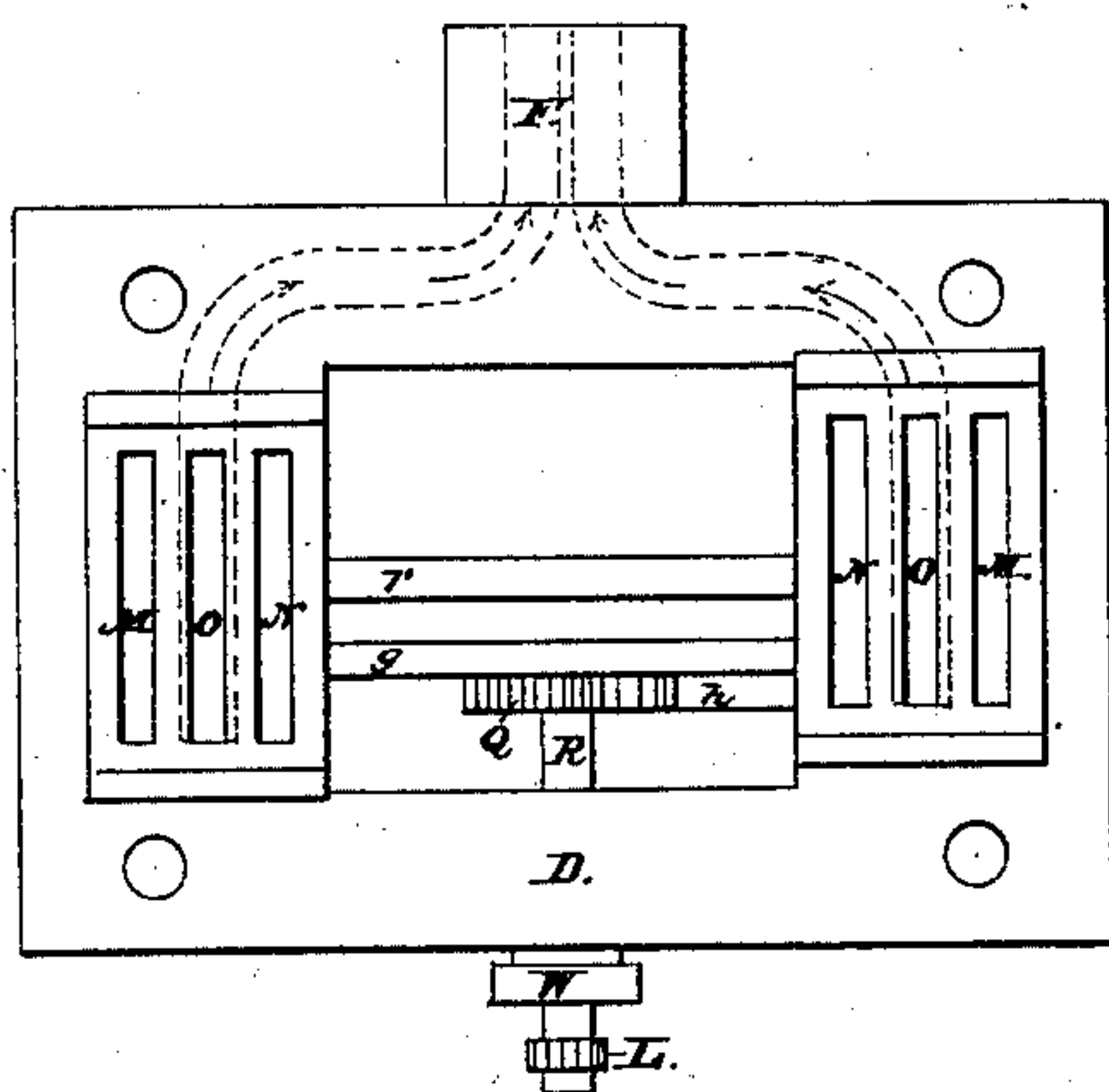


*W.C. Perrine,*  
*Diaphragm Meter.*

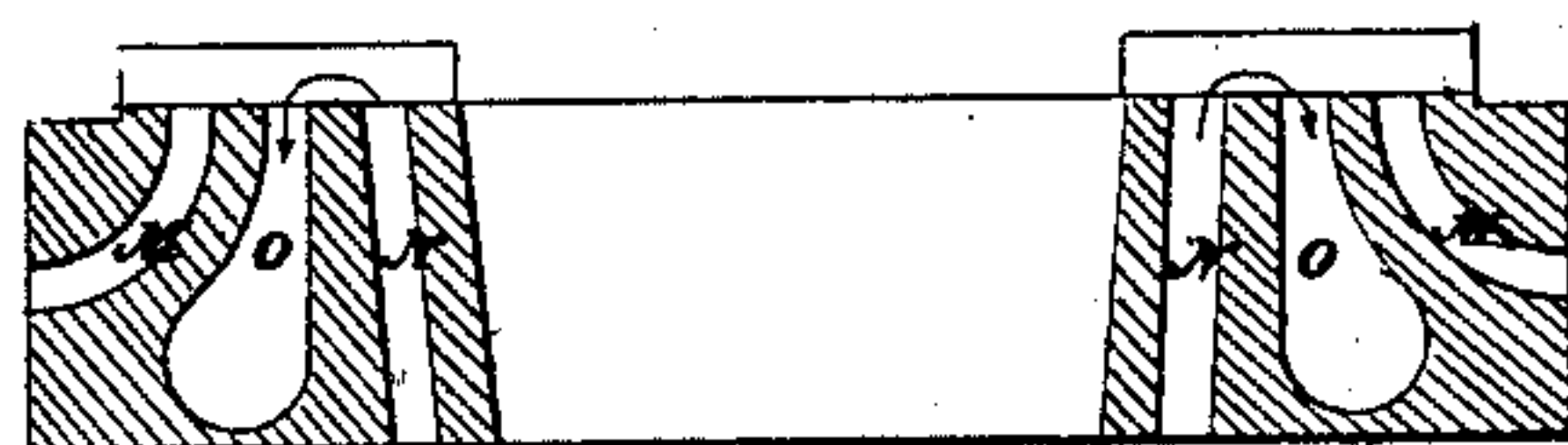
*N<sup>o</sup> 20,169.*

*Patented May 4, 1858.*

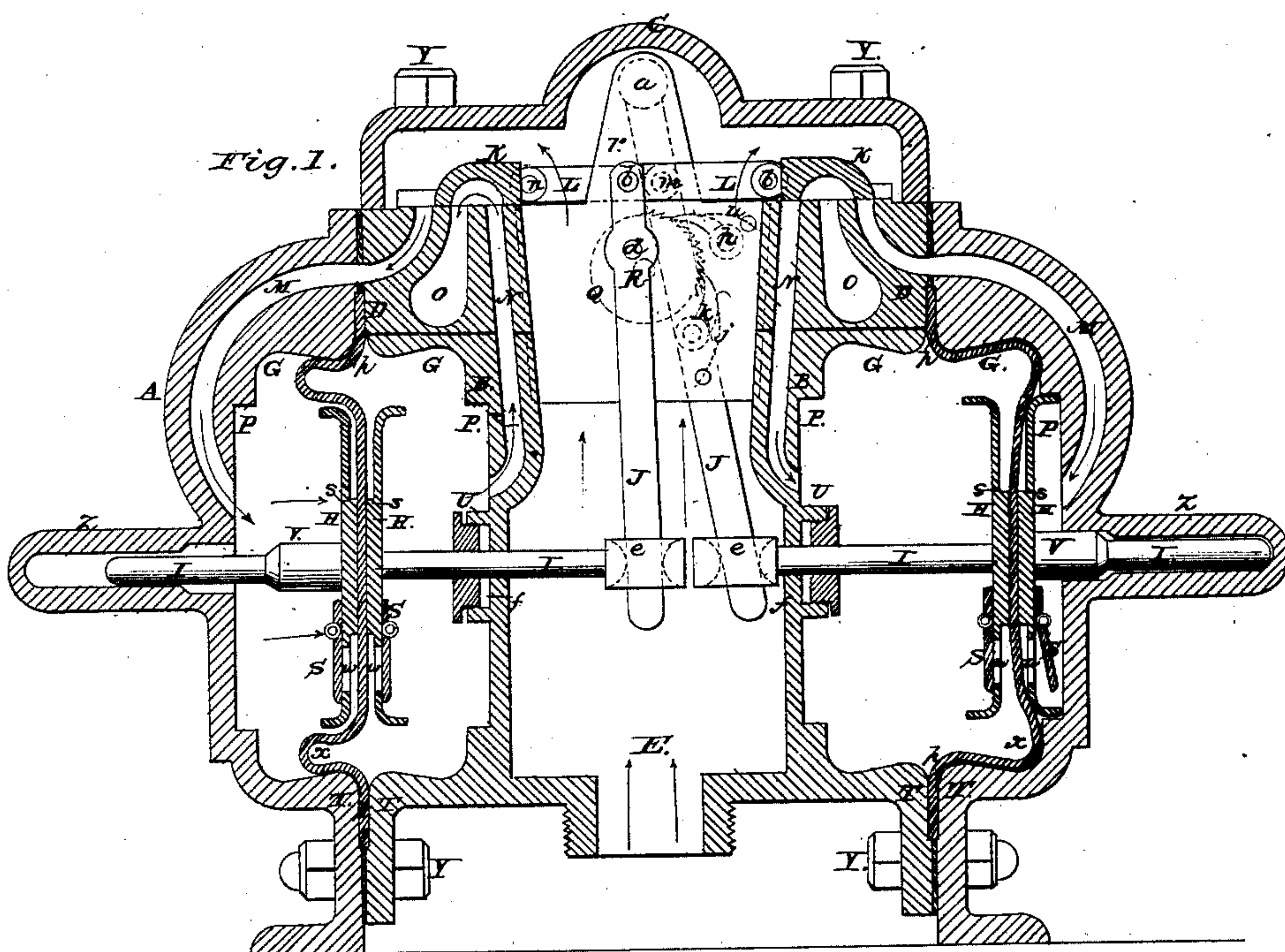
*Fig. 2.*



*Fig. 3.*



*Fig. 1.*





# UNITED STATES PATENT OFFICE.

WILLIAM C. PERRINE, OF NEW YORK, N. Y.

## IMPROVEMENT IN FLUID-METERS.

Specification forming part of Letters Patent No. 20,169, dated May 4, 1858.

*To all whom it may concern:*

Be it known that I, WILLIAM C. PERRINE, of the city, county, and State of New York, have invented certain new and useful Improvements in Diaphragm Fluid-Meters; and I do hereby declare that the same are described and represented in the following specification and drawings.

To enable others skilled in the art to make and use my improvements, I will proceed to describe their construction and operation, referring to the drawings, in which the same letters indicate like parts in each of the figures.

Figure 1 is a section of a meter with my improvements. Fig. 2 is a plan of the plate upon which the valves traverse, and Fig. 3 is a section of said plate.

The nature of my invention and improvements in diaphragm fluid-meters consists in making the measuring-chambers gradually larger in each direction from near the middle where the exterior edge of the diaphragm is fastened, so that the diaphragm will be held by the water, or remain in contact with the part so enlarged until it is drawn away by the plates or center of the diaphragm; also in making some recesses in the ends of the measuring-chambers for the plates on the diaphragm to work into as the meter is operated, and in making some openings in the plates on the diaphragm or in some other part of the meter to effect the same purpose, and providing such openings with valves; also in making recesses in the flanges that hold the diaphragm, so as to allow it to vibrate a very little between the measuring-chamber and the line where it is bound or held by the flanges.

Several diaphragm-meters for fluids have been essayed, some of which may have worked poorly for a while, but at a great expense in supplying new diaphragms and with great loss in the pressure of the fluid measured, as these meters required so large an expenditure of the pressure of the fluid measured to operate them.

My improvements have so far obviated and overcome the defects of the previous ones as to make it the most perfect meter of its kind ever invented, as it is operated with far less power than any other and at less expense for diaphragms.

In the accompanying drawings, A A are the ends, made of cast metal in the form shown,

or in such other form as will answer the purpose, and fastened to the center piece, B B, and valve-plate D D by bolts, two of which are seen at Y Y in the lower part of Fig. 1.

C is the top plate, made in the form shown, and fastened to the other parts by the bolts Y Y at the top of Fig. 1. There is a circular cavity, G, in the inside of each of the ends A A, and a similar cavity in each side of the center piece, B, to correspond with those in the ends to form the measuring-chambers G G and G G.

The edges of the diaphragms H H, made of leather or some other flexible material, are clamped between the flanges T T of the ends and center piece and the valve-plate D, so as to leave the middle of the diaphragm to work freely in the measuring-chambers G G. The parts opposite to each other on each side of the diaphragm around the chambers G G are cut away for a space about three-fourths of an inch wide, so as to make a rabbet forming the recess *p* a little wider than the thickness of the diaphragm, so as to allow it, the diaphragm, to vibrate a very little in the recess *p*, between the measuring-chamber and the line where the diaphragm is clamped and held by the flanges.

The edges of the diaphragms serve to pack the joints between the ends and central parts of the meter. The corners where the recesses *p* join the chambers are rounded off with a gentle curve, as shown in the drawings, so that the diaphragm may bend very gradually over them, and the chambers are gradually enlarged in each direction from the curves which round off the corners above mentioned, as shown in the drawings, making each half of the chamber somewhat in the form of a dovetail, with the extreme corners in each direction rounded or hollowed, so as to form a *cyma reversa* with the curves of the corners next to the recess *p*.

The object and purpose of enlarging the chambers in each direction from the middle, so as to make them dovetailing, are that when the diaphragm is carried into either side of the chamber by the water it braces itself around the dovetailing form of the chamber, so that when the water is let in on the opposite side of the diaphragm it presses the center of the diaphragm away from the side of the chamber first, because it moves easiest—be-



cause it is not braced, as it is around the dovetailing part. Therefore the center of diaphragm moves first and draws the exterior or outer portion after it, as shown in the left-hand chamber of the drawings, where the diaphragm is shown as being drawn away from the dovetailing or enlarged portion of the chamber. The effect of this construction and arrangement is to relieve the diaphragm of a great portion of the strain or pressure and wear in the operation of the meter, so that it will last a long time and be very durable.

In the diaphragm meters heretofore made, to the best of my knowledge, the exterior portion of the diaphragm is moved first and draws the center after it, so that a considerable power (far more than is necessary in mine) is required to operate them, and the diaphragms soon break away under the pressure and have to be renewed.

In order the more certainly to compel the water, when it enters the measuring-chambers, to move the centers of the diaphragms first, I fasten the circular plates *H H* each side of the centers of the diaphragms, and upon the traverse-rods *I I*, which rods are arranged in the tubes *Z Z* on the ends, and in the stuffing-boxes *U U* on the central plates, *f f*, so as to traverse freely, being operated by the pressure of the water on the plates *H H* and diaphragms. The tubes *z z* may have grooves in them, or there may be grooves in the rods *I I*, or flat plates on their sides for channels for the water to pass into and out of the tubes by the sides of the rods, so as not to resist or impede the motion of the rods or diaphragms.

The plates *H H* are made in the form shown in the drawings, or in such other form as will answer the purpose, and provided with hubs *s s* on the sides next to the diaphragms, so that the water may pass in freely by the sides of the diaphragms to the openings *w w* through the plates. The edges of these plates are turned over, as shown in the drawings, and fitted to enter freely into the recesses *P P* in the sides of the chambers, so that when the edge of the plate enters the recess *P* most of the water on that side of the diaphragm in the chamber has to pass through the small opening *w*, so that the motion of the water escaping from one side and entering on the other side of the diaphragm, and also the motion of the traverse-rod is gradually reduced until it ceases entirely, and the valve *k* changes, so that the motion of the water assumes the opposite direction and closes the valve *s* and forces the plate out of the recess. A pipe to supply the meter with fluid may be applied at *E*, and the fluid passes up through the middle of the meter between the plates *f f*, and through the middle of the valve-plate *D* into the chamber over it formed by the cap *C*, and from thence through the channels *M M* to one side of each of the diaphragms, and through the channels *N N* to the other side of each of the diaphragms.

Between the openings or channels *M* and

*N* in the valve-plate there is a channel, *O*, leading to the escape-pipe *F*, as shown in Fig. 2. On the top of the valve-plate *D* there are some flanges *q q* opposite the openings *M*, *N*, and *O*, between which flanges the slide-valves *K K*, made in the form shown in the drawings, with a cavity in the under side to connect the openings *M* and *N* with *O* alternately, so as to connect the measuring-chambers with the escape-pipe *F*, to let the water pass out of the meter.

The diaphragm in each chamber operates the valve *K* for the opposite one through the traverse-rods *I I*, levers *J J*, and links *L L*, which connect the levers to the valves by the joints *b b* and *m n*, as shown in Fig. 1. The rods *I I* have slots *e e* through their ends, one of which ends should be set off in one direction and the other in the opposite, so that the ends with the slots can traverse by each other, or one behind the other, as the rods are operated. The ends of the levers *J J* work freely in the slots *e e* and vibrate on the pins *a* and *d* in the bar *r* of the valve-plate *D*, one of the levers being applied upon one side of the bar *r* and the other upon the other side. The right-hand lever *J* is connected to the left-hand valve *K* by the link *L* and joints or pins *m* and *n*, and the left-hand lever *J* to the right-hand valve *K* by the link *L* and joints or pins *b b*. By this construction and arrangement the motion communicated to one of the diaphragms by the fluid measured is made to operate the valve *K* for the supply and discharge of the opposite chamber and to operate the diaphragm in it; and it is by this mode of operation that the motion of the fluid measured is continued nearly uniform in the supply and discharge pipes *E* and *F* of the meter. The edge of the diaphragm *H*, which serves as packing between the ends and center, has a hole cut in it opposite to the channel *M*, as shown in the drawings.

If for any cause it should be desirable to dispense with the openings *w* in the plates *H*, some holes may be made through that portion of the end opposite the letter *G* from the chamber into the channel *M* and a valve applied in the channel, which hole and valve will serve as a substitute for the opening *w* and valve *S*.

I will now describe the apparatus that is employed to register the quantity of water or fluid that passes through the meter, which consists of the shaft *R*, fitted to turn in proper bearings in the bar *g* and plate *D*, and the fluid is prevented from escaping around the shaft by the packing-box *W*, Fig. 2. The ratchet-wheel *Q* is fastened to this shaft *R*, and is acted upon by the pawl *k*, which is moved by the lever *J*, so as to turn the wheel and shaft, the pawl being pressed against the wheel by the spring *j*, which is also fastened to the lever. The pawl *k* vibrates on a pin in the bar *g*, and is pressed against the wheel *Q* by the spring *u*, so as to prevent the wheel from being turned back by the pawl *k*. The shaft *R* extends through the stuffing-box *W*, and may have a



pinion, L, or a screw applied to it to operate such a registering or recording apparatus as may be preferred.

I contemplate that skillful artisans may modify the improvements which I have invented so as to adapt them to the circumstances in which they wish to use them without evading the merits or principles of their construction.

I believe I have described and represented the improvements which I have made in diaphragm fluid-meters so as to enable any person skilled in the art to make and use them. I will now state what I desire to secure by Letters Patent, to wit:

I claim—

1. Making the measuring-chambers gradually larger in each direction from near the middle, where the exterior edges of the diaphragms are fastened, substantially as described, so that the diaphragm will be held by the water or remain in contact with the part

so enlarged until it is drawn away by the center of the diaphragm or by the plates which move and traverse with the center of the diaphragm.

2. The recesses P P in the ends of the measuring-chambers, in combination with the plates H H, arranged to work into them, (the said recesses.)

3. The openings *ww* in the plates H H, provided with valves or such equivalent openings as will answer the same purpose.

4. Making recesses *pp* with their sides parallel in the flanges T T, so that that portion of the diaphragm in or opposite to said recesses may vibrate a very little between the measuring-chamber and the line, where it is bound or held firmly by the flanges.

WILLIAM C. PERRINE.

Witnesses:

J. DENNIS, Jr.,

JOHN HOLLINGSHEAD.