E. L. BARNES.

LIQUID METER.

APPLICATION FILED OCT. 21, 1907.

911,641.

Patented Feb. 9, 1909.

2 SHEETS—SHEET 1.

Fig. 2.

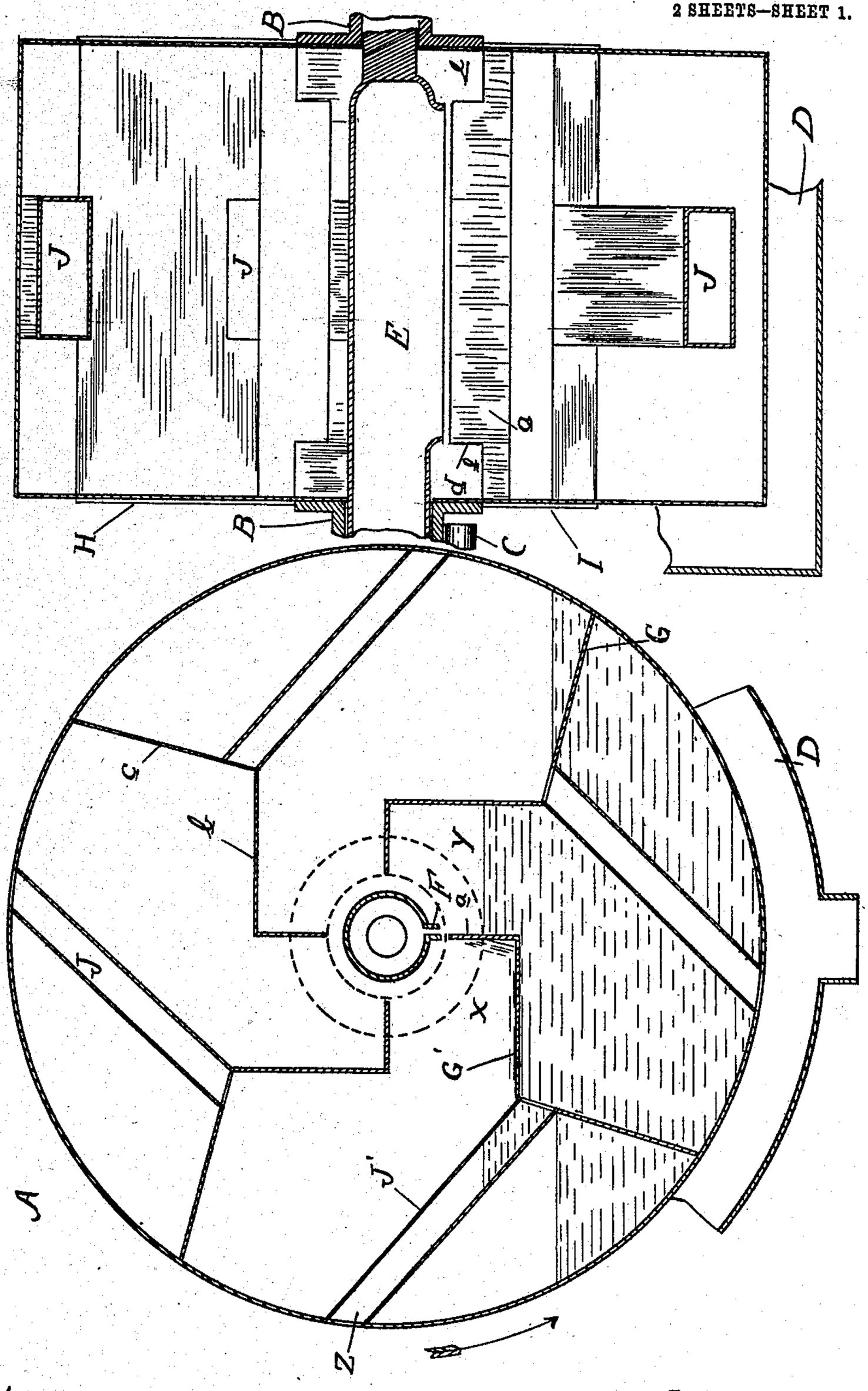


Fig. 1.

Witnesses.

H. R. Ford

James P. Barry.

Inventor.

Eugene. L. Barnes.

By Whittemore Hulbert & Whittemore

Attys.

E. L. BARNES.

LIQUID METER.

APPLICATION FILED OCT. 21, 1907.

911,641.

Patented Feb. 9, 1909.

2 SHEETS—SHEET 2.

Fig. 4.

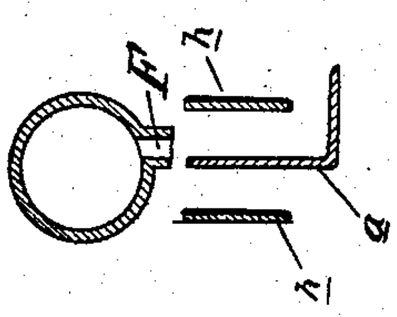
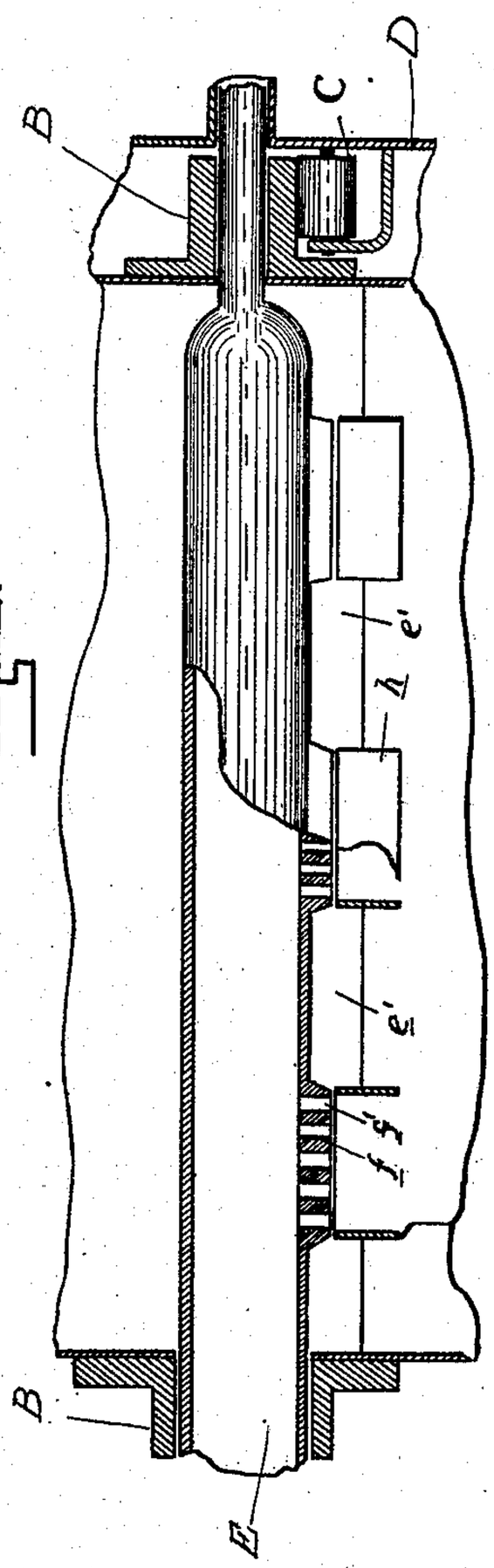


Fig. 3.



WITNESSES

W. K. Ford

Cornelia J. Williams

By

INVENTOR

EUGENE L. BARNES

Whittemore Hulbert & Whittemore

attys

UNITED STATES PATENT OFFICE.

EUGENE L. BARNES, OF DETROIT, MICHIGAN, ASSIGNOR TO CENTRAL STATION STEAM COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

LIQUID-METER.

No. 911,641. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed October 21, 1907. Serial No. 398,490.

To all whom it may concern:

Be it known that I, EUGENE L. BARNES, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Liquid-Meters, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to liquid meters of that class in which the fluid to be measured is fed into a revoluble drum or cylinder, and is measured by the alternate filling and discharging of compartments within said drum.

The invention consists in certain features of construction whereby a high degree of accuracy is obtained with a simple mechanical construction, all as more fully hereinafter set forth.

In the drawings, Figure 1 is a section of the meter in the plane of rotation; Fig. 2 is a vertical central section in the plane of the axis; Fig. 3 illustrates a modified construction of the inlet spout; and Fig. 4 is a section at right angles to Fig. 3.

A is the drum or cylinder, which is provided at its opposite ends with trunnions B journaled in suitable bearings, such as the roller bearings C within an outer tank D.

E is an inlet pipe which enters through one of the trunnions B and is provided with a downwardly extending discharge nozzle F, The drum A is divided into a plurality of compartments by partitions G extending the entire length of the drum and secured to the heads H thereof. The drum is preferably formed of sheet metal, and the heads H are provided with beads I, which form bearings for the ends of the partitions G, which are also preferably secured by soldering.

Each of the partitions G is preferably of the form shown, having a portion *a* thereof which extends radially, and is located near the axis of the drum, but so as to clear the nozzle F. Between the portion *a* and the periphery of the drum the partition is bent to form an extension of the pocket, as indicated at *b* and *c*.

J are discharge conduits connected to each of the partitions G at a point intermediate the portion *a* and the periphery, preferably at an angle of intersection of the portions *b* and *c*. This conduit J extends to the periphery of the drum, and registers with an aperture therein, forming the discharge orifice, but the partition is such that when the portion *a* is arranged vertically beneath the inlet nozzle F the discharge end of the conduit J is above the level of the partition. The conduit J preferably extends only a portion of the length of the drum, but the area of its cross section is sufficient to discharge therethrough the maximum amount of liquid which is fed into the drum at any time.

With the construction as thus far described, when liquid is admitted through the conduit E it will be discharged through the nozzle F into one of the compartments. As the liquid rises in this compartment it will disturb the balance of the drum, and cause the latter to rotate until the portion *a*, of the partition G, is passed beneath the nozzle F and the liquid from said nozzle is directed into another compartment. At the same time, the rotation of the drum will cause the discharge conduit J in one of the compartments to be lowered and permit the passage therethrough of the liquid. Thus the disturbance in the balance of the drum is due on the one hand to the filling of one of the compartments, and on the other hand to the discharging of the liquid from the compartment previously filled.

The accuracy of the measurement depends quite largely upon the accurate cutting off of the compartments. I have, therefore, formed the partitions G with portions *d*, which extend upward into close proximity to the lower end of the discharge nozzle F. This portion of the partition is formed of thin sheet metal, and the nozzle F is of comparatively narrow cross section with the result that the cutting off is quickly effected. It is, however, essential to the operation of the device that a portion of the liquid received by one compartment must be permitted to overflow into another compartment. To this end, the partitions G have formed upon opposite sides of the portion *d* overflow channels *e*. These permit the liquid received in the compartment beneath the inlet nozzle F to overflow into the next succeeding compartment upon opposite sides of the cut-off portion *d*.

For certain uses, and particularly where the velocity of the liquid to be handled is high, a greater degree of accuracy is obtained by dividing the nozzle F (Fig. 3) into a series of openings *f* and each opening subdivided by a series of partitions *f'* which

cause a vertical discharge of the liquid into the drum. Without some such device, the velocity of the liquid entering the conduit E will cause it to shoot at an angle through the nozzle F, raising the level at one end of the compartment higher than at the opposite end, and also agitate the surface of the liquid so as to make the measurement somewhat inaccurate. With my improvement, the liquid is directed vertically downward from the inlet pipe E. A still greater degree of accuracy is obtained if, in place of discharging the liquid directly upon the surface of the liquid already in the compartment, means is provided for directing the jet beneath the surface, avoiding the production of waves. As shown in Fig. 4, the portions *a* of the partitions G have arranged upon opposite sides thereof supplementary partitions *h*, which extend downward beneath the level of the liquid in the compartment at the time when the required overflow into the succeeding compartment is approaching and taking place, and are open at their lower ends. These partitions are preferably interspaced with auxiliary overflow passages *e'*, so that as the meter is approaching and receding from each point of the cut-off the liquid from the nozzle will pass downward between the partitions and will distribute itself uniformly. The overflow is also distributed along the cut-off, so as to prevent a higher level of the liquid at one point in the compartment than at another, and the nozzle F is divided into sections, the jets of which register only with the passages between the partitions.

In the complete operation—supposing one of the partitions G', Fig. 1, to have its portions *a* in registration with the nozzle F, the compartment Y to the right of said partition will have been previously filled with liquid up to the level of the overflow channels *e*, and liquid will have also passed through these channels into the compartment X on the left of the partition. The discharge conduit J', for the partition G', will have its discharge end Z above the level of the channel *e*, so that no discharge of water from the compartment Y is permitted until the drum is further rotated. Its further rotation is effected by the continued inlet of liquid through the nozzle F, which passes either through the channel *e*, or directly into the compartment X, disturbing the balance and causing a movement in the direction indicated by the arrow. This moves the portion *a*, of the partition G', to the right of the nozzle F, cutting off further admission to the compartment Y and further filling the compartment X. At the same time, the discharge end Z of the discharge conduit J' is lowered and the liquid in the compartment Y is permitted to discharge, this action continuing until all the liquid in the compartment Y is discharged therethrough.

By reason of the fact that the discharge conduits J are connected to their respective compartments at a point inward from the periphery of the drum, a portion of the liquid in the compartment is trapped and temporarily retained after the discharge end Z has passed the lowest point in rotation. During the further rotation of the drum, due to the filling of an adjacent compartment, this trapped liquid is gradually discharged by the changing of the angle of the section *c* of the partition as the drum rotates, until finally all the liquid is discharged.

It will be observed that by reason of the construction just described, the rotation of the drum is more uniform, and the tendency towards running ahead of the incoming liquid is entirely avoided. Thus, if the discharge conduit communicated with its compartment at the periphery, after once beginning to discharge the action would be continued automatically, even if no more liquid were admitted to the drum. Moreover, the greater part of the liquid in each compartment would be discharged before the discharge aperture Z reaches the lowest point. Consequently, the angle of rotation through which the compartment is completely discharged would be comparatively small. With my improved construction, the first part only of the discharge is due to the lowering of the peripheral aperture Z, while after this aperture is below the level of the opposite end of the conduit J the further discharge can only be effected by the admission of more liquid to the adjacent compartment of the drum. The rotation of the drum may be communicated through any suitable gear train (not shown) to the index wheels, which record the revolutions.

What I claim as my invention is:

1. In a liquid meter, the combination of a revoluble drum, an axial liquid inlet; partitions within said drum dividing the same into a plurality of compartments successively communicating with said inlet; peripheral discharge connections to each compartment leading back to a point angularly removed therefrom, said connections communicating with their respective compartments at points inward from the periphery whereby a portion of the liquid is trapped and temporarily delayed from discharging.

2. In a liquid meter, the combination with a revoluble drum, of a liquid inlet arranged axially therein and discharging downward, partitions dividing said drum into a plurality of compartments successively registering with the discharge from said liquid inlet nozzle, each of said partitions having an off-set to extend the compartments upon opposite sides of the cut-off portion of the par-

tition; and discharge conduits connected respectively to said compartments in the off-set portion of said partition and extending through the adjacent compartment to a point in the periphery.

3. In a liquid meter, the combination with a revoluble drum, of a liquid inlet nozzle extending axially therein and having a downward discharge; partitions within said drum dividing the same into a plurality of compartments successively registering with the discharge from said nozzle, each of said partitions having a radially extending liquid cut-off portion and an off-set on one side of said cut-off formed by oppositely angular portions, and a discharge conduit connected to the point of intersection of said oppositely angular portions of the partitions and extending therefrom through the adjacent compartment to the periphery.

4. In a liquid meter, the combination with a revoluble drum, of a series of partitions dividing said drum into separate compartments, a liquid inlet nozzle arranged axially within the drum and having a downward discharge portion adjacent to the path of the inner edge of said partitions whereby the latter constitute liquid cut-offs, each of said partitions having an aperture therein at a point further from the axis than the cut-off edge, and constituting an overflow from one compartment to another.

5. In a liquid meter, the combination with a revoluble drum, of a liquid inlet conduit extending axially therein and having a downwardly directed discharge, of a series of partitions dividing said drum into compartments successively registering with the discharge from said nozzle, and means for directing the liquid from said nozzle vertically downward beneath the level of the liquid in the compartment, for the purpose described.

6. In a liquid meter, the combination with a revoluble drum, of a series of partitions dividing said drum into separate compartments, a liquid inlet nozzle arranged axially within the drum and having a downward discharge portion adjacent to the path of the inner edge of said partition whereby the latter constitutes a cut-off, each of said partitions having a plurality of apertures distributed along the length thereof and constituting overflow passages which are further from the axis than the cut-off.

7. In a liquid meter, the combination with a revoluble drum, of a liquid inlet conduit extending axially within said drum and having downwardly directed discharge jets, a series of partitions dividing said drum into compartments successively registering with the discharge from said nozzle, and an auxiliary partition adjacent to each of said partitions forming a means for directing the liquid downward beneath the level in the compartment when the latter is adjacent to the point of cut-off.

8. In a liquid meter, the combination with a revoluble drum, of a liquid inlet conduit extending axially therein and provided with a series of downwardly directed jets, a series of partitions dividing said drum into compartments successively registering with the discharge from said jets, auxiliary partitions adjacent to the main partitions forming conduits for directing the liquid from the jets below the level of the liquid in the compartment as the point of cut-off is approached said auxiliary partitions having intermediate overflow passages for maintaining a uniform level throughout the compartment.

9. A liquid meter comprising a revoluble drum, an axial liquid inlet, partitions dividing said drum into a series of compartments successively communicating with said inlet, and means for discharging said conduits arranged to temporarily retain a portion of the liquid after the outlet therefor has passed the lowest point in its travel.

10. A liquid meter comprising a revoluble drum, an axial liquid inlet, partitions dividing the drum into a plurality of compartments successively communicating with said inlet and discharge conduits at a point inward from the periphery of the drum, for the purpose described.

11. A liquid meter comprising a revoluble drum, an axial liquid inlet, partitions dividing the drum into a plurality of compartments successively communicating with said inlet and a discharge conduit for each compartment, said partitions and discharge conduits being constructed to trap a portion of the liquid in each compartment, whereby its discharge is temporarily delayed.

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

EUGENE L. BARNES.

Witnesses:
AMELIA WILLIAMS,
NELLIE KINSELLA.