W. E. WORTHEN & R. S. GILLESPIE.

Stop Valve.

No. 202,319. Patented April 9, 1878.

Fig. 1.

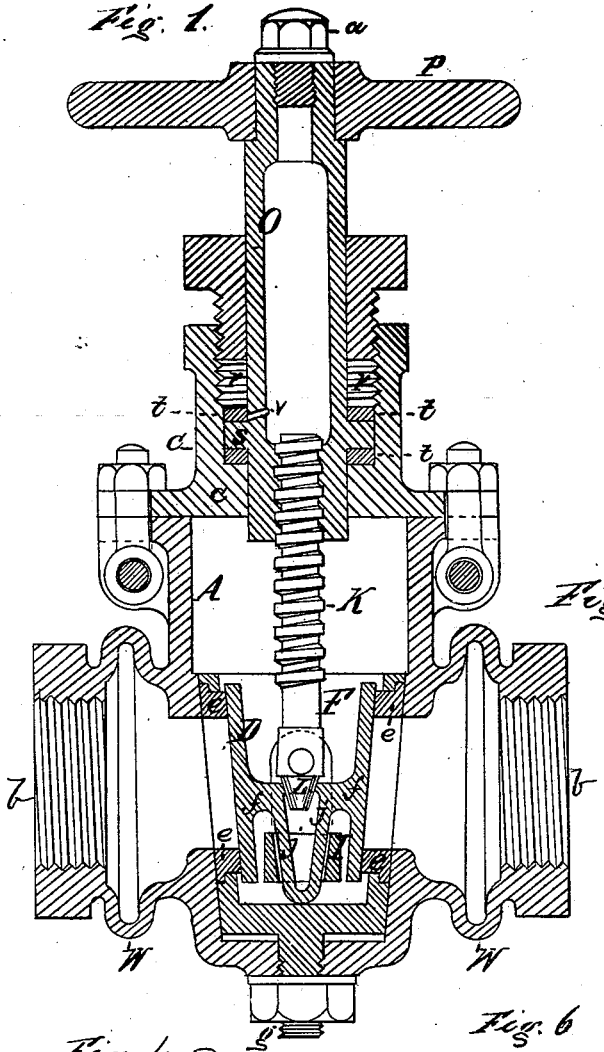


Fig. 3.

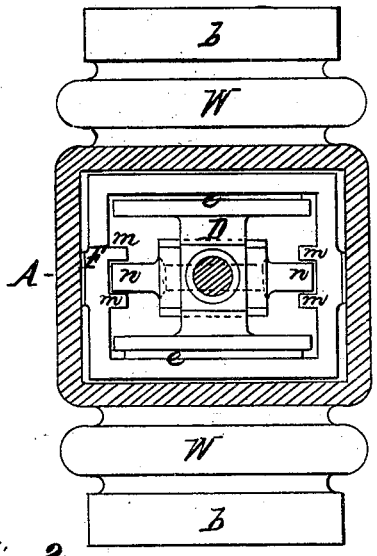


Fig. 2.

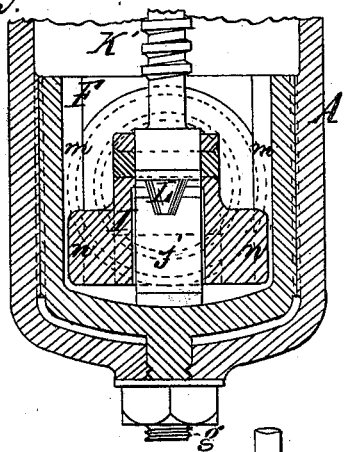


Fig. 4.

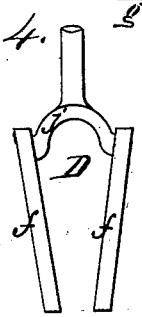


Fig. 6

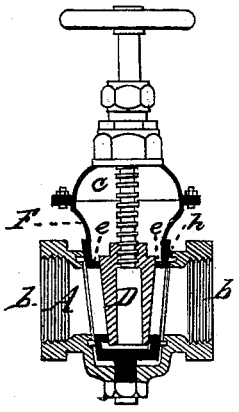
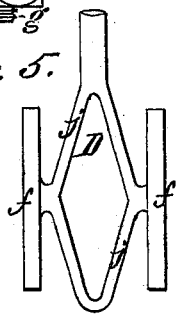


Fig. 5.



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IMPROVEMENT IN STOP-VALVES.

Specification forming part of Letters Patent No. **202,319**, dated April 9, 1878; application filed January 5, 1878.

To all whom it may concern:

Be it known that we, WILLIAM EZRA WORTHEN and RICHARD STEPHEN GILLESPIE, both of the city, county, and State of New York, have made an invention of certain new and useful Improvements in Stop-Valves; and that the following, taken in connection with the accompanying drawings, is a full, clear, and exact description and specification of the same.

Our invention relates to that class of stop-valves commonly called "throughway-gates," in which the water-way extends in a straight line directly through the valve-case, and in which the water-way is closed by a gate having two faces, or only one face, and constructed to move crosswise of the line of the water-way.

The principal objects of our invention are to enable the gate face or faces to be forced firmly against the gate-seats, so as to close the opening securely; to relieve the pressure against the backs of the gate-faces before they are moved to open the water-way; to enable the gate-seats to be readily removed and replaced; to facilitate the lubrication of the screw-nut for operating the gate; and to enable the stop-valve case to adapt itself to slight variations in the lengths of the pipes connected with such stop-valves.

To these ends our invention consists of certain combinations of devices, of which the principal are the following, viz: a duplex gate, capable of expansion and contraction; a removable cage, forming the gate-seats, or holding packing-rings which form such seats; a gate-expander, for expanding the duplex gate; a gate-yoke, for contracting the duplex gate, so as to relieve the pressure against the gate seat or seats; and a screw and screw-standard, for moving the gate. These combinations are set forth in detail at the close of this specification, and some of them may be used without the others, and in stop-valves differing from those which embody our entire invention.

In order that the invention may be fully understood, we have represented in the accompanying drawings, and will proceed to describe, a throughway-gate embodying our invention in the best form in which we have embodied it up to the present date.

In the said drawings, Figure 1 represents a longitudinal axial section of the gate. Fig. 2 represents a transverse section of parts of the same. Fig. 3 represents a horizontal section of parts of the same. Figs. 4 and 5 represent modifications of the expansible gate. Fig. 6 represents a longitudinal section of a modification of throughway-gate embodying portions of our invention.

The throughway-gate represented in Figs. 1 to 3, inclusive, of the said drawings has a valve-case, A, constructed with two nozzles, *b b*, to which the connecting-pipes are applied, and with an open head, to which is bolted a bonnet, *c*, that closes the opening of the head through which the gate and other internal appurtenances of the valve are inserted. The gate D is moved crosswise of the line of the water-way by means of a screw, K, and the gate closes against two gate-seats, *e e*, one for each nozzle of the valve-case. In order that the gate-seats may be readily inserted, removed, and replaced when worn away, they are either secured to or formed upon a removable cage, F, which is inserted through the open head of the valve-case by means of a screw, *g*, at the bottom thereof. When the seats are formed upon this cage the inside faces thereof are made true and smooth to form such seats, as is done in the modification represented at Fig. 6; and in such case the joint between the outer sides of the cage and the adjacent inner sides of the valve-case are made tight by means of packing-rings *h*, preferably of soft metal, interposed between the two. When, however, the second part of our invention is to be embodied, we construct the gate-seats of removable rings *e e*, Figs. 1 and 6, of soft metal, such as Babbitt metal or copper; and we prefer to make these ring-seats thicker than the cage, so that their inner sides form the valve-seats for the gate, and their outer sides, when first inserted, protrude beyond the outer faces of the cage and pack the joint between the cage and the valve-case. As the cage is wedge-formed, the drawing of it downward in the valve-case by the action of the screw *g* crowds the outer faces of the packing-rings against the inner faces of the valve-case, thus compressing the rings and making the joints tight. In order that the rings may be held in place, notwithstanding

the inward pressure incident to the crowding of the cage downward in the valve-case, the rings are formed with flanges or belts, as seen in section at Fig. 1, which bear against the walls of the cage.

The gate D of our valve is duplex, having two faces, *f f*, with the connection *j* between them made of one piece of metal. This gate, however, is expansible, so that its opposite faces, *f f*, may be spread farther apart or drawn closer together. The expansion characteristic is obtained by constructing the connection *j* between the two faces of V or equivalent form, so that it is elastic and flexible to a moderate extent, while it is sufficiently rigid for the practical purposes of a gate. The arrangement of the flexible connection may be varied as found expedient. Thus, the bend may be below the centers of the gate-faces, as represented at Figs. 1 to 3; or the bend may be arranged above those centers, as at Fig. 4; or the bend may be duplicated, so that the connection has the form of what is commonly called a "lozenge" or "rhomb," as represented at Fig. 5. The expansible gate may be expanded so as to force its faces against the gate-seats by means of the lifting-screw K, which also serves to move the gate for opening and closing it. If the gate has a connection of a single V form, the expansion may be effected through the intervention of a cone-expander, L, such as is represented in Figs. 1 and 2, which, by the action of the screw K, is forced downward between the backs of the gate-faces, so as to spread them apart. If such an expander be used, the backs of the valve-faces should be fitted with rounded bearings for such cone. A wedge-expander with plane faces may be substituted for the cone, and the bearing on the backs of the valve-face may be made of corresponding form. If the connection between the gate-faces has the form of a rhomb, as shown at Fig. 5, a special expander is not required, because the pressure of the screw at the upper end of the connection (while the lower end of the connection bears against the bottom of the cage or of the valve-case) causes the connection to spread laterally, and expands the gate.

In order that the pressure of the gate-faces against their seats may be relieved before the gate is opened, a yoke, I, is connected with the lifting-screw. This yoke embraces the V-formed gate-connection *j*, so that when the lifting screw K is raised and the yoke is drawn upward, its inclined inner sides, sliding on the inclined outer sides of the V-connection, press the latter towards each other and contract the gate, so that its faces are freed from the faces of the gate-seats. Then the continued motion of the lifting-screw raises the gate. The gate and yoke are both guided in their movements by lateral guides *m* formed in the cage F, and these guides embrace arms *n*, projecting laterally from the yoke I. The yoke is not a necessity, as the other features of the invention may be used without it; but the employment of the yoke is, in our opinion, an advantage to the operation of the gate.

In order that the gate may be moved, the valve-case A is provided with a tubular screwed standard, O, fitting the screw K, and with a wheel, P, to turn the standard. This screwed standard turns in a stuffing-box, *r*, fitted with a gland of the ordinary construction. The standard is kept from moving endwise by means of its collar *s*, which is held in the stuffing-box by the action of the gland *r*, and is, by preference, embraced between two metallic packing-rings, *t*, inserted in the stuffing-box. In order that the lifting-screw may be lubricated, an oil-hole, closed by a screw-plug, *u*, is formed in the upper end of the tubular standard; and in order that the collar *s* may be lubricated, at least one lateral oil-hole, *v*, is made through the wall of the standard, so that oil can pass from the cavity thereof to the bearing-surface of the standard-collar *s*. If deemed expedient, two or more such lateral oil-holes may be made.

In order that the valve-case may adapt itself to variations in the length of pipes with which its nozzles are connected, it is constructed with an expansion-zone, W, which yields to compression and expansion in the direction of the line of the water-way, and thus adapts itself to the movements of the pipes. In practice we prefer to construct the valve-case with two expansion-zones, W W, one for each nozzle.

The preceding description shows that the form of the members of a stop-valve may be greatly modified and still embody essential features of our invention. In the modification shown, Fig. 6, the valve-case proper A has no bonnet to close the opening through which the cage F is introduced; but the walls of the cage itself are extended upward, and the bonnet *c* is secured to the cage. In this case the joints between the outer faces of the cage and the adjacent inner faces of the valve-case are made tight by means of packing-rings of soft metal *h* inserted between the two, and compressed by crowding or drawing the cage downward in the cavity of the valve-case. In this case, also, the packing-rings may be extended inward through the walls of the cage to form the valve-seats. The valve-seats may, if preferred, be made of rings of soft metal, held in short tubular nozzles projecting inward in the cage; and in this case the inner rims of the rings may be flanged, so as to hold them from being forced outward by the pressure of the gate, and also to enable them to be readily removed from the cage and replaced. A gate having only one valve-face may be so constructed as to embody material parts of our invention by substituting for the second valve-face a boss of smaller area than the face, and providing a cross-bar within the cage or within the valve-case itself (in case the cage be omitted) for such boss to bear against. The expansible valve may be used without the cage, in which case the valve-seats will be

formed either of the metal of the case itself surrounding the inner orifices of the nozzles *b*, or of separate rings or thimbles, secured in the valve-case and projecting inward from its inner faces. The arrangement of the lifting-screw for moving the gate may be varied as found expedient; and in case it be arranged to turn, (as is customary with the screws of some through-gates,) a swivel-connection must be made between it and the yoke and gate, and between it and the expander if the latter has not round cross-sections.

The improvement of the expansion-valve case is not restricted to valve-cases of the forms required for throughway-gates, but is applicable to the cases of globe-valves and stop-cocks; and the improvement for enabling the gate-screw and the collar of its standard to be oiled are not restricted to the use of an expansible gate, because the same improvements may be used in connection with the ordinary gates heretofore used.

We claim as our invention—

1. The combination, substantially as before set forth, of the valve-case and the stationary but removable cage.

2. The combination, substantially as before set forth, of the valve-case, the removable cage, and a ring valve-seat separable from said cage.

3. The combination, substantially as before set forth, of the valve-case, the duplex and jointless but expansible-gate, and the screw whereby said gate is moved crosswise of the line of the water-way of the valve-case.

4. The combination, substantially as before set forth, of the valve-case, the duplex and jointless but expansible gate, the screw for moving said gate, and the expander whereby said gate is expanded.

5. The combination, substantially as before set forth, of the expansible gate, the screw for moving said gate, and the yoke whereby the expansible gate may be contracted.

6. The combination, substantially as before set forth, of the expansible gate, the screw for moving said gate, the gate-expander, and the yoke for contracting said gate.

7. The combination, substantially as before set forth, of the valve-case, the gate-screw for moving the gate thereof, and the tubular screw-standard, constructed with both an oil-hole, through which oil can be introduced into it, and a lateral oil-hole, to permit the oil to pass to the external collar of the screw-standard.

8. The valve-case, constructed substantially as before set forth, with an expansion-zone for one of its nozzles.

Witness our hands this 2d day of January, A. D. 1878.

WILLIAM EZRA WORTHEN.
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