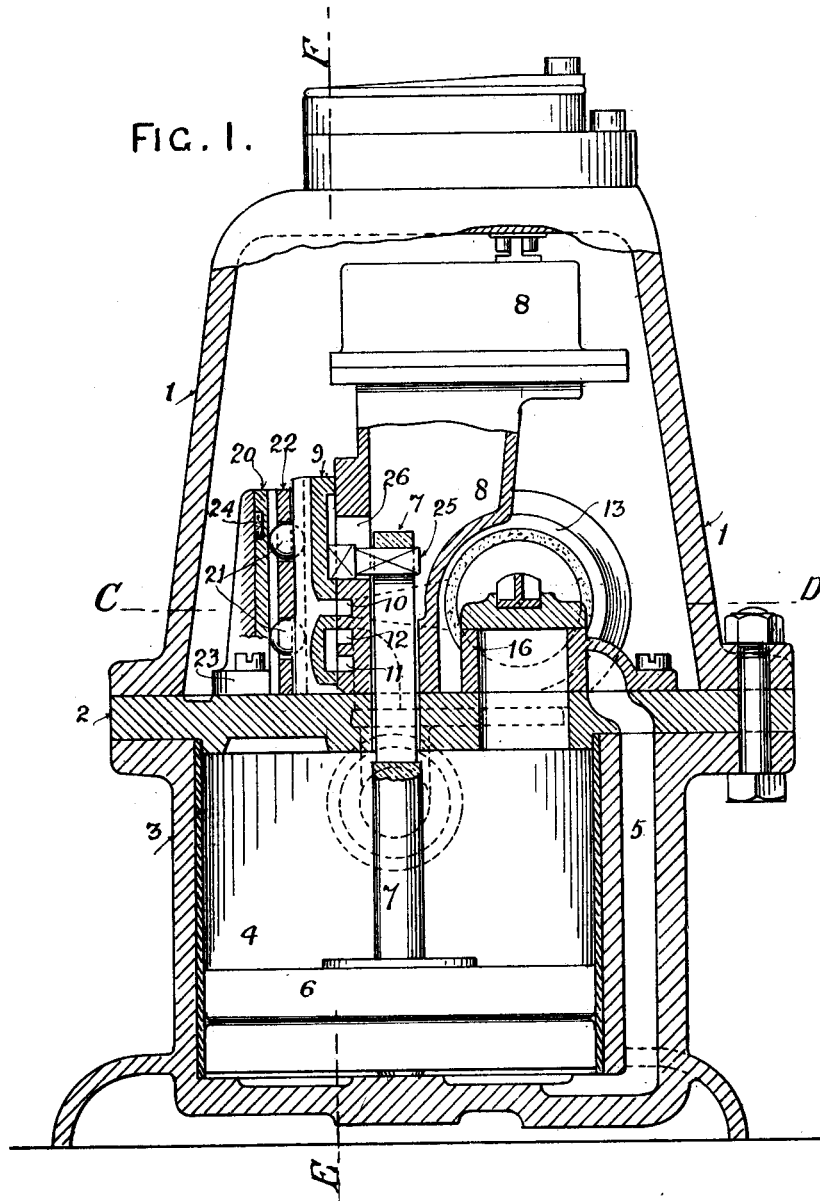
Patented June 11, 1901.

H. H. FROST.
FLUID METER.

(Application filed Oct. 28, 1900.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:
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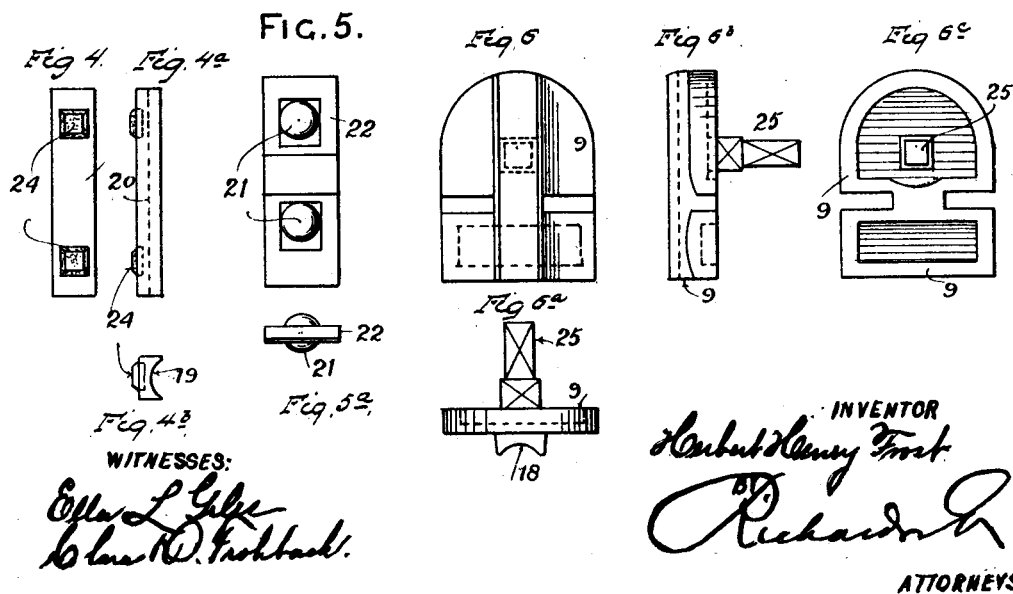
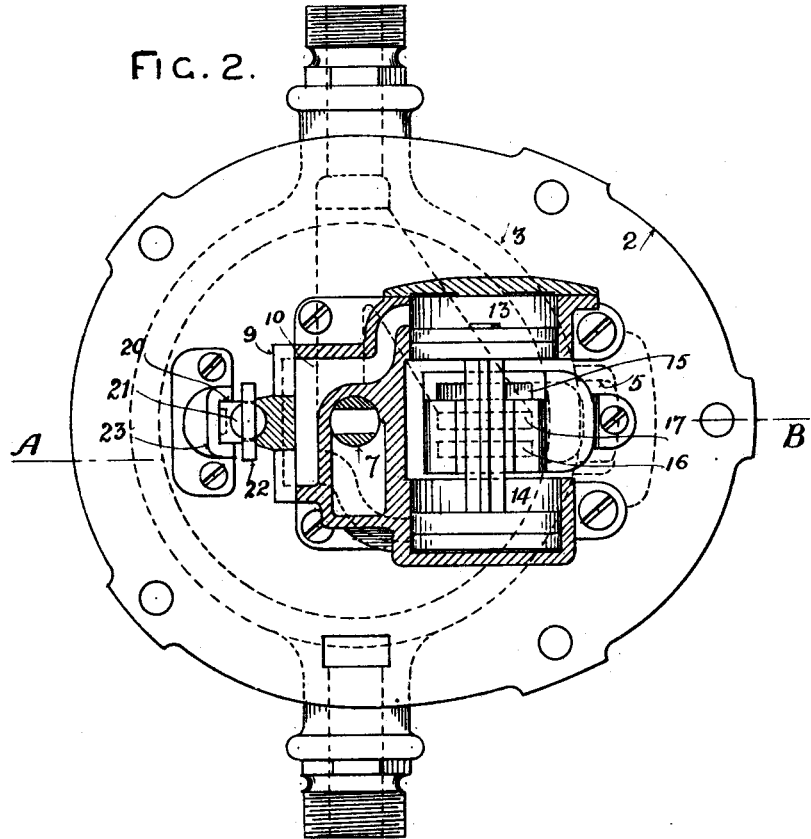
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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

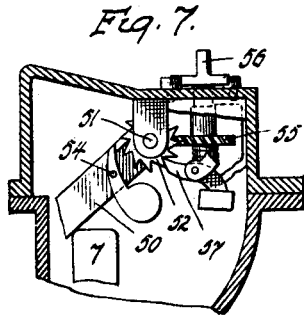
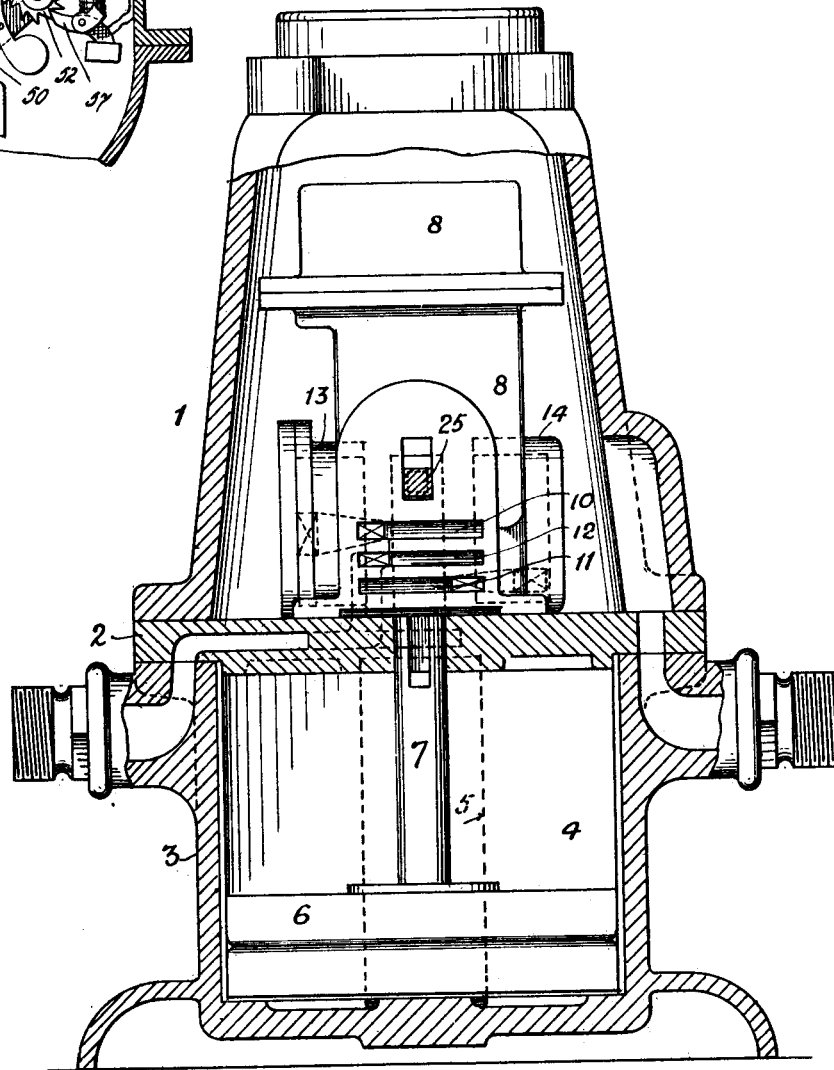


FIG. 3.



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UNITED STATES PATENT OFFICE.

HERBERT HENRY FROST, OF MANCHESTER, ENGLAND.

FLUID-METER.

SPECIFICATION forming part of Letters Patent No. 675,943, dated June 11, 1901.

Application filed October 23, 1900. Serial No. 34,028. (No model.)

To all whom it may concern:

Be it known that I, HERBERT HENRY FROST, a subject of the Queen of Great Britain, and a resident of Tipping street, Ardwick, Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Fluid-Meters, of which the following is a specification.

My invention relates to improvements in fluid-meters, particularly to the meters of the type well-known as "Frost's Patent Meters," such as are described in the specification to United States Letters Patent No. 293,317, the chief object of my present improvements being to dispense with the packing and stuffing-box hitherto employed around the piston-rod, whereby friction is diminished and the meter is made more sensitive and reliable and will measure the fluid accurately even when passed in very small quantities.

In the accompanying two sheets of drawings, Figure 1 is a sectional elevation on the line A B, Fig. 2. Fig. 2 is a sectional plan on the line C D, Fig. 1, and Fig. 3 is a sectional elevation on the line E F, Fig. 1. Fig. 4 is a front view of a detail part. Fig. 4^a is an edge view of the same. Fig. 4^b is a top view of Fig. 4^a. Fig. 5 is a front view of the distance-piece with the antifriction-balls. Fig. 5^a is a top view of Fig. 5. Fig. 6 is a rear view of the valve-cover. Fig. 6^a is a plan view of the same. Fig. 6^b is a side view of Fig. 6, and Fig. 6^c is a view of the side of the valve-cover opposite to that from which Fig. 6 is taken. Fig. 7 is a detail view.

In the drawings the outer casing of the meter is shown formed in three parts 1 2 3, of which 1 is the upper part or cover, 2 the middle plate, and 3 the lower portion, of the casing, these parts being bolted or otherwise secured together in any convenient manner. 4 is the measuring-chamber; 5, the passage leading from the upper part of the meter; 6, the piston; 7, the piston-rod, slotted in its upper portion. 8 is a hollow casting inclosing the upper part of the piston-rod and secured to the plate 2. In this casting 8 are formed three ports 10 11 12, with their ingress, egress, and discharge passages, and formed also with the casting 8 are the two supplementary cylinders 13 14, with their ingress, egress, and discharge ports 15 16 17 and pas-

sages, as described in the specification to the aforesaid patent.

According to my present improvements the recessed sliding valve-cover 9, which controls the ports 10 11 12, is provided with an extension which covers and makes a fluid-tight joint over a slot 26, formed in the valve-block and communicating with the interior of the hollow casting 8, which surrounds the piston-rod. In order that the sliding valve-cover 9 may work freely, I prefer to dispense with slideways and instead form a groove 18 in the back of the valve-cover 9 and a corresponding groove 19 in a separate piece 20 and place two or more balls 21 in the grooves, the balls being held in their places by a distance-piece 22 and the part 20 being held by a bracket 23, fixed to the plate 2, and small pieces of india-rubber 24 or metal springs are introduced between the bracket 23 and the part 20 to give a slight elasticity to the bearing and allow for wear. On the extension of the sliding valve-cover 9 is formed a projection 25, which passes through the slot 26 in the valve-block and lies in the long slot in the piston-rod 7. As the piston-rod moves up and down each time the fluid is discharged from the measuring-chamber 4 it actuates as it approaches the completion of its stroke in either direction the projection 25 on the sliding valve-cover 9, and the projection 25 thus forms the valve-mover and reverses the position of the valve-cover over the ports 10 11 12. In all other respects the action of the meter is exactly similar to that of the patented meter described in the aforesaid specification.

It will be readily understood that by this construction the piston-rod 7 does not require any stuffing-box or packing, but simply passes freely with a sliding fit through the middle plate 2, the fluid being prevented from escaping by the hollow casting 8, which surrounds the piston-rod 7 and the only outlet from which is the slot 26, through which the valve-mover 25 passes and which is sealed by the extension of the sliding valve-cover 9.

To measure the quantity of water or other fluid passed by the meter, an arrangement of wheels and indicator, with a suitable dial, is fixed on the top or other convenient part of the cover and connected to or actuated by the piston-rod 7 or other convenient moving part.

The piston-rod 7 actuates the connections to the registering-wheels as follows: A lever 50 is fixed on a shaft 51, on which is also fixed a ratchet-wheel 52. An actuating-pawl 53 is pivoted at 54 on the lever 50, and each stroke of the piston-rod 7 moves the lever 50 and by the pawl 53 turns the ratchet-wheel 52 one tooth and by a suitable worm (not shown) on the shaft 51 turns a worm-wheel 55 on a shaft 56, which conveys motion to the measuring-wheels, &c., in the top of the meter. The ratchet-wheel 52 is prevented from turning back by a weighted retaining-pawl 57.

In operation when fluid under pressure is admitted to the upper part 40 of the meter through the inlet pipe and passage 27 and the piston 6 is at the bottom of the measuring-cylinder 4, as shown in the drawings, the fluid flows through the open port 15 and down the passage 5 into the bottom of the measuring-cylinder 4, thereby causing the piston 6 to rise, and as the piston-rod 7 approaches the end of its upward stroke the metal at the bottom of the slot in the piston-rod meets with the projection 25 on the sliding valve-cover 9 and raises the latter and so disconnects the ports 11 and 12 and connects the ports 10 and 12. This movement of the valve-cover 9 allows the liquid under pressure to flow from the upper part of the meter 40 through the port 11 and a conducting-passage into the supplementary cylinder 14, so that the liquid forces outward a piston 28, (see Fig. 2,) thereby moving its piston-rod 29 and valve-cover 30 and uncovering the port 16 and at the same time forcing a piston 31 on the rod 29 into the cylinder 13 and expelling the liquid it contains through the port 10 under the recessed valve-cover 9 down through the central port 12 and passages leading to the pipe 32, where the liquid is discharged. At this time the main piston 6 has reached the top of its stroke, and the port 16, having been uncovered by the movement of the pistons 28 and 31, as described, fluid under pressure flows from the chamber 40 through the open port 16 and a passage 33 into the top of the measuring-cylinder 4 and forces down the piston 6, thereby expelling the fluid on the under side of the piston from the measuring-cylinder 4, up the passage 5, through the port 15, under the recessed valve-cover 30, and down through the central port 17 and passage to the pipe 32, where it is discharged. As the piston-rod 7 approaches the end of its downward stroke the metal at the upper end of the slot in the piston-rod 7 meets the projection 25 and moves the valve-cover 9 downward and so uncovers the port 10 and connects the ports 11 and 12,

this movement of the valve-cover 9 allowing the fluid under pressure in the chamber 40 to flow through the port 10 and its passage into the cylinder 13, so that the fluid forces outward the piston 31, thereby moving the piston-rod 29 and valve-cover 30 and uncovering the port 15. When the piston 31 is forced outward, the piston 28 is forced inward and expels the fluid in the cylinder 14 up through the port 16, under the valve-cover 30, and down through the port 17 and out at the discharge passage and pipe 32. The port 15 having been uncovered, as above described, the stroke is again reversed by the fluid under pressure admitted to the chamber 40 flowing through the open port 15 and down the passage 5 into the bottom of the measuring-cylinder 4, as already described. It is thus evident that the apparatus will continue to work as described, discharging alternately from above and from below the piston, so long as fluid under pressure is admitted through the inlet-pipe 27.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, what I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In combination, in a fluid-meter, a measuring-chamber, a double-acting piston therein, the piston-rod passing through the wall of the chamber, a valve-cover connected with the piston-rod, a casing inclosing the projecting end of the piston-rod and having an opening, said valve-cover and piston-rod being connected through said opening and an extension on the valve-cover for sealing said opening, substantially as described.

2. In combination, the measuring-cylinder, the double-acting piston, slotted piston-rod, casing surrounding piston-rod, valve-mover projecting through a slot in the casing into the slot of the piston-rod and the extension of the sliding valve-cover by which the slot in the casing is sealed, substantially as herein set forth.

3. In combination, the casing, the piston and piston-rod, a valve-cover connected with the piston, said cover having a grooved back, a grooved resilient bearing-piece, the balls arranged between the cover and the resilient bearing, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HERBERT HENRY FROST.

Witnesses:

H. B. BARLOW,
HERBERT R. ABBEY.