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VALVE DEVICE FOR CORROSIVE LIQUIDS.

APPLICATION FILED MAR. 2, 1908.

939,927. Patented Nov. 9, 1909.

Fig. 1.

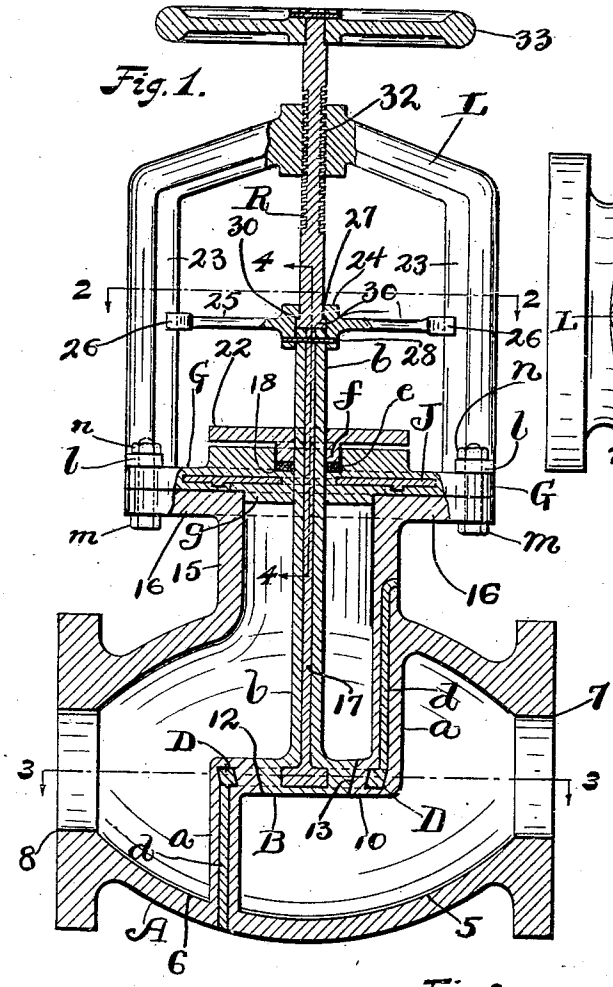


Fig. 2.

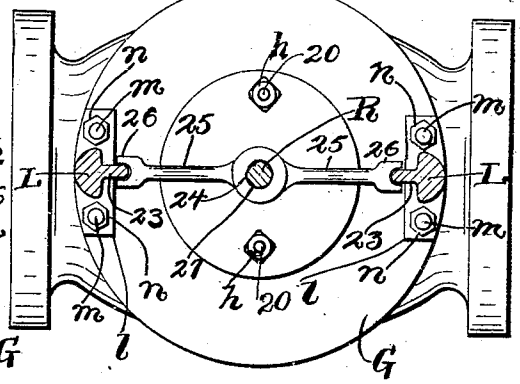


Fig. 3.

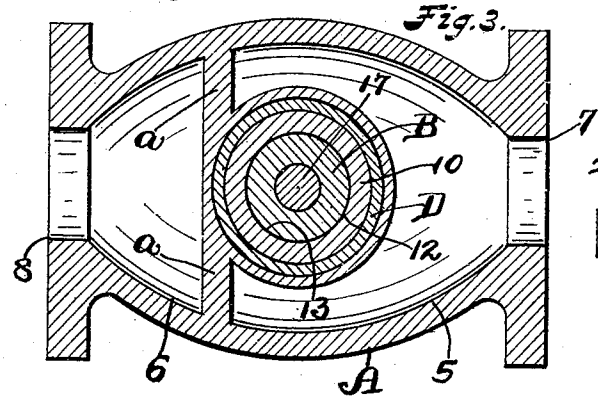
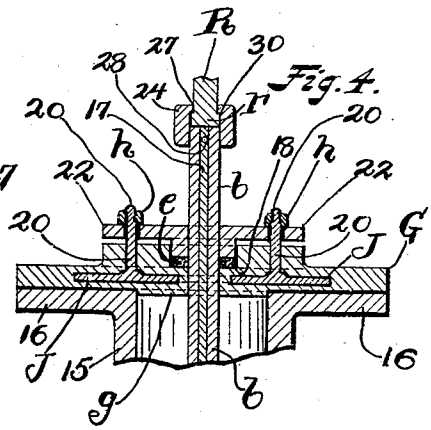


Fig. 4.



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UNITED STATES PATENT OFFICE.

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VALVE DEVICE FOR CORROSIVE LIQUIDS.

939,927. Specification of Letters Patent. **Patented Nov. 9, 1909.**

Application filed March 2, 1908. Serial No. 418,796.

To all whom it may concern:

Be it known that I, WILLIAM H. SMITH, a citizen of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Valve Devices for Corrosive Liquids; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to improvements in valve-devices for use with liquids which will corrode hard metals usually employed in the manufacture of valve-devices, and this invention pertains more especially therefore to valve-devices in which every surface, which is liable to come in contact with or be exposed to the corrosive liquid conducted through the valve-casing of the valve-device, is composed of soft and non-corrodible metal.

My invention consists primarily in the reinforcement of the soft-metal portion of the valve-seat-forming partition of the valve-casing by hard metal in an efficient but inexpensive manner.

Another object is to provide a simple and efficient support for the valve of the valve-device.

Another object is to provide the valve-casing with a cap which is composed in the main of soft and non-corrodible metal, which cap is provided with a stuffing-box around the stem of the valve and is efficiently and inexpensively reinforced interiorly between the inner end of the stuffing-box and its inner side by a hard-metal plate which is embedded in and incased by the soft metal of the cap and extends around the valve-stem.

With these objects in view, and to the end of realizing other advantages hereinafter appearing, this invention consists in certain features of construction, and combinations of parts, hereinafter described, pointed out in the claims, and illustrated in the accompanying drawings.

In the said drawings, Figure 1 is a side elevation, largely in central section, of a valve-device embodying my invention. Fig. 2 is a transverse section on line 2—2, Fig. 1, looking downwardly. Fig. 3 is a transverse section on line 3—3, Fig. 1, looking downwardly. Fig. 4 is a vertical section on line 4—4, Fig. 1.

Referring to the drawings, A indicates the body-portion of a cast-soft-metal valve-casing, which body-portion is provided interiorly with two chambers 5 and 6 which are arranged at opposite sides respectively of a partition *a* formed internally and centrally of the valve-casing. That is, the body A of the valve casing is composed of non-corrodible cast metal. The chambers 5 and 6 are provided with an inlet 7 and outlet 8 respectively at opposite ends respectively of the valve-casing. The partition *a* has a horizontally arranged portion 10 located centrally of the valve-casing and provided with an upwardly flaring aperture 12 which extends vertically through the said portion of the partition and has its surrounding wall forming an upwardly flaring valve-seat 13 for the externally beveled valve-proper B of the valve of my improved valve-device. Obviously communication between the chambers 5 and 6 of the valve-casing is interrupted or established according as the valve is in its closed or open position. It will be observed that the chambers 5 and 6, inlet 7, outlet 8 and aperture 12, together form a passageway arranged interiorly and extending through the valve-casing and that the valve-seat 13 forms a portion of the surrounding wall of the said passageway. The valve is provided with a stem *b* which extends externally of the valve-casing in the direction in which the valve-seat flares and centrally through a tubular neck 15 with which the valve-casing A is provided. The neck 15 is provided at its outer end and externally with a flange 16 which extends around the neck.

Every surface of the valve-casing A which is liable to come in contact with or be exposed to a corrosive liquid conducted or passing through the valve-casing is composed of soft and non-corrodible metal such, for instance, as a composition of lead and antimony, but the valve-seat-forming central portion 10 of the partition *a* is reinforced interiorly by a ring or frame D of hard metal, such, for instance, as cast-iron, which is embedded in and wholly incased by the soft-metal of the partition during the casting of the valve-casing. It will be observed therefore that the frame D is cast in the non-

corrodible metal of the valve-seat-forming portion of the body A of the valve-casing during the casting of the said body. As shown very clearly in Fig. 3, the ring or frame D is arranged concentrically relative to the valve-seat 13 and surrounds the valve-seat 13. The reinforcing hard-metal ring or member D has its internal surface flaring in the direction in which the valve-seat 13 flares and arranged parallel with the valve-seat so as to most efficiently strengthen the valve-seat. The frame reinforcing member D has two arms *d* and *d* embedded in and incased by the soft metal of and extending through opposite end-portions respectively of the partition, which arms are instrumental in reinforcing and supporting the said reinforcing member D.

The end-portions of the partition *a*, as shown in Fig. 1, are arranged substantially parallel with the neck 15 and extend from the central and valve-seat-forming portion of the partition upwardly and downwardly respectively to the top and bottom of the body A.

The reinforcing member D and its arms *d* and *d* have no portion thereof exposed to the chambers 5 and 6 of the valve-casing so that any corrosive liquid passing or conducted through the valve-casing can not come in contact with the said reinforcing member and its arms. The said reinforcing member D and its arms effectually render the valve-seat sufficiently strong to prevent distortion or displacement of the valve-seat by pressure exerted against the said seat by the valve during the closing of the valve. The neck 15 is closed at its outer end around the valve-stem *b* by a cap G composed in the main of soft and non-corrodible metal, such, for instance, as a composition of lead and antimony, which cap has its central portion projecting into the said neck, as at *g*. The inwardly projecting portion *g* of the cap fits so tightly within the neck that a fluid-tight joint is formed between the neck and the cap. At least the inner surface of the inwardly projecting portion *g* of the cap is formed of soft and non-corrodible metal so that the cap is not corroded or injured by corrosive liquid passing or conducted through the valve-casing.

The valve-stem *b* preferably consists of a rod 17 of hard metal which is enveloped by soft and non-corrodible metal, which rod is embedded in and incased by the soft and non-corrodible metal forming the external surfaces of the valve-stem and valve-proper during the casting of the valve, and the said rod is enlarged at its inner end centrally of the valve-proper.

The valve-stem *b* extends through the cap G and through a stuffing-box with which the said cap at its outer side is provided. The stuffing-box is formed by packing *e* arranged within a recess 18 formed in the outer side of the cap G around the valve-stem, which packing is properly compressed by an endwise shiftable tubular gland *f* which surrounds the valve-stem and extends into or engages the said recess. It will be observed that the cap G and its said stuffing-box constitute means for hermetically closing the neck 15 at the outer end of the neck around the valve-stem *d*.

The cap G is desirably reinforced between the inner end of the stuffing-box and the inwardly projecting central portion or inner side of the cap by an annular plate J of hard metal, such, for instance, as steel or bronze. The plate J surrounds the valve-stem *b* between the recess 18 and the inner side of the cap and is embedded in and incased by the soft-metal of the cap during the casting of the cap. It will be observed therefore that the plate J is cast in the non-corrodible metal of the cap and wholly unexposed to the passageway formed as aforesaid by the chambers 5 and 6, inlet 7, outlet 8 and aperture 12 in the body of the valve-casing. The cap-reinforcing plate J is provided with a plurality of studs 20 which are arranged parallel with the valve-stem *b*. The studs 20 project loosely through holes in a laterally projecting flange 22 formed on the gland *f* at the outer end of the gland, and nuts *h* are mounted on the studs at the said end of the gland. By manipulating the nuts *h* the gland can be tightened or loosened relative to the packing *e* to place the packing under the compression required to effect the formation of a fluid-tight joint around the valve-stem where the valve-stem extends through the cap G.

At the outer side of the cap is arranged a hard-metal yoke L having its end-portions provided with lugs *l* arranged next adjacent the outer side of the cap G. Bolts *m* extend through the flange 16 of the valve-casing-neck 15 and through the cap G and the lugs *l* and are arranged with their heads at the inner side of the said flange, and nuts *n* are mounted on the bolts at the outer sides of the said lugs. The cap G and the yoke L are therefore removably secured to the neck-flange 16. The end-portions of the yoke L are arranged at opposite sides respectively of the stuffing-box, and each end-portion of the yoke is provided at its inner side with a rib 23 which extends longitudinally of the said end-portion and is arranged parallel with the valve-stem *b*.

The valve-stem *b* is provided at its outer end with a head 24 which has two laterally projecting arms 25 and 25 arranged at opposite sides respectively of the head and having forked outer ends 26 which straddle the ribs 23 of the yoke L. Obviously the valve-stem is properly guided through the medium of the mutually engaging ribs 23 and

arms 25 during the actuation of the valve. The head 24 is provided centrally with a hole 27 which extends vertically through the head and is enlarged transversely at its inner end to receive the valve-stem which is secured to the head in any approved manner, as, for instance, by a pin 28 which extends laterally through the outer end of the valve-stem and through the head. The head 24 is provided internally, centrally between the outer end of the valve-stem and the outer end of the hole 27, with an inwardly facing shoulder 30 overlapped by the head *r* formed on the inner end of a screw R which extends into the said hole from the outer end of the hole and is arranged in line endwise with the valve-stem and abuts at its inner end against the outer end of the valve-stem. The screw R engages and extends through a correspondingly screw-threaded hole 32 formed in and centrally of the central portion of the yoke. The central portion of the yoke therefore forms a nut engaged by the screw, and the screw is provided at its outer end and a suitable distance from the yoke with a hand-wheel 33 for turning the screw. Obviously therefore the valve is operatively connected with a screw, and the operative connection between the valve and the screw is such that the screw can be turned without turning the valve-stem. Consequently the valve is actuated to open or close according as the screw is turned in the one or the other direction.

By the construction hereinbefore described it will be observed that my improved valve-device for corrosive liquids comprises the following:—a valve-casing having all its internal surfaces, which are exposed to liquid passing or conducted through the valve-casing, composed of soft and non-corrodible metal, which casing has an outwardly projecting tubular neck and is provided centrally with an inexpensively and adequately interiorly-reinforced partition arranged between two chambers which are formed within the valve-casing, which partition has its central portion arranged opposite the inner end of the neck and provided with an aperture which extends through the partition and is arranged substantially in line endwise with the said neck; a valve controlling communication between the said chambers through the said aperture and provided with a suitably guided stem arranged centrally of and extending through and beyond the outer end of the aforesaid neck, said valve-stem and the valve-proper having their external surfaces, which are exposed to any liquid passing or conducted through the valve-casing, composed of soft and non-corrodible metal; a cap fitted to the outer end of the aforesaid neck and having any surface thereof, which is exposed to liquid passing or conducted through the valve-casing, composed of soft and non-corrodible metal, which cap is provided in its outer side with a recess extending around the valve-stem and has an inexpensive and adequate interior reinforcement between the said recess and the inner side of the cap; packing within the inner end of the said recess; a gland controlling the compression of the packing; inexpensive and convenient means for operating the gland to shift the gland inwardly or loosen the gland relative to the packing, and simple means for effecting an endwise movement of the valve-stem to open or close the valve according as the valve-stem is actuated in the one or the other direction.

What I claim is:—

1. In a valve-device for corrosive liquids, a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing and has a flaring valve-seat forming a portion of the surrounding wall of the said passageway, said valve-seat being reinforced by a hard metal frame which is " cast in " the non-corrodible metal of the valve-seat-forming portion of the body and wholly unexposed to the said passageway, which frame surrounds the valve-seat, and a suitably supported movable valve controlling continuity in the said passageway and arranged and beveled to render it capable of seating against the flaring valve-seat.

2. In a valve-device for corrosive liquids, a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing and has an annular flaring valve-seat forming a portion of the surrounding wall of the said passageway, said valve-seat being reinforced by a hard metal frame which is in the form of a ring which is " cast in " the non-corrodible metal of the valve-seat-forming portion of the body and wholly unexposed to the said passageway, which ring surrounds the valve-seat and has its internal surface flaring in the direction in which the valve-seat flares, and a valve controlling continuity in the said passageway and arranged to seat against the said valve-seat.

3. In a valve-device for corrosive liquids, a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing and has an outwardly projecting tubular neck which is integral with the body, said body being provided with a partition which has a portion arranged opposite the inner end of the aforesaid neck and is provided with a valve-seat which is formed by the surrounding wall of an aperture formed in the partition and flaring in the direction of the said neck, said valve-seat being reinforced by a hard metal frame which is " cast in " the non-corrodible metal of the valve-seat-forming portion of the body and wholly

unexposed to the aforesaid passageway, which frame surrounds the valve-seat, and a valve controlling continuity in the said passageway and arranged to seat against the valve-seat.

4. In a valve-device for corrosive liquids, a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing and has an outwardly projecting tubular neck which is integral with the body, said body being provided centrally between the ends of the aforesaid passageway with a partition which has a central portion which is arranged opposite the inner end of the neck and end-portions which are arranged substantially parallel with the neck, said partition having a valve-seat which is formed around an aperture formed in the central portion of the partition and reinforced by a hard metal frame which is "cast in" the non-corrodible metal of the valve-seat-forming portion of the partition and wholly unexposed to the aforesaid passageway and surrounds the valve seat, said frame being provided with two arms which are rigid with the frame and arranged at opposite sides respectively of the said frame and projecting the one toward and into the neck and the other in the opposite direction, and a valve controlling continuity in the said passageway and arranged to seat against the valve-seat.

5. In a valve-device for corrosive liquids, the combination, with a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing, which body has an outwardly projecting tubular neck and is also provided internally with a valve-seat which extends around the said passageway and is arranged opposite the inner end of the neck, and a valve controlling continuity in the said passageway and provided with a stem extending through and beyond the outer end of the neck, of a non-corrodible cast metal cap instrumental in closing the outer end of the neck and provided in its outer side with a recess extending around the valve-stem, which cap is reinforced interiorly by a hard metal plate arranged between the inner end of the recess and the inner side of the cap; packing within the inner end of the recess; a gland controlling the compression of the packing; means for operating the gland to shift the gland inwardly or loosen the gland relative to the packing, and means for effecting an endwise movement of the valve-stem to open or close the valve.

6. In a valve-device for corrosive liquids, the combination, with a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing, which body has an outwardly projecting tubular neck which is provided at its outer end and externally with a flange extending around the neck, said body being also provided internally with a valve-seat which is arranged opposite the inner end of the neck and extends around the said passageway, and a valve controlling continuity in the said passageway and arranged to seat against the valve-seat and provided with a stem arranged centrally of and extending through and beyond the outer end of the neck, of a non-corrodible cast metal cap fitted to the outer side of the aforesaid flange and provided in its outer side with a recess extending around the valve-stem, which cap is reinforced interiorly by a hard metal plate arranged between the inner end of the recess and the inner side of the cap and overlapping the outer side of the aforesaid flange; packing within the inner end of the recess; a gland controlling the compression of the packing; means for operating the gland to shift the gland inwardly or loosen the gland relative to the packing, and means for effecting an endwise movement of the valve-stem to open or close the valve.

7. A valve-device for corrosive liquids, a valve-casing having a non-corrodible cast metal body which is provided interiorly with a passageway extending through the valve-casing and has an outwardly projecting tubular neck which is integral with and arranged at an angle to the body, said body also provided interiorly with a valve-seat which is arranged substantially in line with the neck and extends around the said passageway; a valve controlling continuity in the said passageway and provided with a stem extending through and beyond the outer end of the neck; a cap instrumental in closing the outer end of the neck and provided in its outer side with a recess extending around the valve-stem, said cap having a non-corrodible cast metal body-portion and a hard metal reinforcing member which is "cast in" the non-corrodible metal of the cap between the recess and the inner side of the cap; packing within the recess; a gland controlling the compression of the packing; studs rigid with the aforesaid reinforcing member and projecting outwardly through the gland, and nuts mounted on the studs at the outer end of the gland.

In testimony whereof, I sign the foregoing specification, in the presence of two witnesses.

WILLIAM H. SMITH.

Witnesses:
C. H. DORER,
VICTOR C. LYNCH.