(No Model.)

J. THOMSON.

DISK WATER METER.

No. 568,640. Patented Sept. 29, 1896.

Fig. 1.

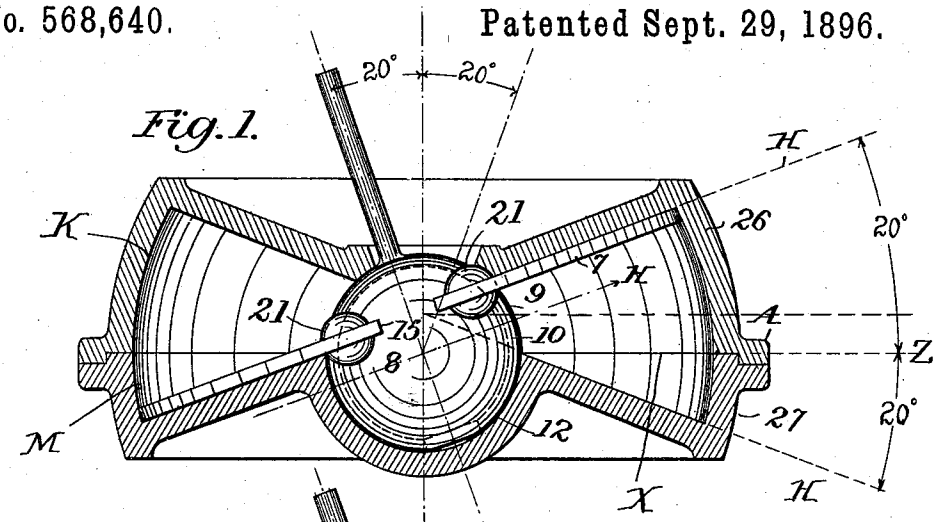


Fig. 2.

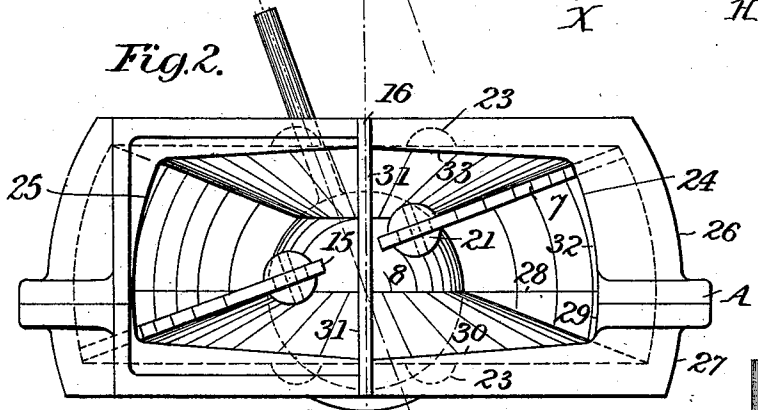


Fig. 4

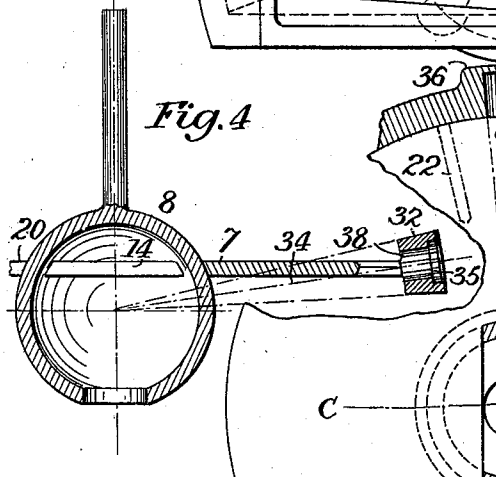


Fig. 3.

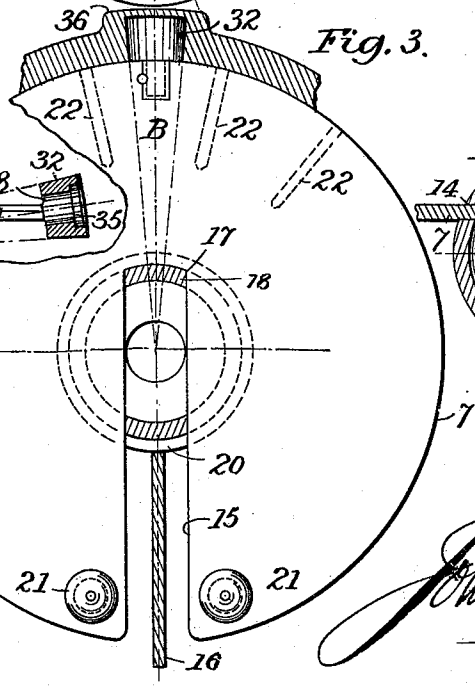
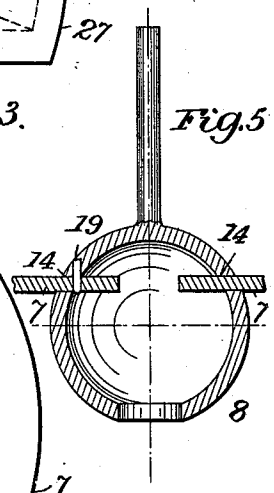


Fig. 5



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DISK WATER-METER.

SPECIFICATION forming part of Letters Patent No. 568,640, dated September 29, 1896.

Application filed December 5, 1895. Serial No. 571,155. (No model.)

To all whom it may concern:

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

This is an invention in disk water-meters, relating in particular to the arrangement of the disk with respect to the ball and the disk-casing, to the manner of attaching the disk to the ball, to the ports of the disk-casing, to the counterbalancing of the disk, and to the disk-thrust-controlling roller.

In view of the advanced and well-known state of the art, the drawings are purposely stripped of all details, such, say, as extraneous casings and waterways, and only such elements are shown as are to be here more particularly dealt with.

In said drawings, Figure 1 is a vertical central section through a disk-casing A, giving an edge view of the disk and its ball-bearing, this illustration indicating such an embodiment of my invention as relates to the arrangement of the three following elements, namely: the disk, the ball, and the spherical wall and the frustums of the disk-casing. Fig. 2 is a side view of the disk-casing complete, showing the inlet and outlet ports and the diaphragm, together with the ball and disk. Fig. 3 is a top plan view of the disk, but with the ball, diaphragm, and a portion of the disk-casing shown in horizontal section. Figs. 4 and 5 are central detail sections of the ball and disk, respectively, on the lines B C, Fig. 3.

The first feature relates to the disposal of the disk 7, this being arranged so that its intersection with the ball 8 shall be in a zone of the said ball or sphere of materially less diameter than that of the sphere itself. In other words, the plane of the disk is above (or below) the center of the ball, and one section of the ball, as the lower, will extend both above, as 9, and below, as at 10, the plane H of the center of the ball. The object of this is to obtain with a flat disk the greatest possible extent of bearing-surface for the ball in the lower socket-bearing 12. In fact, as shown in the drawings, this socket is an exact hemispherical cavity, while that portion of the ball which acts in this socket is, as just described, greater than a hemisphere. The advantage of this is to better control the oscillating action of the disk to afford greater ball-bearing surface and to maintain the disk concentric with the outer walls of the casing. The disposal of the disk as here shown does not require that the angle of the upper-case frustum shall be different from that of the lower with respect to the faces or medium plane X of the disk-casing sections, as is shown by the dimensions expressed in degrees between the dotted lines H of Fig. 1 and the plane X, although the center of vibration of the disk is at one side of the actual medium plane of the disk-casings indicated by the broken line Z.

The second feature relates to the attachment of the disk to the ball by forming two transverse slits, as 14, on opposite sides of the ball, adapted to receive the disk in the manner shown. That is, the usual disk-slot 15, which straddles the diaphragm 16, is simply extended farther through the disk, as to 17, so as to straddle also the connecting section 18 of the ball, between the slots 14, one section acting as a stop in one direction, and to secure the disk against slipping out backwardly a pin, as 19, may be inserted. In this wise hollow or solid balls of the greatest accuracy and of low cost to manufacture may be used, while there is a contingent advantage in that no manual fitting is required at the point where the face of the ball meets the edge of the diaphragm.

The third feature relates to counterbalancing the disk, either by the attachment of material 21 at or near the edge or edges of the slot or in the removing of material 22 from the body of the disk, opposite from the slot, the said attachment or removal, as the case may be, being sufficient to compensate for the material removed from the disk to form the slot, that is, the slotted side of the disk is of equal weight with the unslotted side. When counterbalancing material, that is, weight-pieces, as in the form of balls or buttons 21, is added, this necessitates forming cavities in the face or faces of the frustums to receive the same, as indicated in dotted lines 23, Fig. 2. The application of such weights is generally preferable in the instance of metal disks; but when hard rubber is employed the alternate method, as indicated by the dotted cavities 23, is the better, as the desired result may thus be

reached by simply drilling a few holes into the edge of the disk. The advantage of thus counterpoising the disk is to adapt it for the highest speed of operation without shock or jar and in producing a more uniform distribution of the working strains upon the bearing-surfaces.

The fourth feature relates to the ports, essentially consisting in forming each of the ports, that is, the inlet-port 24 and the outlet-port 25, of unequal extent vertically and of unequal area as relates to the upper section 26 and the lower section 27 of the two sections constituting the disk-casing A. Thus in the drawings submitted the area of each port, Fig. 2, measured in direct elevation, equals 2.6 square inches, but each space in the lower section bounded by the lines 28 29 30 31 equals only 0.8 square inches, or $\frac{0.8}{2.6}=30.7$ per cent., whereas each space in the upper section bounded by the lines 28 32 33 31 equals 1.8 square inches, or $\frac{1.8}{2.6}=69.3$ per cent. In this connection reference may be made to my Patent No. 375,023 of December 20, 1887, in which the design here contemplated would be undesirable, not to say impracticable. If the sections were separable on a different plane, the port-area would still be unequally proportioned upon opposite sides of the plane of the center of the ball. So, too, the spherical contour of the upper section at K would be greater than that of the lower section at M.

The fifth feature is comprised in the construction and disposal of the thrust-roller 32 and its bearing 38, this being an amplification in detail of the design shown in my Patent No. 535,641 of March 12, 1895. Thus when the disk is mounted out of the equatorial center of the ball, while the bearing for the thrust-roller might lie in the plane of the disk, it would not realize the best theoretical conditions in that the center of its rotation is not in a plane coincident with that of the center of the ball. Hence I so arrange the roller, as shown in Fig. 4, that the longitudinal center or axis 34 of the roller-bearing 38 must project to the center of the ball and be at an angle to the plane of the disk. It has also been found preferable to mount the roller 32 on a bearing having an outer head or collar 35, as in this wise the radial thrust of the roller when in action, due to the centrifugal force, is not transmitted to the outer wall, as 36, of the slot in the disk-casing, which would tend to produce a cramping action.

I do not limit myself to the precise construction and arrangement of parts shown, and it will be evident that the individual features of my invention may be used separately apart from the others, and some of them in meters of a different character from that shown.

What I claim is—

1. A disk meter provided with a flat disk and ball, the said flat disk being at one side of the center of the ball and having a disk-casing, formed of two sections, in which the angles of the frusta are equal but the socket-bearings and spherical contour are of unequal extent and area.

2. The combination in a meter, of a ball, a disk secured to the ball at one side of the center thereof, and a disk-casing formed of two sections, the spherical contour, as K, M, being of unequal extent, and having frusta with bearing-faces for the opposite faces of the disk whose angles, as H, from the faces of the two sections, as X, are equal, substantially as described.

3. The combination in a meter, of a ball, a flat disk secured to the ball at one side of the center thereof, a casing formed of two sections each having an unequal portion of the spherical contour, frusta with bearing-faces of equal angles for the opposite faces of the disk, and with a socket-bearing adapted to the said flat disk and the ball, substantially as described.

4. The combination in a disk water-meter, of the ball having side grooves and a flat slotted disk extending into said grooves, substantially as described.

5. The combination in a meter, of a ball having side grooves, and a slotted disk having portions at the center on opposite sides of the slot extending into the said grooves, substantially as described.

6. The combination with the ball of a meter, of a disk of substantially equal weight on all sides of the ball, substantially as and for the purpose herein described.

7. In a meter, a casing, a disk, a ball central with the disk, and ports unequally arranged on opposite sides of a plane extending centrally through the ball, substantially as described.

8. In a disk water-meter, the combination with the ball and disk, of a sectional casing having inlet and outlet-ports formed unequally in both sections, substantially as described.

9. The combination with the ball and disk, of the thrust-roller bearing turning on an axis in a plane which radiates from the center of the ball at an angle to the plane of the disk, substantially as described.

10. The combination with the disk and disk-casing, of the roller-bearing, the roller mounted thereon, and the head or collar secured to the outer end of the bearing, whereby the outward end thrust of the roller is resisted by said head or collar, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN THOMSON.

Witnesses:
MEYER KRASNER,
GEO. A. MAYLAND.