J. HEMPHILL.

AIR-VALVES FOR BLAST CYLINDERS.

No. 185,321. Patented Dec. 12, 1876.

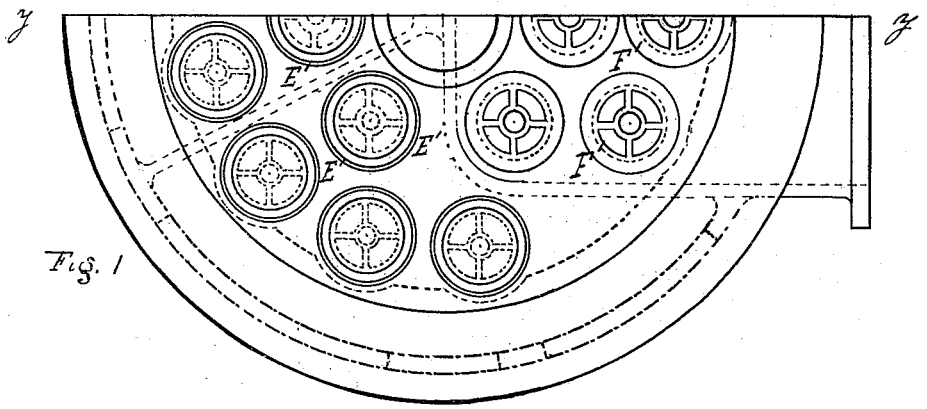
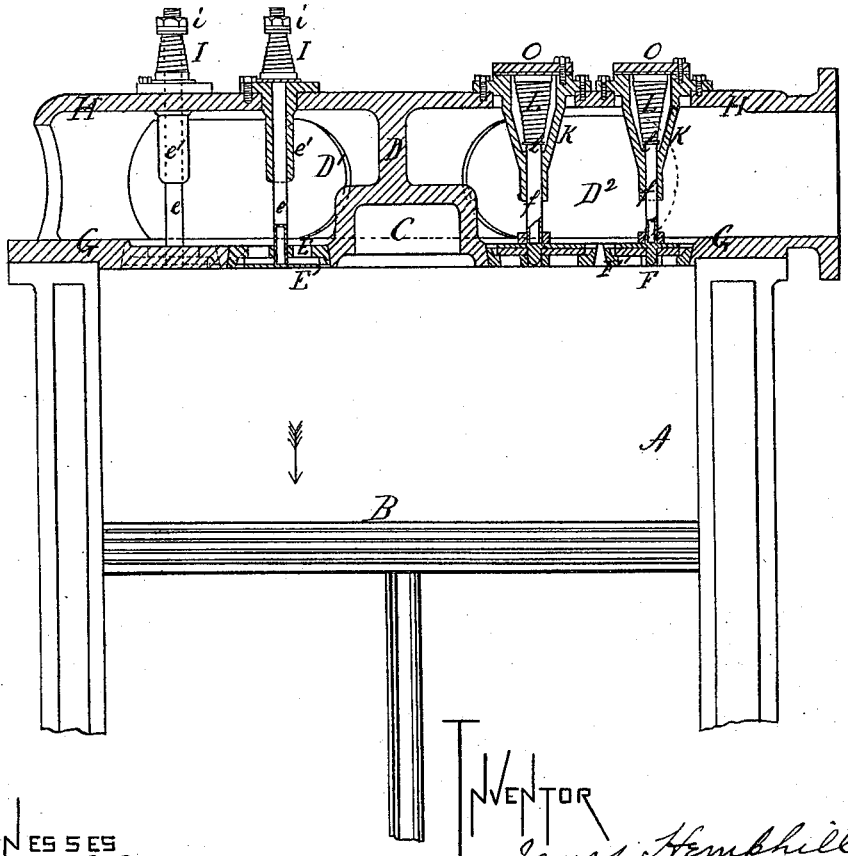


Fig. 1

Fig. 2



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UNITED STATES PATENT OFFICE.

JAMES HEMPHILL, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN AIR-VALVES FOR BLAST-CYLINDERS.

Specification forming part of Letters Patent No. **185,321**, dated December 12, 1876; application filed January 9, 1875.

To all whom it may concern:

Be it known that I, JAMES HEMPHILL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Air-Valves for Blast-Cylinders; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming a part of this specification, in which—

Figure 1 is a plan of the head and its valves, and Fig. 2 is a section of the head and valves on the line *y y* of Fig. 1.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of blast-cylinder heads for blowing-engines; and it consists in combining with the cylinder-head a set of poppet-valves, controlled by volute springs, whereby a tight valve is obtained, and the rattle and wear thereof overcome, giving greater power and regularity than have heretofore been obtained in the blast.

Heretofore the blast-cylinders of blowing-engines have been provided with flap-valves, which opened and closed by atmospheric pressure, or the difference in the density of the air within and without the cylinder, and, as there were no means provided for controlling the valves, they beat upon their seats with a rattling disagreeable noise, and to the injury of the valve, necessitating frequent repairs to prevent leakage. In overcoming these objections I have supplied the cylinder-head with poppet-valves, and to insure a constant and uniform action and seating of the valves I have provided volute springs, to be used in connection therewith.

I will now proceed to describe my invention with reference to the drawings, in which A represents the blowing-cylinder, of cast-iron or other suitable material, of the usual form, accurately turned on the inside, and provided with a piston, B, made air-tight by a packing. The cylinder is closed at both ends by heads, in which are located the inlet and outlet valves, and through one of which the piston-rod will pass, being surrounded by the usual stuffing-box, so that it may work air-tight. C indicates the cylinder-head, divided by a partition, D, into two chambers, in one of which, D^1, the inlet-valves E are located, and in the other, D^2, are the exit-valves F. The chamber D^1 communicates with the exterior, while from the chamber D^2 a suitable pipe leads to the furnace or other point where the blast is to be used. The head G is provided with valve-seats E′ and F′, corresponding in number to the number of valves used, part of which are for the inlet-valves E and part for the outlet-valves F, and are accordingly located on opposite sides of the head. These valve-seats may be faced in any of the well-known ways. E represents the inlet-valves, provided with stems *e*, passing through sleeves *e′*, attached to the outer head H, and projecting for such a distance beyond head H as will permit a volute spring, I, to be slipped over the end of the valve-stem and secured thereto by means of a nut, *i*. F represents the exit-valves, which, like the inlet-valves, are poppets, but from their location and the necessity of having air-tight joints, are somewhat differently arranged, though their principle and operation are the same. These valves are provided with stems *f*, which enter and are guided by sleeves K, secured to the head H, and projecting into chamber D^2. Upon the ends of valve-stems which enter the sleeves are formed shoulders or similar devices for seating disks *l*, against which one end of volute spring L bears, the other end of said spring resting against the inner face of cap O, which closes the end of sleeve K. Sleeve K is bored tapering, as shown in the drawing, or otherwise formed to accommodate volute spring L.

The operation of these devices is as follows: When the piston is moving in the direction of the arrow, Fig. 2, the air within the cylinder back of the piston will become rarefied, so that the pressure of the external air will overcome the volute springs and lift the inlet-valves off their seats, allowing the cylinder to fill; but the exit-valves will be held in place by the density of the air in chamber D^2, and by the volute springs. As soon as the cylinder is filled, and before the piston commences its return-stroke, or as it turns its corner, the volute springs of the inlet-valves force them down upon the seats without jar or noise. On the return-stroke of the piston the air in the cylinder becomes sufficiently dense to lift the exit-

valves, which are, in turn, forced back upon their seats at the time specified. By this construction, the piston will work closer to the cylinder-head than it can in any other cylinder known to me, which is an additional advantage, more noticeable in small cylinders, and of great importance.

I am aware that poppet-valves provided with spiral springs have been used in hot-air and gas engines, and make no claim thereto; but

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

In combination with the cylinder-head of a blast-cylinder, poppet-valves E and F, provided with volute springs for controlling the valves, substantially as specified.

In testimony whereof I, the said JAMES HEMPHILL, have hereunto set my hand.

JAMES HEMPHILL.

Witnesses:
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