2 Sheets—Sheet 1.

R. HAMMOND.

BALANCED SLIDE-VALVES.

No. 195,005. Patented Sept. 11, 1877.

Fig 1.

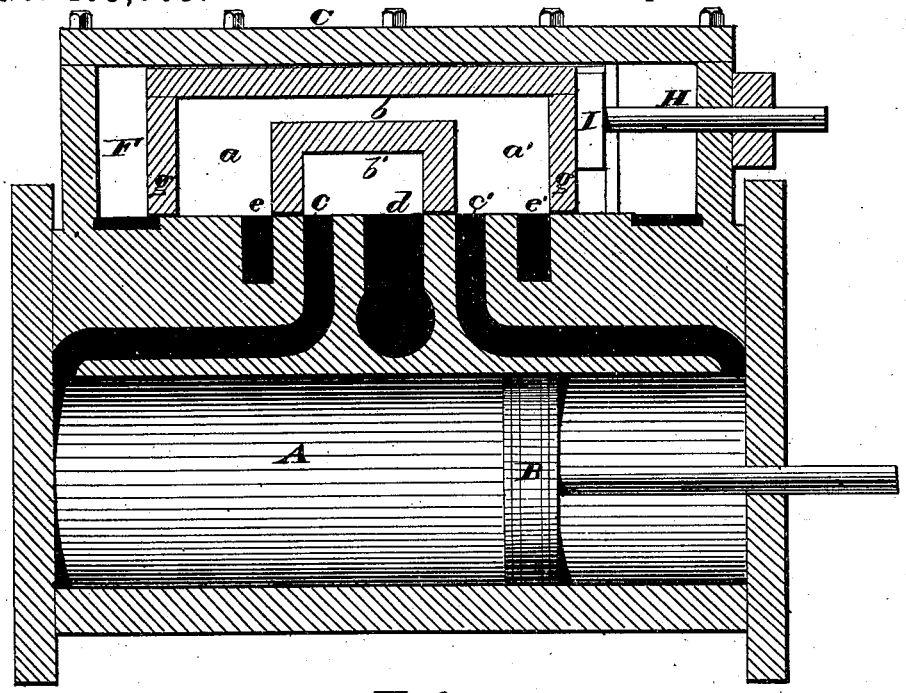
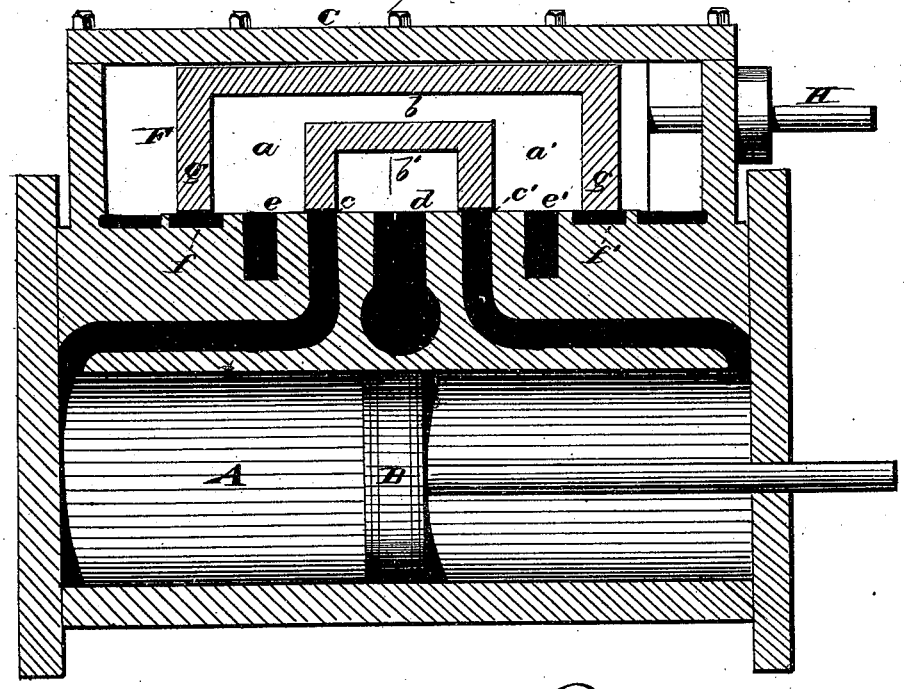


Fig 2.



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2 Sheets—Sheet 2.

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Fig. 3.

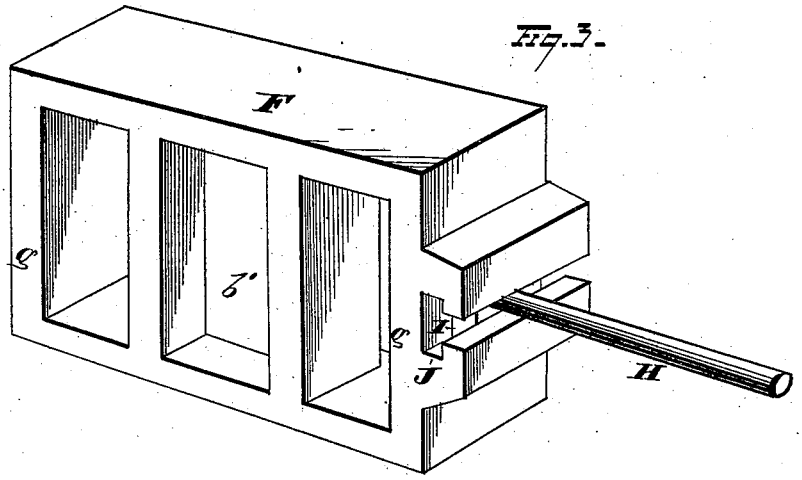
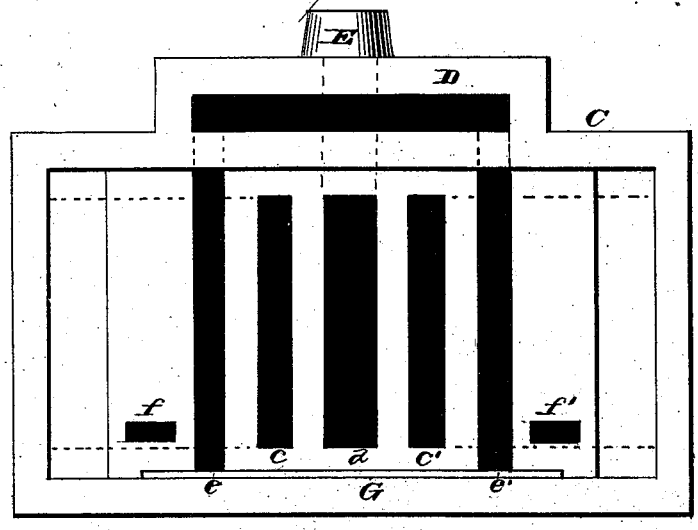


Fig. 4.



WITNESSES

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UNITED STATES PATENT OFFICE.

RICHARD HAMMOND, OF FRANKLIN, PENNSYLVANIA.

IMPROVEMENT IN BALANCED SLIDE-VALVES.

Specification forming part of Letters Patent No. **195,005**, dated September 11, 1877; application filed August 16, 1877.

To all whom it may concern:

Be it known that I, RICHARD HAMMOND, of Franklin, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Balanced Slide-Valves; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in balanced slide-valves for steam-engines.

The object of the invention is to provide a slide-valve of such construction that the steam will enter the steam-ports to the cylinder through the valve itself, and from each end thereof, and when the steam-ports are closed steam will pass from the interior of the valve to the steam-chest, and exert pressure on the back of the valve to hold the same to its seat.

In the accompanying drawings, Figure 1 is a vertical section of my improved valve as applied to a cylinder, the valve being in position for conducting steam to one end, and exhausting steam from the opposite end, of the cylinder. Fig. 2 is a similar view, with the valve in position for cutting off steam from each steam-port to the cylinder. Fig. 3 is a view in perspective of the face of the valve. Fig. 4 is a plan view of the valve-seat.

A represents the ordinary cylinder, and B the piston, of a steam-engine. C is a valve-chest provided with an outer steam-chamber, D, which latter is furnished with the steam-inlet E, through which steam passes, through suitable ports, to the cylinder of the engine, as will hereinafter more fully appear. F represents a hollow B-valve, the steam-passages *a a'* of which are connected by a steam-passage, *b*, the latter equal in width to the steam-passage. *b'* is the exhaust-passage of the valve. The valve-seat is provided with the ordinary steam-ports *c c'* leading to opposite ends of the cylinder and intermediate exhaust-port *d*. The valve-seat is provided with ports *e e'*, which latter are located outside of the steam-ports and parallel therewith. Ports *e e'* extend across the valve-seat, and connect with the live-steam chamber D. Steam-passages *f f'*, each of a length exceeding the width of the outer valve-faces *g* of the valve, are formed in the valve-seat outside of the steam-ports *e e'*. G represents a valve-seat, secured to one side of the valve-chest, for the purpose of supporting the valve when the valve-chest is located on the side of the cylinder.

The valve-rod H is secured to the valve by means of a slide, I, which fits within a vertical slot, J, formed in the end of the valve, whereby the latter may have free vertical movement without interfering with the reciprocation of the rod or valve.

The operation of my improved valve is as follows: When the valve is in the position shown in Fig. 1, steam enters the steam-chamber D through steam-inlet E. As the ends of ports *e e'* communicate directly with chamber D, steam will enter both ports, and flow from port *e'* directly into the steam-port *c'*, while steam from the opposite port *e* passes through the steam-passage *a b a'* in the valve, and is conducted into the steam-port *c'*. At the same time the exhaust steam from the opposite end of the cylinder finds exit to the main exhaust-passage *d* through the exhaust-passage *b'* of the valve.

As the steam-passages *a a'* in the valve are of a width greater than the throw of the valve, it will be observed that the interior of the valve is at all times filled with live steam, and hence there is a constant upward pressure exerted on the entire lower surface of the back of the valve.

In order to insure a downward pressure of the valve on its seat slightly in excess of the upward pressure on the valve, the outer steam-passages *f f'* are so located and arranged that, when the bridges *g* of the valve are in position to shut off steam from the live-steam ports *c c'*, the live steam in the valve, which, as heretofore stated, has at all times a free inlet to the valve, will flow from the valve beneath the end valve-faces *g* through steam-passages *f f'* and into the steam-chest, and thereby allow the steam to exert a downward pressure on the back of the valve. As the back of the valve is of greater area than the lower surface thereof, it follows that the downward pressure will somewhat exceed the upward pressure on the valve. The excess of

down pressure is somewhat diminished, owing to the fact that the lower surface of the back of the valve is at all times subjected to the direct pressure of steam; while the back of the valve has steam supplied thereto only intermittingly, and at a time when the steam is cut off from the live-steam ports to the cylinder.

From the foregoing it will be observed that I have secured as nearly a balanced valve as is possible, and this result is effected without the employment of complex mechanism found in many of the so-called balanced valves.

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

1. A valve provided with a live-steam chamber equal in area to the lower surface of the back of the valve, and an intermediate exhaust-chamber, said valve adapted to have free vertical movement in the valve-chest, in combination with the valve-seat provided with an intermediate exhaust-port, and two steam-ports located on opposite sides of said exhaust-port, one set of said steam-ports leading to the ends of the cylinder, while the other set of ports are at all times in direct communication with the steam-inlet and opposite steam-passages of the valve, substantially as described.

2. The combination, with a valve formed with live-steam passage *a b a'* and exhaust-steam passage *b'*, of the steam-ports *c c' e e' f f* and exhaust-port *d*, substantially as set forth.

3. A valve provided with a live-steam chamber equal in area to the lower surface of the back of the valve and an intermediate exhaust-chamber, said valve adapted to have free vertical movement in the valve-chest, in combination with the steam-chest provided with an auxiliary steam-chamber, and steam-ports leading therefrom, and directly connecting said auxiliary with the steam-chamber of the valve, substantially as described.

4. A balanced valve, constructed substantially as set forth, whereby the live steam has free entrance to the interior of the valve at all times, and is admitted intermittingly to the back of the valve, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 13th day of August, 1877.

RICHARD HAMMOND.

Witnesses:
I. E. HANAND,
J. BRODERICK.