J. A. HUTCHISON.

Balanced-Valve.

No. 160,327. Patented March 2, 1875.

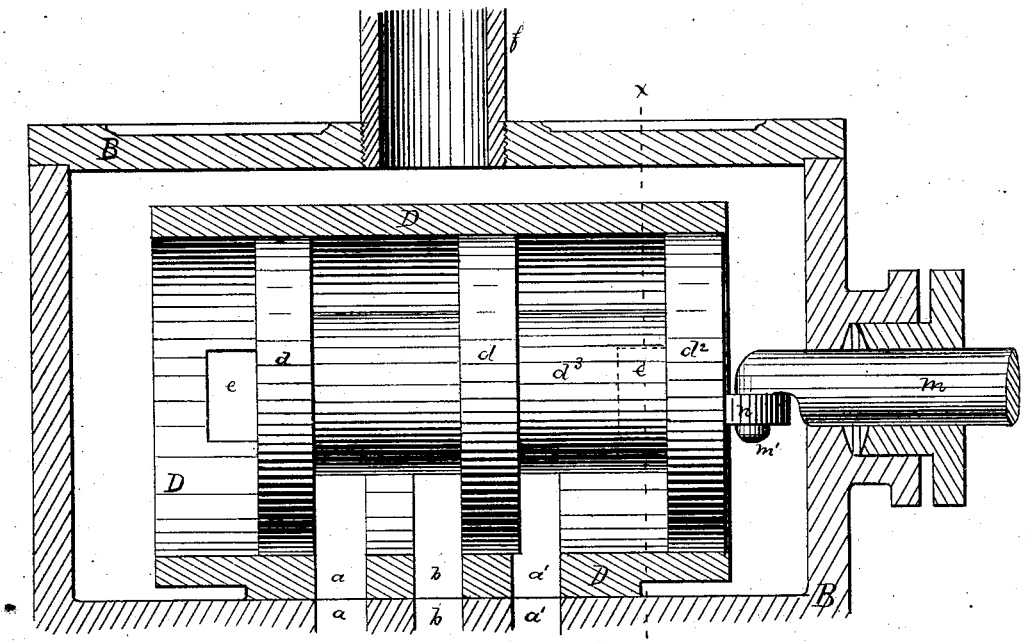

Fig. 1.

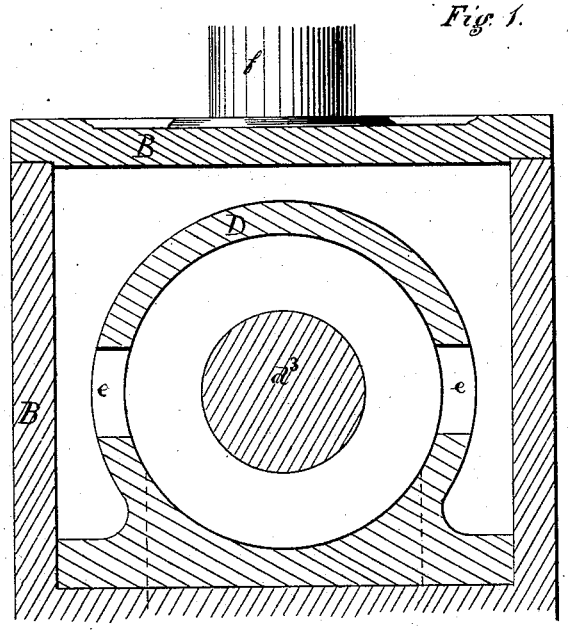

Fig. 2.

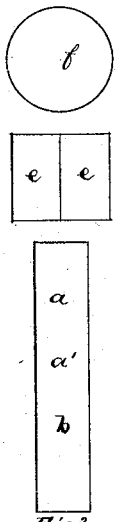

Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

JAMES A. HUTCHISON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN BALANCED VALVES.

Specification forming part of Letters Patent No. **160,327**, dated March 2, 1875; application filed January 9, 1875.

To all whom it may concern:

Be it known that I, JAMES A. HUTCHISON, of Pittsburg, county of Allegheny, State of Pennsylvania, have invented or discovered a new and useful Improvement in Steam-Engine Balanced Valves; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a longitudinal sectional view of a steam-valve chest, with my improved valve construction arranged therein. Fig. 2 is a transverse section through *x x*, Fig. 1, and Fig. 3, by a diagram, illustrates the relative areas of the steam pipe and ports.

The object of my invention is, first, an improved construction of balanced valve; second, an arrangement of ports in connection with the ordinary steam-chest and steam-cylinder, whereby the steam-exhaust ports will exceed in capacity the steam-receiving ports.

In the drawing, B represents an ordinary steam-chest, and *a a'* the steam-ports, leading to the opposite ends of the cylinder, and *b* the exhaust-port. Inside the steam-chest B I arrange a valve-case, D, of cylindrical or other suitable form, as square, rectangular, or otherwise, in cross-section, and in this I arrange the piston-valves *d* d^1 d^2, of any suitable construction, and affix them to a common valve-stem, d^3. The ends of the valve-case D are always open, at least to such extent as to allow the steam-pressure to act against the outer ends of the outer piston-valves *d* d^2, so that so far as relates to longitudinal pressure these piston-valves will be perfectly balanced, and also when steam is admitted between *d* and d^1, or d^1 and d^2, such pressure acting equally either way, will not destroy such balance. At suitable points in the opposite sides of the valve-case D, and opposite each other, I make the steam-supply ports *e* so that when a piston-valve, *d* or d^2, is passing such ports the steam-pressure, acting equally on its opposite sides, will leave it, as to lateral pressure, perfectly balanced. These ports *e*, at the opposite ends of the valve-case D, are alternately covered and uncovered by the end piston-valves *d* d^2, so as thereby to open and cut off communication alternately to and from the steam-receiving ports *a a'*, which lead to the opposite ends of the main-cylinder, and the middle piston-valve d^1 passes back and forth over the exhaust-port *b*, so as to open and close the exhaust, as will be readily understood by those skilled in the art. Steam is supplied from the boiler by the usual pipe, *f*.

By arranging now the relative areas of these ports I am enabled more perfectly than has, I believe, been done by any like means to secure, with any given or desired steam-receiving capacity, a greater steam-exhaust capacity, and to this end I make the area in cross-section of each of the ports *a a' b* greater than the aggregate area of each pair of supply-ports *e e*, (the two ports opposite each other being considered as a pair.) While not limiting myself to any specific or fixed relative area for such ports and for the steam-pipe *f*, I have illustrated in the diagram, Fig. 3, what I believe to be the best relative areas. In this diagram, supposing the area in cross-section of the pipe *f* to be 1, the area of two opposite ports *e e* is represented as 1, and of each of the ports *a a' b* is represented approximately as 2. Hence the steam-exhausting capacity of the engine on either stroke from one end of the main cylinder will be double, or about double, the steam-receiving capacity, on the same stroke, to the other end of the main cylinder.

By thus rapidly exhausting the steam in the manner described I get rid, in part at least, of the difficulty experienced from the presence of exhaust-steam in the cylinder as a hindrance to the forward stroke. But, as already stated, the relative areas of these ports may be varied, provided only that each port *a a' b* shall have an area greater than that of each pair of ports *e e;* and for the purposes of this part of my invention a single supply-port of the same area may take the place of each pair of ports *e e*.

In order that the piston-valves *d* d^1 d^2 may, under the equal or balanced pressure to which they are subject at all times, as above set forth, work with perfect freedom, and without binding at all from imperfect alignment, or from an imperfect adjustment of the packing, I connect the valve-stem *m* to the piston-valves by a hook, *m'*, engaging an eye, *n*, which latter, as affixed to the piston-valves or

their stem, though in lieu thereof other suitable joint may be used, as a ball-and-socket, swivel, hinge, or other like joint.

The result above stated will thus be secured, and the piston-valves d d^1 d^2 being ground or provided with any suitable means of self-packing, will work free and true in their case D.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The piston-valves d d^1 d^2 and the valve-case D, in which they operate, arranged in the steam-chest B, the interposed valve d^1 serving to govern the exhaust-port, whereby steam-pressure being free to act against the outer ends of the outer piston-valves, and in the operation of the engine, between the valves, such valves will be balanced at all times, the combination being substantially as set forth.

2. The steam-supply ports e in the valve-case D, and the receiving and exhaust ports a a' b, the area in cross-section of each of said ports being greater than the aggregate area of each pair of said supply-ports, in combination with an arrangement of valves for covering and uncovering the same, substantially as described.

In testimony whereof I have hereunto set my hand.

JAMES A. HUTCHISON.

Witnesses:

W. GIBSON MILLER,

LEWIS HUTCHISON.