M. LEITCH.

VALVE.

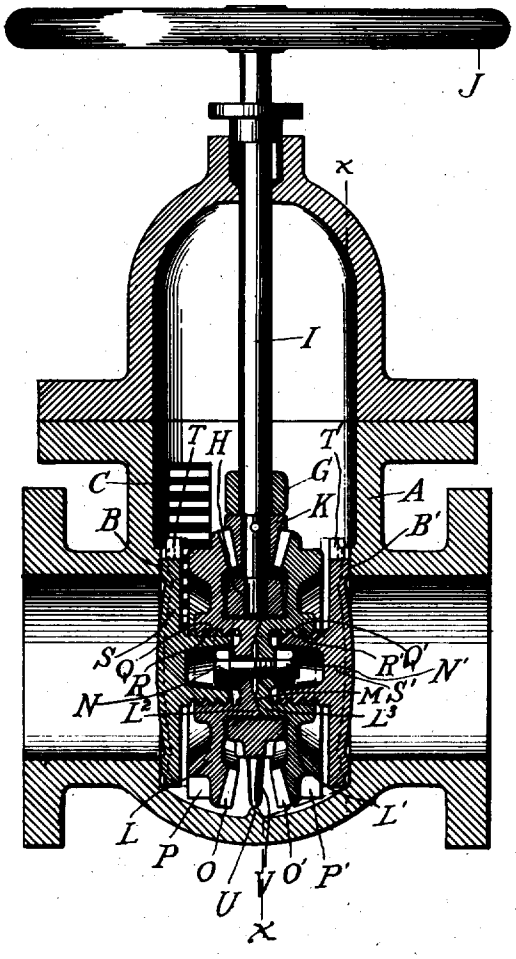
APPLICATION FILED MAR. 16, 1910.

1,012,870.

Patented Dec. 26, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

Fred. W. Dannenfelser.

Chas. A. Pauly

Inventor

MEREDITH LEITCH

By his Attorneys

Barton, Brownell & Mitchell

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1,012,870. **Patented Dec. 26, 1911.**

3 SHEETS—SHEET 2.

Fig. 2.

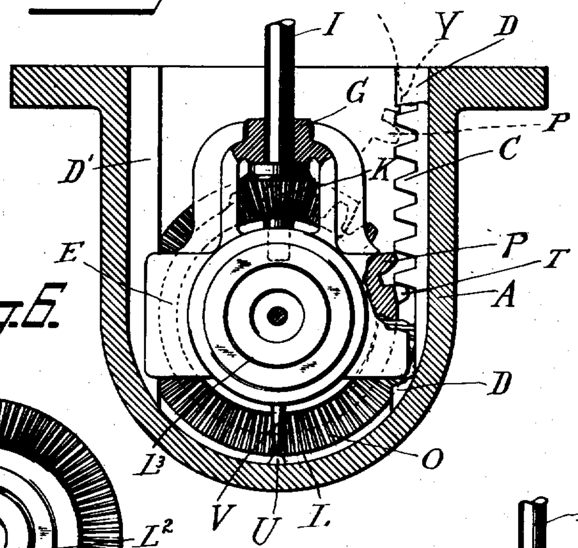


Fig. 6.

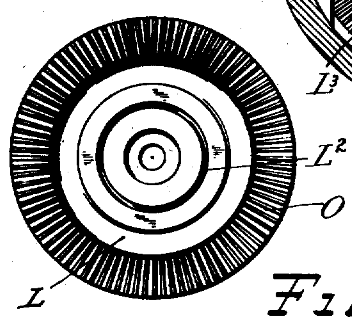


Fig. 4.

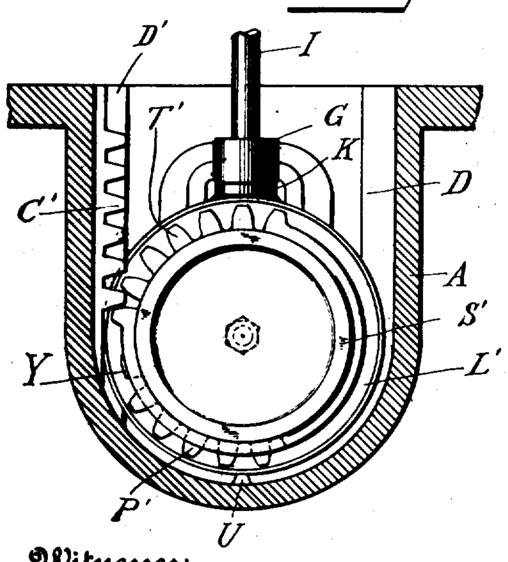
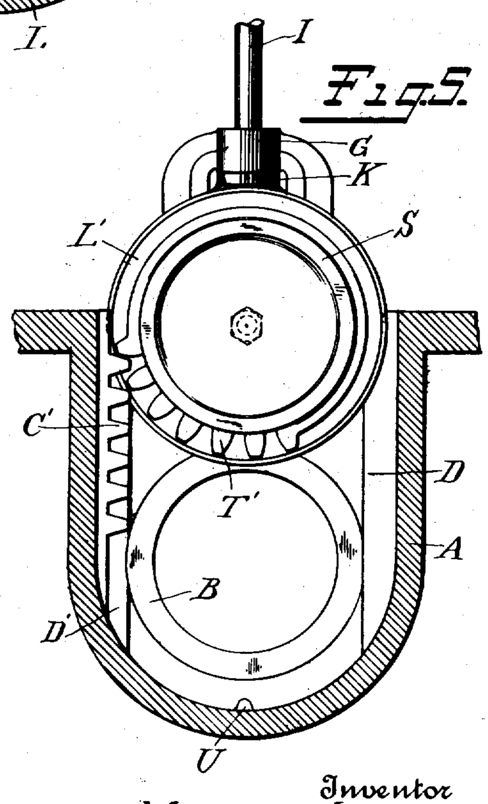


Fig. 5.



Witnesses:
Fred M. Dannenfelser
Chas. A. Peard

Inventor
MEREDITH LEITCH
By his Attorneys
Bartlett Brownell Mitchell

M. LEITCH.

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3 SHEETS—SHEET 3.

Fig. 3.

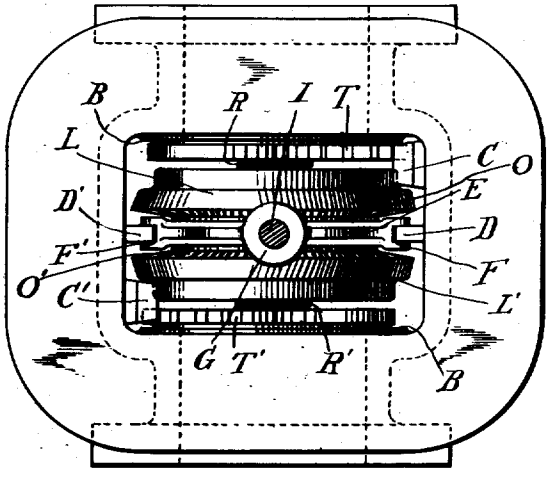


Fig. 7.

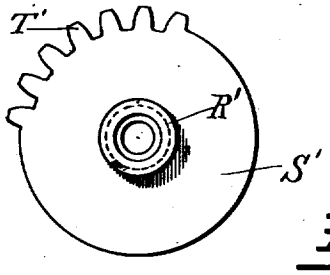


Fig. 8.

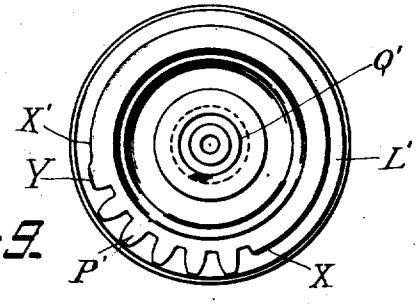
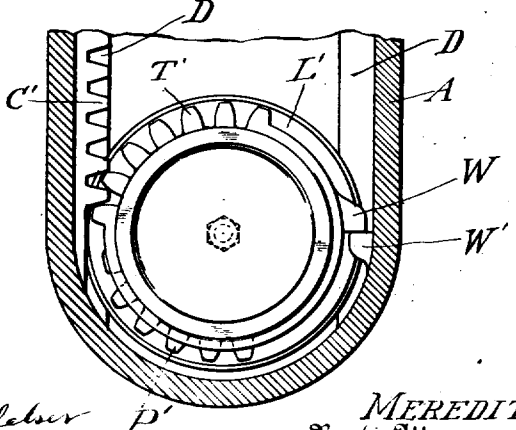


Fig. 9.



Witnesses:

Fred'k. Dannenfelser

Chas. A. Peard

Inventor

MEREDITH LEITCH

By his Attorneys

Bartlett Brownell & Mitchell

UNITED STATES PATENT OFFICE.

MEREDITH LEITCH, OF SPRINGFIELD, MASSACHUSETTS.

VALVE.

1,012,870. Specification of Letters Patent. Patented Dec. 26, 1911.

Application filed March 16, 1910. Serial No. 549,717.

To all whom it may concern:

Be it known that I, MEREDITH LEITCH, a citizen of the United States, residing at Springfield, county of Hampden, State of Massachusetts, have invented certain new and useful Improvements in Valves, of which the following is a full, clear, and exact description.

My invention relates to improvements in valves and has for its object to produce a new and improved gate valve that can be opened or closed quickly, also a valve having a single valve stem, in which, in closing by rotating the single valve stem a valve disk will move into position so that the axis of the disk coincides with the axis of the valve seat and at this point stop, and by further rotation of the same valve stem, the disk will approach its seat and be tightly closed against it without any scraping or abrasive action; also a valve in which, when being opened, upon rotating of the shaft or valve stem in the opposite direction from that for closing the valve, the disk will be positively withdrawn from its seat regardless of the pressure of the fluid until clear from the seat, and will then, by further rotation of the valve stem, be withdrawn from the orifice into the valve bonnet; also a valve having two seats and two disks which opens and closes as above described, the movements of the disks to and from their seats being simultaneous; also a valve, in which, when opened or closed, the valve will, by a further rotation of the valve stem, be locked in position so that the valve disks may not move downward by gravity or upward in an improper manner; also a valve that opens and closes quickly, but in which the movement of the valve disks to and from the seats is a slow movement; also a gate valve in which any transverse and any rotating movements of the disks while in engagement with their seats is prevented; also a valve in which any of the facings which are used in connection with the well known type of globe valve can be used.

Another object is to provide a valve in which the faces of the disks will conform to any distortion of the seats from parallelism.

Another object of my invention is to provide a valve in which the working parts may be for the most part formed by casting and without machining, so as to preserve the resisting scale upon the working parts.

Another object is to provide a valve whose parts shall occupy compact space and yet be of such proportions as to resist rough usage and overcome such obstacles that may come into the valve body, such as corrosion, pebbles and so on.

The following is a description of a valve embodying my invention, reference being had to the accompanying drawings, in which—

Figure 1 shows a longitudinal section of the valve casing and operating parts. Fig. 2 is a transverse section of the valve casing with the parts on one side of the yoke removed, the valve disk being in depressed condition but not yet seated. Fig. 3 is a plan view of the valve with the bonnet removed, the parts being as in Fig. 1. Fig. 4 is an end view of the inner portions of the valve, the case being shown in section on the line x—x, Fig. 1. In this view the valve disks are shown in the position in which they are when seated. Fig. 5 is a similar view showing the parts in raised position. Fig. 6 is a detail view of one of the geared members. Fig. 7 is a detail rear view of one of the valve disks. Fig. 8 shows the reverse of Fig. 6. Fig. 9 shows a modification.

Referring more particularly to the drawings, A is a valve casing having the seats B—B′ and also racks C—C′ and guides D—D′. In small sized valves, the parts B—B′, C—C′ and D—D′ are usually for convenience cast integral with the valve casing.

E is a yoke having grooves F—F′ engaging the projections D—D′ and sliding up and down thereon. This yoke provides bearings G—H for the shaft I of the hand wheel J. Securely fixed to the shaft I between the bearings G and H is a beveled pinion K.

L—L′ are two geared members which may be termed wheels having lateral projections L^2—L^3 which enter in the frame E, said projections having ball and socket surfaces which meet at M.

N is a bolt holding the two wheels L—L′

together, passing loosely through the hole in the wheel L and screwing into the wheel L'.

N' is a lock-nut upon the end of the bolt. This bolt is adjusted so as not to interfere with the movement of the two wheels relatively to one another on the surfaces M.

The wheels L—L' are provided with bevel gear teeth O—O' to engage the teeth on the bevel pinion K continuously. They are also provided with spur gear teeth P—P', extending along a part of their peripheries, which, when the valve is closed as shown in Fig. 1 and Fig. 4, are out of engagement with the racks C—C', but when the wheels are moving upward or downward, engage those racks and produce such movement according to the direction in which the hand-wheel J is moved. The wheels L—L' are provided with internal screw-threads Q—Q' with which external screw-threads R—R' located on valve disks S—S' engage, the axis of the threads being substantially normal to the yoke E. These valve disks are provided with spur gear teeth T—T' which are of a sufficient number so as to always engage the racks C—C' whatever the position of the valve disks may be. These valve disks, when the valve is closed, bear against the seats B—B' so as to completely interrupt the passage of any fluid through the valve.

U is a projection formed on the bottom of the valve casing with which an extension V from the yoke, when the yoke has reached its lowermost position, engages, the downward movement being limited by such engagement. The yoke E makes engagement with the stop U just as the teeth P—P' become disengaged from the racks C—C'.

Fig. 9 shows a modification whereby the downward movement of the valve is limited without engagement between the yoke and the valve casing. This is brought about by forming upon each of the disks S—S' a projection W which engages a projection W' on the valve body opposite the racks with which the disks engage.

The wheels L—L' at each side of the spur teeth thereon are each provided with a plain surface I which, after the spur teeth P—P' have disengaged the racks C—C' when the valve is in its depressed position, engages the lower tooth of the respective racks, thus preventing the yoke and connected parts from moving upward until after the wheels L—L' have revolved so that the gear teeth P—P' engage with the teeth of the racks C—C' and the valve disks are fully withdrawn from their seats. When the valve is wide open, the engagement of the smooth faces X' with the upper teeth of the racks also prevents the valve disks from moving downward under the action of gravity until the hand-wheel has been operated for the purpose of producing that result. In order that the spur gears on the wheels L—L' may not get out of proper relation with the rack, I provide on each wheel a cam surface Y which engages with the upper teeth of the racks and lifts the parts against the action of gravity so as to insure the correct engagement of the teeth P—P' and their racks.

The operation of the valve is as follows: In Fig. 1 the parts are shown with the valves in closed position, the disks being engaged with their valve seats. The screw-threads on the engaging portions are right-hand screw-threads. If the hand-wheel is turned clockwise, the first action is to cause the pinion K to revolve the nut-wheels L—L' in opposite directions and screw the projections on the disks S—S' into the recesses in the nut wheels L—L', thus withdrawing the disks S—S' from their valve seats B—B' to the positions shown in dotted lines (Fig. 1). During this operation, the disks S—S' are held from rotating by the engagement of their spur teeth with the racks C—C' and the parts are held from rising if the friction between the screw-threads should be great, by the engagement of the surfaces X with the lower teeth of the racks C—C'. When the teeth P—P' upon the wheels L—L' have moved a sufficient distance so that they engage the racks C—C' the movements of the disks, S—S' along their axes are stopped and the wheels L—L' are lifted by reason of the engagement of their teeth P—P' with the racks C—C'. The valve disks S—S' travel along with the nuts L—L' and rotate synchronously with them by reason of the engagement of the teeth on the disks and wheels with the racks C—C'. When the valve disks S—S' have reached their uppermost position, the blank surfaces X' upon the wheels engage the upper teeth of the racks C—C' and prevent the downward movement of the movable portions under the action of gravity. In closing the valve, the hand-wheel J is moved counter-clockwise until the teeth P—P' upon the wheels L—L' are brought into engagement with the racks C—C' and then further movement of the hand-wheel J causes the movable parts to descend, the wheels L—L' and disks S—S' moving synchronously. When the downward movement has been completed, the lower end V of the yoke E engages the projection U and the teeth upon the wheels L—L' disengage the racks C—C'. A continuation of the movement of the hand-wheel J causes the wheels L—L' to revolve so as to be somewhat unscrewed from the projections on the disks S—S', the disks S—S' meanwhile being held from rotation by reason of the engagement of their teeth T—T' with their corresponding racks C—C'. In case the valve case becomes in any way distorted so that the valve seats B—B' are a little out of parallelism, the

valve disks S—S′ adjust themselves so as to nevertheless fit the valve seats, this being permitted by the ball and socket joint whose faces meet at M. The final closing of the valve disks S—S′ is brought about by a movement parallel to their axes and to the axes of the valve seats without any rotation of the valve disks S—S′. There is therefore, no abrasion or scoring of the faces of the valve disks S—S′ or their seats B—B′ upon the closing of the valve. In a similar manner upon opening of the valve, the first movement of the valve disks S—S′ is to withdraw from their seats B—B′ along the line parallel to their axes so that there is no abrasion or scoring upon the opening of the valve. The valve disks S—S′ always register with the same portions of their seats B—B′ so that if the surface contacting upon the seat bears any imprint of the seat or vice versa, the imprints will always register and effect a tight closing.

Up and down movement of the valve is rapid because it is approximately the same as the peripheral velocity of the teeth on the pinion K. The movement of the valve disks S—S′ parallel to their axes is, however, slow, since it is due to the reducing effect of the pinion K and wheel L and a screw-thread motion. The initial opening and final closing of the valve is such as is desired particularly for opening and closing valves for fluids under high pressure or velocity.

If the valve in a water pipe has remained open for a number of years, it is possible that the rack and gears may become filled with what are termed "rust barnacles", and when it is desired to close the valve these obstacles may be broken away. This will be effected by turning the hand-wheel quickly back and forth, causing the gears to strike the teeth against the rack and loosen up any obstruction until the disks have been worked down into their lowest position. On reaching this point, if they are full of obstructions such as rust, etc., the same back and forth movement of the hand wheel will operate to dislodge the rust and loosen up the screws so that the disks may be finally forced out against the seats.

I have shown two geared members L—L′ and two valve disks S—S′ and this is the construction that would ordinarily be used although two geared members and valve disks would not be necessary under all circumstances.

My invention permits of various modifications as will be evident to one skilled in the art. The form shown is, however, the preferred embodiment.

What I claim is:

1. In a valve, the combination of a valve casing, a shaft and a pinion carried by said shaft, a geared member engaged by said pinion and adapted to be rotated thereby, a valve disk, said geared member and disk having, one a screw-threaded projection and the other a coöperating screw-threaded recess, and also having peripheral gear teeth, and racks on said casing engaged by said peripheral teeth.

2. In a valve, the combination of a valve casing, a shaft and a pinion carried by said shaft, a geared member engaged by said pinion and adapted to be rotated thereby, a valve disk, said geared member and disk having, one a screw-threaded projection and the other a coöperating screw-threaded recess, and also having peripheral gear teeth, and racks on said casing engaged by said peripheral teeth, and a bearing for said shaft embracing a projection on said geared member.

3. In a valve, the combination of a valve casing, a shaft and a pinion carried by said shaft, a geared member engaged by said pinion and adapted to be rotated thereby, a valve disk, said geared member and disk having, one a screw-threaded projection and the other a coöperating screw-threaded recess, and also having peripheral gear teeth, and racks on said casing engaged by said peripheral teeth, and a bearing for said shaft embracing a projection on said geared member, said geared member having on its rear surface a ball and socket bearing.

4. In a valve, the combination of an operating shaft, a pinion secured to said shaft, a yoke in which said shaft is rotatably mounted, a valve casing having guiding surfaces for said yoke, a rack carried by said casing, a valve disk having teeth engaging said rack, a geared member engaging said pinion and also engaging said rack when said valve is open, but disengaged from said rack when in lowermost position, said valve disk and geared member having, one a screw-threaded recess and the other a screw-threaded projection, having a common axis substantially normal to said valve disk.

5. In a valve, the combination of a valve casing, a yoke guided thereby, a rack secured to said casing, a valve disk having gear teeth engaging said rack in all positions of said disk, a geared member having two sets of teeth, one engaging said rack in certain positions but disengaged therefrom when in its lowermost position, a screw-thread connection between the valve disk and member, whose axis is substantially normal to the plane of said yoke, a shaft journaled in said yoke, and a pinion fixed to said shaft and engaging the second set of teeth in said member.

6. In a valve, the combination of a valve casing, a yoke guided thereby, racks secured to said casing, two valve disks having gear teeth engaging said racks in all positions of said disks, two geared members,

each having two sets of teeth, one engaging one of said racks in certain positions but disengaged therefrom when said members are in lowermost position, a screw-thread connection between the valve disks and members whose axis is substantially normal to the plane of said yoke, a shaft journaled in said yoke, and a pinion fixed to said shaft and engaging the second set of teeth on said members.

7. In a valve, the combination of an operating shaft, a pinion secured to said shaft, a yoke in which said shaft is rotatably mounted, a valve casing having guiding surfaces for said yoke, a rack carried by said casing, a valve disk having teeth engaging said rack, a geared member engaging said pinion and also engaging said rack when said valve is open, but disengaged from said rack when in lowermost position, said valve disk and geared member having, one a screw-thread recess and the other a screw-threaded projection, having a common axis at an angle to the axis of said pinion, and a stop for limiting the downward movement of the parts.

8. In a valve, the combination of an operating shaft, a pinion secured to said shaft, a yoke in which said shaft is rotatably mounted, a valve casing having guiding surfaces for said yoke, a rack carried by said casing, a valve disk having teeth engaging said rack, a geared member engaging said pinion and also engaging said rack when said valve is open, but disengaged from said rack when in lowermost position, said valve disk and geared member having, one a screw-thread recess and the other a screw-threaded projection, having a common axis at an angle to the axis of said pinion, said yoke engaging said casing so as to limit the downward movement of said yoke.

9. In a valve, the combination of an operating shaft, a pinion secured to said shaft, a yoke in which said shaft is rotatably mounted, a valve casing having guiding surfaces for said yoke, a rack carried by said casing, a valve disk having teeth engaging said rack, a geared member engaging said pinion and also engaging said rack when said valve is open, but disengaged from said rack when in lowermost position, said valve disk and geared member having, one a screw-thread recess and the other a screw-threaded projection, having a common axis at an angle to the axis of said pinion, said member having a plain surface beyond said teeth engaging said rack when said disk is fully raised and locking it against movement by gravity.

10. In a valve, the combination of an operating shaft, a pinion secured to said shaft, a yoke in which said shaft is rotatably mounted, a valve casing having guiding surfaces for said yoke, a rack carried by said casing, a valve disk having teeth engaging said rack, a geared member engaging said pinion and also engaging said rack when said valve is open, but disengaged from said rack when in lowermost position, said valve disk and geared member having, one a screw-thread recess and the other a screw-threaded projection, having a common axis at an angle to the axis of said pinion, said member having a plain surface at one side of its teeth which engages said rack when said member is in its lowermost position and its teeth are out of engagement with said rack.

11. In a valve, the combination of a valve casing having a seat, a valve disk for said seat, means for moving said valve disk positively toward and away from said seat in a direction substantially normal to said seat and also in a direction substantially parallel to the plane of said seat, and means for preventing one of said movements from occurring until after the other movement has begun.

12. In a valve, the combination of a valve casing having a seat, a valve disk for said seat, means for moving said valve disk positively toward and away from said seat in a direction substantially normal to said seat and also in a direction substantially parallel to the plane of said seat, and means for causing said two movements to begin and end at different times.

13. In a valve, the combination of a valve casing, a shaft and pinion carried thereby, two geared members engaging said pinion and adapted to be rotated thereby in opposite directions, two valve disks, said geared members and disks having coöperating screw-threaded recesses and projections, and also having peripheral gear teeth, and racks on said casing engaged by said peripheral teeth.

14. In a valve, the combination of a valve casing, a shaft and pinion carried thereby, two geared members engaging said pinion and adapted to be rotated thereby in opposite directions, two valve disks, said geared members and disks having coöperating screw-threaded recesses and projections, and also having peripheral gear teeth, and racks on said casing engaged by said peripheral teeth, and a bearing for said shaft, said bearing embracing projections on said geared members.

15. In a valve, the combination of a valve casing having a plurality of racks carried thereby, a yoke within said casing and engaging bearing surfaces thereon, geared members carried by said yoke and each carrying a portion of a ball and socket joint, valve disks having screw-thread connection with said geared members, a shaft journaled in said yoke, a pinion secured to said shaft and gearing with said geared members,

said geared members and disks having projecting teeth adapted to engage with said racks.

16. In a valve, the combination of a valve casing having a plurality of racks carried thereby, a yoke within said casing engaging bearing surfaces thereon, contacting geared members carried by said yoke and having ball and socket surfaces at their contacting portions, valve disks having screw-thread connection with said geared members, a shaft journaled in said yoke, and a pinion secured to said shaft and gearing with said geared members, said geared members and disks having projecting teeth adapted to engage with said racks.

MEREDITH LEITCH.

Witnesses:
OWEN J. MARRA,
FREDERICK K. FEARNSIDE.

Correction In Letters Patent No. 1,012,870.

It is hereby certified that in Letters Patent No. 1,012,870, granted December 26, 1911, upon the application of Meredith Leitch, of Springfield, Massachusetts, for an improvement in "Valves," an error appears in the printed specification requiring correction as follows: Page 2, line 50, for the reference-letter "I" read *X;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 30th day of January, A. D., 1912.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

said geared members and disks having projecting teeth adapted to engage with said racks.

16. In a valve, the combination of a valve casing having a plurality of racks carried thereby, a yoke within said casing engaging bearing surfaces thereon, contacting geared members carried by said yoke and having ball and socket surfaces at their contacting portions, valve disks having screw-thread connection with said geared members, a shaft journaled in said yoke, and a pinion secured to said shaft and gearing with said geared members, said geared members and disks having projecting teeth adapted to engage with said racks.

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