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WATER METER INTERMEDIATE GEARING.

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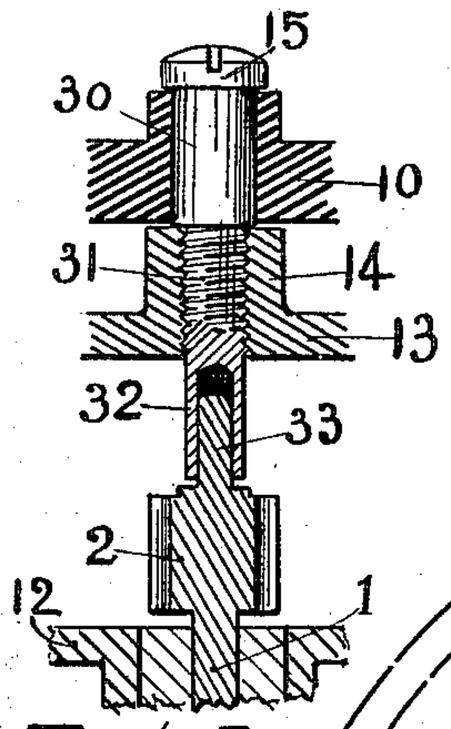

FIG. 5.

FIG. 1.

FIG. 7.

FIG. 6.

FIG. 3.

FIG. 4.

FIG. 2.

Witnesses.

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WATER-METER INTERMEDIATE GEARING.

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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 Improved Water-Meter Intermediate Gearing, of which the following is a specification, reference being made therein to the accompanying drawings.

This invention relates to the improvement of that portion of a water-meter mechanism situated between the measuring piston, wheel or motor, and the registering appliances; and commonly termed the intermediate reducing-gearing.

In no class of machinery is it more essential that the working parts move with the utmost freedom, than in a water-meter mechanism; since the sensitiveness of the meter action is an important qualification in the practical efficiency and accuracy of results attained in registering the amount of flow, and avoiding excessive proportional variations under large or small volume of flow. The intermediate train of reducing gearing has always, heretofore, been a great source of friction and resistance, and means for eliminating or reducing this friction has been much sought for. Also another objection has been owing to fine particles of gritty substances, which are present in all waters, to a more or less extent, settling in and around the bearings and causing them to wear away quickly; and because of the difficulty of replacing the worn parts, practically necessitating an entire new intermediate gear train before other parts of the water-meter become materially deteriorated.

The prime object of my present invention is to provide, in a water-meter mechanism, an intermediate train of gearing in which the friction and wear will be practically negligible, or but a small quantity; said gearing having certain features of construction of a peculiar character, adapted for elimination of friction and wear, as hereinafter more fully explained.

Another object is to prevent or obviate the accumulation in the bearings, of particles of fine sand or other hard or gritty substances which are present in water; and which cause wear of the bearings.

A further object is to provide a step-bearing means for gear spindles, in water-meter intermediate gearing, the parts of which can be easily and quickly removed when it is required by reason of wear or other cause, and new parts readily substituted, or the old parts conveniently repaired at comparatively little expense.

Minor objects and features of my invention are set forth and explained in the following description.

I attain these objects by the means illustrated in the accompanying drawings, wherein—

Figure 1 represents an elevation view of a train of water-meter intermediate gearing embodying my invention; one of the vertical spindles with its gears and bearings being shown in vertical section, at line X on Fig. 2, the relative location of the meter-wheel, top of the meter-casing, and register mechanism, being indicated by broken lines. Fig. 2 is a horizontal section at about the position of line Y on Fig. 1; also showing the general. relation of certain parts on plan, by dotted, and by broken lines. Fig. 3 is a separate plan view of the bridge-plate or the step-bearing plate. Fig. 4 is a central vertical section of the bridge-plate and spacing piece separately. Fig. 5 represents a fragmentary sectional view of the top-gear-axis stud as adapted for supporting the top end of the primary pinion. Fig. 6 is a fragmentary vertical section through the adjustable top-bearing bushing for the vertical gear-spindles: and Fig. 7 illustrates a form of entire non-metallic step or bridge-plate applicable to small sized water-meters.

Referring to the drawings the letter A indicates the upper part or dome of a water-meter casing: B indicates the operating piston, meter-wheel or propelling element; and C a registering mechanism, which parts may be of well known or suitable construction; but are partially delineated in the drawings to show the general arrangement and relation of the meter-wheel or device which is operated by the flow of water in contact therewith, the registering mechanism, and the train of intermediate speed reducing gearing which transmits the motion from the meter-wheel to the registering devices.

The intermediate reducing train consists of a series of pinions and spur gears. As illustrated, it comprises a primary pinion 2 that receives motion from the shaft 1 of the

meter-wheel, or is rotatively actuated by movement of the propelling element as the water passes through the meter; a gear 3 and pinion 4 mounted on a vertical axis spindle 5 and driven by said pinion 2; a second gear 6, and pinion 7, mounted upon a second vertical axis spindle 9; and a central top gear 10 driven by the pinion 7 on the second spindle 9. This intermediate gear train is arranged upon a suitable supporting frame, within the meter casing, and comprising a bottom plate 12 and a top plate or yoke 13 carried upon and at suitable distance above said bottom plate.

The primary pinion 2 is axially central with the frame while the vertical spindles 5 and 9 are located at such distance away from the center, and from each other, as will give the proper meshing of the several gears and pinions in the train. Upon the upper side of the yoke 13, there is a central gear-seat boss 14, its top surface being machined flat and smooth, and having a central tapped hole, into which is screwed a vertical stud 15 upon which the top gear 10 is mounted to revolve. Said top gear is provided with pins or studs 11 which engage the cross-head or crank 16 that operates the registering mechanism C, which is of usual character. The several gears 3, 6 and 10 are preferably made of a hard-rubber compound, or other non-metallic material, while the several pinions 2, 4 and 7 are made of bronze alloy, phosphor bronze, or other hard material that will resist the action of chemicals found in water at various localities.

The bottom plate 12 is provided with chambered bosses 17 and 18 cast integral therewith, in which are arranged hard-rubber bushings, as at 20, having vertical holes therethrough of proper size to serve as journal bearings for the upright spindles, 5 and 9. Likewise the top-plate or yoke 13 is provided upon its upper side with a corresponding number of bosses 21 and 22 having therein hard-rubber bushings to serve as journal bearings for the upper ends of said spindles. Said bosses are in vertical alinement with the holes in the bosses of the bottom plate. The spindles 5 and 9 are mounted to turn freely within their journal bearings.

The upper bushing 23 is best made as shown in Fig. 6, with its top-end closed as at *e* and its cylindrical body adjustable up and down within the boss 21, a set-screw *s*, or equivalent means being provided for retaining the bushing in its adjusted portion. This construction facilitates the proper assembling of the spindles in their mountings, and the regulation thereof to the desired amount of endwise play. The capped bushing also protects the top bearing from grit.

Below the bottom-plate 12 and extending across beneath the respective bearing bosses 17 and 18, I provide a bridge-plate or under bearing member 25 adapted to serve as a step-bearing for sustaining the lower ends of the two vertical spindles 5 and 9. Said bridge-plate, together with an intervening spacing piece 28, is securely fastened to the bottom plate 12, in a manner to leave a clear open space 24 between the top-face of the bridge-plate and the bottom ends of the bosses 17 and 18; the bridge-plate and the spacing-piece each having an approximately central hole, through which is arranged a screw 27, that is threaded into a tapped hole in the plate 12, midway between the bosses; thereby rigidly attaching said bridge-plate and spacing-piece in position, for supporting the spindles with a predetermined amount of space between the bridge or under bearing-member and the spindle-bearing bosses.

The lower ends of the spindles, 5 and 9, are best formed as shown in Fig. 1, with a conoidal, rounded or spherical end termination; and are made of such length as to extend a predetermined distance below the bottom holes of their respective bearing-bosses to step upon the bridge-plate. This bridge-plate is preferably made of bronze about one-eighth to one-fourth inch, more or less in thickness, of any convenient width, and of a length somewhat exceeding the distance between the spindle-bearings. At positions coincident with the spindle-bearings, tapered holes or suitably shaped recesses are formed in the bridge-plate and within said holes or recesses, are fixed plugs, or fillings, 26 of hard rubber or some other nonmetallic substance such as agate, sapphire, or similar material; the upper side thereof being dressed off to a smooth surface. These plugs or inserts 26, serve as the contact members upon which the ends of spindles 5 and 9, are supported and turn, the point of contact being very small owing to the rounded or conoidal form of one or both of the adjacent contacting surfaces. The taper of the holes prevents the plugs 26 from falling through the plate. To insure of the bridge-plate always being in the same position laterally, and to facilitate putting it back the same way, after taking it apart, I provide a small dowel pin 29, fixed in the bottom-plate and extending through a hole in the bridge-plate, so that the parts can be assembled only in their proper way. The bridge-plate 25 being formed separate from and attachable to the intermediate gear supporting frame or bottom plate 12, renders the manufacture thereof convenient and permits of the proper fitting of the step-bearing members 26, before said bridge-plate is assembled upon the bottom plate. The bridge-plate can be readily removed and replaced or renewed at any time, if neces-

sary, without requiring the renewal of the entire bottom-plate. The flat top surface of the bridge-plate and space between said surface and the ends of the bearing-bosses permit the washing out of any grit that might otherwise accumulate about the lower ends of the spindles. In some instances, especially in the case of small sized water-meters, the bridge-plate may be made all of hard rubber; an example of such a bridge-plate 25ª is shown in Fig. 7.

The center stud 15 for the top gear 10, in some instances, is formed with an upper cylindrical portion 30, adjacent to its head, that serves as the axis upon which the top-gear is mounted to revolve; a shoulder and a threaded portion 31 that screws into a tapped opening through the boss 14 and plate 13, for rigidly holding the stud in place and with a downwardly extending portion 32 that serves as an axis support for the upper end of the primary pinion 2, as best shown in Fig. 5: wherein the primary pinion is provided with a projecting axle or stem 33, and the extended portion of the stud is made tubular, of suitable size to fit over said stem as a bearing for steadying or supporting the upper end of the primary pinion, thus causing it to run true and with less friction, especially in cases where said pinion is connected with a short crank shaft, as in some styles of water-meters.

By the construction and combination, as heretofore described, there is produced an intermediate gearing of water-meters, that has proven by actual use, to be practically frictionless, very durable, noiseless in its action, and comparatively inexpensive to manufacture, and which renders the water-meter light running, less liable to variations of registration by fluctuations in the flow, and in which the sensitiveness for registration of the smallest volume of flow is greatly enhanced.

What I claim and desire to secure by Letters Patent is:—

1. In a water-meter mechanism, the combination, of an intermediate supporting means having journal-bearing bosses thereon, a series of hard-rubber gears and vertical bronze pinions coacting therewith, vertical spindles whereon said gears and pinions are mounted, the lower ends of the spindles being of a rounded or conical shape and extending a predetermined distance below their bearing-bosses, and a bridge-plate presenting a non-metallic surface upon which the spindle ends are sustained, with a free open space between the bridge-plate and bearing-bosses, substantially as set forth.

2. In a water-meter mechanism, the combination with the meter-wheel, registering means, and intermediate train of reducing gears having vertical axis spindles; of an intermediate-supporting plate or frame provided with journal bearings for the gear-axis spindles, and a removable bridge-plate underlying said supporting plate and forming a step for the ends of said gear-axis spindles.

3. In the intermediate gearing in a water-meter, the combination, with vertical intermediate gear-spindles carrying the intermeshing gears and pinions mounted thereon, and the upper and lower upright journal-bearing bosses within which said vertical spindles revolve; of an under bearing-member for the ends of said spindles, arranged with a clear open space between the top of said under-bearing member and the bottom ends of the lower journal-bearing bosses, the ends of said spindles being exposed within said open space.

4. In a water-meter mechanism, the combination with the intermediate gear-train including coacting gears and pinions having upright axial spindles, and the supporting-plate or frame therefor, provided with bearing-bosses carrying non-metallic bushings within which said spindles are journaled; of an underlying bridge-plate secured to said supporting-plate and extending beneath the ends of said bearing-bosses and axis spindles, means securing said bridge-plate to the supporting-plate, and an intervening spacing-piece that serves for keeping said bridge-plate at a predetermined distance away from the lower ends of the bearing-bosses, for the purpose set forth.

5. In a water-meter intermediate-gear mechanism, of the class described, the combination, with the lower supporting-plate, and gear spindles; of a removable metallic bridge-plate extending beneath the spindles and provided with recesses or tapered holes therein in alinement therewith, and step-bearing members of a non-metallic substance inserted in said holes and presenting smooth top surfaces adapted for sustaining the ends of the gear spindles.

6. In the intermediate gear-train for water-meters, the combination, with the vertically disposed spindles having the intermeshing gears and pinions mounted thereon, and upper and lower journal-bearings for the respective spindles, said spindles having rounded or conoidal lower ends protruding below their lower journal bearing, and a stationary underlying member having non-metallic plugs or step-devices inserted therein upon which the lower ends of the vertical spindles are respectively sustained, substantially as set forth.

7. In a water-meter mechanism, the combination, with the intermediate gearing including the coacting hard-rubber gears and bronze pinions with vertical metallic spindles whereon said gears and pinions are mounted, and the supporting plates or frame having journal bearing bosses with

bushings therein; of the underlying removable bridge-plate provided with non-metallic spindle-sustaining members thereon, in alinement with the spindles, a spacing-piece positioning said bridge-plate in relation to the bearing-bosses, a screw attaching the bridge-plate to the supporting plate, and means for retaining said bridge-plate against lateral displacement.

8. In a water-meter intermediate-gear mechanism, the combination with a reducing gear and pinion, a vertical gear spindle, and its top supporting-plate having a bearing-boss formed thereon; of a hard-rubber spindle-bearing bushing, closed at its upper end, and adjustable up and down within said bearing-boss, and means for securing said bushing at adjusted position.

9. In a water-meter intermediate-gear mechanism, the combination with a train of gears comprising a series of coacting gears and pinions mounted upon vertical spindles, a primary meter-actuated pinion, a top gear provided with register-actuating means, and lower and upper bearing-supporting plates or frame; of a center axis-stud on which the top gear is mounted, said stud having an extended lower end adapted as an axis-support for the top end of said primary pinion.

10. In a water-meter intermediate-gearing, the combination as described, with the meter-actuated primary pinion having an upward projecting stem or axle, the supporting frame provided with axle-bearings and an upper gear-seat boss, a top-gear wheel above said boss, and the series of coacting gears and pinions intermeshing in train therewith; of the central axis-stud for said top gear, said stud comprising an axis portion within the top-gear, an intermedial portion threaded into an opening through said gear-seat boss, and a downwardly extended tubular portion adapted as a bearing for the stem or axle at the upper end of said primary pinion.

Witness my hand this 15th day of February, 1911.

WILLIAM H. LARRABEE.

Witnesses:

CHAS. H. BURLEIGH,

EDW. K. OTIS.