(No Model.) 3 Sheets—Sheet 1.

# J. A. TILDEN.

## ROTARY FLUID METER.

No. 385,971. Patented July 10, 1888.

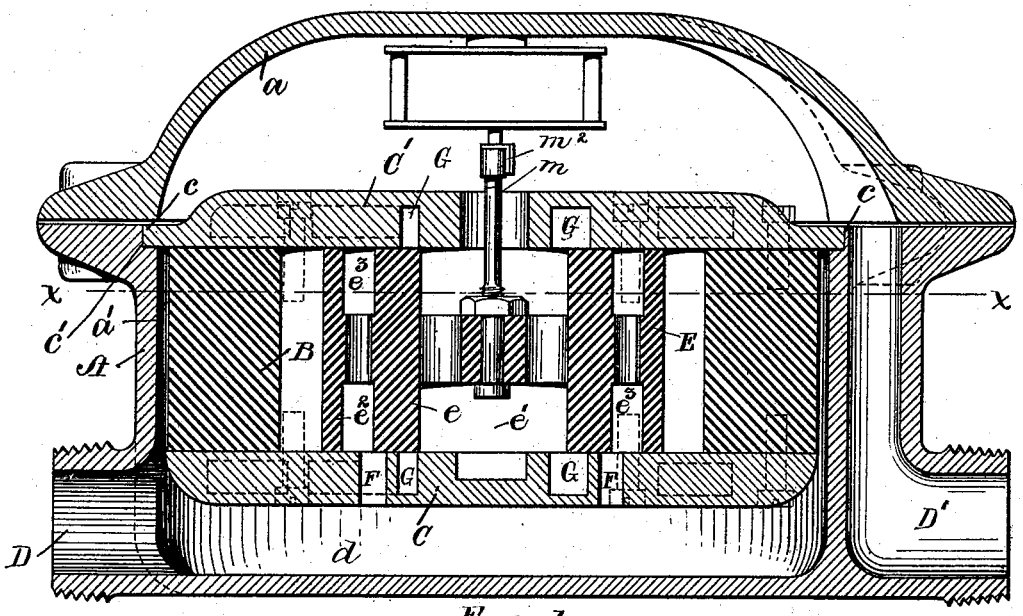



Fig. 1.

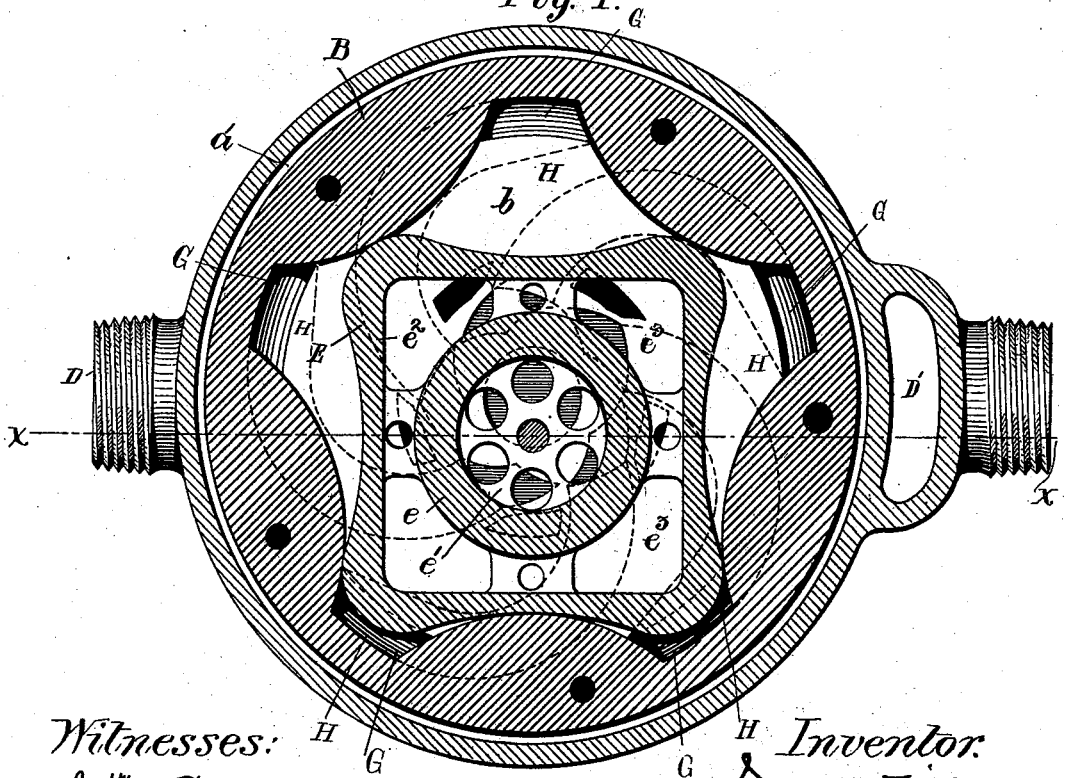



Fig. 2.

Witnesses:
J. H. Dolan.
E. P. Small.

Inventor.
James A. Tilden.
by his attys.
Clark & Raymond.

(No Model.) 3 Sheets—Sheet 2.

# J. A. TILDEN.

## ROTARY FLUID METER.

No. 385,971. Patented July 10, 1888.

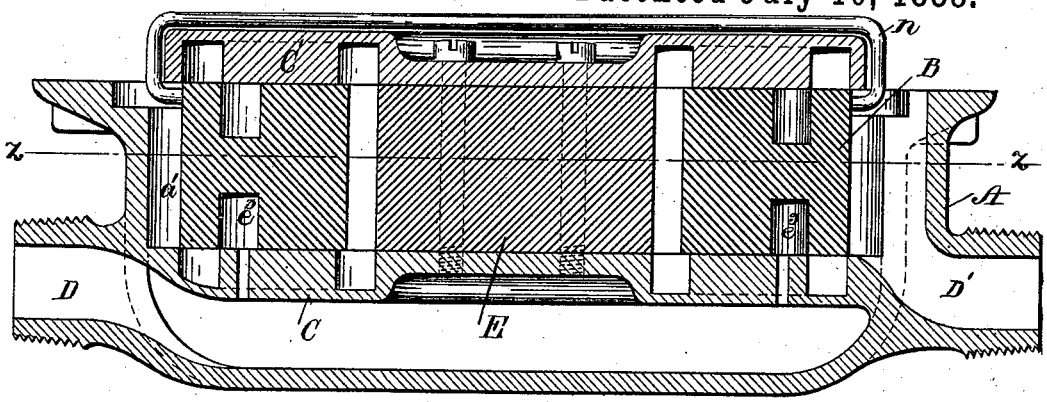
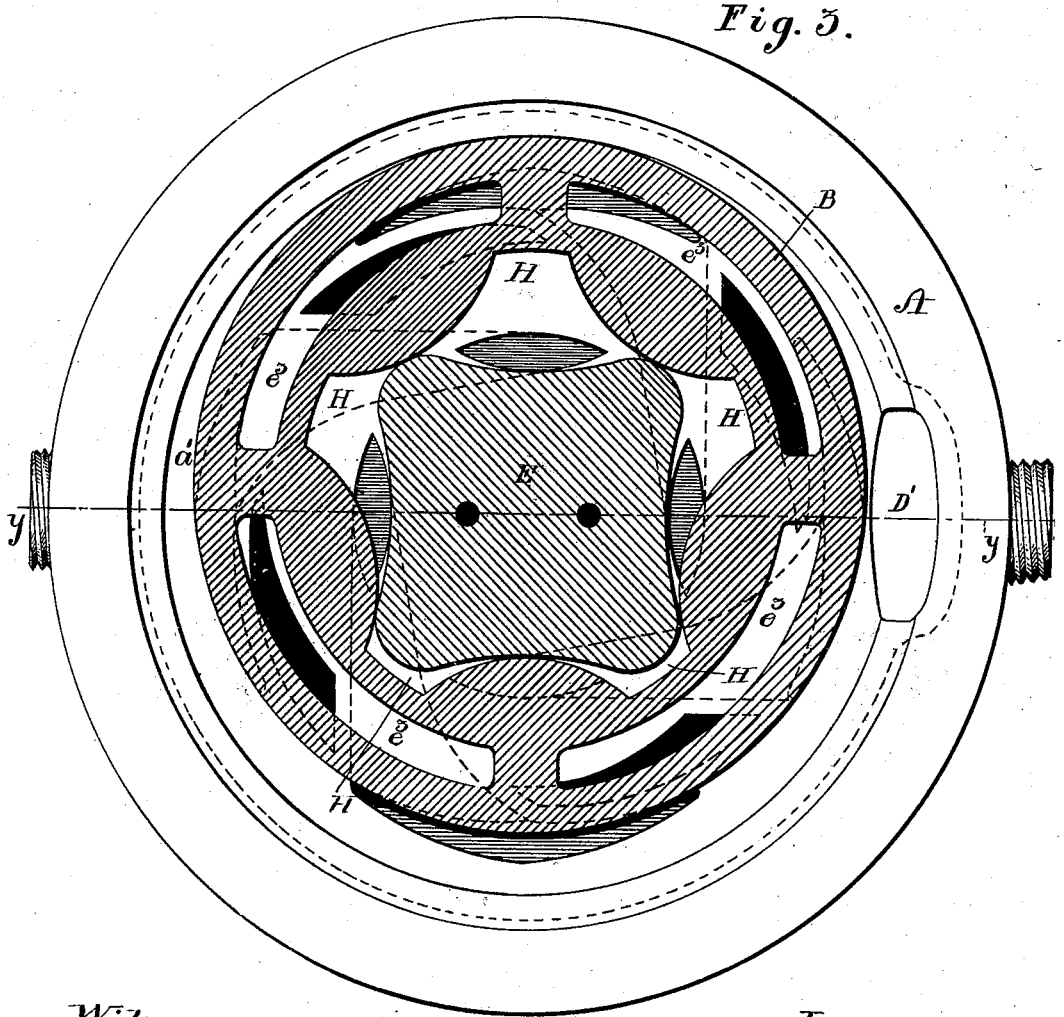



Fig. 5.




Witnesses:
L. M. Dolan.
E. F. Small.

Fig. 4.

Inventor:
James A. Tilden.
by his attys
Clarke & Raymond.

(No Model.) 3 Sheets—Sheet 3.

# J. A. TILDEN.

## ROTARY FLUID METER.

No. 385,971. Patented July 10, 1888.

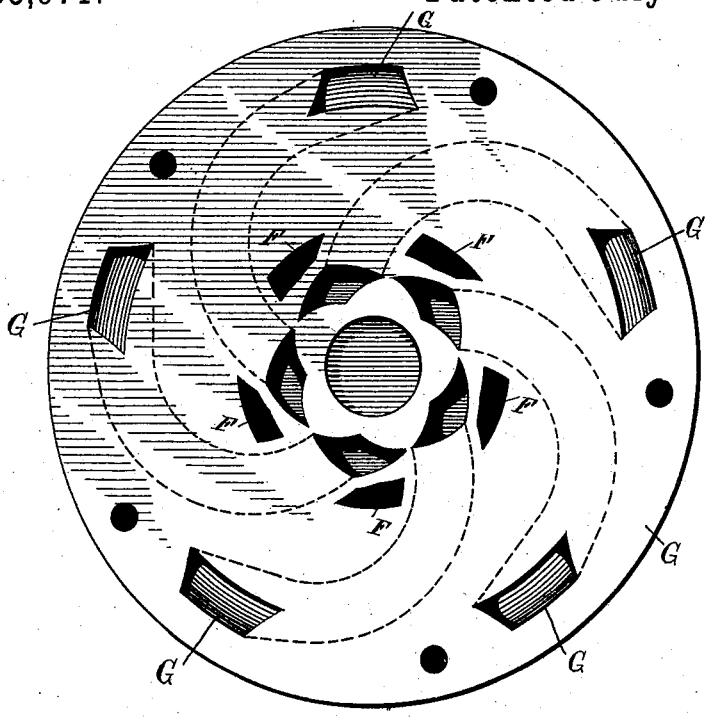



Fig. 5.

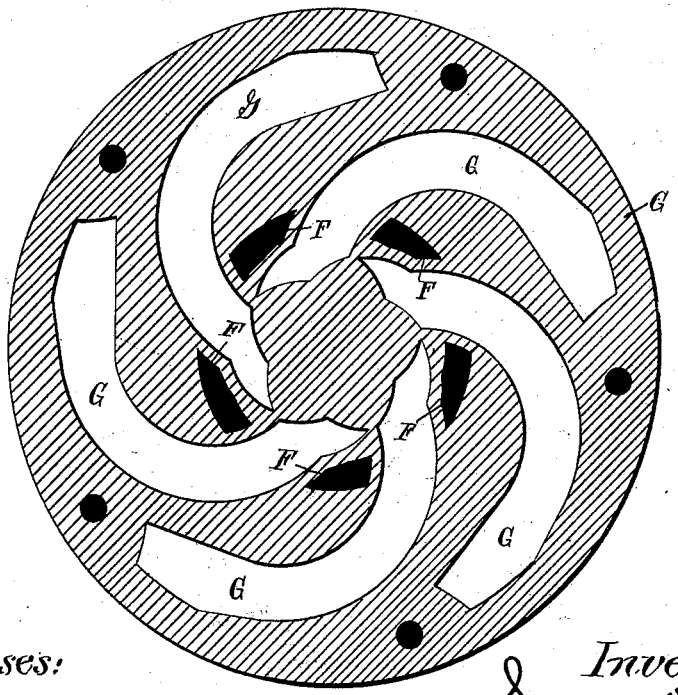



Fig. 6.

Witnesses:
J. N. Dolan.
E. F. Small.

Inventor:
James A. Tilden,
by his attys
Clarke & Raymond.

# UNITED STATES PATENT OFFICE.

JAMES A. TILDEN, OF HYDE PARK, MASSACHUSETTS, ASSIGNOR TO THE HERSEY METER COMPANY, OF PORTLAND, MAINE.

## ROTARY FLUID-METER.

SPECIFICATION forming part of Letters Patent No. 385,971, dated July 10, 1888.

Application filed March 19, 1888. Serial No. 267,704. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES A. TILDEN, of Hyde Park, in the county of Norfolk and State of Massachusetts, a citizen of the United States, have invented a new and useful Improvement in Fluid-Meters, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to the class of fluid-meters which are sometimes called "rotary" meters, and which involve the use of one or more rotary parts in the machine. In the meter herein described such rotary part may be the piston or the portion which I have termed the "ring" or "wall," or both; and the object of the rotation of the piston or parts named is to cause the measuring-chamber, which is also the piston chamber, to be divided or separated into two or more sections, which are alternately increased and decreased in size, which are also alternately connected with the supply and exhaust ports or passages, and which are the measuring-chambers of the meter.

The invention relates, especially, to the form of the piston and of the piston chamber, and to the shape, form, and arrangement of the supply and exhaust ports.

In the drawings, Figure 1 represents a vertical central section upon the line *x x* of Fig. 2, and Fig. 2 a horizontal section upon the line *x x* of Fig. 1, of a meter containing the features of my invention. Fig. 3 shows in vertical section upon the line *y y* of Fig. 4, and Fig. 4 in horizontal section upon the line *z z* of Fig. 3, a slightly-different arrangement or construction of parts from that illustrated in Figs. 1 and 2. Figs. 5 and 6 show in plan and section one of the port-plates.

Referring to the drawings, A represents the case of the meter, and *a* its cap. The case preferably is cylindrical in shape, and has a cylindrical cavity, *a'*.

B is the section or part which I have termed the "wall" or "ring." It has a cylindrical shape, and in the construction represented in Figs. 1 and 2 it is made somewhat smaller than the full size of the cavity *a'*.

*b* is the piston-chamber. It is preferably of the shape represented in Fig. 2, although the exact form therein shown is not essential, and is only requisite in connection with a piston of the shape in section illustrated in said view.

C is the lower port-plate. C' is the upper port-plate, and both these plates lap upon the ends of the ring or wall B, the upper plate, C', extending beyond the outer edge of the wall, so that its edge *c* may enter the recess *c'* in the upper edge of the case, and be held or secured therein by a portion of the cap *a*, which laps upon it.

D is the inlet-passage.

*d* is the distributing-chamber.

D' is the outlet-passage.

E is the piston, and when used in a piston-chamber having the shape represented in Fig. 2 it preferably has an edge configuration like that shown in said figure. It comprises two sections or parts—viz., the inner cylindrical section, *e*, which has a cylindrical cavity, *e'*, open at both ends, and the outer section, $e^2$, which incloses the inner section and forms a chamber, $e^3$, which extends around the outer edge of the said inner section. (See Fig. 2.) The cylindrical chamber *e'* and the outer chamber, $e^3$, of the piston are respectively always in connection with the exhaust and supply ports.

In the construction represented in Figs. 1 and 2 the supply-ports are the ports F in the lower port-plate, C, and the fluid flows through these ports from the distributing-chamber *d* into the piston-chamber $e^3$. This chamber $e^3$ is connected by the ports G, which serve alternately as supply-passages, by which fluid is allowed to enter the measuring-chambers H, and as the exhaust-passages by which the fluid is permitted to flow from these chambers into the escape-chamber *e'* of the piston. In other words, each of the ends H of the piston-chamber is at some time in the rotation of the piston a measuring-chamber, in that it is adapted to receive and discharge fluid, and it is formed by the contact of the edge of the piston at two or more lines or points extending from top to bottom, with lines or points constantly moving, to be sure, upon the inner surface of the

ring or wall B, and each of these measuring-chambers H is alternately connected by a port, G, with the supply-chamber $e^3$ of the piston and the outlet-chamber $e'$ thereof, and the cylindrical section $e$ of the piston acts as a valve in successively opening and closing the passages G, first in relation to the supply-chamber $e^3$, and then in relation to the outlet-chamber $e'$, whereby the measuring-chambers are permitted to fill with the fluid and after they are filled to be shut off from the source of supply by closing the mouth of the passage through which said supply was permitted to flow and allowed to discharge its contents by causing said passage to be connected with the outlet or escape chamber. This alternating flowing of the liquid from the piston supply-chamber $e^3$ to the measuring-chambers H and back again through said passages to the piston escape-chamber $e'$ communicates the necessary movement of rotation to the piston, which causes it to be rotated in the piston-chamber and to make the contacts with the wall thereof, which divides it into the various measuring-chambers, and the rotation of the piston is communicated to the registering mechanism by means of a shaft or spindle, $m$, which bears against a plate, $m^2$, connected with the shaft of the registering mechanism. The connection between the spindle or shaft $m$ and the plate $m^2$ is such as to permit the spindle or shaft to take a circular path in relation to the plate $m^2$—that is, the shaft or spindle is constantly bearing upon the plate $m^2$ as it turns. In Figs. 3 and 4 I have represented the modification in construction which would arise from providing the wall with a rotary movement in relation to the piston, or, in other words, giving the wall the same movement that the piston described in Figs. 1 and 2 has. When this modification is employed, the wall B is made enough smaller than the chamber $a'$ in the piston-case as to permit it to have the movement of rotation described, and it has the receiving-chamber, which is the equivalent of the receiving-chamber $e^3$ of the piston. This receiving-chamber is connected by ports in the lower port-plate with the distributing-chamber, and also by means of ports, which are the equivalent of the passages G, with the measuring spaces or recesses H, and these passages G serve to alternately supply the measuring spaces or recesses with the fluid and to exhaust them. In the first case, by the position of the wall in the chamber they are permitted alternately to form a connection between the supply-chamber $e^3$ of the wall and the measuring-spaces, and by the movement of the wall they are again enabled to discharge the measuring-spaces by being connected with the escape-chamber, which in this construction is between the outer surface of the wall and the piston-case. (See Figs. 3 and 4.) The division of the piston-chamber into measuring spaces or recesses is obtained in precisely the same manner as it is obtained where the wall is stationary and the piston caused to rotate.

I would say that it is possible to cause a meter having the general form of piston and wall herein described to operate either by the rotation of the piston in relation to a stationary wall, as represented in Figs. 1 and 2, or the rotation of the wall in relation to a stationary piston, as represented in Figs. 3 and 4, or by the movement of both the piston and the wall, in which event, when the construction employed in Figs. 1 and 2 is used, the piston would rotate more rapidly than the wall, and when the construction represented in Figs. 3 and 4 the wall would rotate somewhat more rapidly than the piston.

To communicate the rotation of the wall to the register in the construction represented in Figs. 3 and 4, I have secured the upper port-plate to the lower port-plate by means of bolts, the lower port-plate preferably being cast integrally with the case of the meter, and I have arranged a rod, $n$, about the upper port-plate, its end being secured to the wall and at opposite points, and being bent to extend across the upper port-plate, so that it turns about it and communicates the rotation of the wall to the shaft of the register.

It will be observed that the supply-chamber, whether in the piston or ring, extends in a vertical or straight direction from end to end, and that, also, the entrances to the ports in the port-plates are oppositely arranged in relation to each other; also, that the ports in both port-plates have the same general direction or curve; also, that the escape-chamber of the piston is vertical or straight from end to end, and is of the same area throughout excepting at its center, where there is a web. This construction and arrangement of the passages and ports provides for a very equal and uniform balancing of the piston or valve and decreases the sliding friction to a minimum, does not retard materially the flow of the water, and so distributes its force that there is very little, if any, friction caused by the head of the water acting upon the piston in its passage through the meter.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a fluid-meter, the combination of a rotary section or part having a chamber extending vertically through the same from end to end and of the same area at each end, connected by ports with a source of supply, and which rotary section may be either the ring or the piston of the meter, with said piston and said ring shaped, substantially as represented, to conjointly form fluid-measuring spaces, an upper port-plate and a lower port-plate, between which the piston and ring are held, and passages or ports in each port-plate having the same general curve or direction, and the openings to which are oppositely arranged, so that they act in pairs, each pair of which connects a measuring-chamber with the supply-chamber and with the delivery-chamber, and which by the movement of said movable

part of the meter, whether it be the ring or the piston, are caused to alternately connect the supply-chamber with said measuring-chamber and the measuring-chamber with the delivery-chamber, as and for the purposes specified.

2. The combination, in a fluid-meter, of the ring B, having a piston-chamber, *b*, bounded by its inner surface, which is shaped substantially as specified, a piston, E, contained in said piston-chamber and shaped to conjointly form with the wall of the ring B the measuring-chambers H, the said measuring-chambers, the vertical chamber $e^3$, extending through the piston from end to end and of the same area at each end, the port-plate C, having the inlet-ports F always open to the chamber $e^3$, and also having the ports or passages G, connecting with the measuring-chambers, and the port-plate C′, having the ports or passages G, also connecting with the measuring-chambers, and the inlets to which are opposite the corresponding ports in the port-plate C, the said port-plate also having a central opening or passage connected with the chamber $e'$, and the said chamber $e'$ in the piston extending vertically through the same from end to end and of the same area at both ends, the distributing or supplying chamber *d*, and the outlet *d*′, substantially as described.

JAMES A. TILDEN.

In presence of—
F. F. RAYMOND, 2d,
E. P. SMALL.