H. D. DUNBAR & J. M. FOSS.

VARIABLE EXHAUST FOR STEAM ENGINES.

No. 180,011. Patented July 18, 1876.

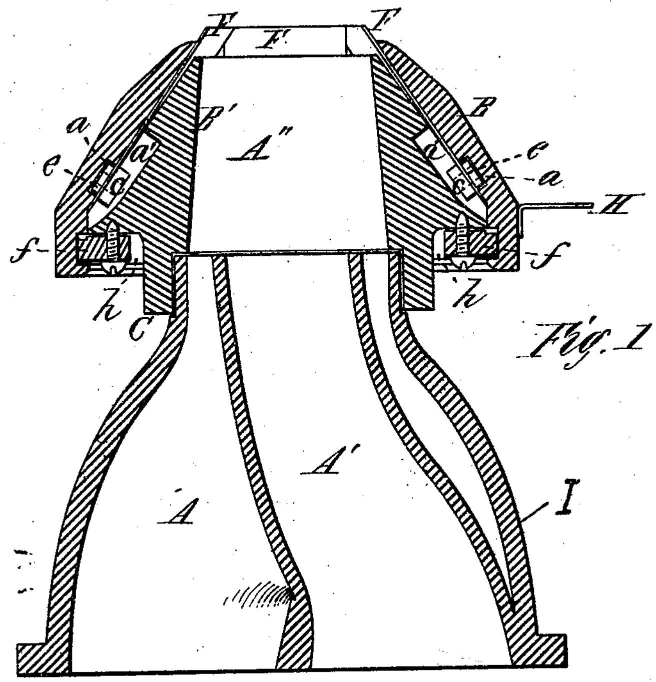

Fig. I

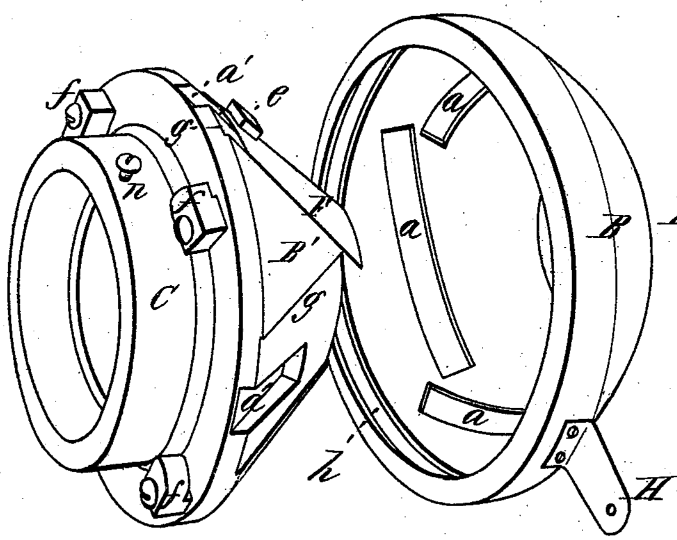

Fig. II

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UNITED STATES PATENT OFFICE.

HENRY D. DUNBAR, OF NORTH HARTLAND, AND JAMES M. FOSS, OF ST. ALBANS, VERMONT, ASSIGNORS TO THEMSELVES AND D. M. MUZZEY.

IMPROVEMENT IN VARIABLE EXHAUSTS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. **180,011**, dated July 18, 1876; application filed April 29, 1876.

To all whom it may concern:

Be it known that we, HENRY D. DUNBAR, of North Hartland, and JAMES M. FOSS, of St. Albans, both in the State of Vermont, have invented a new and useful Variable Exhaust for Steam-Engines; and that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, and to the letters of reference marked thereon.

Our invention relates to the exhaust of steam-engines, and has for its object the variation in size of the orifice through which the steam escapes after leaving the cylinders; and to this end our invention consists of a conical tubular head, provided with vertical grooves, upon which head is fitted a correspondingly-shaped cap, provided with inclined grooves, with a series of plates fitted to the head, and arranged to slide up and down thereon by partially rotating the cap, to reduce or increase the size of the orifice at the top, as will be more fully hereinafter described.

Figure I is a central vertical section of our invention as applied to an exhaust-nozzle, and Fig. II is a perspective view of the device.

In the drawings, B′ represents a conical head, in the exterior conical surface of which are made a series of recesses, *g*, in which are fitted a corresponding series of plates, F, provided with a knob, *e*, on the outside, and another, *c*, on the inside, the plates F being curved to fit the cone-shaped head, coming together at the top, as shown in Fig. I, forming an orifice between their ends. These recesses *g* are still further recessed or grooved at *a′*, which grooves extend in a vertical direction, and the knob *c*, upon the inner or concave side of each plate, when the latter is in place, is in one of said grooves.

The cap B is also provided on the inside with inclined grooves *a*, corresponding in number with the plates F, each one of which receives the knob *e*, on the outside of the plate placed in front. When the plates are all put in place in the recesses *g*, with the inside knobs *c* in the vertical grooves *a′*, the cap B is placed over the plates and upon the head B′, with the knobs *e* in the inclined grooves *a* in the cap, and the latter is secured in place by the buttons *f*, pivoted to the lower edge of the head, which buttons are sufficiently long for one end of each to be turned into the annular groove *h*, made in the lower end of the cap. When thus secured upon the head the cap may be given a short vibrating rotary motion to and fro upon the head, and when rotated in one direction the knobs *e*, on the outside of the plates, ride up the inclined grooves *a* in the cap, while the knobs *c*, on the inside of the plates, pass up the vertical grooves *a′* in the head, and prevent the plates from moving horizontally, and by this rotary movement of the cap the plates are caused to move up and nearer together at their upper ends, and reducing the size of the aperture; or, by rotating the cap in the opposite direction, the plates are caused to move downward, thereby enlarging the aperture at the top. The lower end of the head B′ is provided with a flange, C, which is placed upon the end of an exhaust-pipe, and secured by a set-screw, *n*, turned in against the pipe.

We prefer, however, to use this variable exhaust in combination with an exhaust-nozzle, I, having two pipes, A and A′, one within the other, but separated at their lower ends, as shown in Fig. I, the inner one somewhat smaller than the other, so that when the steam exhausts through one a draft is created thereby out of the other.

This exhaust-nozzle is located in the exhaust-chamber, and the cap may be provided with a piece, H, to which a rod is attached, extending to the cab of the engine, by which the cap may be rotated in either direction to change the size of the orifice at the upper ends of the plates F by moving the latter up or down, the steam in either case passing up the pipe A or A′, and through the orifice A″ in the head, and out through the orifice formed by the upper ends of the plates.

We are aware that variable exhausts have heretofore been made, in which a series of plates arranged in the form of the frustum of a cone were used, the upper ends of which plates were tilted inward to reduce the size of the escape-orifice, and outward to enlarge it, and we do not claim the same, nor any exhaust in which the plates do not change their position

by a direct or positive upward and downward movement in changing the size of the escape-orifice.

By the arrangement above described we keep the exhaust-orifice entirely free from projecting above and around it, so that a free upward draft is permitted of the air surrounding the escaping column of steam, which materially aids in the exhaust of the steam from the cylinder.

Having thus described our invention, what we claim as new is—

1. The combination of the conical head B′, a series of plates, F, moving in a vertical direction, and the conical cap B, having a vibrating rotary movement upon the head to move said plates up or down, substantially as herein described.

2. The combination of the conical head B′, the vertically-moving plates F, the conical operating-cap B, and the exhaust-nozzle I, substantially as described.

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Witnesses:
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