(No Model.)

4 Sheets—Sheet 1.

L. H. NASH.

OSCILLATING WATER METER.

No. 353,699. Patented Dec. 7, 1886.

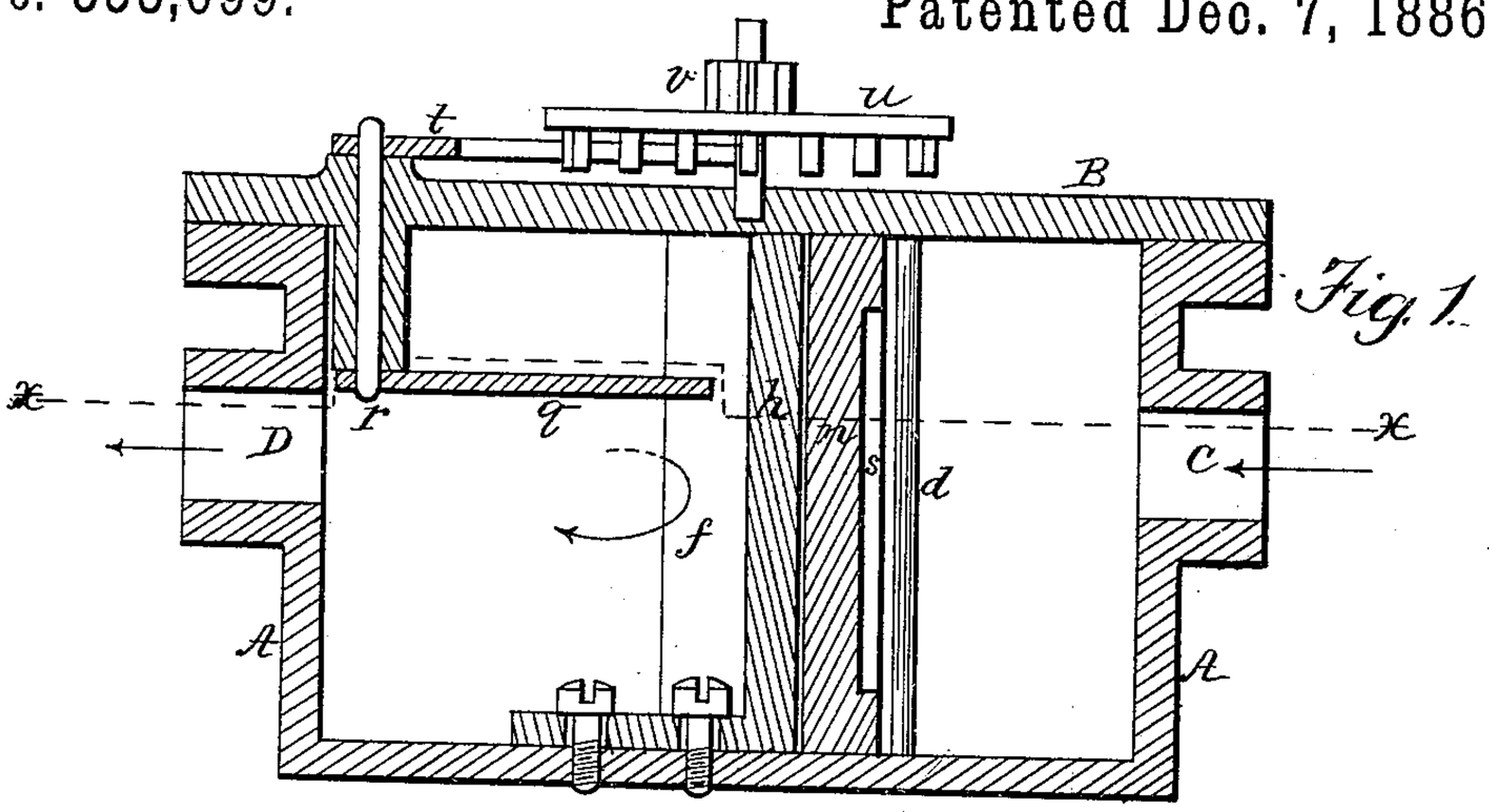
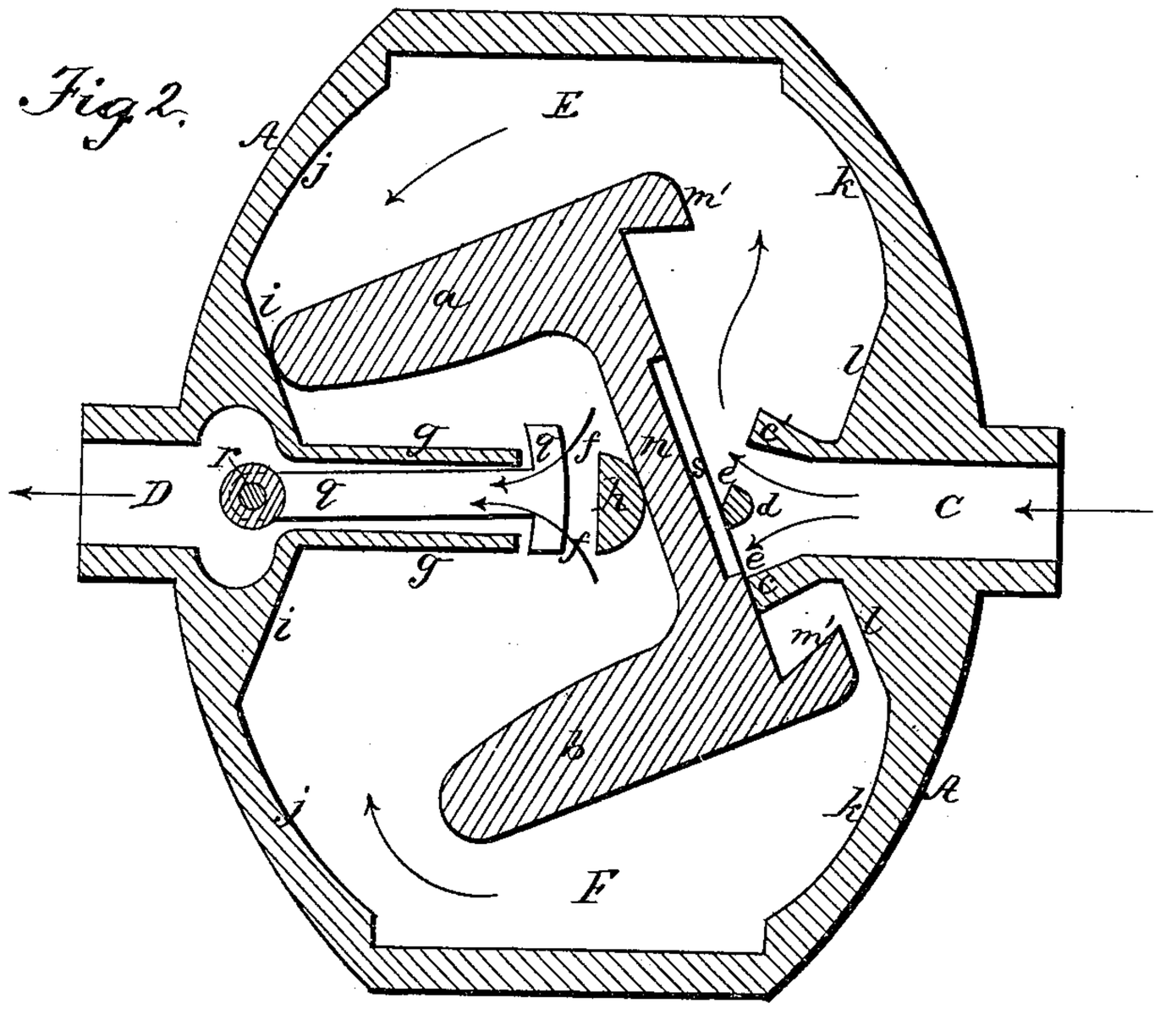


Fig. 1.

Fig 2.



WITNESSES

Bessie P. Johnson.
R. C. Grant

INVENTOR

Lewis Hallock Nash
by Johnson and Johnson
Attorneys.

(No Model.)

4 Sheets—Sheet 2.

L. H. NASH.

OSCILLATING WATER METER.

No. 353,699. Patented Dec. 7, 1886.

Fig. 3.

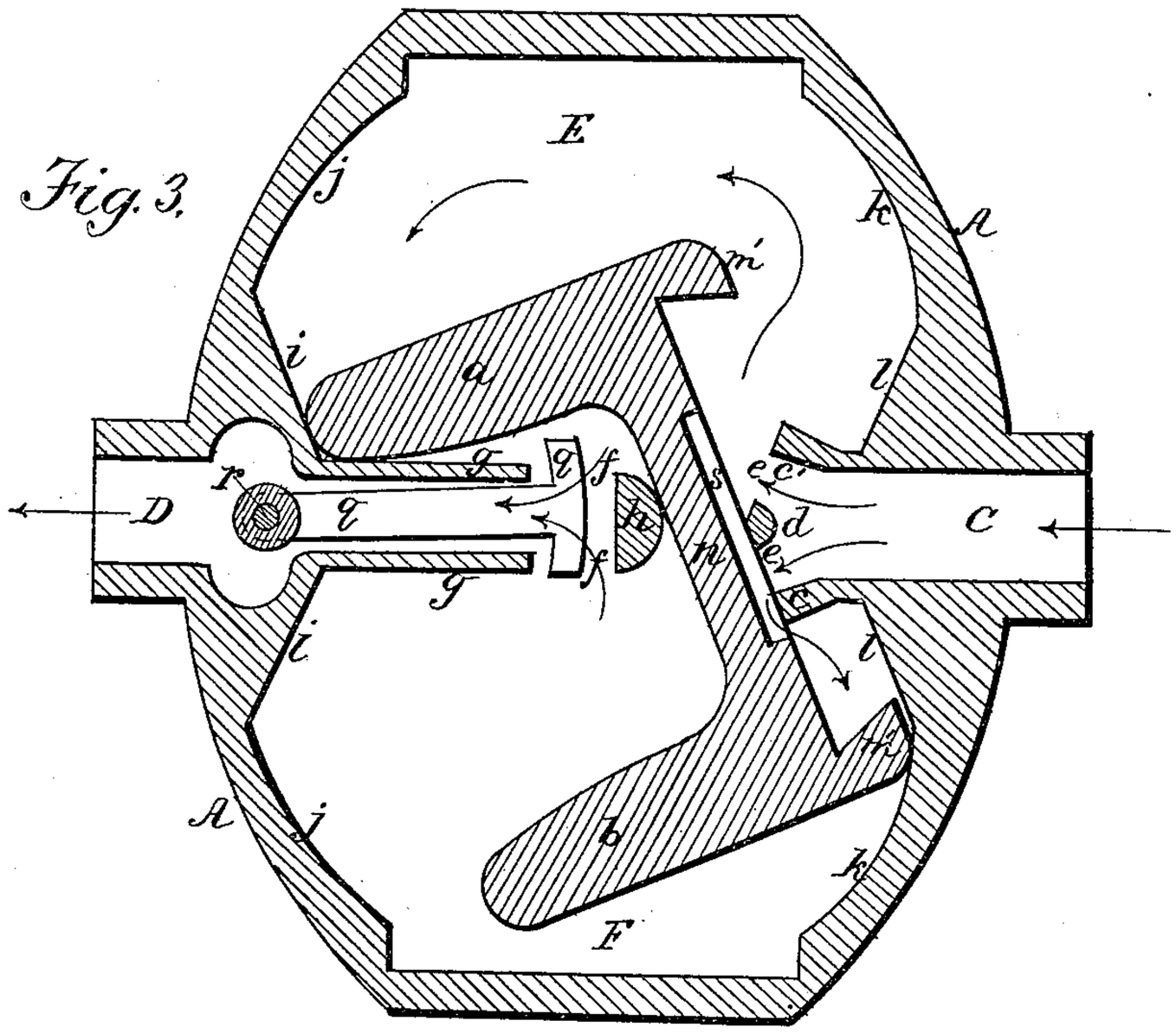
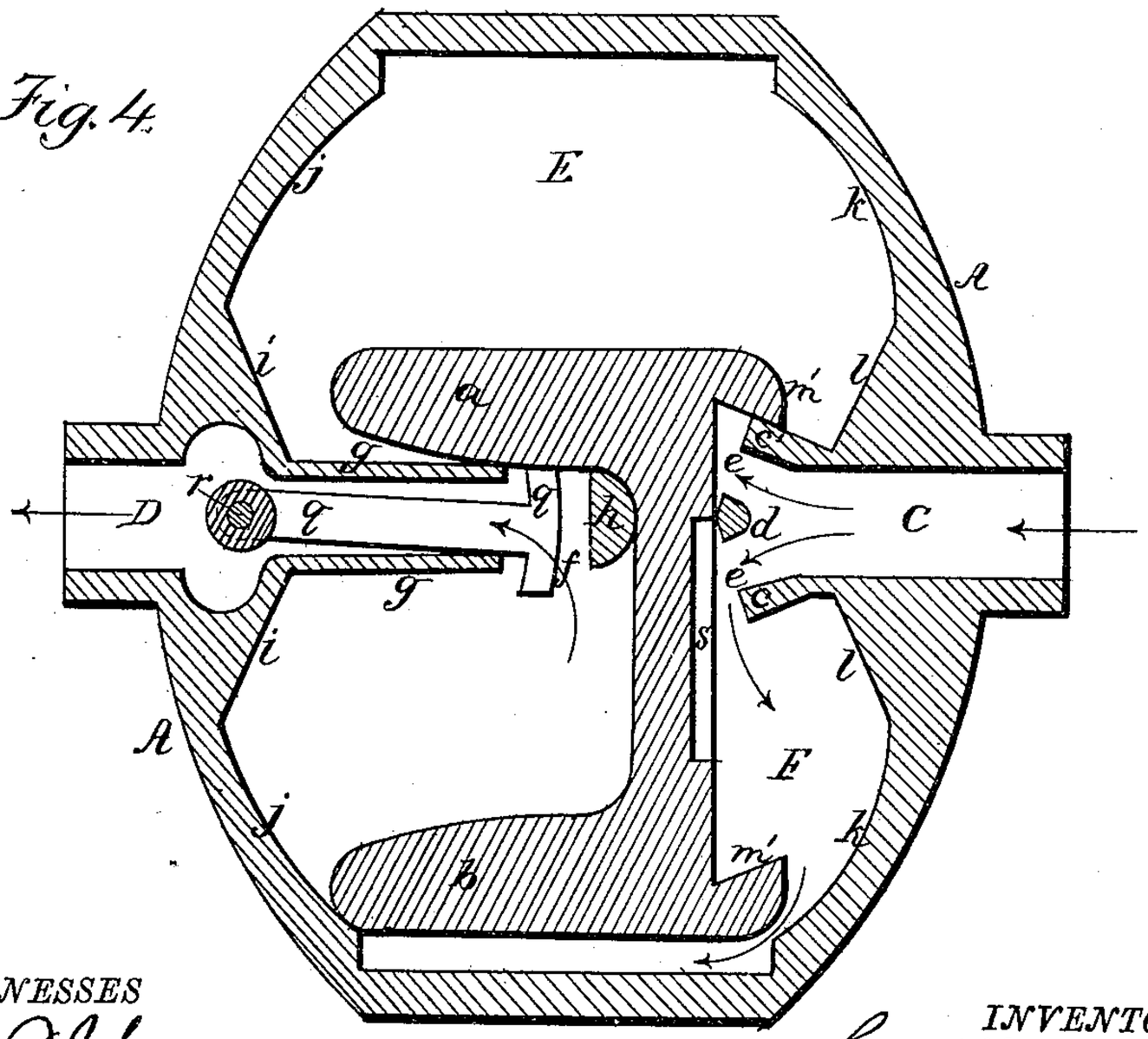


Fig. 4.



WITNESSES

Bessie B. Johnson

R. E. Grant

INVENTOR

Lewis Hallock Nash

by Johnson and Johnson

Attorneys.

(No Model.)

4 Sheets—Sheet 3

L. H. NASH.

OSCILLATING WATER METER.

No. 353,699. Patented Dec. 7, 1886.

Fig. 5.

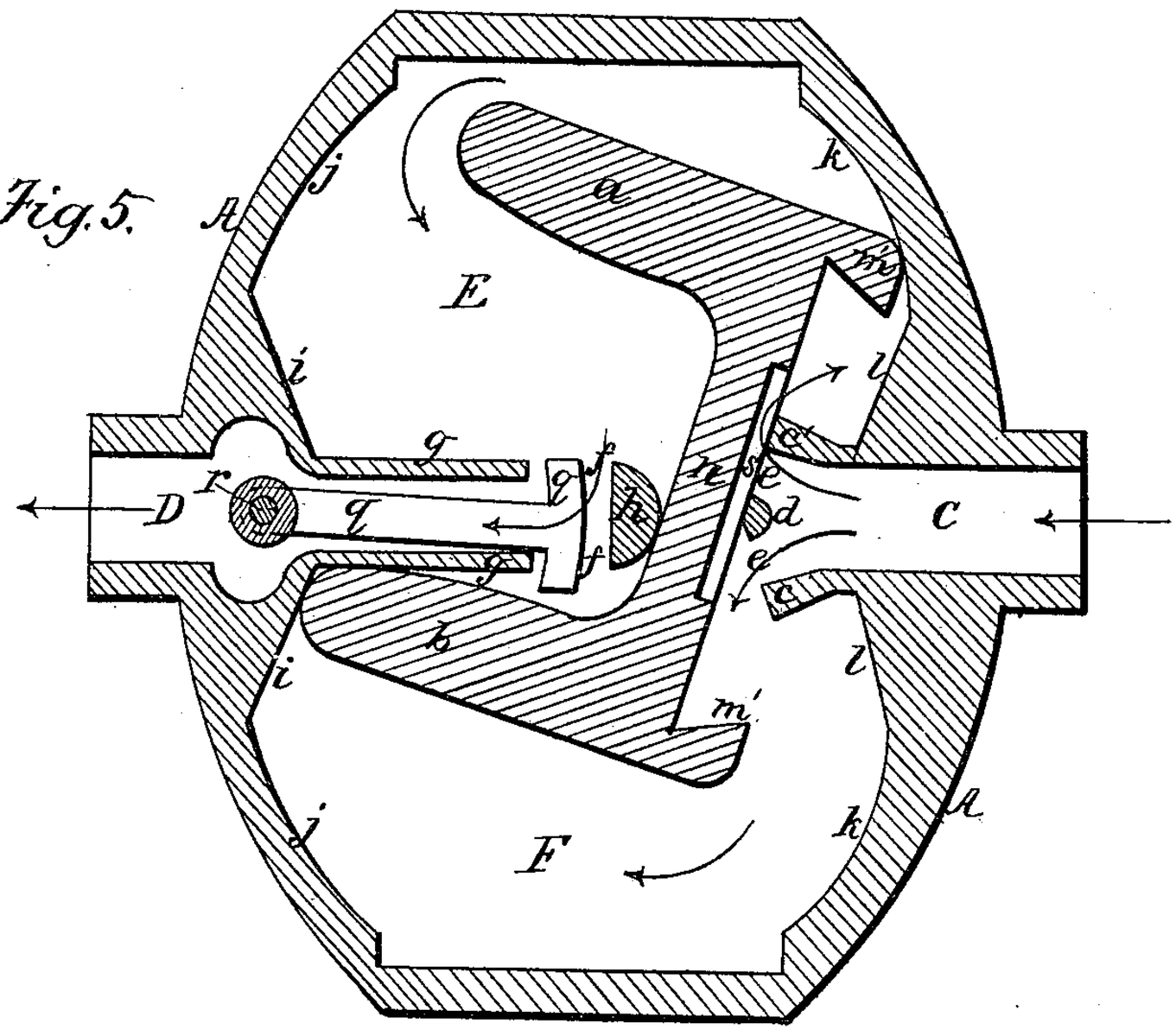
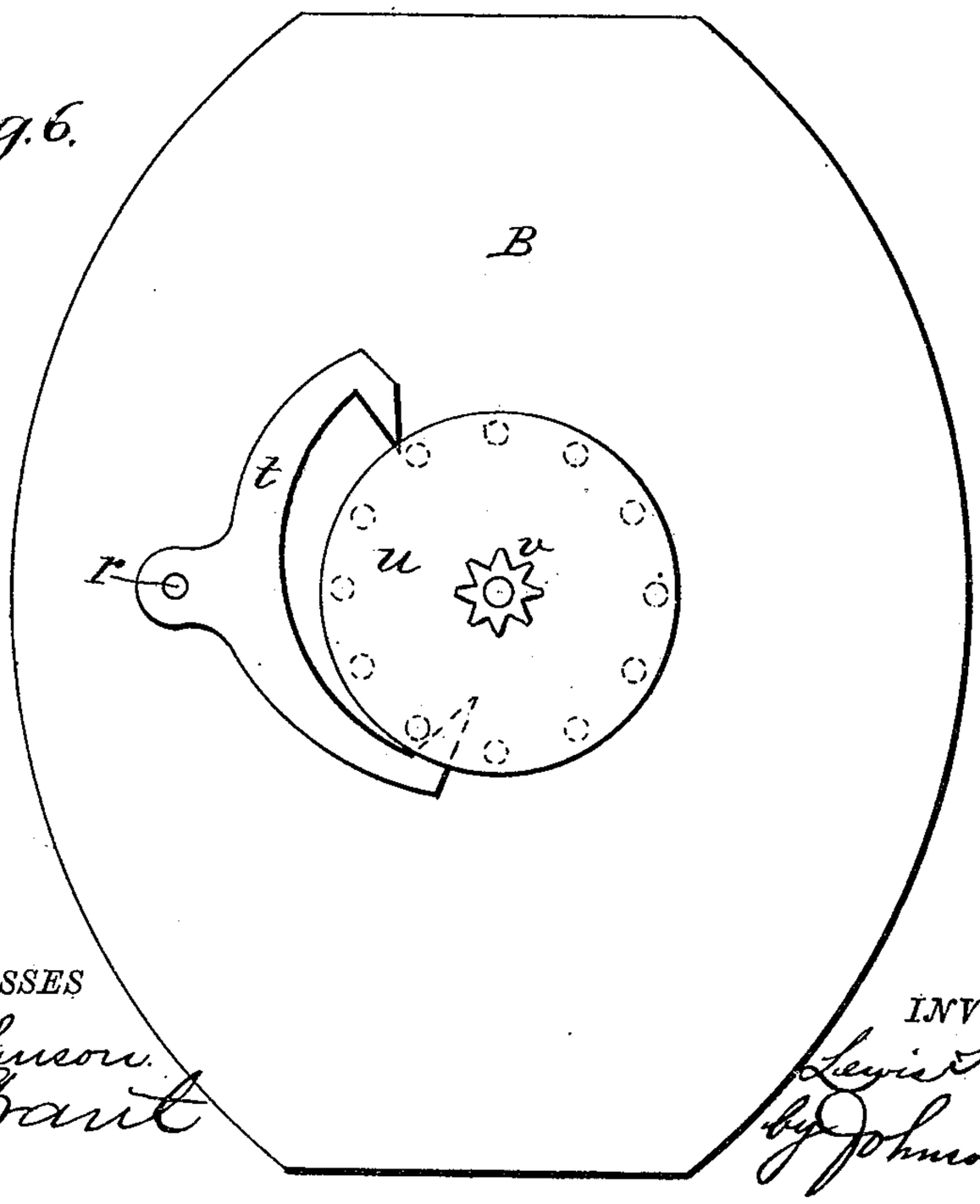


Fig. 6.



WITNESSES

Bessie P. Johnson.
R. E. Grant

INVENTOR

Lewis Hallock Nash
by Johnson and Johnson
Attorneys.

(No Model.) 4 Sheets—Sheet 4.

L. H. NASH.

OSCILLATING WATER METER.

No. 353,699. Patented Dec. 7, 1886.

Fig. 7.

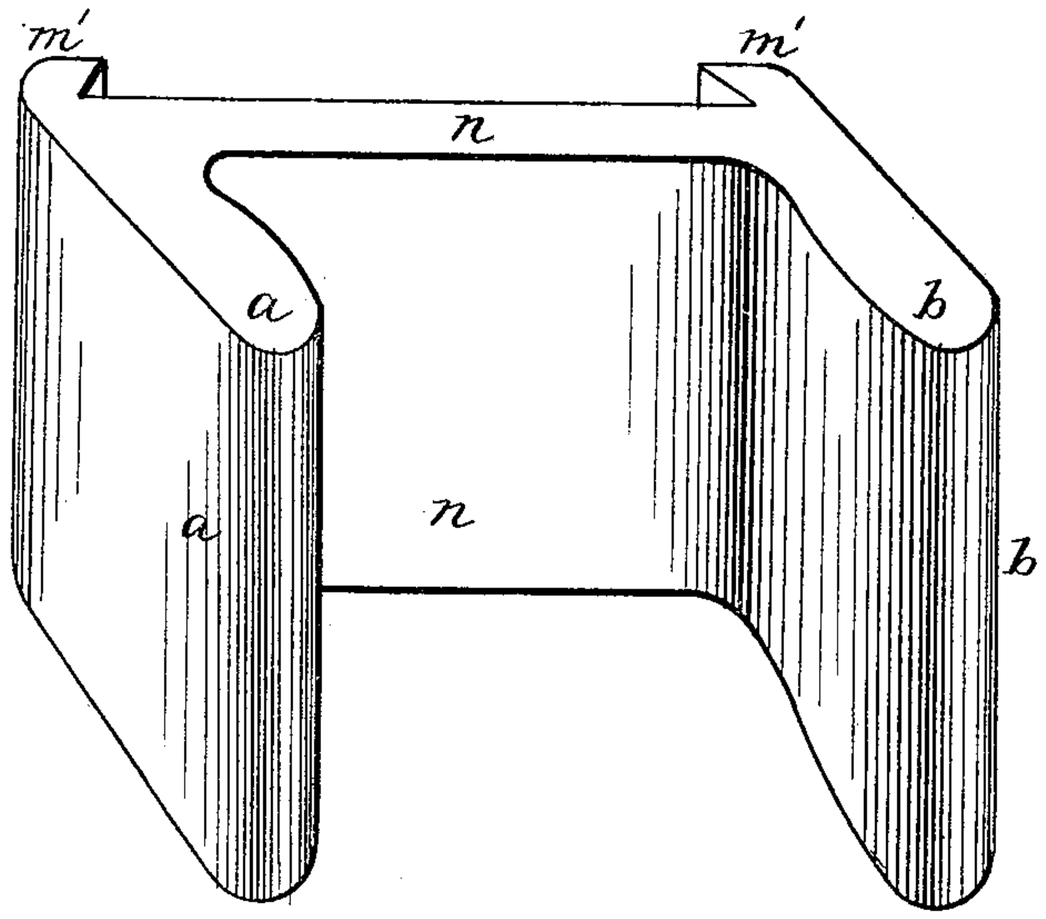
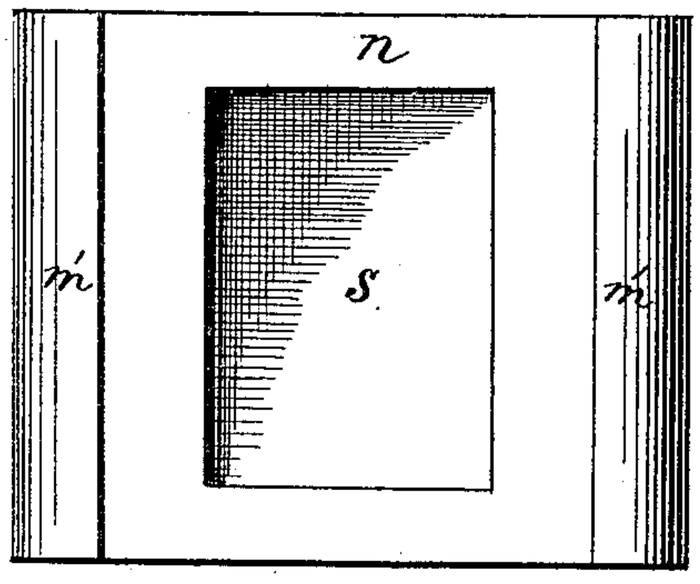


Fig. 8.



WITNESSES

Bessie B. Johnson.

R. E. Grant

INVENTOR

Lewis Hallock Nash

by Johnson and Johnson

Attorneys.

UNITED STATES PATENT OFFICE.

LEWIS HALLOCK NASH, OF BROOKLYN, ASSIGNOR TO THE NATIONAL METER COMPANY, OF NEW YORK, N. Y.

OSCILLATING WATER-METER.

SPECIFICATION forming part of Letters Patent No. 353,699, dated December 7, 1886.

Application filed September 22, 1885. Serial No. 177,846. (No model.)

To all whom it may concern:

Be it known that I, LEWIS HALLOCK NASH, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Oscillating Water-Meters, of which the following is a specification.

My invention relates to water-meters in which an oscillating piston is employed to divide the chamber of a case into measuring-chambers, which are made receiving and discharging by the movement of said piston over and upon an interior abutment of the case, which serves as a guide in connection with the walls of the case to control the dividing function of said piston.

While I use a piston having an oscillating movement, as stated, yet I employ a piston of novel construction, and have so organized it for operation in its case that the pressure of the flow alone causes it to move in an orbit unlike other oscillating pistons in contact with the chamber-walls, and maintain a joint-forming contact therewith without depending upon any positive controlling connection of the piston with the case. The path which my new piston describes is defined by a reciprocating movement between guides, terminating in a swinging movement upon and between the same guides, as contradistinguished from a piston having a continuous movement in curved lines, as in my patents of June 17, 1884, and June 23, 1885. This compound movement of the piston is effected by the peculiar form of the piston and of the inclosing-case. For this purpose I use a piston having the form of the cross-section of a trough of right-angled sides. The inner and the outer walls of the bottom of the trough form the bearings for its reciprocating movement, as stated, while the sides of the trough form the pistons proper in its dividing and measuring function.

My invention embraces improvements in the case and in the piston, and in their co-operating action, which I shall now describe, reference being had to the accompanying drawings, in which—

Figure 1 represents a vertical section of a water-meter, showing the register-connecting mechanism. Figs. 2, 3, 4, and 5 show horizontal sections on line *x x* of Fig. 1, showing the piston in the different positions of its movements in dividing the case, as stated. Fig. 6 shows the register-operating connection with the register mechanism at the top of the case. Fig. 7 represents the piston in perspective, and Fig. 8 the recessed side of the piston.

The case A is preferably of a single casting, having a cover, B, through which the register-connections pass, and the case has the usual inlet and outlet passages, C and D. The walls of these passages extend within the chamber of the case in a manner to form abutments extending from the opposite walls of the chamber for dividing the latter into two measuring-chambers, in each of which the pistons proper, *a b*, operate to divide them into receiving and discharging spaces. The abutment which extends from the inlet side is the mouth of the inlet, and its side walls form end bearings, *c c'*, between which is a central guiding-bar, *d*, forming an inlet-passage, *e*, leading to each piston-chamber. The abutment which extends from the outlet side also forms the mouth of the outlet, and has a length greater than the first-described abutment, but, like the latter, forms inlet-passages *f f* from each chamber. The opposite sides of this abutment form bearings *g* for the pistons *a b* in the movements of the latter, as I shall hereinafter describe. Between these abutments, and forming the end of the inner end of the hollow outlet-abutment, is placed a bar, *h*, extending from head to head of the case, and having a curved bearing-surface for the piston. This bearing-bar I prefer to make adjustable to take up the wear of the piston, which is constantly pressed against its bearing side by the inflow.

The interior wall of the case on each side of the outlet-abutment is formed with a straight surface, *i*, of sufficient length to control the rectilinear movements of the piston, and from these straight surfaces the wall terminates in curved portions *j*, for controlling the swinging movements of the piston at the reversing of the stroke thereof. At the inlet-abutment these corresponding portions of the chamber-wall are of corresponding shape; but their functions, however, differ, as will be presently described. The piston, as stated, in shape re-

sembles the cross-section of a trough, and therefore consists of three sides, two of which form the pistons *a* and *b* proper, and the third the connection *n* thereof. The ends and inner walls of the pistons are preferably curved to accommodate its movement, while the inner wall of the connection *n* is preferably straight.

The outer wall of the connection *n* has joint-forming projections *m' m'* just back of the pistons, and are so formed as to make a joint upon the inlet side of the case in the operation of the piston, as I shall presently describe. These bearings should have their outer ends curved to make the joint contact with the case, while the inner of these projections are inclined inward, so as to engage and form a joint with the outwardly-inclined walls *c c'* of the abutment at the inlet side of the case. The outer wall of the piston-connecting bar *n* has a surface recess, *s*, adapted to open communication around the bearings *c c'* with the measuring-chambers more particularly at the moment when the piston begins its swinging movement.

The registration of the flow is effected by the action of the piston sides upon a lever-arm, *q*, pivoted at *r* in the outlet-passage, so that its T-shaped head stands at the mouth of the outlet-ports *f f* in position to receive the alternate action of the piston sides to vibrate said lever, which is supported on a vertical pivot-shaft, *r*, which latter thereby operates an escapement, *t*, which drives an escapement-wheel, *u*, which in turn operates the dial mechanism by means of the pinion *v*, as shown in Fig. 6. I may, however, use any other form of register connecting and operating mechanism.

The motion of the piston controls the operation of the meter as follows, viz: The piston, being in the position shown in Fig. 2, makes a joint contact at two points of the case, at *c* and at *i*, and has a bearing upon the bar *h*, closing the inlet-passage into chamber F and opening communication with the chamber E, into which the flow is directed, so that the pressure in the said chamber is upon the outer walls of all that portion of the piston which extends therein, and water from both chambers has free outlet at the ports *f f*. As seen, this pressure extends from *i* to *c*, the bar *h* serving as the fulcrum of the piston, and the leverage-arm from *h* to *i* being longer than from *h* to *c* the pressure of the inflow tends to hold the piston in contact with the case-wall at *i*, to maintain the joint contact at *c* and to drive the piston in a straight line into the chamber F, hinging its side *a* against the bearing-wall *g* of the outlet-abutment, and its joint-forming projection *m'* in contact with the curved case-wall at *k*, as shown in Fig. 3, preserving all the time the joint-forming contacts. At this moment the direction of the movement of the piston is changed from a rectilinear to a swinging movement by the point of the piston *a* resting on the wall *g*, the bearing-point *m'* in contact with the curved wall *k*, and the piston-bar *n* in contact with the bar *h*; so, having these three points of bearing, the piston's continued movement must cause it to swing to bring its piston *b* into the position shown in Fig. 4, its end bearing upon the curved side wall, *j*, and breaking its contact with *k*. At the beginning of this movement the piston surface recess *s* allows the water to flow around the bearing-point *c* into the chamber F, to produce a pressure upon the piston in the chamber F and assist the swinging movement of the piston. The piston having reached in its swinging movement the position last stated, its bearing projection *m'* makes contact with the wall *c'*, cutting off the supply of water into chamber E, and at the same time the piston side *a* opens the port *f*, allowing the water to escape through said port into the outlet-passage, while the inflow-passage C is thereby fully opened into the chamber F, driving the piston *b* in contact with the curved wall *j*, completing its swinging movement, and in contact with the straight wall *i*, completing its rectilinear movement in its return-stroke into the chamber E to the position shown in Fig. 5. In this movement the chamber F is filling, and the piston *b*, resting upon the wall *g*, is guided by its bearing-point *m'* and fulcrum *h* in its continued movement to the position shown in Fig. 2, the flow at this position of the piston entering the chamber E through the recess *s* in the piston-connecting bar. In this operation of the piston it is obvious that I may dispense with the joint-forming function of the case-bearings *c c'*, and transfer such joint-forming action to the piston projections *m' m'* and the case-walls *l l*; but in either case the piston-bar surface recess *s* is not an essential, as the water will always have free access around the surfaces *c c'* the moment the piston begins its swinging movement.

The exact interior form of the chamber-walls, which determines the path of the piston, is not essential, as it may be changed; but it is essential to my invention that the proportion of the pistons in relation to the fulcrum *h* shall be such as to hold the pistons always in contact with the case, and thus dispense with positive connections for this purpose.

While I have described the path of the piston as being in part rectilinear and in part curved, yet the rectilinear direction, while being substantially straight, may be slightly varied by slightly curving the surfaces *i i* without affecting the operation of the piston. In the division of the piston's movements it is shown as having a considerable swinging movement; but it need not have so much.

I have shown the trough form of the piston as having right-angled sides; but these piston sides may stand at angles greater or less than a right angle and make no difference in the operation.

It is not intended to claim herein a register-

connecting device consisting of a pivoted vibrating lever-arm arranged to be vibrated by a piston having an oscillating movement within communicating measuring-chambers, as such matter is made the subject of claim in an application for a patent for improvements in water-meters filed by me of even date herewith, under Serial No. 177,845.

I claim—

1. The combination, in a water-meter, of a case divided into two measuring-chambers by interior opposite wall-abutments, and having suitable interior wall-bearings, and a fulcrum placed between said abutments nearer the inlet than the outlet passage of the case, with a piston formed of two joint-forming elongated piston parts, *a b*, connected by a bearing-bar having two shorter joint-bearing end parts, *m' m'*, at the inlet side of the case, substantially as described, for the purpose specified.

2. In a water-meter, a piston adapted to have a motion in its case in a substantially right line, terminating in a swinging movement, a return motion in a similar right line, and a further swinging movement back to the point of beginning, and constructed of a bearing-bar having joint-forming piston projections at each end, in combination with a case having two measuring-chambers formed with interior wall conformations adapted to control the movements of said piston, and having inlet and outlet ports, substantially as described.

3. In a water-meter, a case having a chamber provided with inlet and outlet passages, straight and curved inner wall surfaces *i j k l*, a bearing-bar, *h*, placed nearer to the inlet-passage than to the outlet-passage, and abutment-joint forming bearings *c c' g g*, in combination with a piston having the piston sides *a b*, the connecting-bar *n*, and the projections *m' m'*, constructed and operating substantially as described.

4. The combination, in a water-meter, of the case A, having its measuring-chambers formed with interior abutments and wall conformations, substantially as described, with a piston having the elongated piston sides *a b* connected by the bar *n*, a fulcrum-bearing therefor, and register-connecting mechanism operated by the piston sides, substantially as described.

5. In a water-meter, a piston having the right-angled sides *a* and *b*, and having the projections *m' m'*, in combination with a case having a fulcrum-bearing for said piston, a guide-bearing, inlet and outlet ports, and interior straight and curved wall conformations, substantially as described, for the purpose specified.

6. In a water-meter, a case having a fulcrum guide-bar located therein between the inlet and the outlet passages, nearer the inlet side of said case, in combination with a piston having sides *a* and *b*, of a length adapted to make contact on opposite sides of the inlet and outlet passages of said case, in such manner that the leverage from the fulcrum to the bearing part of the piston at the outlet side of the case will be greater than the leverage of the joint-forming end of the piston at the inlet side of the case, whereby the pressure of the inflow always maintains the contact of the piston with the case.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LEWIS HALLOCK NASH.

Witnesses:

A. E. H. JOHNSON,

J. W. HAMILTON JOHNSON.