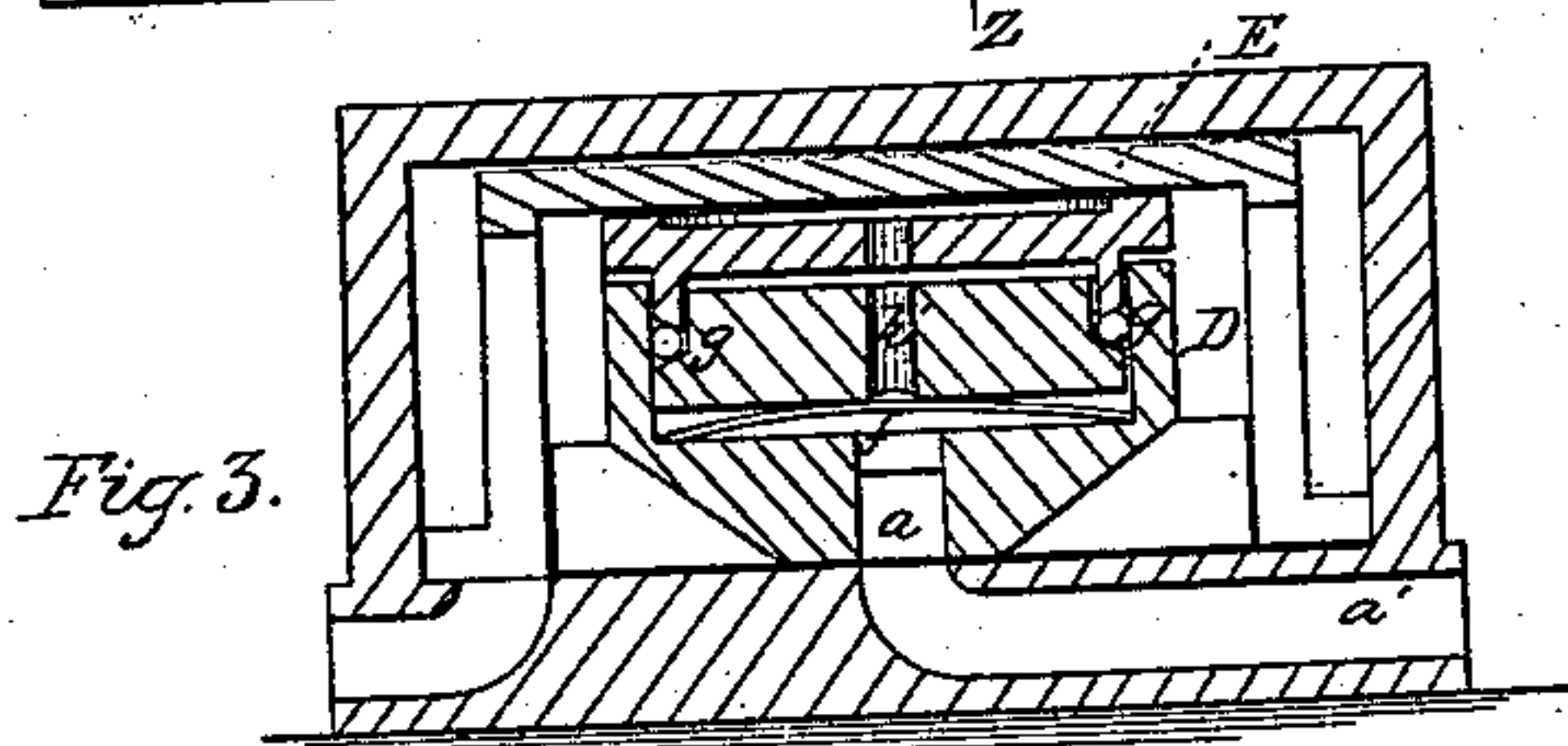
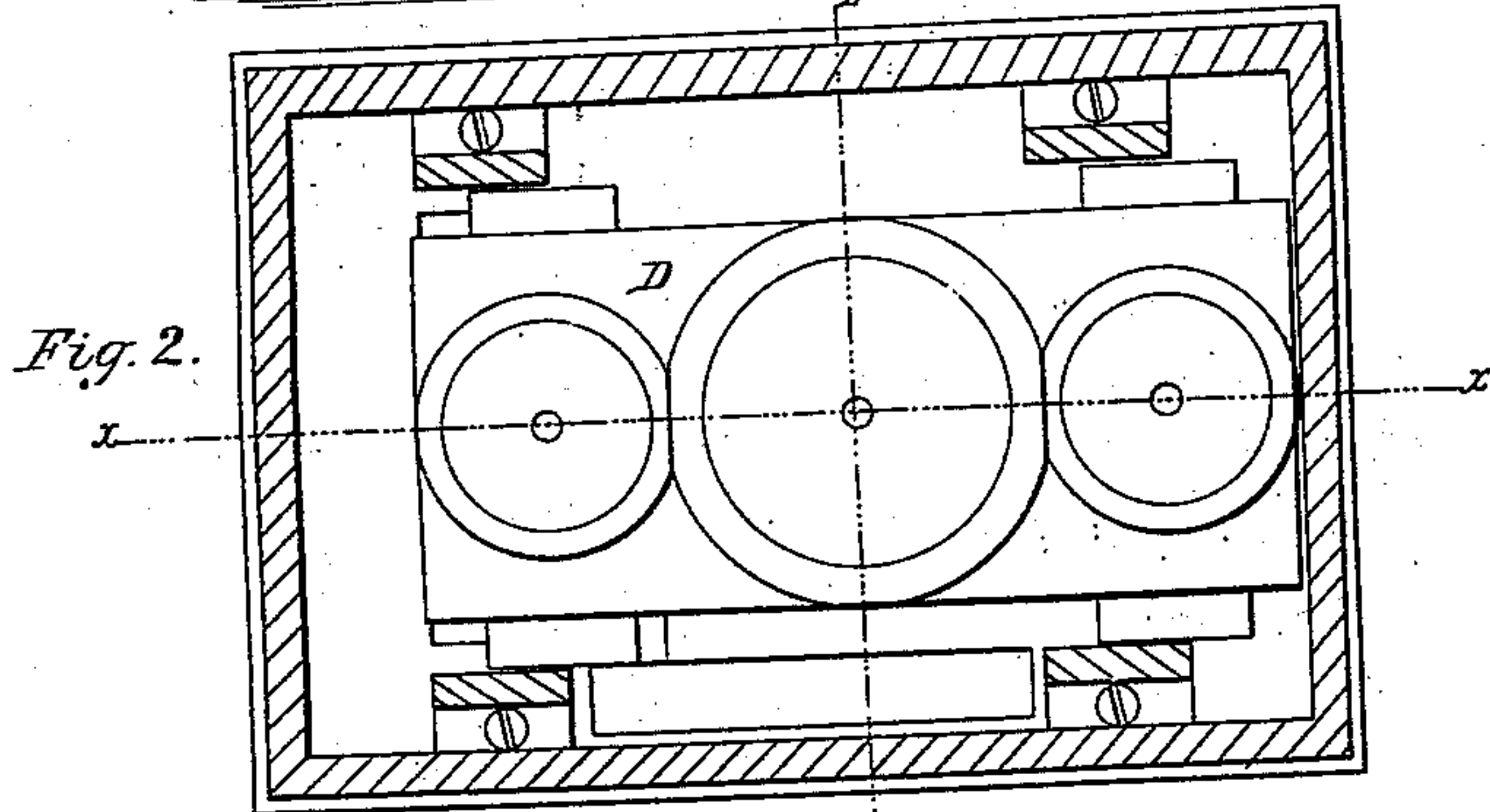
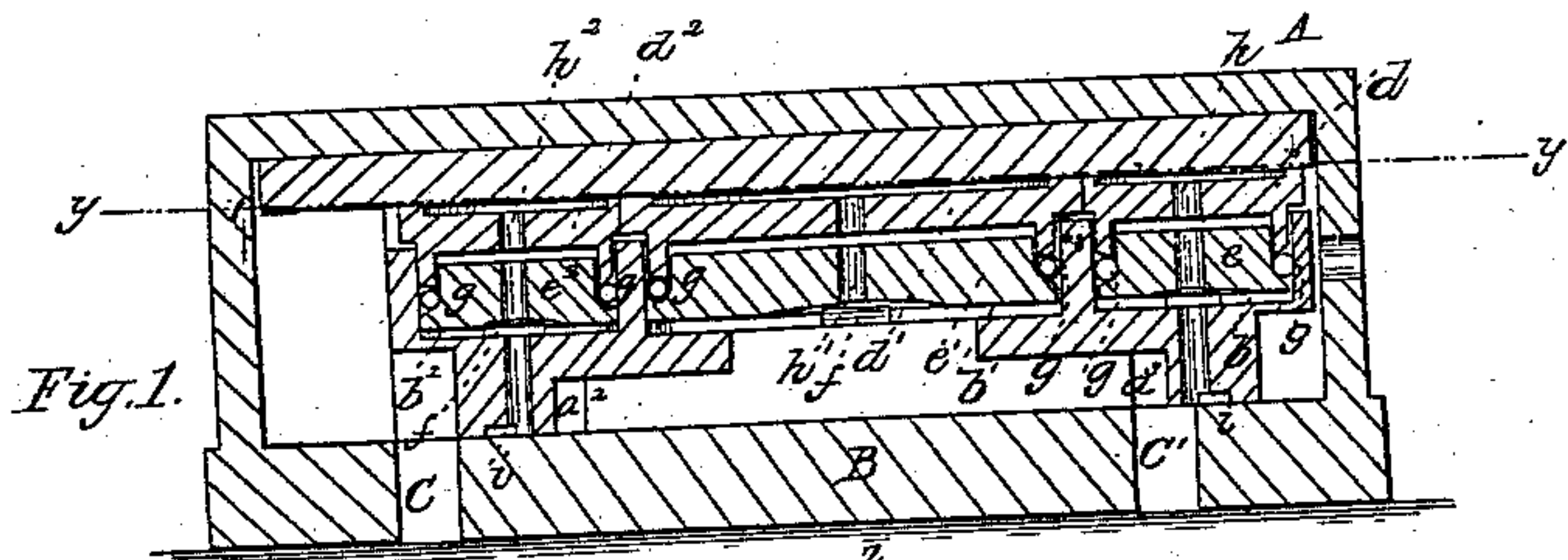


*J. R. Hall,*

*Steam Balanced Valve.*

*N<sup>o</sup> 82,520.*

*Patented Sep. 29, 1868.*



*Witnesses.*  
*H. C. Ashkettle*  
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# UNITED STATES PATENT OFFICE.

J. R. HALL, OF SALEM, OHIO.

## IMPROVEMENT IN STEAM SLIDE-VALVES.

Specification forming part of Letters Patent No. 82,520, dated September 29, 1868.

*To all whom it may concern:*

Be it known that I, J. R. HALL, of Salem, in the county of Columbiana and State of Ohio, have invented a new and useful Improvement in Balanced Slide-Valves; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a longitudinal vertical section on the line  $x x$  of Fig. 2. Fig. 2 represents a horizontal section on the line  $y y$  of Fig. 1. Fig. 3 represents a vertical transverse section on the line  $z z$  of Fig. 2.

Similar letters of reference indicate corresponding parts.

The object of this invention is to provide a balance-valve that will be equally balanced at all times and under the varying conditions arising from the action of the steam on entering and exhausting from the cylinder.

It consists in the construction of cylinders in the back of the valve, and the provision of the said cylinders with plungers having recesses in the top, opening to the inner face of steam-chests, having areas equal to the different parts of the valve exposed to an upward pressure, and openings to admit the live steam to them, and provided with packing-joints to control the steam in passing to and from the said recesses, as will be more fully described on reference to the accompanying drawings, wherein—

A represents the valve-chest, B the valve-seat, and C C' the ports. D represents the valve, and E a hood or bridge, under which the valve works and against which the downward pressure is obtained. The valve is provided with a longitudinal channel,  $a$ , for receiving the live steam through the passage  $a^1$ , and with transverse channels  $a^2$  and  $a^3$ , for supplying it to the ports C and C'.

$b$ ,  $b^1$ , and  $b^2$  represent short cylindrical chambers provided in the top of the valve, in which are fitted plungers  $d$ ,  $d^1$ , and  $d^2$ , having recesses in the top ends, which are fitted to work steam-tight against the underface of the bridge E or valve-chest.

In the said cylinders, in the back of the valve, followers  $e$ ,  $e^1$ , and  $e^2$  are provided,

which are uniformly borne upward by elliptic or other suitable springs,  $f$ , sufficiently to cause the pistons to bear fairly on the bridge. Annular recesses are formed in the faces of these plungers, between which and the walls of the cylinders corresponding annular projections on the under side of the pistons fit, but leaving sufficient space for rings of flexible and elastic packing  $g$  to be inserted, to preserve steam-tight joints between the plungers and the walls of the cylindrical chambers to prevent the escape of the steam at the open ends of the said cylinders. Communication with the recesses in the upper ends of the plungers for the live steam under the valve is made through the central passages  $h$ ,  $h^1$ , and  $h^2$ .

The recess in the piston  $d^1$  is intended to be filled with live steam from the supply-passage  $a^1$ , which, bearing against the lower face of the bridge, will balance the upward pressure on the live-steam passage  $a$  under the valve, and is always open to the live steam. The area of the recess in the said piston  $d^1$  should be enough greater than the area of the live-steam passage  $a$  to keep a fair bearing of the valve upon the valve-seat—say about twenty-five per cent.

As the ports C and C' are alternately opened and closed, the upward pressure on the lips of the valves varies according to the position of the valves, alternating between the full pressure due to the area of the ports and none when the exhaust has taken place, from which, in the valves as ordinarily constructed, great inequality of friction takes place, and to avoid which is the principal object of my invention; and to this end I have arranged the pistons  $d$  and  $d^2$  at each end of the valve, which operate as follows:

When the port is open to the steam-cylinder, communication is also opened with the recesses in the said pistons through the holes  $h$  and  $h^2$ . The area of each recess is calculated to be the same as the area of each port. The lips of the valve being also provided with recesses in those parts which lap on the seat, the measurement of which from the outer edge to the edges of the lips being the same as the breadth of the ports, and communication with them through the holes which lead to the recesses in the pistons being always open, the pressure will always be the same in both di-

rections, whether little or great, while the ports are open to the steam, and, when open to the exhaust, the steam will also exhaust from the recesses, thereby effecting an equal balancing-pressure under the ends of the valves, and removing the same when the said upward pressure is removed, the exhaust is effected into the valve-chamber, and may be carried off in any desired manner.

The holes through the plungers may be made so small that the leakage which may occur from imperfection of the seat against the bridge will weaken the pressure in the recesses between the plungers and the bridge, and thus the plunger will be made to bear harder against the bridge, and thereby sooner seat itself. The

recesses may also be made of any shape other than annular, if desired.

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

The arrangement of the valve D, with its chambers  $b\ b^1\ b^2$ , the recessed followers  $e\ e^1\ e^2$ , and the pistons  $d\ d^1\ d^2$  with the central passages  $h\ h^1\ h^2$  and the passages  $a^1\ a^2\ a^3$ , whereby to balance the pressure of steam upon the valve, substantially as herein set forth.

J. R. HALL.

Witnesses:

GEO. W. FISHER,

HARRY B. GARRIGUES.