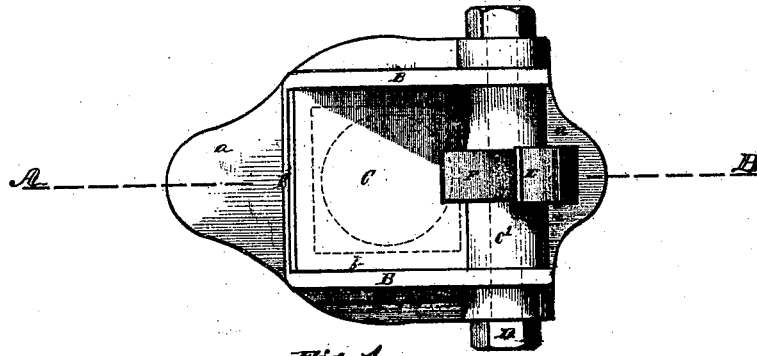


*W. A. Foster,*

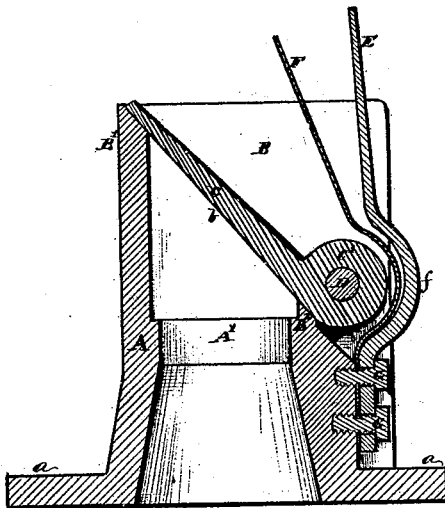
*Exhaust Nozzle.*

*No. 107,605.*

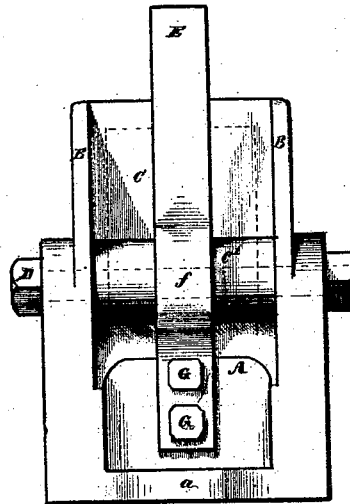
*Patented Sep. 20. 1870.*



*Fig. 1*



*Fig. 3*



*Fig. 2*

*Witnesses*

*W. D. McIntire*  
*Chas. A. Morgan*

*Inventor*

*William A. Foster*

# United States Patent Office.

WILLIAM A. FOSTER, OF FITCHBURG, MASSACHUSETTS.

Letters Patent No. 107,605, dated September 20, 1870.

## IMPROVEMENT IN EXHAUST-NOZZLES FOR STEAM-ENGINES.

The Schedule referred to in these Letters Patent and making part of the same

To all whom it may concern:

Be it known that I, WILLIAM A. FOSTER, of Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Exhaust-Nozzle for Locomotives; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing forming a part of this specification, in which—

Figure 1 represents a plan view of such parts of a locomotive as are necessary to illustrate my improvement;

Figure 2 represents a rear view of the same; and

Figure 3 represents a central vertical section of the same on the line A B, fig. 1.

To enable those skilled in the art to which my invention belongs to make and use the same, I will proceed to describe it more in detail.

The object of my invention is to provide a means of closing the exhaust-pipe in locomotives to prevent cinders and other substances from being drawn into the cylinders when the steam is shut off, and the engine is in motion.

My invention relates to a spring valve for closing the exhaust-nozzle of a steam-engine, and consists in the employment of an additional spring to arrest the outward movement of the valve, as hereinafter described.

In the drawing—

The part marked A represents the nozzle of the exhaust-pipe, which pipe may be arranged in the ordinary manner, and, consequently, does not require to be more fully described.

Flanges, *a*, are formed around the lower end of the nozzle A, by means of which it can be secured to the end of the exhaust-pipe.

Its upper part above the circular orifice A' is made in rectangular form, with vertical flanges, B B', at three of its sides, while, at its fourth or rear side, is hung a valve, C, which extends diagonally across the interior, between the flanges B B', and completely closes the opening.

Diagonal shoulders, *b*, are formed on the vertical sides B, while at the front, B', and back, B'', the metal is properly beveled, and, in connection with the shoulders *b*, forms a square valve-seat, as indicated by dotted lines, figs. 1 and 2, so that the valve C will fit closely at all points when closed.

The valve C is hung upon a pivot-bolt, D, which extends through the rear part of the nozzle from side to side, as shown in the drawing, and upon which the valve is allowed to swing freely.

An upright spring, E, is arranged at the back of

the valve C, against which the latter strikes when thrown open, and is thereby relieved from any injurious shock, and at the same time prevented from swinging too far back.

A small returning-spring, F, is also arranged between the valve C and spring E, for the purpose of quickly closing the valve C.

This spring F is made very flexible, and its upper end stands well out over the valve, as indicated.

The springs E and F are curved, as shown at *f*, so as to clear the hinge C' of the valve C, and their lower ends are firmly secured to the nozzle A by screws or bolts, G.

The valve C is raised by the exhaust steam or air as it issues from the orifice A', and is closed by its own weight, assisted by the spring F, when the jet from the orifice A' ceases.

It is well known to those conversant with the working of locomotive steam-engines, that, when the steam is shut off, and the engine is in motion, a partial vacuum is formed within the cylinders, and, when the exhaust-valve opens, the air, being capable of quicker action than the piston, rushes back through the exhaust-pipe and into the cylinder, to overcome the vacuum, and carries with it a greater or lesser quantity of cinders, a part of which becomes lodged among the valves and within the cylinder.

The cinders thus drawn in work in between the faces of the valve and valve-seat, and greatly increase the amount of friction between the parts, wearing away the metal in a very uneven manner, so that the parts require to be very often refaced, especially upon coal-burning engines.

The cinders also assist in wearing away the packing of the pistons and the interior of the cylinders.

This difficulty is wholly obviated by the use of the devices herein described, as the valve C prevents any back current from passing through the exhaust-pipes, and, consequently, excludes all cinders and other matter.

Another advantage gained by the use of the stop-valve C in the manner described is that, by preventing the ingress of air in front of the piston, a more perfect vacuum is formed in the cylinder when the steam is shut off, so that the machinery works with greater ease, because the piston does not have to force out a quantity of air, as it does with the ordinary construction of the exhaust-pipe.

In lieu of arranging the valve C at the ends of the nozzle A, said valve may be arranged at any other position in the exhaust-pipe; for instance, it may be placed in the horizontal part of the pipe, and be hinged at its upper side, in which case no spring

would be required for closing the valve, as its own weight would be fully sufficient for the purpose.

The valve may be made in rectangular form, as shown, or in any other desired shape, to fit the opening of the exhaust-pipe.

Having described my improvement in locomotives,

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

1. The spring E, operating substantially as described.

2. The combination with the exhaust-nozzle of a steam-engine and its valve, of the two springs E F, for operation substantially as shown and described.

WILLIAM A. FOSTER.

Witnesses:

H. D. MCINTIRE,  
CHAS. A. MORGAN.