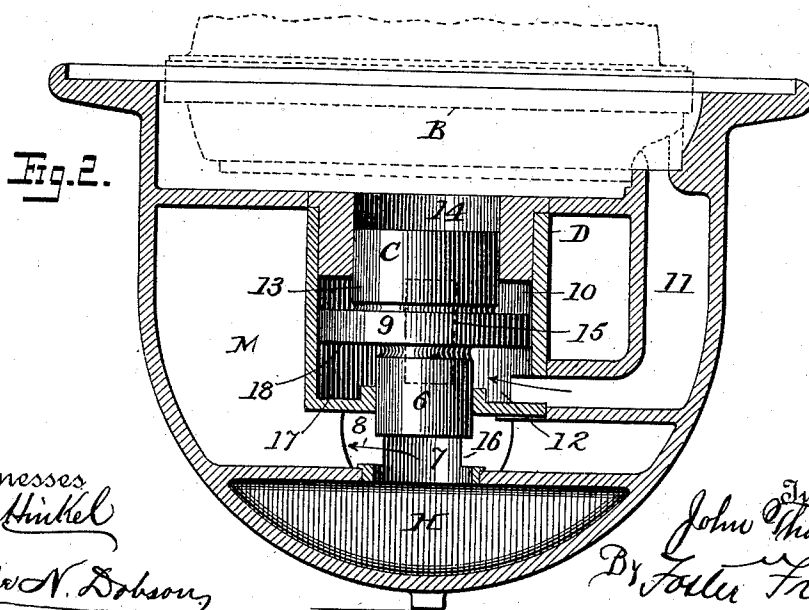
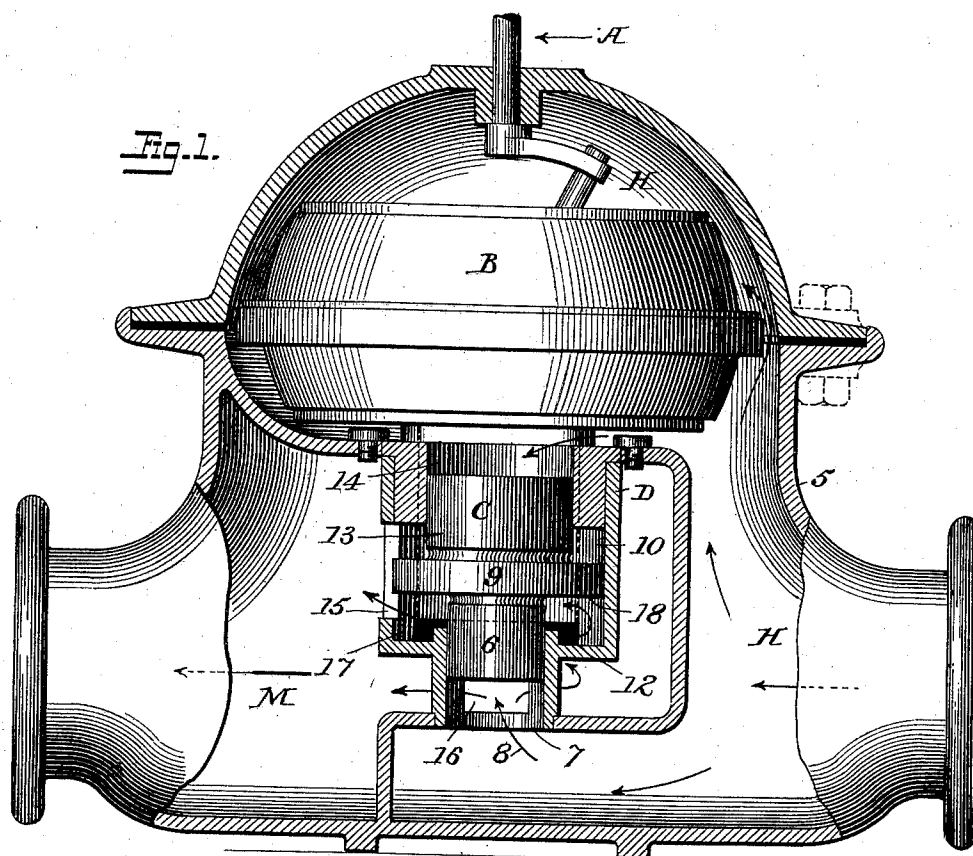


(No Model.)

J. THOMSON.
POSITIVE PROPORTIONAL WATER METER.

No. 476,100.

Patented May 31, 1892.



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UNITED STATES PATENT OFFICE.

JOHN THOMSON, OF BROOKLYN, ASSIGNOR TO THE THOMSON METER COMPANY, OF NEW YORK, N. Y.

POSITIVE PROPORTIONAL WATER-METER.

SPECIFICATION forming part of Letters Patent No. 476,100, dated May 31, 1892.

Application filed January 12, 1892. Serial No. 417,848. (No model.)

To all whom it may concern:

Be it known that I, JOHN THOMSON, a citizen of the United States, residing in the city of Brooklyn, Kings county, State of New York, have invented certain Improvements in Positive Proportional Meters, of which the following is a specification.

This invention relates to positive proportional meters; and it has for its object to provide means for controlling the proportional flow of two separate streams through a meter, which means shall be positively operated by differences of pressure between the several chambers of the meter, and in which an increase of resistance in the measuring-instrument shall cause the controlling means to restrict the passage of the fluid through the meter, while a decrease of resistance in the measuring mechanism will result in opening the passages through the meter.

The invention consists in means for accomplishing these results, and while they may be varied by those skilled in the art without departing from the principles of the invention I have chosen to illustrate the invention in connection with a valve mechanism such as is disclosed in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional elevation of an apparatus embodying my invention, and Fig. 2 is a transverse center section of Fig. 1.

Referring to the embodiment of the invention illustrated in the drawings, the valve C is shown as of the plunger type, having three transverse sections of different diameters, and is contained within a valve-casing D, mounted within the main casing 5. Such a valve might properly be designated as a "compound differential valve." The smallest section 6 of the valve is fitted to the cylinder 7, through which the main volume is discharged, as see arrows 8. The largest diameter 9—the mid-section of the valve—is mounted in the cylinder 10, which receives the discharge from the measuring-chamber B through the cored water-way 11 and valve-casing port 12, while the intermediate diameter 13 operates in still another cylinder 14; but from this cylinder there is no discharge.

A more ready comprehension of the device and its function will be obtained by giving numerical values to the areas of the different valve-sections. Thus, assume the smallest section 6 equal to an area of one square inch, the largest section 9 equal to three square inches, and the intermediate section 13 equal to 1.5 square inches. Now, it is to be observed that the ends 6 and 13 of the valve are both exposed to the pressure of the main inlet-chamber H, in which, also, the measuring device B is contained, while the section 9 is reached only by the water discharged from the measuring device.

It is to be noted that the valve acts by gravity to close the ports 15 and 16, the extent of which effect is to make sufficient difference of pressure between the main inlet-chamber H and the main outlet-chamber M to overcome the inertia and normal friction of the measuring device.

The operation is as follows: First, assume the valve full down to close the ports and a draft made from chamber M, causing an immediate difference of pressure between the main chambers M and H; second, suppose this difference of pressure to equal one-pound pressure to each square inch. Then there will be a total pressure exerted upon the end 13 of the valve of $1.5 \times 1 = 1.5$ pounds and upon the small end 6 of valve one multiplied by one equals one pound. The effect of the pressure upon the small end 6 of the valve is to elevate it and open the ports, while that upon the other end 13 tends to depress it and keep the ports closed, the extent of which tendency is the difference of pressure upon the two ends, or $1.5 - 1 = 0.5$, the net downward thrust in pounds. Hence it is clear that the effect of creating in chamber H a greater pressure than in chamber M is to tend to depress the valve and close the valve-ports 15 16; but, as already stated, the measuring mechanism B is also situated within the compass of chamber H. Therefore when the difference of pressure between M and H is sufficient to overcome the resistance of the measuring mechanism the pressure transmitted by the measured stream will reach to and act within the annular chamber 17, formed by the valve-casing and the large diameter 9 of

the valve. The end-pressure surface 18 of the valve in this annular chamber is to be greater than that of the upper outer end 13, and for present illustration will be taken as equal to two square inches. Now, as the pressure upon the valve in the annular chamber acts in a similar direction with the pressure upon the small end 6, we have the combined areas of two plus one equals three square inches to open the valve-ports opposed by the area of 1.5 square inches. Hence the valve will be elevated against the action of gravity and also against the pressure on the end 13, which action will continue until some position of equilibrium will again have been reached. If, then, an obstruction comes to the flow of the measured stream, the consequence of this will be to prevent an equal effect in pressure from reaching the annular chamber and to also in like degree increase the pressure in the main inlet-chamber H. The result of this is, by relieving the valve at 18 and increasing at 13, to force the valve downward, both by gravity and by direct positive pressure, and to throttle the ports until another position of equilibrium is automatically established. On the contrary, if the resistance of the measuring device is relieved this will increase the pressure in the annular chamber and decrease the pressure in the main inlet-chambers, wherefore the valve will be elevated and the ports opened.

It is to be understood that the ports through which the two streams are ejected bear a constant relation to each other in respect of their areas.

By making the end-surface area of the valve in the annular chamber but slightly greater than that of the outer end 13 a valve of compact proportions and moderate weight may be employed and yet require a considerable difference of pressure between the main chambers to cause its operation—as, for instance, if the area of the face 18 were but 0.1 square inch greater than that of the end 13 and the weight of the valve were one pound, then it would require $\frac{1.0}{0.1} = 10$ pounds pressure per square inch to lift the valve.

It will of course be evident without illustration that a spring may be employed to act with or take the place of gravity and that the conditions of operation may be readily reversed without affecting the principles involved. So, too, the ends of the valve might be of equal diameters, in which case the proportional control would be between the discharge of the measured stream and the weight of the valve or its resilient resistance; but in such instance, as well as in that illustrated, the operation of the valve can only take place

after or upon the operation of the measuring device, and the consequence of either a temporary or permanent increase in the friction of the measuring device is to close and throttle the ports, and thus maintain a practically invariable proportionate discharge under all conditions of action.

Other modifications in construction and arrangements will suggest themselves to those skilled in the art, and need not be recited in detail here, it being understood, however, that the invention is not limited to the construction shown and described above.

What I claim is—

1. In a proportional meter, the compound differential valve having ends of unequal diameters exposed to the pressure of the main inlet-chamber and a mid-section connected to the discharge from the measuring mechanism, the face surface of said mid-section being greater than that of either of the ends, substantially as described.

2. In a proportional meter, the compound differential valve having ends of unequal diameters exposed to the pressure of the main inlet-chamber and a mid-section having one of its faces whose surface is greater than that of either of the ends connected to receive the flow from the measuring mechanism, the greater end diameter being formed upon that side of the aforesaid mid-section reverse to its receiving-surface.

3. In a proportional meter, the compound differential valve having ends of unequal diameters exposed to the pressure of the main inlet-chamber and a mid-section having one of its faces whose surface is greater than that of either of the ends connected to receive the flow from the measuring mechanism, the lesser end diameter being formed upon the receiving side of the aforesaid mid-section.

4. In a proportional meter, the compound differential valve having ends of unequal diameters exposed to the pressure of the main inlet-chamber and a mid-section having one of its faces whose surface is greater than that of either of the ends connected to receive the flow from the measuring mechanism, the greater end diameter operating in an unported cylinder, while the lesser end diameter operates in a ported cylinder which receives the unmeasured fluid and the mid-section operates in a ported cylinder from whence the measured volume is ejected.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN THOMSON.

Witnesses:

J. F. COFFIN,

HERMANN PRILLWITZ.