# E. ARMSTRONG.

## Slide-Valve for Steam-Engines.

No. 163,437. Patented May 18, 1875.

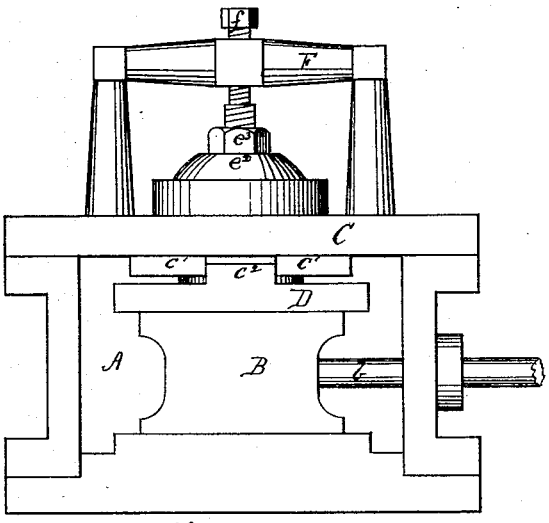


Fig 1.

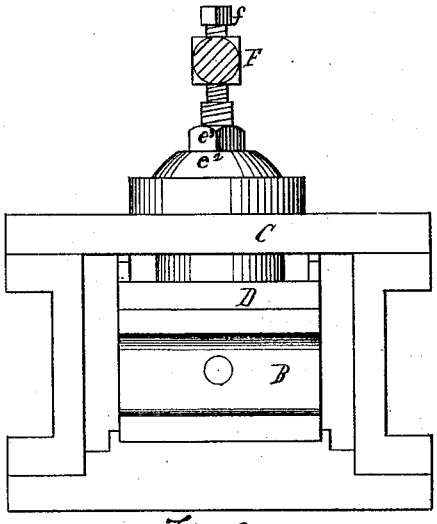


Fig 2

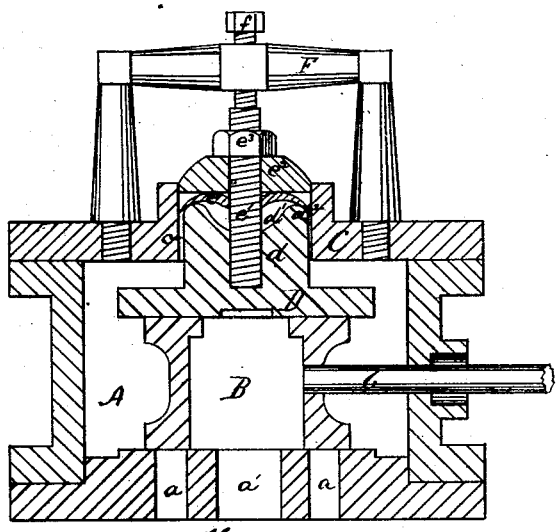


Fig 3

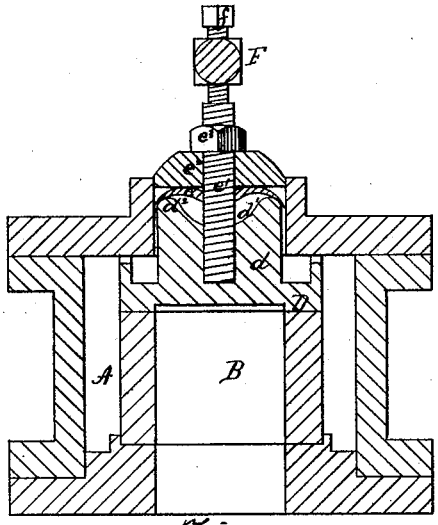


Fig 4

WITNESSES.

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# UNITED STATES PATENT OFFICE.

EDWARD ARMSTRONG, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JAMES R. HUTCHINSON, OF SAME PLACE.

## IMPROVEMENT IN SLIDE-VALVES FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **163,437**, dated May 18, 1875; application filed March 31, 1875.

*To all whom it may concern:*

Be it known that I, EDWARD ARMSTRONG, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Slide-Valves of Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a side view of the valve. Fig. 2 is an end view of the same, and Figs. 3 and 4 are vertical sections.

Like letters refer to like parts wherever they occur.

My invention relates to devices for balancing or relieving the pressure on slide-valves of steam-engines; and it consists in combining, with the relief-plate, an elastic cup-shaped metallic disk, which distributes and equalizes the upward pressure of the steam, so that the tendency of the valve to tilt or wear is overcome, and at the same time the valve is relieved of pressure.

In the drawing, A represents the steam-chest, having ports *a a' a*, valve B, and valve-stem *b*, of the usual construction. C is the cover of the steam-chest, and D the valve-cover or relief-plate. The relief-plate D is provided with a cylindrical stem, *d*, preferably cupped, as at $d^1$, and having rounded or ground-off edges $d^2$, to accommodate and insure the seating or contact of a cupped disk, *e*. Secured to the stem *d*, and rising centrally therefrom, is a stud, $e^1$, threaded above to receive a nut, $e^3$. *e* is an elastic cup-shaped metallic disk, having a central opening for the passage of stud $e^1$, said disk being covered and held in place by a cup, disk, or washer, $e^2$, and nut $e^3$, but is free at the edge or periphery. The cover C of the steam-chest has an opening, *c*, in which the stem and cupped disk of the relief-plate work, the area of said opening being less than that of valve B, so that the bearing-down pressure will exceed the upward pressure on the relief-plate, causing the plate to keep in perfect contact with the valve under all circumstances.

To the cover of the steam-chest may be secured arch or bridge F, provided with set-screw *f*, for the usual purpose of controlling the stem of the valve-cover or relief-plate D, and the under side of C may also be provided with lugs $c^1$ $c^1$, to engage with similar devices $c^2$ on the relief-plate or valve-cover, whereby the mobility of the relief-plate is insured, and its displacement guarded against.

The relative position of tne several parts are shown clearly in Figs. 3 and 4, and their operation is as follows: The washer or disk $e^2$, being brought down by nut $e^3$ upon the convex surface of the cupped disk *e*, forces out or slightly flattens the disk, so that it packs the opening *c* of cover C, and as the convex surface of the cupped disk and the edges $d^2$ of stem *d* are ground to match, a perfectly-tight joint is obtained.

This cupped disk *e*, being slightly movable, will adjust itself to any oscillation of the relief-plate or valve-cover D, at the same time that it acts as a spring to equalize the pressure upon the relief-plate and correct the tendency of the valve to wear, and as a packing.

The advantages of my improvement are as follows: first, simplicity of construction; second, it is easy of adjustment; and, third, at all times, by tightening the nut, a perfectly-tight joint may be obtained by the spreading of the cup.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

In combination with the relief-plate D, having a suitable stem or projection, *d*, an elastic concave metallic disk, *e*, secured to the stem and free at its periphery, substantially as and for the purpose specified.

In testimony whereof I, the said EDWARD ARMSTRONG, have hereunto set my hand.

EDWARD ARMSTRONG.

Witnesses:
F. W. RITTER, Jr.,
T. B. KERR.