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VALVE FOR USE WITH CORROSIVE LIQUIDS.

APPLICATION FILED MAR. 16, 1917.

**1,311,954.** Patented Aug. 5, 1919.

Fig. 1.

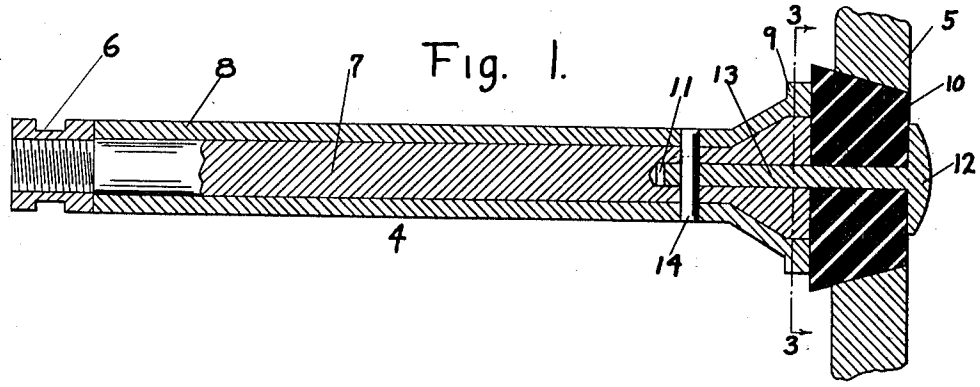



Fig. 2

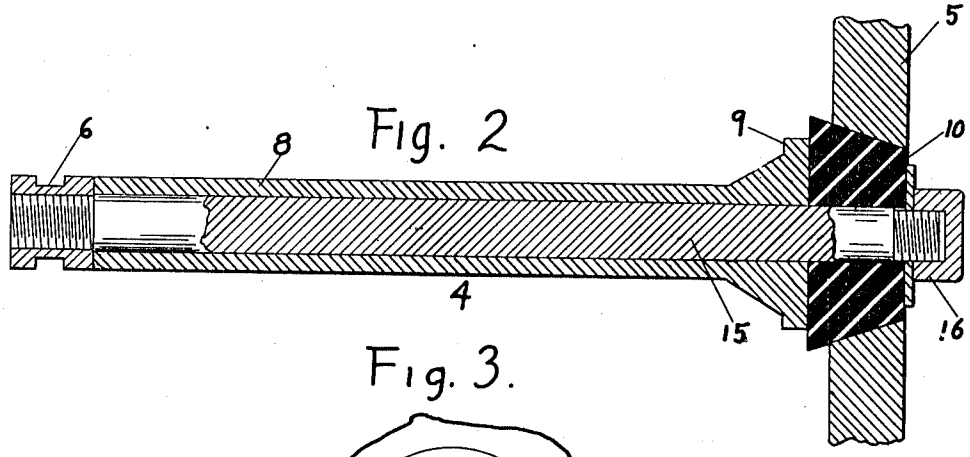
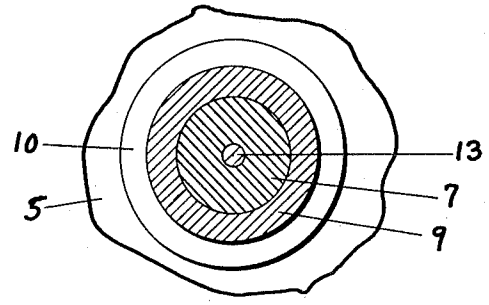



Fig. 3.




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# UNITED STATES PATENT OFFICE.

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## VALVE FOR USE WITH CORROSIVE LIQUIDS.

1,311,954. Specification of Letters Patent. Patented Aug. 5, 1919.

Application filed March 16, 1917. Serial No. 155,210.

*To all whom it may concern:*

Be it known that I, CHARLES T. DALLY, a citizen of the United States, and a resident of West Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Valves for Use with Corrosive Liquids, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawing, which forms a part of this specification.

My invention relates to valves of the type or class commonly referred to as reciprocating valves, because of the fact that they move bodily toward and away from their seats in controlling the flow of liquid past the valve and valve seat with which the valve coöperates; and relates particularly to valves designed to control the flow of corrosive liquids, such, for example, as acids, which act chemically upon a valve and seat formed from the metals most commonly used in mechanical devices, thus injuring the same and resulting in a leaky valve and one which wears out rapidly and has to be replaced frequently.

Heretofore the usual practice in providing a valve for controlling the flow of a corrosive liquid has been to make the valve and valve seat from lead, or rather from lead containing a small portion of antimony, whereby a valve and seat is secured which will resist the corrosive action of most liquids. A valve and seat formed from that material, however, are comparatively soft, and are rapidly worn out and rendered unserviceable because of the distortion which follows from the repeated forcing of the valve onto its seat, and because of the erosive action of the liquid the flow of which the valve is designed to control, particularly if the liquid carries solid and hard particles with it. Furthermore, if solid matter is carried along with the liquid, as is frequently the case, particles of the solid substance are liable to be caught between the valve and its seat and become embedded in one or the other, or to cause injury to the valve or seat, because of the soft and non-resistant character of the material from which they are made and the inability of the said material to withstand the action of hard and abrasive matter frequently encountered in the service for which the valve is designed.

The object of my invention is to provide a valve for the purpose stated in which the seating surface or valve proper is made of a yielding resilient material, such as rubber, whereby the contact between the valve and seat is cushioned and the seat, even though of soft material such as lead, will be subjected to a minimum of injury due to impact of the valve upon its seat. Such a valve, in addition, will adapt itself to inequalities of considerable magnitude in the valve seat, and still remain tight even though the seat may be much worn; and, should hard particles be caught between the valve and seat, the yielding character of the valve will prevent them from being forced into the material of the seat upon the closing of the valve. Also, the inherent resilience of the valve will, as the same is opened, tend to dislodge and throw off, as it were, such particles as may have been caught in the seating of the valve and temporarily forced thereinto, thus permitting the said particles to pass into and onward with the stream of liquid.

With the above and other objects of invention in view my invention consists in the improved valve and combination of valve and valve seat illustrated in the accompanying drawing, hereinafter described at length, and finally claimed in the concluding claims wherein the particular features wherein my invention consists are pointed out, and in such variations and modifications thereof as will be obvious to those skilled in the art to which my invention relates.

Referring to the drawing wherein the preferred embodiment of my invention is illustrated:

Figure 1 is a view showing a section of my improved valve upon a longitudinal central plane;

Fig. 2 is a view showing a slightly modified form thereof; and

Fig. 3 is a view showing a section upon a transverse plane indicated by the line 3—3, Fig. 1.

Referring to the drawing, the reference numeral 4 designates a suitable valve stem shown as of a length sufficient to extend through a stuffing box or gland provided

in the casing of any suitable form in which the valve and its seat, shown conventionally at 5, are inclosed; and which stem is shown as provided with a grooved collar 6 at its outer end with which suitable means, not shown, may be connected for moving the valve toward and from its seat, as is usual in reciprocating valves of the type to which my invention relates.

The valve stem illustrated comprises a central core 7, made from steel or equivalent material to give the valve the necessary strength, and which core extends longitudinally of the stem and is incased in a protective non-corrodible sheathing 8 made of lead (or of lead containing a small quantity of antimony, both of which, as well also as equivalent materials, are contemplated whenever the term "lead" is employed in this description or in the concluding claims); the purpose of which sheathing is to provide a valve stem which will resist the corrosive action of the liquid the flow of which is to be controlled by the valve. The valve stem may, however, be made entirely of a material which will not be injured or corroded by the liquid in question, as will be appreciated.

The inner end of the valve stem is preferably enlarged to a greater or less extent, as shown at 9; in order to provide a greater area of contact between the end of the stem and the soft and resilient valve 10 held in place against the end of the stem, and a better support for the valve; and the valve stem of the form of my invention illustrated in Fig. 1 is provided with a longitudinally extending passage 11.

The valve 10 is held in place against the inner end of the valve stem by means of a valve securing member having an enlarged head 12, and a reduced portion or stem 13 extending into the passage 11 in the valve stem; and said securing member is secured to the valve stem by means of a transverse pin or key 14 extending through holes provided for it in the valve stem, and adjacent the inner end of the reduced portion of the valve securing member, as illustrated in Fig. 1 of the drawing. The distance between the inner face of the head 12 and the hole adjacent the end of the extending portion 13 should be such that the valve 10 will be compressed somewhat, in bringing the holes in the valve stem and in the extending portion into line with one another to permit the insertion of the key 14; whereby the valve is held in a more or less compressed condition between the head 12 and the end of the valve stem and the entry of liquid into the joint between the valve and the end of the stem, and between the valve and the inner surface of the head, is prevented. It will be appreciated that the valve securing member will be made from a material which will resist the corrosive action of the liquid, although it need not be resistant to the same degree as the valve stem as the head only thereof is exposed to the action of the liquid and may be of sufficient mass to withstand the action of the liquid for as long as the valve is likely to last, or the valve securing member may be replaced at slight expense when a new valve is secured to the valve stem, should such a course be deemed necessary or desirable. I have in practice made the valve securing member from bronze with satisfactory results.

The valve seat 5 will ordinarily be made from a material which will not be acted upon by the liquid flowing past the valve and seat, such, for example, as lead, and the yielding and resilient valve 10 is made from a non-metallic material softer than the valve seat and one which will not be acted upon by the liquid, such, for example, as rubber; from which it follows that the seating of the valve will be cushioned, and that the valve will adapt itself to inequalities in the seat and secure a tight closure even though the seat may be injured or worn to a considerable extent. Furthermore, should particles of hard material be caught between the valve and seat as the valve is closed they will cause a displacement of the portion of the yielding valve adjacent and in immediate contact with them, and will not be forced into or otherwise injure the harder but still comparatively soft valve seat; and, as the valve is opened and moved from its seat, any hard particles caught between the valve and seat as above will ordinarily be released and permitted to pass into and along with the stream of liquid flowing past the valve and seat. The valve is illustrated as in the form of a frustum of a cone, although it may be made with a curved peripheral surface such as is secured by the use of a valve of semi-spherical or similar form; and the fact that the valve shown seats in a conical or tapering seat provides a structure in which the valve is compressed in a radial or approximately radial direction as the valve is seated, which action is accompanied by expansion of the valve against the inner end of the valve stem and the inner surfaces of the head 12 or washer beneath the nut 16; whereby the liquid is prevented from entering between the valve and the members between which it is held, and between the central opening therein and the portion of the securing means extending through said opening.

In the modified form of my invention illustrated in Fig. 2 the central core 15 extends beyond the inner end of the valve stem and through the valve, and the valve is held in place relatively to the inner end of the stem by means of a suitable nut 16 in threaded engagement with the extremity of the core. In this form of my invention the core

is of uniform diameter throughout, while in the form shown in Fig. 1 the core is shown as provided with an enlargement at its inner end, whereby the non-corrodible sheathing is more securely held in place upon the core. Either one of these details of construction may, however, be used in either of the forms of my invention illustrated, as will be appreciated.

Having thus described and explained my invention, I claim and desire to secure by Letters Patent:

1. A valve of the class described having a suitable stem provided with a longitudinally extending passage; a valve securing member having a head, and a reduced portion extending into the passage aforesaid; a valve formed from rubber; and a key extending through holes provided in said stem and the reduced portion of said valve securing member, said key holding said valve in compressed condition between a portion of said stem and the head of said valve securing member, substantially as described.

2. A valve of the class described having a suitable stem provided with an enlarged end, and a longitudinally extending passage; a valve securing member having a head, and a reduced portion extending into the passage aforesaid; a valve formed from yielding non-metallic material; and a key extending through holes provided in said stem and the reduced portion of said valve securing member, said key holding said valve in compressed condition between the enlarged end of said stem and the head of said valve securing member, substantially as described.

3. A valve of the class described having a suitable stem provided with an enlarged end, and a longitudinally extending passage; a valve securing member having a head, and a reduced portion extending into the passage aforesaid; a valve formed from yielding non-metallic material; a key extending through holes provided in said stem and the reduced portion of said valve securing member; said key holding said valve in compressed condition between the enlarged end of said stem and the head of said valve securing member, and a valve seat formed from non-corrodible material and upon which said valve is adapted to seat, substantially as described.

4. A valve of the class described having a suitable stem provided with a longitudinally extending passage, and which stem comprises a central core incased in a protective non-corrodible sheathing; a valve securing member having a head, and a reduced portion extending into the passage aforesaid; a valve formed from a yielding non-corrodible material; and a key extending through holes provided in said stem and the reduced portion of said valve securing member, said key holding said valve in compressed condition between a portion of said stem and the head of said valve securing member, substantially as described.

5. A valve of the class described having a suitable stem provided with a longitudinally extending passage, and comprising a central core incased in a protective non-corrodible sheathing; a valve securing member having a head, and a reduced portion extending into the passage aforesaid; a valve formed from a yielding non-corrodible material; a key extending through holes provided in said stem and the reduced portion of said valve securing member; said key holding said valve in compressed condition between a portion of said stem and the head of said valve securing member, and a valve seat formed from a non-corrodible material harder than said valve and upon which said valve is adapted to seat, substantially as described.

6. A valve of the class described having a suitable stem provided with a longitudinally extending passage, and comprising a central core incased in a metallic non-corrodible sheathing; a valve securing member having a head, and a reduced portion extending into the passage aforesaid; a valve formed from rubber; and a key extending through holes provided in said stem and the reduced portion of said valve securing member, said key holding said valve in compressed condition between a portion of said stem and the head of said valve securing member, substantially as described.

7. In a device of the class described, a valve stem comprising a core incased in a non-corrodible sheathing, and a valve of yielding non-metallic material removably secured to said stem and bearing directly against the ends of said core and sheathing, substantially as described.

8. In a device of the class described, a valve stem comprising a core having an enlarged end and incased in a non-corrodible sheathing, and a valve of yielding non-metallic material removably secured to said stem and bearing directly against the enlarged end of said core, substantially as described.

9. In a device of the class described, a valve stem comprising a core incased in a non-corrodible sheathing, said core and sheathing being enlarged at one end, and a valve of yielding non-metallic material removably secured to said stem and bearing directly against the enlarged ends of said core and sheathing, substantially as described.

10. In a device of the class described, a valve stem comprising a core incased in a non-corrodible sheathing, and a valve of yielding non-metallic material removably

attached to said core and bearing directly against the end of said sheathing, substantially as described.

11. In a device of the class described, a valve stem comprising a core incased in a non-corrodible sheathing, said sheathing having an enlarged end, and a valve of yielding non-metallic material removably and rigidly attached to said core and bearing directly against the enlarged end of said sheathing, substantially as described.

In testimony whereof I have signed my name to this specification this 13 day of March, 1917.

CHARLES T. DALLY.