(No Model.) 2 Sheets—Sheet 1.

# J. M. HARTMAN.

## VALVE.

No. 543,549. Patented July 30, 1895.

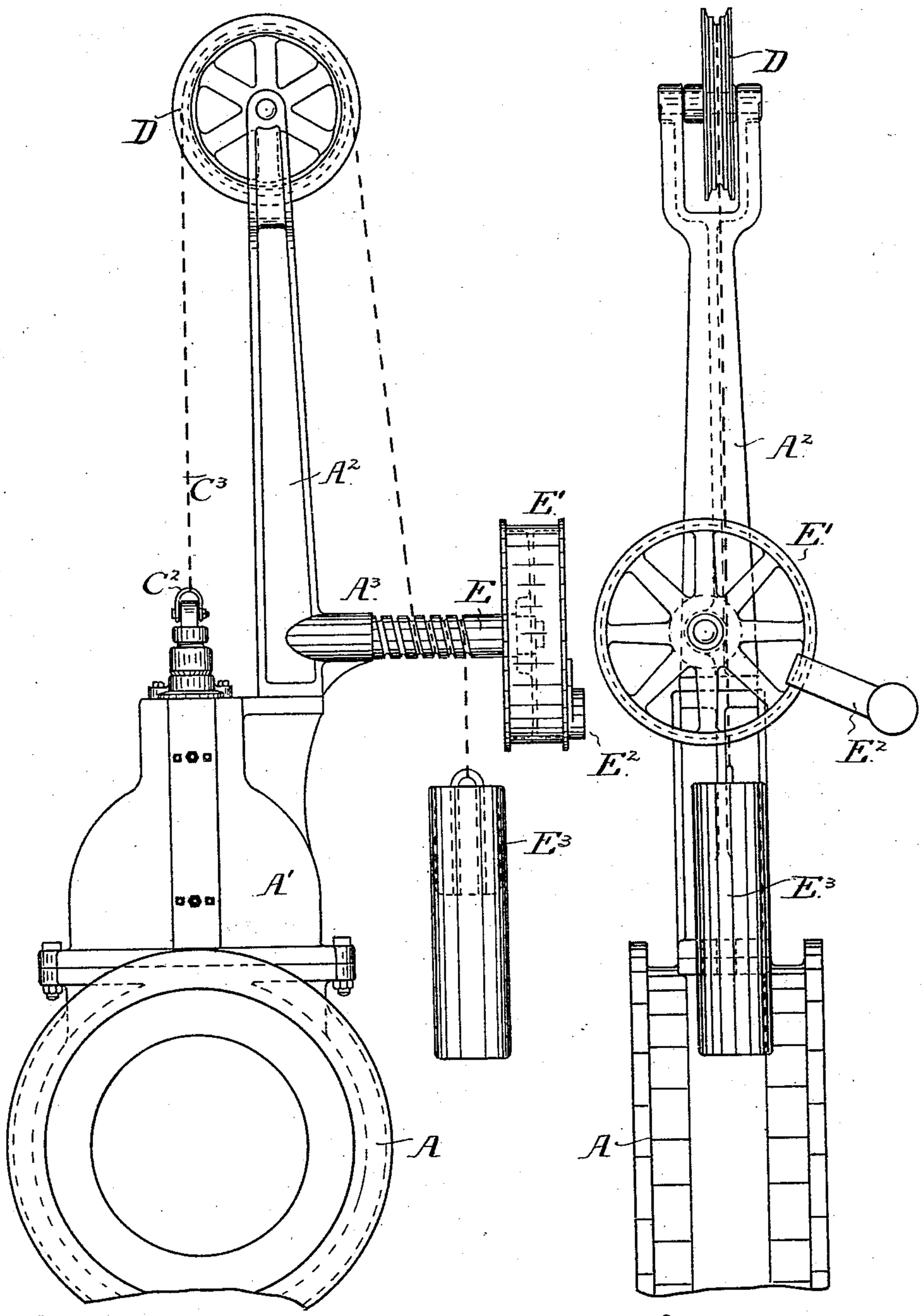


Fig. 1.




Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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## VALVE.

No. 543,549. Patented July 30, 1895.

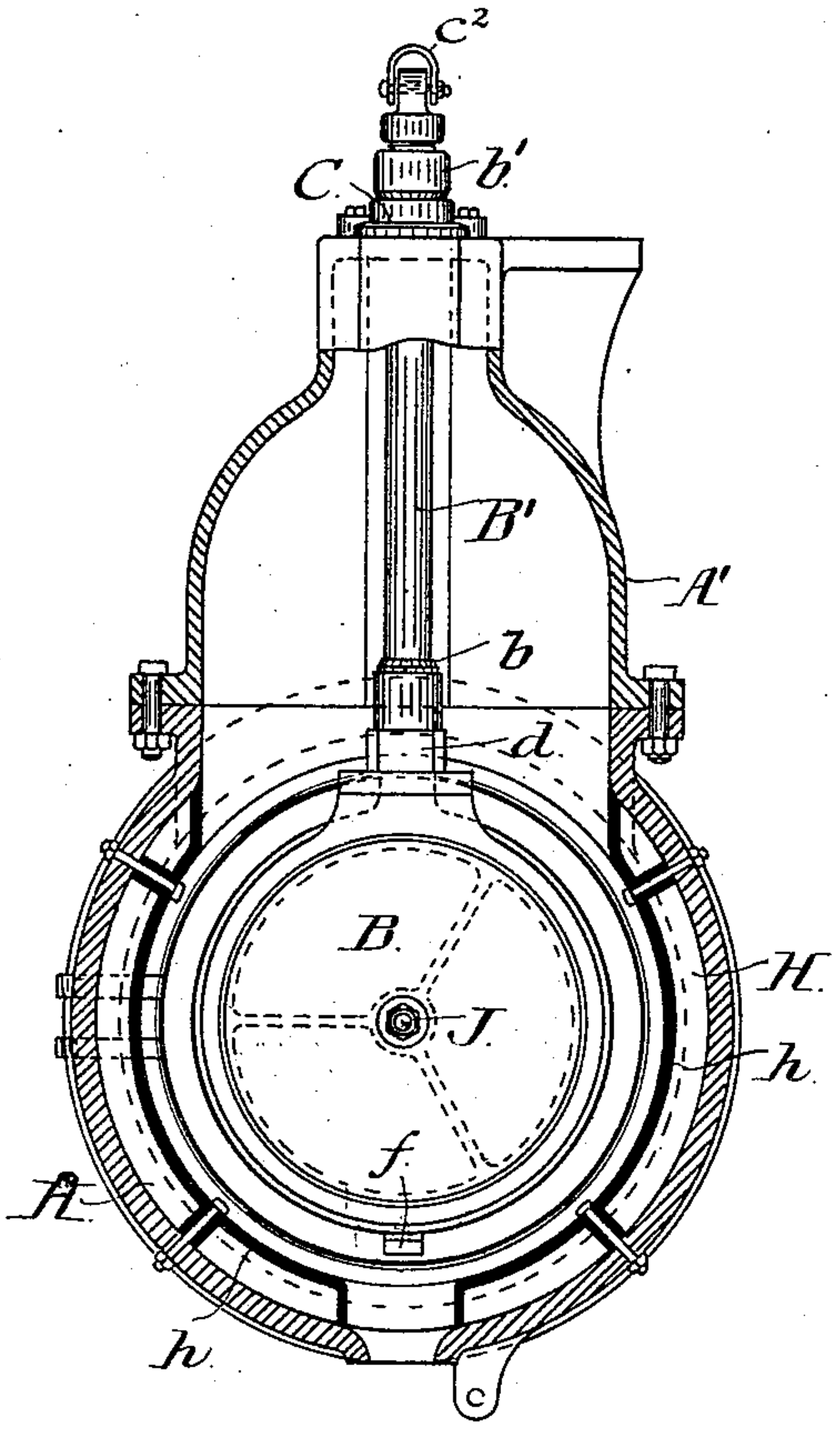


Fig. 3.

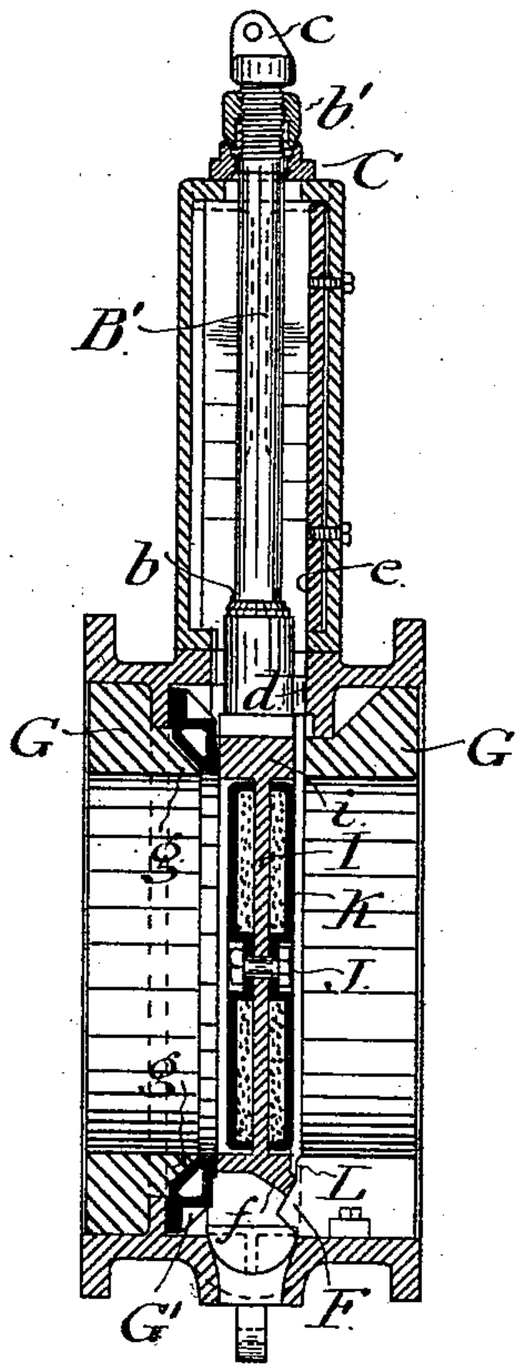


Fig. 4.

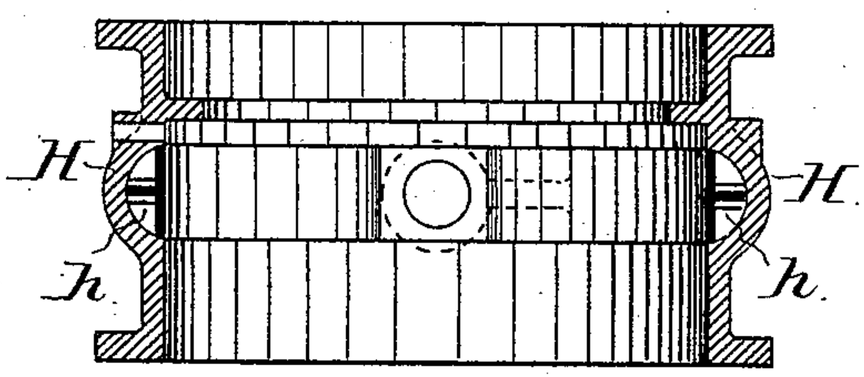


Fig. 5.

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# UNITED STATES PATENT OFFICE.

JOHN M. HARTMAN, OF PHILADELPHIA, PENNSYLVANIA.

## VALVE.

SPECIFICATION forming part of Letters Patent No. 543,549, dated July 30, 1895.

Application filed February 24, 1891. Serial No. 382,355. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN M. HARTMAN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Valves, whereof the following is a specification, reference being had to the accompanying drawings.

My improvements in their entirety are especially adapted for use in connection with hot-blast stoves; but obviously some of the features of the invention may be advantageously employed in other connections.

In the drawings, Figure 1 represents a front elevation of the exterior of the valve-body and the actuating devices, Fig. 2 being a side elevation thereof. Fig. 3 is a transverse sectional view through the valve-body, showing the rear of the valve. Fig. 4 is a vertical longitudinal section through the valve-body and valve, and Fig. 5 is a horizontal longitudinal section through the valve-body alone.

Among the prominent features of my invention are the following: I dispense with the use of a close-fitting gland and packing for the valve-stem, thus avoiding the danger of jamming, which is incident to that method of construction, owing to the accumulation of dust, gum from oil, or dirt upon the stem. I improve the guiding of the valve-disk and prevent accidental displacement while moving, and I insure its close contact with its seat. I so construct the seat and the valve-disk itself as to afford efficient protection when used for hot blast or otherwise exposed to the destructive effects of heat.

Referring to the drawings, A represents the valve casing or body, and A′ the vertical extension thereof for the withdrawal of the valve. B represents the valve-disk having a vertical stem B′, which projects up through the extension A′ of the casing and is connected with a chain $C^3$. Said chain passes over the pulley D and descends to a horizontal shaft E, having a threaded portion, as shown in Fig. 1, around which the chain makes several turns, and is then connected to a downwardly-depending counterweight $E^3$. The shaft E is provided with an actuating wheel or pulley E′, which carries a weighted arm $E^2$. The valve casing or body A is provided with an interior lining G of fire-brick, and the valve-seat G′ consists of a hollow metallic annulus adapted for interior water circulation.

In order, as far as possible, to protect the metal of the water-cooled seat from injury from the passing hot blast when the valve is open, I construct it, as shown in Fig. 4, of triangular cross-section, and carry the fire-brick lining over the inclined back of the annulus, as indicated at *g*. Thus only the edge of the metal is exposed, the danger of driving back the water is lessened, and the life of the seat is greatly prolonged.

Heretofore it has been usual, in order to prevent cracking of the valve body or casing from the effects of the heat, to enlarge that portion of the periphery which is immediately adjacent to the valve-disk, but notwithstanding such enlargement the danger of cracking is still very serious with the high heats now used. To avoid this difficulty I construct the body with a slight hollow bulge H around that portion which is immediately adjacent to the valve-disk, and I insert in the hollow of said bulge an annular shield *h* of T-shaped cross-section, as shown, leaving an air-space between it and the inner surface of the bulged portion.

The valve-disk itself is composed of a thin flat plate I, having a peripheral flange *i* projecting around each side, so as to form an exaggerated H in cross-section. Metal shields K, dished on their under sides, as shown, are secured on each side of the flat plate I within the flange *i* by means of a central bolt J, and the hollows between said shields and the proximate surfaces of the plate I are filled with fire-clay or other non-conducting material. I find this system preferable to the use of a hollow water-cooled valve.

The flange or rim *i* of the valve-disk is provided at bottom with a rearwardly-projecting inclined lug *f*, and I insert in the lining G at the bottom of the body a removable wedge-block F, whose inclined face extends into the range of movement of the lug *f*. Above said incline the face of the block is made vertical for a short distance, as indicated at L. The purpose of these features of construction is as follows: Heretofore various devices to hold the valve-disk against its seat have been provided on the sides of the disk itself, making two faces to be engaged at the same time, and

thus requiring an adjustment too fine for practical work under the severe conditions of use. Furthermore, these guides were liable to be destroyed by the heat of the blast. By the use of the wedge-block above described it will be seen that as soon as the valve has descended, so as to bring the lug *f* into contact with the inclined face of the block, the valve-disk will be forced against its seat and held there in the most efficient manner. In the use of gate-valves on fire-brick stoves the hot-blast valve should always be open before admitting cold blast to the stove. Through the carelessness of the stove-tender, however, it frequently happens that this valve is left closed until after the cold blast has been turned on. Under these conditions the moment that the disk leaves the wedge-block the pressure of the blast would tend to push it outward and bend the stem. As, however, in my method of construction the lug *f* remains in contact with the vertical face L until the valve-disk has risen sufficiently to open a free passage for the blast, the pressure on both sides of the valve becomes equalized before it is withdrawn from support, and thus any bending of the stem is prevented.

The stem B′ is provided near its lower end with an upwardly-beveled collar *b*, and near its upper end, exterior to the valve-casing or body, is provided with an oppositely-beveled collar *b′*, which is made adjustable by being fitted upon a threaded portion of the stem, as indicated in the sectional view of Fig. 4. The opening for the stem in the top of the extension A′ is made large enough to afford free play to the stem, so that it cannot jam therein, but upon the top of the extension I mount a ring C, whose inner periphery is beveled both from above and from below, so as to conform to and make a close joint with the beveled surfaces of the collars *b* and *b′*, respectively. Thus when the valve is in its lowest position, or closed, as shown in Figs. 3 and 4, the upper collar *b′* fits snugly within the beveled upper side of the ring C and makes a tight joint therewith, and when, on the other hand, the valve is open or raised into its highest position the bevel of the lower collar *b* fits into the beveled under surface of the ring C, making a similar close joint therewith. To insure proper contact in each direction I provide the weighted arm $E^2$, above described, upon the actuating-shaft of the valve-raising chain $C^3$. The counter-weight $E^3$, being supposed to be just sufficient to balance the valve, the weighted arm is so arranged that when the valve is in its uppermost position said arm shall bear downward in a direction which tends to raise the valve, thus destroying the equilibrium and holding the beveled edges close together. When, on the other hand, the valve descends into its lowest position, the position of the weighted arm is such as to tend to raise the counter-weight $E^3$, and thus, by relieving the valve of the balance which said counterweight afforded, its own weight insures a tight fit between the bevel of the collar *b′* and the ring C. The object of making the upper collar detachable is to compensate for wear of the pulleys, &c., so that a close fit may always be maintained.

Heretofore it has been usual to place the guides for valves of this class upon the same side of the stem as the valve-disk face, and if the pressure during the period of opening and closing came against the face side the stem would leave its guides and the valve would shift out of position. To avoid this I provide upon the rear side of the stem a horizontal guide-block *d*, which is guided in a strip *e*, secured along the surface of the vertical extension A. Said strip is removably secured in position by means of screw-bolts, as shown clearly in Fig. 4, and can be renewed from time to time as wear takes place. Furthermore, I suspend the stem from a point which is out of line with its axis and to one side of the center of gravity of the valve.

By reference to Fig. 4 it will be seen that the eye *c* at the top of the stem and to which the end of the chain $C^3$ is attached is not over the center of the stem, but is toward the face side of the valve.

In the operation of hot-blast stoves the ashes often settle upon the seat and disk, adhering sufficiently to require cleaning before the valve can close tight. By suspending the valve in the manner above described the disk-face is caused to scrape against the seat, and thus remove the accumulations of dust, &c., thus insuring a close fit upon the seat.

Having thus described my invention, I claim—

1. The combination of the valve, the valve stem and the casing having an opening for the free passage of said stem, with a ring mounted upon the exterior of the casing at said opening, said ring having its inner periphery beveled on both sides, and a pair of collars mounted near the top and bottom of said stem respectively, and having oppositely beveled surfaces, each in correspondence with the bevel upon the proximate side of the ring, substantially as set forth.

2. The combination with the valve, the valve stem having oppositely beveled collars, and the valve casing having a ring beveled on both sides, as set forth, and surrounding said stem, of a chain connected with the upper end of said stem, a balancing device (such as a pulley and counter-weight) and a rotatable weighted arm having a shaft engaging with said chain, whereby in the uppermost and lowest positions of the valve the counter-weight and the valve may respectively be overbalanced, to maintain a close fit between the respective collars and the ring, substantially as set forth.

3. The combination with the valve, valve stem, and the casing provided with a ring having a bevel on its upper side, of a longitudinally adjustable collar, mounted near the

upper end of the stem, and having a beveled edge in correspondence with the bevel on the upper side of said ring, substantially as set forth.

4. The combination of the valve; the valve-casing having an extension for withdrawal of said valve; the valve-stem provided with a point of suspension out of the line of its axis and toward the front face of the valve; a guide block, *d*, mounted upon the rear face of said stem; and a guide-strip, *e*, mounted upon the interior of said extension to guide said block, substantially as set forth.

5. The combination with the valve, of a rearwardly projecting lug mounted at the bottom thereof, and a wedge-block mounted in the bottom of the casing opposite to the seat, said wedge-block having an inclined surface upon its lower portion and a substantially vertical surface extending above the inclined portion, whereby the valve is supported during the act of raising, until the opening of a passage sufficient to establish equilibrium on both sides thereof, substantially as set forth.

6. The combination with the valve casing, of an outwardly bulged portion extending around that portion which is immediately adjacent to the valve, and a detachable shield of T-shaped cross section mounted within said bulged portion, substantially as set forth.

7. The combination with the valve and casing, of a seat consisting of a hollow metallic annulus of triangular cross section, provided with interior water circulation and a fire brick lining extending over the inclined back of said annulus, whereby only the edge of the water-cooled seat is exposed to the direct action of the passing blast, substantially as and for the purposes set forth.

8. The combination with the casing, and the valve seat situated therein, of the valve having a stem passing freely through an opening in the extension of said casing, and a supporting attachment for said stem arranged on that side of the center of gravity of the valve which is toward the seat, whereby in the opening and closing of the valve the face thereof is caused to scrape against the seat, as and for the purposes set forth.

9. The valve B consisting of a flat disk having an annular flange projecting on each side around its periphery, in combination with dished plates secured on each side of said disk within said flanges, and a packing of refractory non-conducting material arranged within the dished portions of said plates, substantially as set forth.

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