No. 702,970. Patented June 24, 1902.

W. H. LARRABEE.

DISK WATER METER.

(Application filed Mar. 12, 1902.)

(No Model.)

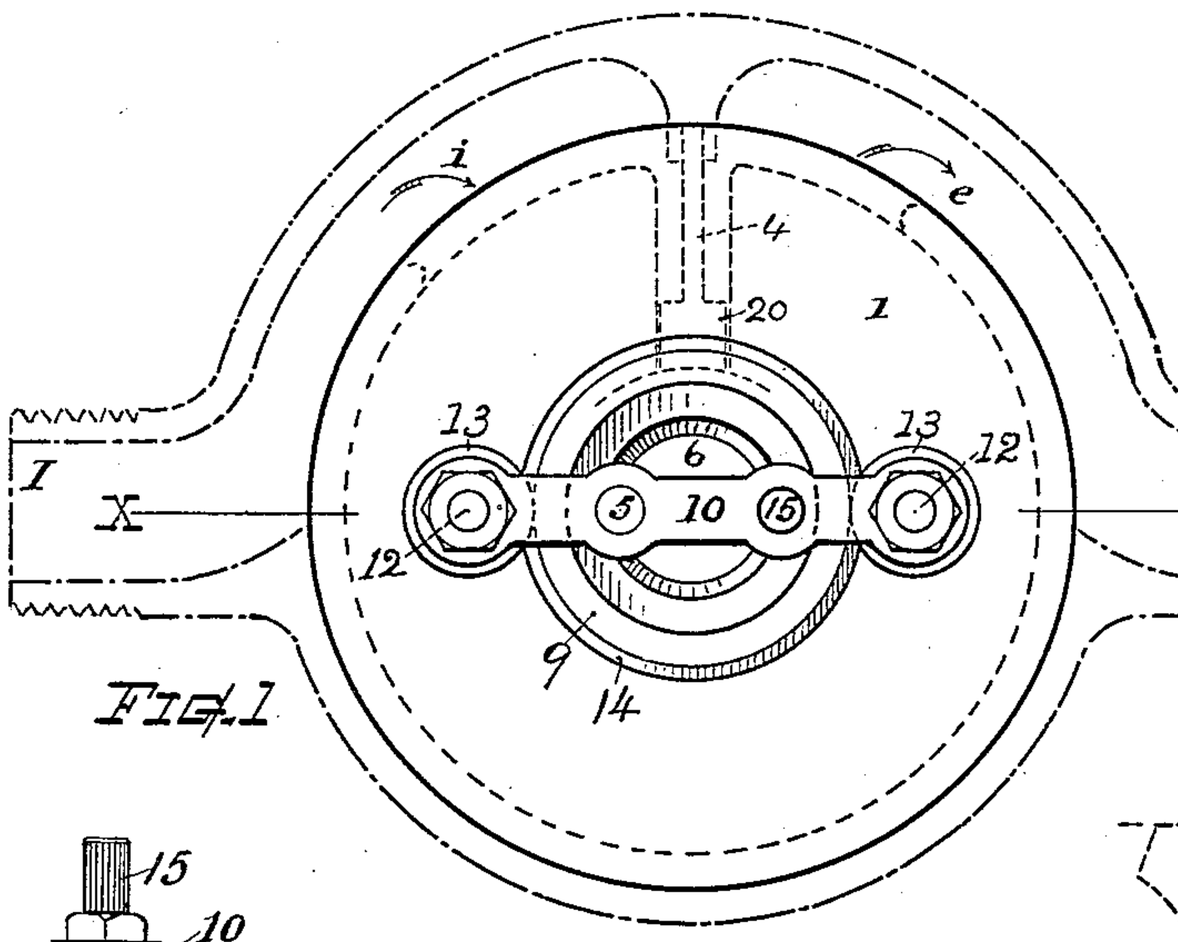

FIG. 1

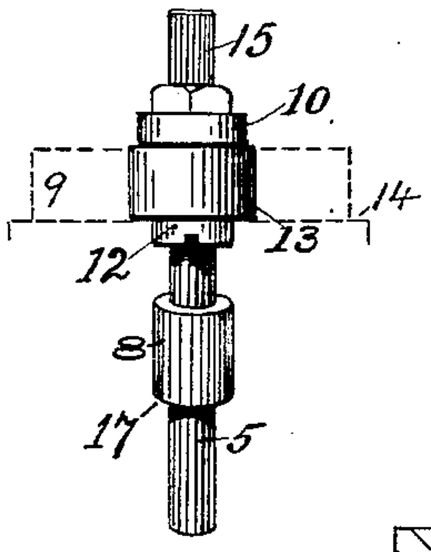

FIG. 4

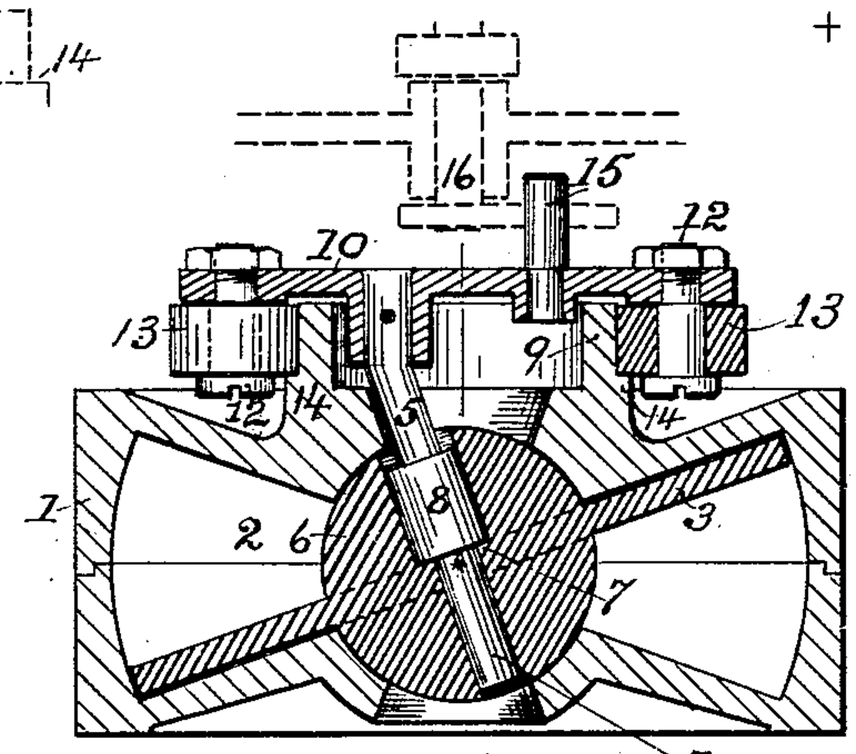

FIG. 2

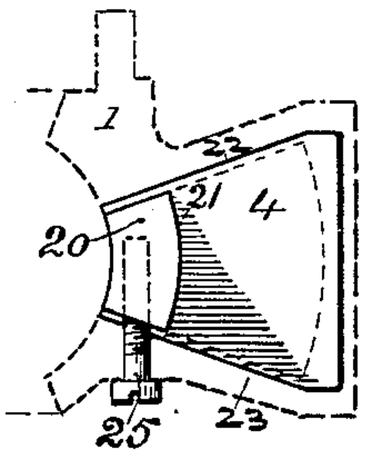

FIG. 5

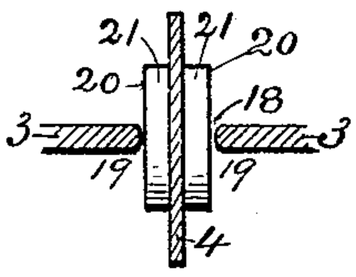

FIG. 6

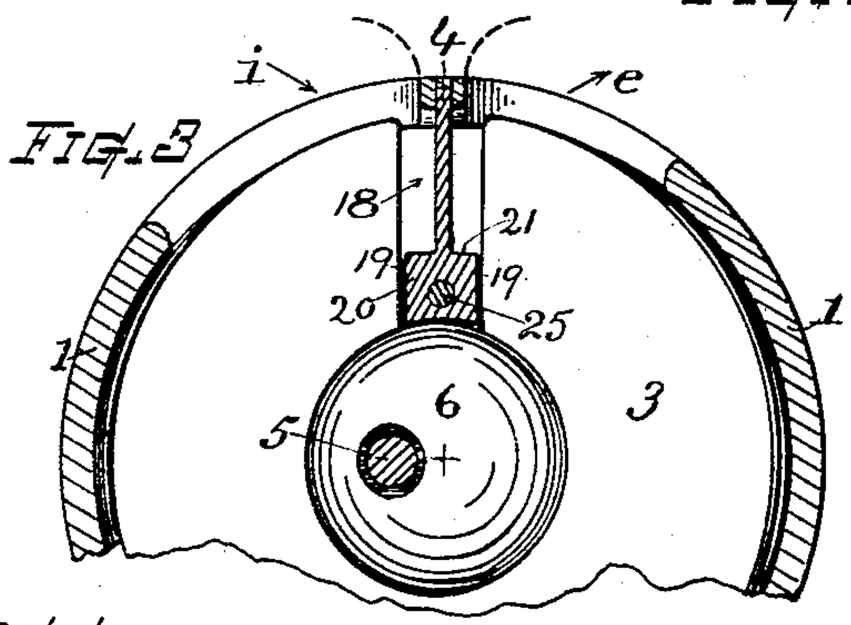

FIG. 3

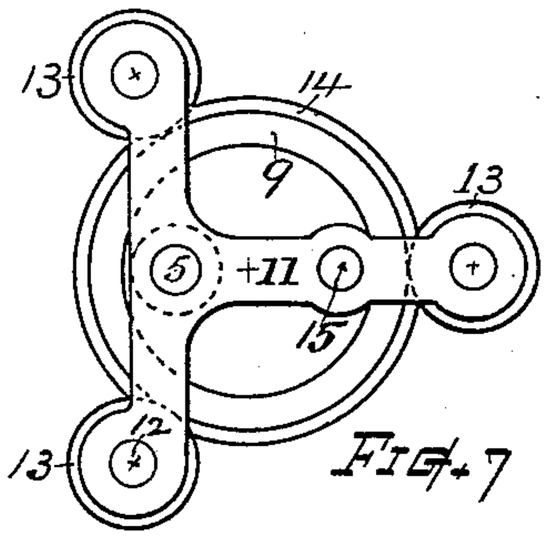

FIG. 7

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UNITED STATES PATENT OFFICE.

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DISK WATER-METER.

SPECIFICATION forming part of Letters Patent No. 702,970, dated June 24, 1902.

Application filed March 12, 1902. Serial No. 97,816. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. LARRABEE, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Disk Water-Meters, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

My present invention relates to improved means for controlling the disk piston in relation to the diaphragm and the fulcrum-surfaces of the casing and for operating the register mechanism; and it consists in a peculiar construction of the diaphragm-plate and a crank-bearing mechanism of novel construction and arrangement, the objects being to provide mechanism externally supported on a cylindrical or circular portion of the disk-chamber casing and adapted for keeping the disk piston at the proper inclination for meeting the fulcrum-surfaces on the casing at all positions of the rocking or nutating movement, and for easily transmitting motion from the disk piston to the register-actuating gearing, as more fully hereinafter explained.

Another object is to afford a simple and efficient means for resisting the rotary tendency of the disk piston and preventing excessive friction or fracture at the outer corners of the disk-piston plate.

These objects I attain by the mechanical devices and combinations explained in the following detailed description, defined in the summary, and illustrated in the accompanying drawings, wherein—

Figure 1 represents a plan view of a mechanism embodying my invention as applied to a fluid or water meter, with dot-and-dash lines indicating a form of outer casing. Fig. 2 represents a vertical sectional view at line X X on Fig. 1. Fig. 3 is a horizontal section showing the casing, the partition or diaphragm, and the disk piston. Fig. 4 is an end view of the traverse-arm, carrying the piston-controlling shaft, separate from the disk piston and casing. Fig. 5 is a separate side view of the diaphragm with the position of the casing in relation thereto indicated by dotted lines. Fig. 6 is a vertical section showing the contact relation of the diaphragm and disk-piston plate, and Fig. 7 illustrates a modification in the structure of the traversing arm.

Referring to the drawings, the numeral 1 indicates a suitable disk-chamber casing inclosing a chamber 2, within which the disk piston 3 is arranged, said chamber being provided with an inlet-port *i* and an exit-port *e*, communicating with suitable supply and service passages, which may be disposed in an outer casing, as indicated by dot-and-dash lines at I and E on Fig. 1, or in other efficient manner. A partition or diaphragm 4 is arranged within the chamber between the ports *i* and *e*, preferably made of the improved form shown and hereinafter more fully described.

The disk piston 3, which is best made of hard vulcanized rubber or similar suitable material and provided with a central bearing-ball 6, is in accordance with my invention formed with an axial opening through its center perpendicular to the plane of the disk. Said opening is preferaby made with its upper part of larger bore than its lower part and with an intermediate annular offset or shoulder 7. The piston-shaft 5 is fitted to turn freely within the opening and extends through or nearly through the ball. The piston-shaft is provided with a boss or portion 8 of larger diameter than the general diameter of the shaft, thereby affording a shoulder 17, that counter matches the interior offset in the ball, thereby keeping the shaft and disk piston in proper relation endwise to each other. In some instances this boss or shoulder may be omitted and the shaft and opening made of one diameter.

Upon the top of the disk-chamber casing I provide a circular flange or cylinder 9, externally fitted as a track or rollway, concentric to the vertical axis of the chamber, and upon the upper part of the piston-controlling shaft 5, which projects upward within said circular flange, I arrange a traversing bar, cross-head, or arm 10, extending transverse in re-

spect to the axis and over the flange 9 and rigidly fixed upon said piston-shaft. The end of the piston-shaft, which may be bent to the proper angle, is disposed and secured therein at one side of the central vertical axis of the disk chamber and casing, so that the piston-shaft below stands at an inclination corresponding with the desired tilt of the disk piston, usually about twenty degrees, more or less. (See Fig. 2.) At the ends of the arm or member 10 there are fixed depending bearing-studs 12, carrying small rollers 13, made of hard rubber or suitable material, that roll upon the exterior surface of the circular rollway-flange, causing the arm to traverse about the circle concentric to the central axis when the disk piston is operated. At the foot of the flange 9 there is preferably formed an annular ledge or offset 14, against which the lower corners of the rollers run, and which thus serves for supporting the rollers and moving parts at proper elevation and prevents the arm from striking on the top edge of the rollway-flange.

Upon the controlling-arm 10, at a position eccentric to the main central axis, there is rigidly fixed a stud, detent, or upwardly-projecting pin 15, adapted for engaging and operating the register-actuating gearing or member, as indicated at 16 on Fig. 2. The register and its actuating-gearing may be of any well known or suitable construction and not being of my invention are not herein more fully shown and described. The pin 15 is shown as fixed to the controlling-arm at the opposite side of the central axis from that at which the piston-shaft 5 is attached thereto; but said pin may, if in any instance desired, be located upon the arm at any position suitable for performing its function.

In Fig. 7 I have shown an arm carrying three rollers 13, as such number may in some cases be desired. The form of the arm is varied to give three ends; but in other respects the construction and operation are essentially the same as that above described.

As a feature of my invention the partition or diaphragm 4 is constructed as best shown in Figs. 3, 5, and 6, the outer or main portion thereof being of the usual thickness, but the inner end thereof adjacent to the bearing-ball 6 and for about one-third, more or less, of the length the diaphragm has an increased or greater thickness, giving an outstanding face 20 and offset 21 upon each side of said diaphragm, this area of greater thickness extending from the bottom to the top of the disk chamber. The faces 20 are preferably in planes parallel to each other and the central plane of the diaphragm radial from the center axis of the chamber. The slot 18 in the side of the disk piston 3 is formed in such shape, preferably of parallel width, that it will adjacently but not tightly embrace the thick portion of the diaphragm, its edges 19 abutting on the outstanding faces 20, and stand entirely free and distant from the surfaces at thinner portion of the diaphragm, (see Figs. 3 and 6,) so that the piston-contact caused by a rotatory tendency of the piston will be taken and borne on the surfaces 20, which are at a position comparatively near the center of motion and having small movement, while the outer corners of the disk are free from contact with the diaphragm. It will be seen, therefore, that the strain, friction, and wear are thus reduced to a minimum and act against an amply rigid and sustained body of metal in the thickened end of the diaphragm, while there is no liability of fracture at the outer corners of the disk plate by a resistant contact thereof and pressure of the passing fluid. The diaphragm is firmly secured in the casing by a screw 25, that is threaded into an opening in the thickened portion of the diaphragm, as indicated in Figs. 3 and 5. The edges of the diaphragm at 22 and 23 may be grooved into the upper and lower portions of the casing. While I prefer the screw 25 for fastening the diaphragm to the bottom of the casing, it is obvious that a thick-end diaphragm may be fastened in place by other means, or such as heretofore employed for securing an ordinary style of diaphragm.

In the operation the nutating motion of the disk piston causes the shaft to revolve in a circle, carrying with it the arm 10 and rollers that roll about the exterior of the cylindrical flange. Any pressure tending to force the disk 3 from or against its fulcrums with undue strain is effectually prevented by the roller 13 at the right or left hand end of the arm 10, as the case may be, acting against the cylindrical exterior surface of the flange 9, and the arm keeping the shaft at the given degree of angularity. Thus the disk piston is kept under proper control without undue friction, either in respect to the moving of the disk piston in the chamber, its action on the diaphragm, or the driving of the register-gearing.

I claim as my invention and desire to secure by Letters Patent—

1. In a disk-piston action, the disk-chamber casing having a concentric circular rollway-flange with an external guiding-surface, the disk piston having a central ball with a shaft-bearing opening at the axis thereof perpendicular to the plane of the disk, a traversing arm carrying depending bearing-studs, rollers mounted on said studs and rolling on the external surface of said circular flange, and a shaft fixedly supported in said traversing arm and extending on an incline into and turning within the central opening of said disk piston, substantially as set forth.

2. In a disk-piston action, in combination, a disk-chamber casing provided with a circular concentric flange having an exterior rollway-surface and annular ledge thereon, the disk piston supported by a bearing-ball within said casing and having an axial opening perpendicular to the plane of the disk, a controlling member carrying a plurality of roll-

ers that run upon said rollway adjacent to said ledge, the piston-controlling shaft fixed in said member and extending at an angle into the disk piston, and a pin on said member adapted for moving the register-actuating mechanism.

3. In a disk-piston action, in combination, a disk chamber and casing, a nutating disk piston having a center bearing-ball with a hole through the axis thereof, the upper portion of said hole formed of a larger diameter than the lower portion, and provided with an intermediate annular offset therein, a piston-controlling shaft fitting in said hole, said shaft extending through, or nearly through the ball, and having a shoulder adapted for abutting upon said intermediate offset, a traversing member supporting the end of said piston-shaft, adapted for positively maintaining its inclined relation, a circular guide-flange fixed concentric to the axial line of the disk chamber, a plurality of rollers supported on said traversing member and running upon said guide-flange, and a register-driving projection arranged on said member.

4. In a disk water-meter, in combination with the disk-chamber casing, a diaphragm having a portion of its area from the bottom to the top of the chamber formed of greater thickness than the main portion of said diaphragm, the exterior sides of the thicker portion presenting outstanding surfaces for contact with the disk edges; a nutating disk piston having a radial slot, the edges of which are adapted to contact with said outstanding surfaces of the diaphragm, an obliquely-disposed depending shaft turning within a bearing-opening at the axis of the disk piston, a traversing member having said shaft fixed therein, for controlling the inclination or tilt of the disk piston, and means for supporting said traversing member for movement concentric with the axis of the casing.

5. In a disk water-meter, in combination, as described; the disk-chamber casing, the diaphragm having a portion of greater thickness at its inner end, adjacent to the ball-bearing, and a retaining-screw passing through the casing, and engaging in an opening formed in said thicker portion of the diaphragm, substantially as set forth.

Witness my hand this 8th day of March, 1902.

WILLIAM H. LARRABEE.

Witnesses:
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CHARLES S. BACON.