(82.)

2 Sheets--Sheet 1.

T. A. CURTIS.

Liquid Meters.

No. 122,759, Patented Jan. 16, 1872.

FIG. 1

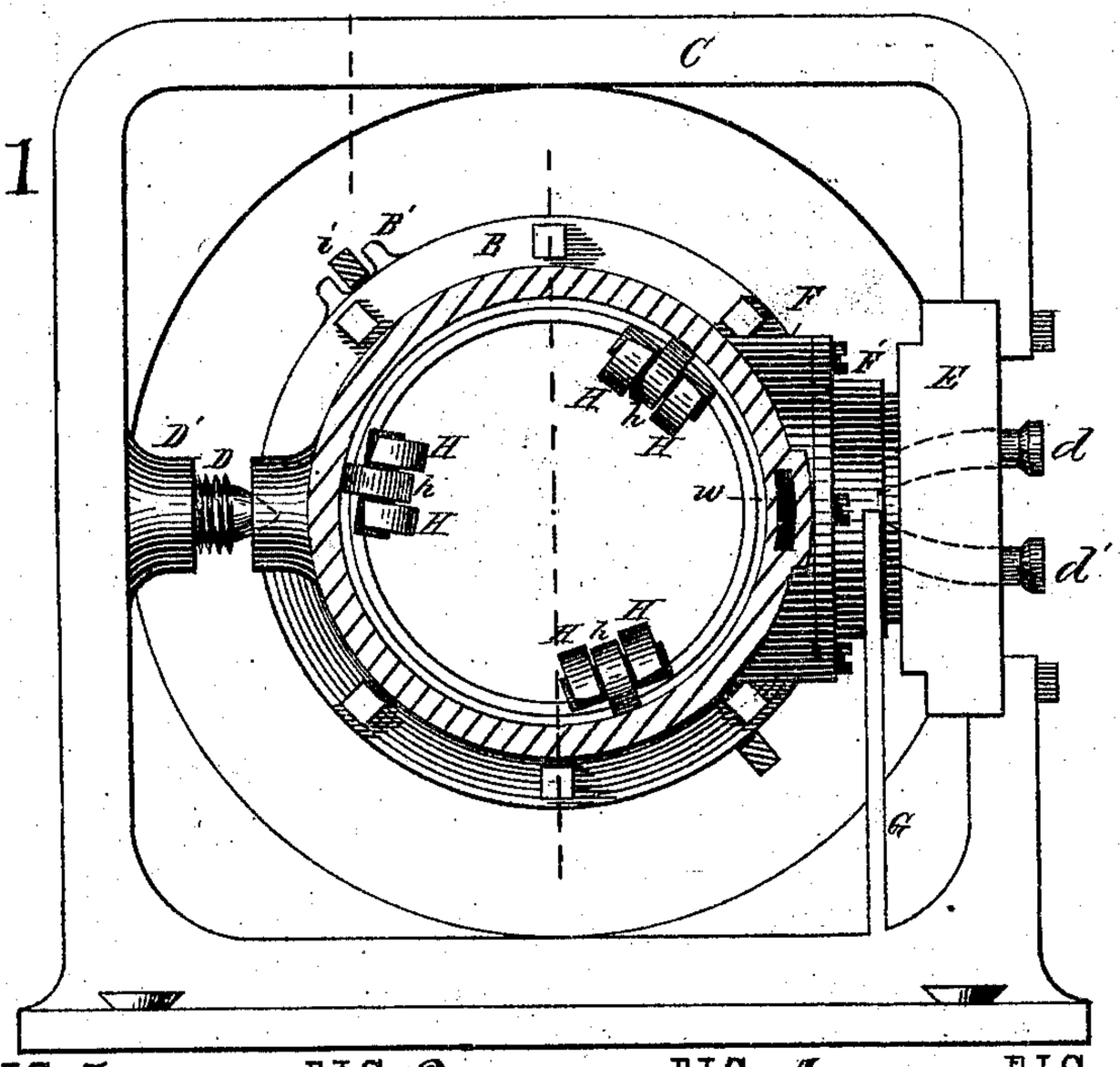

FIG. 6

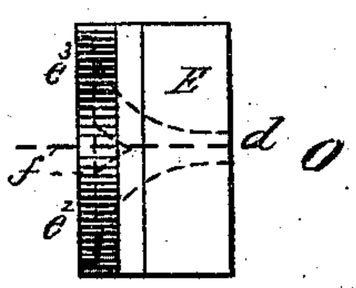

FIG. 7

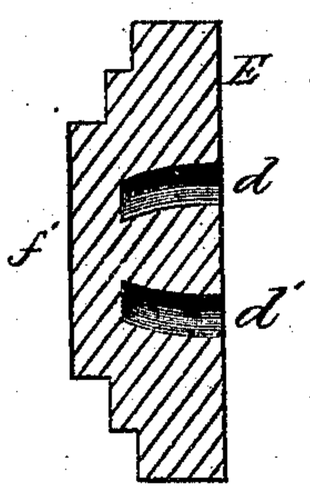

FIG. 3

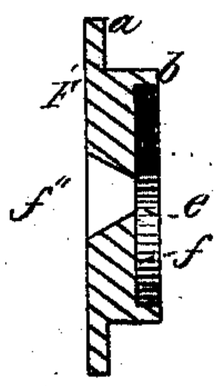

FIG. 2

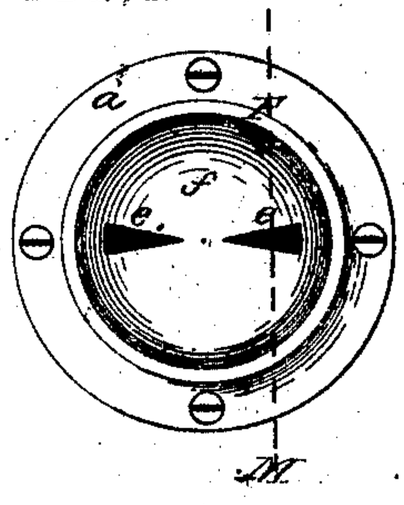

FIG. 4

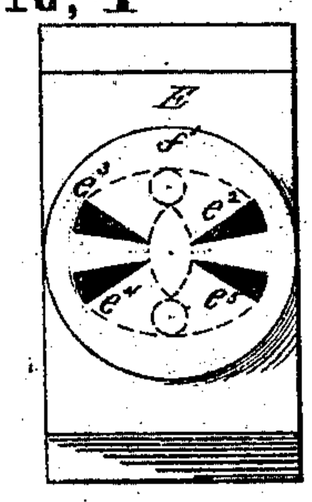

FIG. 5

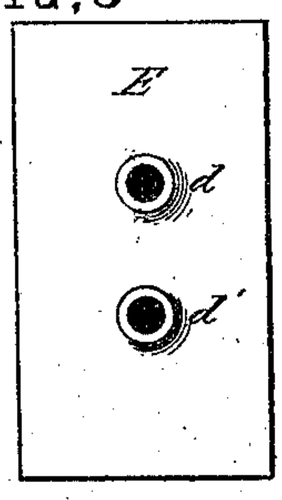

FIG. 8

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Inventor,
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(82.)

2 Sheets--Sheet 2.

T. A. CURTIS.
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FIG. 10

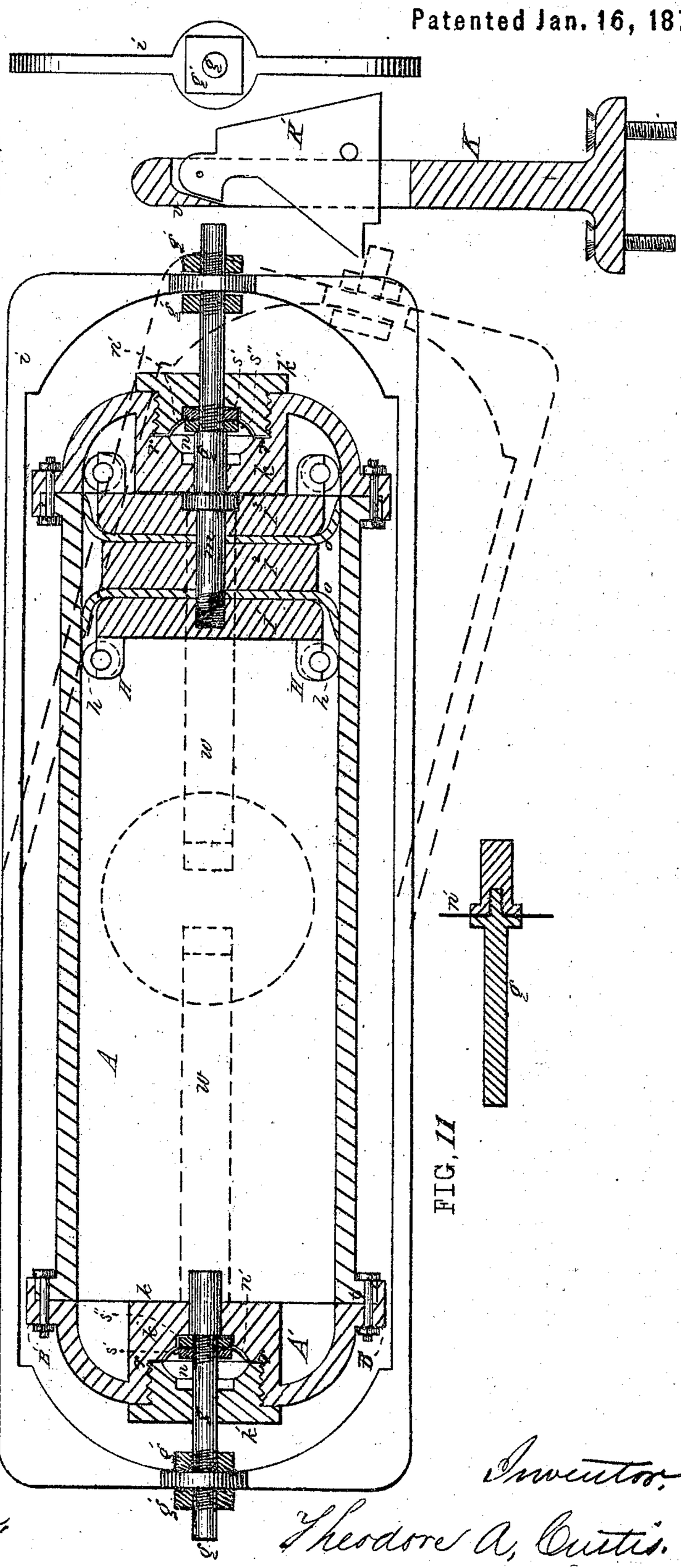

FIG. 9

FIG. 11

Witnesses.

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UNITED STATES PATENT OFFICE.

THEODORE A. CURTIS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO HIMSELF AND J. S. CURTIS, OF HARTFORD, CONNECTICUT.

IMPROVEMENT IN LIQUID-METERS.

Specification forming part of Letters Patent No. 122,759, dated January 16, 1872.

To all whom it may concern:

Be it known that I, THEODORE A. CURTIS, of Springfield, in the county of Hampden and State of Massachusetts, have invented a new and useful Liquid-Meter; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, and to the letters of reference marked thereon, in which—

Figure 1 is a transverse sectional view of my invention at line N, showing the weight within the cylinder, and also showing a side view of the valve. Fig. 2 is a front view of that portion of the valve which is attached to the cylinder, showing its working-face and its ports. Fig. 3 is a vertical section through line M of Fig. 2. Fig. 4 is a rear view of that portion of the valve which remains stationary, or is attached to the frame showing its working-face and its port-openings. Fig. 5 is a front view of the stationary part of the valve, showing the inlet and outlet. Fig. 6 is a top or plan view of the stationary part of the valve, showing in dotted lines the arrangement of the ports. Fig. 7 is a vertical section of the same through line O of Fig. 6. Fig. 8 is a vertical section of the frame at line P. Fig. 9 is a longitudinal section of the cylinder, showing the connecting-bar in position upon the cylinder, and its position in connection with the latch, and Fig. 10 is an end view of the connecting-bar.

My invention relates to an oscillating device for measuring the flow of liquids, and consists of a cylinder or tube suspended upon two points or bearings, one on each side at or near the middle, and having a valve to control the flow of the liquid into and out of the cylinder or tube; said cylinder or vessel having two short rods, one at each end, operating through the head, and a cavity is made in each head, in which is placed a diaphragm, which is centrally secured to the rod, so that it moves to and fro as the rod moves, while its outer edge is secured to the cylinder-head by turning a nut firmly against a shoulder, with the outer edge of the diaphragm between. If desirable, the diaphragm may be dispensed with and the cavity filled with any suitable packing material, making a common stuffing-box with its packing around the rod. To the outer end of each rod is secured a bar, which extends from one end of the cylinder, outside, to the other, forming a firm connection between the two rods. These rods are operated to and fro by a weight, having two cup-leathers attached, which, as it is caused, by the pressure of the water, to move to and fro in the cylinder, strikes against the end of one or the other of said rods, the outside connecting-bar causing the other rod to move also in the same direction. As either of the rods is moved outward, and the same end of the cylinder drops by the weight of the piston, the outer end of said rod is caught under a swinging weight, and the cylinder is thus held in that position until the piston is forced to the other end of the cylinder and strikes against the other rod, throwing that out under the weight; and so on, as each rod is thrown out the other is withdrawn from under its weight, and the cylinder is free to change its position.

That others skilled in the art may be able to make and use my invention, I will proceed to describe its construction and operation.

In the drawing, A represents the cylinder, having the water-ways *w* therein extending upon one side, from each end, to and into the middle projection or hub F, as shown in dotted lines in Fig. 9, and opening out at the face of said hub, to which hub is secured the valve F′, by screws or bolts passing through the flange *a*. The valve is shown more in detail in Figs. 2 and 3, in which *f* is the working-face of the part F′, having an annular flange, *b*, at or near its outer edge, and the ports *e* extending directly through it; and these ports should coincide in form and position upon the back, at *f″*, with the form and position of the openings in the hub F, and the ports upon the face *f* of the valve should be similar in form and position to that shown at *e* in Fig. 2. The block E may be rectangular in its general form, or of any other desirable shape, and upon one side thereof is formed the circular face *f′*, made to fit closely the face *f* upon the part F′ inside the annular flange *b*. Through the block E are made the ports e^2, e^3, e^4, and e^5, the space between the two ports e^2 and e^5 being sufficient to completely cover one of the ports *e*, and the space between the ports e^3 and e^4 being suffi-

cient to cover the other port *e* when the cylinder is placed in a horizontal position. The two ports e^2 and e^3 extend inward and upward toward each other, and, uniting, form the orifice *d* at the other side of the block, as shown in Figs. 6 and 7, and the two ports e^4 and e^5 extend inward toward each other, and downward, uniting and forming the lower orifice *d'*, and the block *e* is secured in an upright position to the frame C by bolts, or in any other desirable manner. The space between the two upper ports e^2 and e^3 might be cut away, so that the upper orifice *d* should extend in width from the point e^2 to the point e^3, uniting both said ports in one larger one, and the lower space upon the face *f* might be similarly treated; but I prefer to have the orifices divided as described, in order to give a better and larger bearing-surface upon the face *f'*; and also that the packing of leather or other suitable material placed between the faces *f* and *f'* may wear as smoothly as possible. The cylinder-heads A' are made with the piece or stop *k* upon each projecting inward to that point at which it is desired that the piston should complete its stroke. A cavity or recess, *n*, is made in the central part of the cylinder-head, and a packing-nut, *k'*, is made to turn in from the outside against the shoulder *r*, so that the outer edge of the diaphragm *n'* is held firmly between the inner end of said nut and the shoulder *r*. Both the packing-nut and the part *k* have a central hole therein, through which passes the rod *g*, one at each end of the cylinder, which rod has a collar, *s''*, thereon, and the diaphragm *n'* is perforated at the center, so that the rod may pass through, bringing the diaphragm up against the collar *s''*, and the nut *s'* is turned up tightly against the diaphragm, so that the diaphragm is firmly held, at the center, between the nut *s'* and the collar *s''*, and will move to and fro with the rod, while the outer edge of the diaphragm is held firmly against the shoulder *r*. The small nut *s'* finds a bearing at the recess *s* when its rod *g* is out, and the collar *s''* finds a bearing at the recess *s* in the part *k* when the rod is in. Instead of the collar *s''* and nut *s'* being made separate, and placed upon the rod, the rod might be made in two parts, with a threaded hole in one end of one part, and a threaded projection upon one end of the other part; and the two parts, somewhat enlarged at these ends, to hold the diaphragm more firmly, could be screwed together tightly, with the central part of the diaphragm between. This equivalent arrangement is shown clearly in Fig. 11. If it should not be deemed desirable to use the diaphragm it may be omitted, together with the collar *s''* and nut *s'*, the rod *g* be made of the same diameter throughout, and smooth, and the cavity *n* filled with any suitable packing material, with the packing-nut turned in against it, forming a common stuffing-box, filled and used in the ordinary manner. The shifting-bar *i* extends from one end of the cylinder to the other, upon the outside, and, in order that said bar may be rigid and free from any tendency to spring, I prefer that it should completely encircle the cylinder longitudinally, although it may be successfully used only upon one side; and this bar *i* is connected at each end, outside the cylinder, to the rod *g*, preferably by having a screw-thread made upon the rod, near the outer end, and a hole made in the bar at *i''*, through which the rod *g* is inserted, and the two nuts *g'*, one upon each side of the bar, turned up tightly against it. These rods *g*, one at each end of the cylinder, are thus secured to the bar *i* in such manner and position that when one rod with its diaphragm *n'* is at the extreme outer end of its stroke the other rod with its diaphragm *n'* is at the extreme inner end of its stroke, and vice versa. The outer end of the rod *g* projects a little beyond the end of the bar *i*, and the upright K having the weight K' pivoted thereto is placed at the proper distance from the end of the rod, so that when the rod *g* makes its outward stroke and that end of the cylinder is down the pointed end of the weight will hang just over the end of the rod, as shown in Fig. 9; and the weight K' is limited in its inward movement by a pin, *u*, striking against the upright K, or by a stop, *v*, at the upper end of the upright, or in any other convenient manner. The bar *i* may be held in an inclined position by means of one or more projections or guides, E', placed upon the cylinder or its flange. The piston I is made with two cup-leathers, *o*, each with its open end toward the end of the cylinder, said piston or weight being made with a middle plate, I^2, and two other plates, I^1 and I^3, one on each side of the plate I^2, with the cup-leathers between, and all secured together by a bolt, *m*, one end of which has a head thereon and the other passing through two of the plates and the cup-leathers and into a threaded hole made in one of the outside plates. By this construction of the piston I avoid a central perforation entirely through it, and also avoid any consequent necessity for packing the same to prevent any leakage of water through from one side of the piston to the other.

In very large or extraordinary-sized meters, where the weight of the piston is considerable, it might be desirable to give the piston some support, in order that the axes of the cylinder and the piston might more nearly correspond; and for this purpose I should cast the lugs or projections H upon the outside of each outside plate in pairs, and then making a recess, *h'*, in each pair, place in the rollers *h*, which should have their journals bearing in said recesses. If these rollers should be put in place as the piston is inserted in the cylinder they would remain in place without any fastening, as the size of the cylinder would keep them secure and would roll along its inside surface as the piston moved to and fro therein. I do not, however, consider these rollers necessary even in quite large meters, as the pressure of the water is so even and regular that the pis-

ton will move sufficiently true without the assistance of the rollers. The cylinder is suspended so that it will tilt or oscillate by placing the two faces *f* and *f'* of the valve and its block together and turning the pointed screw D' into its recess in the part D, and the valve is made sufficiently tight and its friction regulated by turning said pointed screw either in or out.

Instead of having the rod *g* move into the part *k* as the piston presses against it and the end of the part *k* stopping the movement of the piston, it is evident that the rod *g* might stop the piston by one of the collars or nuts upon said rod striking against the inner end of the packing-nut *k'*, but such action might tend to work the packing-nut loose or derange other parts, and I prefer to use the stop *k* or a similar projection from the cylinder-head.

Having thus described the construction of my invention, I will proceed to describe its operation. One end of the cylinder being tilted down so that the end of the rod is under the latch or weight K' one of the ports *e* in the part F' coincides with the port e^5 in the block E while the other port *e* coincides with the port e^3. The water then being admitted at the inlet *d'* it passes in at the port e^5 and through the water-way *w* inside to the lower end of the cylinder, forcing the piston along to the upper end of the cylinder, the water which is in front of the piston as it moves being forced out the other water-way and through the port e^3 out at the outlet *d*. When the piston approaches the upper end of the cylinder it strikes against the inner end of the rod *g* and forces it out until the piston reaches the part *k*, where its movement is stopped. As the rod *g* is thus moved out the bar *i* is moved also, and the other rod *g*, to which it is attached, is thus moved in and its outer end withdrawn from under the latch K'. The piston then in the upper extreme end of the cylinder, by its own weight, causes that end of the cylinder to fall, and the rod *g* as it falls is caught beneath the swinging-latch K' at that end of the cylinder, and it is held in that inclined or tilted position. The port *e* in the part F, which before was the outlet, now becomes the inlet and coincides with the port e^4 in the part E, and the other port *e* coincides with the port e^2 and the water passes in through the port e^4 and water-way *w* to the lower end of the cylinder, forcing the piston back again, the water with which the cylinder is filled in front of the piston passing out through the water-way *w* in the upper end of the cylinder and out through the port e^2 and outlet *d;* and the machine thus continues its oscillating movement as long as the water is permitted to pass in at the orifice *d'* and out at the orifice *d*.

I am aware that oscillating cylinders have heretofore been used for the purpose of measuring liquids, and I do not claim the same nor any part thereof, as the device herein described differs very materially in construction, arrangement, and operation from those heretofore used, for it will be seen that I dispense with the great amount of friction unavoidably occasioned by the moving of a perforated packed piston upon a rod and do away with all necessity of packing the piston when perforated for that purpose, and the machine is otherwise rendered much more simple in its construction, and is also cheaper and more durable, and is very much more accurate in its results, and if repairs are necessary all its parts are easily removed and put together.

The construction of the valve as herein described, which controls the passage of the water through the meter, is also calculated to give the least amount of friction and wear with the most successful and accurate operations of the machine, and will last very much longer in practical operation than any arrangement of a ground-in cock or a plug operating within a shell.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. I claim the combination of the diaphragms *n'*, the end rods *g*, the cylinder-heads A', packing-nuts *k'*, and connecting-bar *i*, all constructed and arranged substantially as described.

2. I claim the interior guide-piece or projection *k*, in connection with the rods *g*, bar *i*, and latch K', for the purpose of changing the position of the cylinder at the instant the piston has finished its stroke, substantially as herein described.

3. I claim, in the said tilting meter, the rods *g*, one in each end of the cylinder, in combination with the connecting-bar *i*, constructed and operating substantially as described.

THEODORE A. CURTIS.

Witnesses:
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E. O. BARNEY.

(82)