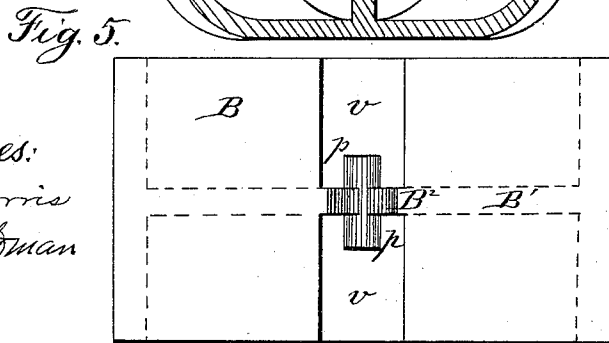
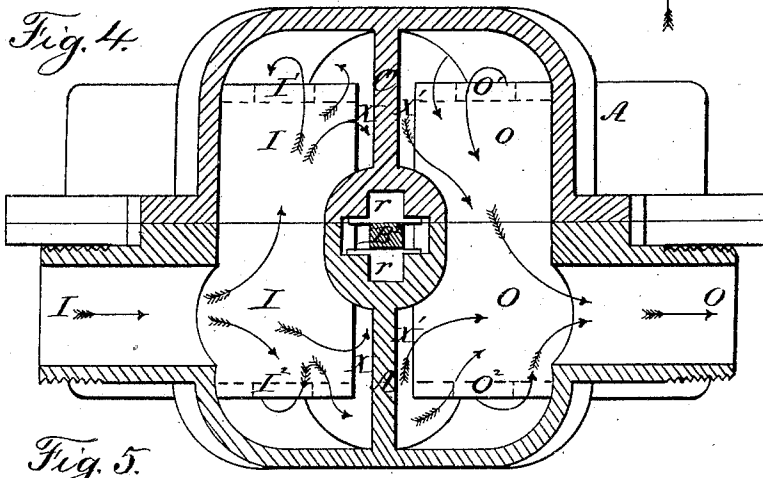
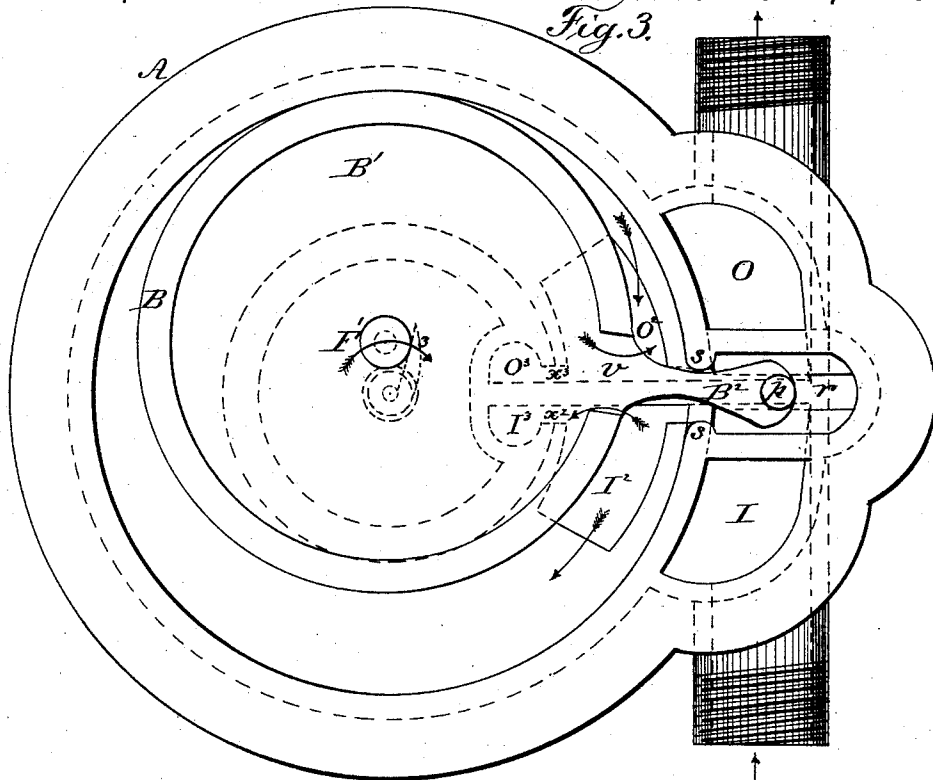


L. H. NASH.

OSCILLATING WATER METER.

No. 320,577.

Patented June 23, 1885.



Witnesses:
 L. H. Nash
 J. C. Whitman

Inventor:
 Lewis Hallock Nash
 by Johnson and Johnson
 Attys.

(No Model.)

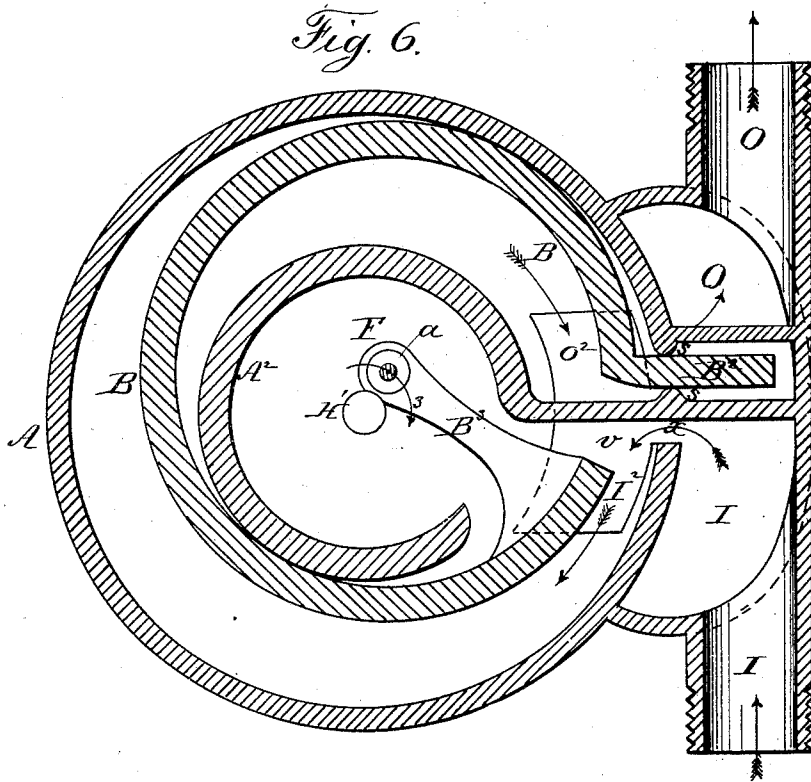
3 Sheets—Sheet 3.

L. H. NASH.

OSCILLATING WATER METER.

No. 320,577.

Patented June 23, 1885.



Witnesses:
L. H. Norris.
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Inventor:
Lewis Hallock Nash
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Atty.

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. 320,577, dated June 23, 1885.

Application filed April 26, 1884. Renewed January 24, 1885. (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.

In an application for a patent for improvements in water-meters, filed by me December 18, 1883, under Serial No. 114,916, I have described a water-meter in which an eccentrically-moving piston is controlled by co-operating studs and a radial abutment, which divides the inflow from the outflow, upon which the piston swings in its movement to divide the chamber-case into receiving and discharging spaces, and I do not, therefore, broadly claim herein such means for controlling an eccentrically-moving piston.

In my said application the piston is adapted to form a guiding-bearing upon the said dividing-abutment, and consequently causes wear upon these parts.

The object of my present improvement is to relieve the wear upon the piston and upon the abutment, and avoid the necessity of having the piston slide with a bearing upon the dividing-abutment.

To this end my present invention consists in providing a ring-piston with an external arm, upon which it swings in a guide formed within the case. The piston-arm in this function may extend within a chamber formed in the radial dividing-abutment, the open end of said chamber being closed by said arm in every position in the movement of the piston, to complete the dividing function of the abutment, when the piston has a transverse web. When, however, an open ring-piston is used its external guiding-arm is arranged in a chamber at one side of the radial abutment.

My present invention also embraces an arrangement of ports in the piston and in the case, to allow of free inlet and discharge for the water into and from the interior of the piston, and in a construction of the controlling members of the piston by which foreign matters may be allowed to pass through the meter-case without injuring or stopping the meter.

Referring to the accompanying drawings,

Figure 1 represents a vertical section of a water-meter embracing my invention, taken on the line $z z$ of Fig. 2, which represents a horizontal section of the same taken on the line $\gamma \gamma$ of Fig. 1. Fig. 3 represents a plan view of the lower section of the case, and a top view of the piston therein. Fig. 4 represents a vertical section, taken on the line $w w$ of Fig. 1, through the inlet and outlet passages, and the chambered bearing for the piston-arm. Fig. 5 represents an elevation of the piston, showing its side openings and guiding-arm; and Fig. 6 represents a view similar to Fig. 3, showing a modified arrangement of the guiding-arm when used with an open ring-piston, such as shown in my said application.

The meter-case A is preferably of cylindrical form, and of two symmetrical sections properly joined and secured together. Each section has an interior corresponding ring projection, $A^2 C^2$, extending inward around the center of each head, leaving a space between their inner open ends, as shown in Fig. 1.

The case has a radial abutment formed of two integral or separately set-in pieces, $C' A'$, (shown in elevation in Fig. 1,) which extend from one side of the ring projections and divide the inlet from the outlet passages and ports. These abutment-divisions extend inward from each cylinder-head, leaving a space between their inner ends or edges equal in width to the space between the inner ends of the ring projections $C^2 A^2$, and on the same horizontal plane therewith, as shown in Fig. 1.

The piston consists of a cylinder having a middle transverse web, B' , but open at each end, and has two longitudinal side slots, $v v$, Fig. 5, which extend from each open end to the web, having a sufficient width to receive the abutment and leave a free passage for the water into and from the interior of the piston on each side of said abutment, instead of forming a bearing of the piston upon the opposite sides of the abutment. The piston thus constructed is placed within the case, with its web B' forming a joint with the case ring projections and radial abutments, as shown in Fig. 1. The piston thus constructed is of such a diameter relatively to the chamber of the case and to the ring projections as to allow the piston to

have an eccentric movement within the case to divide it into receiving and discharging chambers by a continuous contact with the inner wall of the case and the outer wall of the abutment ring projections. The inlet-passage I on one side of the radial abutment conveys water to the inlet-ports I' and I² in the cylinder-heads, while the discharge of the water from the meter is effected through corresponding ports on the opposite side of the abutment, of which O² is shown as communicating with the discharge-pipe O in Figs. 2 and 4, the port O' being directly over the port O², as shown by dotted lines in Fig. 4.

The meter-case is enlarged at the inlet and outlet side, so as to form a passage in each head, which communicate with the inlet and the outlet passages and the top and bottom ports, I' O' and I² and O², as shown in Figs. 1 and 4. These head-passages are divided by the radial abutment, as shown in Fig. 4, and may be of any form that will allow the water to enter the chamber of the case by the head-passages I' I² on one side of the abutment and to leave it by the head-passages O' O² on the other side of said abutment.

Each cylinder-head has an interior projecting stud, H H', of suitable length and form; and the piston has corresponding studs, F F', extending from the opposite sides of the web, and in such relation to the case-studs as to maintain contact therewith for the purpose of maintaining the piston in contact with the inner wall of the case and the outer wall of the ring projections, and thus control the eccentric movements of the piston to divide the case-chamber and the interior of the piston into receiving and discharging spaces. Co-operating with these studs in the function just stated I provide an arm, B², which extends from the outer side of the piston, of suitable length and form to complete the joint between the abutment-pieces C' A', having at its end one or more pins, p, standing at right angles therewith. Formed in the case at or near the radial abutment is a chamber adapted to receive the arm B², having its inner open end of sufficient area to allow of the lateral movement of the arm with the piston and to form a joint therewith. At the top and bottom of this chamber grooves r r are formed, adapted to receive the pins p p on the end of the arm, and thereby form a guide-bearing for the piston and complete the control of its movement, in connection with the studs before described. The arm is of such shape as to form a joint with the case wall at the points s s at the open end of said chamber, and thus prevent the water from passing or crossing over through this case-chamber from the inlet to the outlet passage I and O, such joint being shown as formed at s on the outlet side of the radial abutment in the position of the piston in Fig. 3. The guiding-chamber has a length sufficient to allow of the movement of the pins p p in the full movements of the piston. Although I prefer the guiding action of the pins on the

arm, yet they may be dispensed with, and the guiding action obtained by the arm forming a guide-bearing as well as a joint on the case-wall at s s.

It has been found in practice in a meter having a piston of considerable height, which is preferred, that if only the end or head ports in the case-heads are used, the water must necessarily flow one-half the height of the piston from each end in a very short time, if the piston is moving very fast, in order to properly fill the receiving and discharging spaces. It has also been found that this action occurs in its greatest degree when the piston is passing the positions shown in full and dotted lines in Fig. 2, because in passing from said positions to the position shown in Fig. 3 the water would have to pass over half the length of the piston from each end, as stated, and from these causes the rapid movement of the piston tends to cause a suction, which retards the movement of the piston. In order to avoid this resisting suction I have provided auxiliary ports or passages in the walls of the case, piston, and abutment, which I will now describe. The walls of the case on each side of the radial abutment are formed with ports x x', which open direct into the case from the inlet and outlet passages, and thus afford a free inflow and outflow the whole height of the piston. The walls of the ring projections on each side of the abutment are formed with ports x² x³, which communicate by suitable passages, I³ O³, with the inlet and outlet passages in the case-heads, and for this purpose these passages are formed in the walls of the ring projections, and serve to convey the water to the interior of the piston freely throughout its height. In Fig. 2 the arrows indicate the flow of the water from the passages I² O², through the wall-ports x² x³, into the chamber of the piston; and it will be understood that the passages I³ O³ open at each end into the head-passages, and thereby communicate with the inlet and the outlet passages I and O, in the same manner as the head-passages. These auxiliary ports in the walls of the case and abutment ring projections, the purpose of which I have just described, co operate with the side slots, v v, in the piston to freely supply the water into the receiving-spaces of the case and of the piston, and to as freely effect the discharge from these spaces, and thereby avoid resisting suction upon the piston. So important is this provision of auxiliary ports that it has been found in practice that the piston may travel at the rate of eight hundred revolutions per minute without retarding the flow more than one per cent., the piston practically moving without appreciable resistance. The form of these auxiliary ports is not material so long as they effect the free flow stated; nor is it necessary that they should all be used to effect the result stated, as the slots in the piston would give good results without the others.

In order to allow the piston to have some

yielding capacity in the event of a hard substance—as sand or fiber—passing into the meter, I have shown the controlling-studs of the piston as constructed to have a certain yielding capacity. A preferred construction for this purpose is to reduce the piston studs F F to a smaller size in the middle of their length, as at *a a*, having their ends F' F' of a diameter to form a contact with the base of the case-studs H H, the inner ends, H' H', of which are reduced in diameter, so as to be separated from the base of the piston-studs. Now, supposing a piece of hard substance to pass in with the water and be lodged between the piston and the case, it would force the piston-studs against the case-studs, and the parts *a a* of the studs, being comparatively slender, they will bend and thus free the piston.

Instead of the studs, it is obvious that I may substitute a crank-connection, which may also have such a construction as to yield in the contingency stated.

In the stud H of the upper case-head is journaled a shaft, 1, having at its inner end a crank-arm, 2, (shown by dotted lines in Figs 2 and 3,) adapted to bear upon the stud F, while the outer end of said shaft extends through the case-head and carries a pinion, *b*, which meshes with a gear-wheel, *a'*, on the shaft *d*, which is stepped in the head and, passing through the stuffing-box of a covering-plate, D, has a gear-wheel, *c*, which engages with and operates any suitable registering mechanism by which the revolutions of the piston are indicated.

The piston is shown as divided into upper and lower chambers by its web B'; but the meter may be constructed so that the piston will operate with one chamber on the side of its web, the functions and operations of all the parts being the same. The registering mechanism may be dispensed with and the device used as a pump or engine.

I have shown and described the piston as having a transverse web; but as the office of said web is merely to carry the piston-studs it is obvious that it may be dispensed with and the said studs carried by an interior projecting arm, B³, of the piston, as in Fig. 6.

I have shown the piston-guiding arm B² as being arranged between the inner ends of the radial abutment-pieces C' A', and such arrangement requires these abutment-pieces to be separated; but I may have the abutment-pieces join and place the piston exterior guiding-arm B² at one side of the radial abutment, as in Fig. 6, in which case the guiding-arm will work in a chamber of the case at the side of the abutment upon the guide-bearings *s s*.

In the operation of the meter, the piston being in the position shown by full lines in Fig. 2, the water enters through the inlet-passage I, thence into the interior of the piston through the ports I', I², *x*, and *x*², and presses against the inner surface of the piston and forces it in the direction of the arrow 3, while the water discharges from the interior of the

piston through the corresponding ports on the opposite side of the abutment, the inlet and outlet being indicated by the arrows. When the piston has commenced to move to the position shown in dotted lines in said figure, the water will enter the case-chamber outside of the piston through the same ports, and, pressing against the outer side of the piston, continue to force it in the same direction, while the water discharges from the opposite side of the chamber through the corresponding ports on the opposite side of the abutment. In the position shown in the dotted lines the exterior pressure alone acts upon the piston; but as the piston approaches the position shown in Fig. 3 the water again enters the interior receiving-space of the piston through the ports I', I², and *x*² of the case and ports *v v* of the piston, and it escapes from the discharging-space of the piston through corresponding outlet-ports on the opposite side of the abutment. In this continuous movement of the piston its studs F' F' revolve around and in contact with the studs H H of the case, whereby the movement of the piston is made eccentric, maintaining always a controlling bearing co-operating with the guide-bearing of the piston-arm. The revolution of the piston-studs will push forward the crank-arm 2, and thus operate the registering-gearing, which is not shown, to register the movement of the piston. The external piston-arm, B², forms a joint at all times with the wall-edges *s s* of an oblong slot, as in Fig. 3, such joint being shown as made with one side, *s*, only of said slot. When the piston is in the position shown in Fig. 2 in full lines, that part of the arm which joins the web will be in contact with both edges *s s*, and as the piston continues its movement the contact will be made at the other edge, *s*, so that the point of contact is continually changing, preventing the flow of the water around the arm from the inlet to the outlet. This arm also forms a guide upon which the piston swings, being provided with guide-pins for that purpose, while in Fig. 6 the guide-bearing is formed by the edges *s s* and the arm.

I claim—

1. The combination, with a meter-case having inlet and outlet ports divided by a radial abutment terminating in an enlargement around the center of the case, of a ring-piston having an external guide-arm upon which it swings, a confining case-guide for said arm, ports or passages in the piston-wall, and studs carried by the piston and by the case, whereby the movement and dividing function of the piston is controlled, substantially as herein set forth.

2. The combination of a meter-case having inlet and outlet ports divided by an abutment, substantially as described, with a piston having an external guide-arm adapted to form a joint with the walls of the case, and having, also, ports or passages in its outer

wall, and co-operating studs carried by the case and by the piston, substantially as herein set forth.

3. The ring-piston having an external guide-arm, ports or passages in its outer wall, and one or more interior studs, substantially as described, combined with a meter-case having inlet and outlet ports divided by an abutment, and one or more studs co-operating with the piston-studs, said case having a wall opening or chamber formed with guide-bearings for said piston-arm, substantially as herein set forth.

4. The piston having an external guide-arm, B^2 , provided with pins, ports or passages in its outer wall, and a transverse web, combined with a meter-case having inlet and outlet ports divided by an abutment, and having a chamber or grooved guideway, r , for said arm-pins, having the joint-forming bearings s , and fixed and movable studs, substantially as described, for the purpose specified.

5. The combination, in a water-meter, of the case having the dividing abutment and ring projections, with an eccentrically-moving piston having a guide-arm projecting from its outer wall, and ports or passages in the latter, with an inclosed guide for said arm formed within the meter-case, and means, substantially such as described, for controlling the dividing movement of the piston.

6. The combination, with a meter-case having inlet and outlet ports divided by an abutment, substantially as described, of a piston having an external guide-arm, and a port or passage, v , in its outer wall on each side of the said abutment, and means, substantially such as described, co-operating with said guide-arm for controlling the movements of said piston in dividing the case.

7. The case A of a water-meter, having inlet and outlet head-ports divided by an abutment and the vertical wall-ports $x x'$ on each side of said abutment, as described, combined with an eccentrically-operating ring-piston having an external guiding-arm, and side ports, $v v$, on each side of said abutment, substantially as described, for the purpose specified.

8. The case A of a water-meter, having inlet and outlet head-ports divided by an abutment, and having vertical wall-ports $x x' x^2 x^3$ on each side of said abutment, as described, combined with an eccentrically-operating ring-piston having an external guiding-arm, and side ports, $v v$, on each side of said abutment, the said case-wall and piston-ports communicating with the inlet and discharge passages I O, substantially as described, whereby the water has a free flow into and from the discharging-spaces of the meter when the piston is in the positions described.

9. The combination, with the meter-case having inlet and outlet ports divided by an abutment, as described, of an eccentrically-oscillating ring-piston having a controlling connection with the case adapted to yield to

an obstruction to the movement of the piston, substantially as described, for the purpose specified.

10. The combination, in a water-meter, of a case having inlet and outlet ports divided by an abutment, as described, with an eccentrically-oscillating ring-piston having side ports and a controlling connection, consisting of one or more fixed interior case-studs and a coating piston stud or studs, having a bearing, F' , connected with the piston by an arm, α , adapted to yield or bend sidewise, for the purpose stated.

11. The combination, with the meter-case having the radial abutment and the ring-projections and one or more studs, H, of an eccentrically-oscillating piston having a coating stud or studs, F' , side ports, and an external guide-arm, B^2 , and a confining or controlling guide for said arm arranged in the case outside of its chamber, for the purpose described.

12. The ring-piston having a transverse web, B' , side ports, $v v$, an external guide-arm, B^2 , and studs $F' F'$, combined with a case having the following elements, viz: the radial abutment, the ring projections, the studs H, a confining guide or groove for the piston-arm in the case-wall, and inlet and outlet ports, all constructed and arranged for operation substantially as herein set forth.

13. The meter-case having the radial abutment terminating in an enlargement, A^2 , around the center of the case, formed with the ports and passages $x^2 x^3 I^3 O^3$ on each side of said radial abutment, said case having the inlet and outlet head-ports, the outer wall-ports, $x x'$, and the inlet and outlet passages I and O, combined with an eccentrically-oscillating piston having the side ports, $v v$, and means, substantially such as described, for guiding and controlling the piston in its path, for the purpose described.

14. The meter-case having the radial abutment dividing the inlet from the outlet ports, the ring projections, and the inclosed guide or groove r , formed within the radial abutment, combined with an eccentrically-oscillating piston having an external guide-arm adapted to operate within said guide or groove, the said piston being controlled in its path, as described.

15. The case having inlet and outlet ports divided by an abutment, combined with a piston having an external arm having a bearing in the case, substantially as described, for the purpose specified.

16. The case A, having inlet and outlet ports divided by an abutment, and the vertical wall-ports $x x' x^2 x^3$ on each side of said abutment, combined with a piston adapted to have an eccentrically-oscillating movement within said case, as described, for the purpose specified.

17. The combination, with a case having inlet and outlet ports divided by an abut-

ment, of a piston provided with wall-ports v on each side of said abutment, as described, for the purpose specified.

5 18. The combination of the piston B with a case having inlet and outlet ports divided by an abutment having an enlarged head, A^2 , provided with the wall-ports x^2 x^3 , and passages I^3 O^3 at its junction with the radial abutment part A' , substantially as described, for
10 the purpose specified.

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.