

No. 705,225.

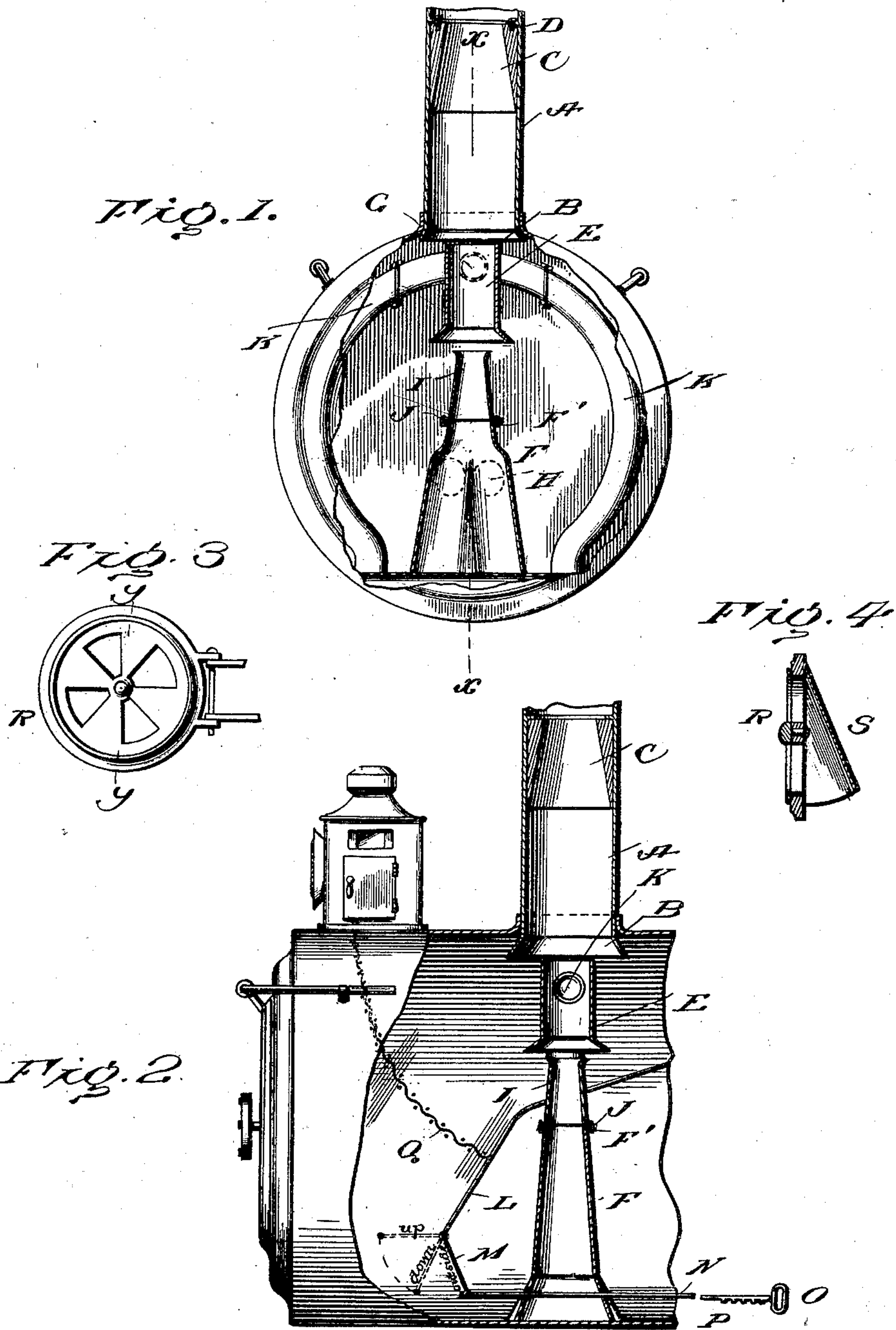
Patented July 22, 1902.

J. A. ESON.

FORCED DRAFT APPLIANCE FOR LOCOMOTIVES.

(Application filed Dec. 7, 1901.)

(No Model.)



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FORCED-DRAFT APPLIANCE FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 705,225, dated July 22, 1902.

Application filed December 7, 1901. Serial No. 85,191. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. ESON, a citizen of the United States, residing at Rawlins, in the county of Carbon and State of Wyoming, have invented certain new and useful Improvements in Forced-Draft Appliances for Locomotives; 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 appertains to make and use the same.

My invention relates to certain new and useful improvements in forced-draft appliances for locomotives.

It has for its object to economize in the use of fuel and to reduce to the minimum the generation of smoke and the nuisance of cinders ejected from the stack.

In the ordinarily-constructed locomotive it is conceded that from thirty-five to fifty per cent. of the fuel used to generate steam is wasted, because it is well known that the larger volume of smoke and cinders escaping or ejected from the stack of the locomotive is very rich in carbon or heat units. The standard and commonly-accepted theory has been that the exhaust-steam fills the stack at or near the base and creates a vacuum in much the same way as if a piston was passed quickly through the stack and that the air passing through the ash-pan, grates, fire, and flues to fill the vacuum thus produced creates what is termed "forced draft."

My invention is based upon the hypothesis that the stated theory is based upon a fallacy, because if the exhaust does create a vacuum unchecked its effect would be to snap or whip the fire completely away from the coal in the fire-box. For instance, if an unchecked vacuum be created in an eighteen-inch barrel-stack a vacuum-lift of three thousand six hundred and sixty-seven pounds would be the result, which would obviously draw the fire absolutely away from the coal in the fire-box. This is not so, because the volume of steam released from the cylinder has sufficient amount of retained force to expel all the air from the stack even if a twelve-inch nozzle were used, and it would be impossible to get more than atmospheric pressure no matter how much it was forced. I have found from observation and experience that in all en-

gines with open straight stacks when working strong a clearly-defined motion can be observed coming through the center of the stack and occupying about one-half of the area of the exit, while at each side there is a rolling motion resulting from the friction of the steam passing through the center of the stack. It is therefore obvious that it is the central or axial movement of the steam which creates positive draft and that the outer or rolling portion is a retardent or detriment to draft.

My invention is designed to produce what may be termed a "soft exhaust" at the top or exit of the stack and to avoid the rolling retardent action hereinbefore referred to and to produce a steady and even draw on the fire, which will result in a more perfect combustion of the coal and cinder, as well as a large proportion of the smoke in the fire-box, and the escape of only such gases as result from the mixing of the oxygen contained in the air and the carbon contained in the coal.

With these ends in view my invention consists in the construction and arrangement hereinafter described and claimed.

In order that those skilled in the art to which my invention appertains may fully understand the same, I will proceed to describe the construction and operation, referring by letters to the accompanying drawings, in which—

Figure 1 is a front end view showing the dry-pipe, steam-pipes, nozzle-tip, petticoat or draft pipe, and stack of a locomotive. Fig. 2 is a longitudinal section taken on the line *x x* of Fig. 1 with the dry-pipe and steam-pipes omitted; Fig. 3, a front view of damper in the stoking-door of the fire-box, and Fig. 4 a central section of the same on the line *y y* of Fig. 3.

Similar letters of reference denote like parts in the several figures of the drawings.

A represents the stack fifteen inches in diameter at the collar B, which latter extends down four inches within the smoke-box and is flared outwardly, as clearly shown at Fig. 1.

C is a cone-choke fifteen inches long and adapted to fit within the upper or exit end of the stack A. This cone or choke C has its central exit of nine and a half inches, and the inner wall tapers gradually toward the lower

end, as clearly shown, and is fastened in position by screws D, passing through lugs, as clearly shown at Fig. 1, or in any other desirable manner.

5 E is a petticoat-pipe ten inches in diameter set one and a half inches above the nozzle-tip and one and a half inches below the lower edge of the lower flared edge of the collar B of the stack and is secured in position in any
10 desirable manner. The lower end of the petticoat for a distance of about five inches is flared outwardly at an angle of forty-five degrees.

F is the nozzle-stand of the type used for
15 single nozzles and with its upper end terminating at a point central of smoke-box, as clearly shown at Fig. 1. The upper end of the nozzle is contracted, as shown, and to a diameter of eight inches and equal to that of
20 the dry-pipe G. The openings H into the nozzle are oval and slightly larger in area than the steam-ports in low-pressure cylinders on compound engines.

At the upper end the nozzle F is formed
25 with an annular flange F', by means of which the nozzle-tip I, having a similar flange J, is secured thereto by suitable bolts, not shown, but in an obvious manner. This nozzle-tip tapers gradually from eight inches in diameter at its base to six inches at its upper or
30 choked end and is twelve inches from base to choke-line, from which point it is flared outwardly in a curved line.

K represents the steam-pipes leading to the
35 cylinders and connected by the ordinary nigger-head or T-joint with the dry-pipe G.

The draft-plate L is fastened to the flue-sheet above the flues and extends diagonally across the steam-pipes and nozzle-tips, and
40 thence in a vertically oblique direction to a point just back of the boiler-brace, fitting as closely as possible around the nozzle-tip and steam-pipes, the lower edge of said draft-plate terminating fifteen inches above the bot-
45 tom of smoke-box, all as clearly shown at Fig. 2.

To the lower edge of the draft-plate is hinged closely a plate M of such depth that when in its lowermost position it will terminate five inches above the bottom of the
50 smoke-box. The lower edge of the plate M is pivotally connected with an operating-rod N, the outer end of which extends within the cab and is provided with an operating-handle O, formed with a series of notches or gates
55 P, adapted to interlock with a suitable check or bar located in the cab and designed to hold the plate M in any given position, it being shown in three different positions at Fig. 2.

Q is a No. 5 wire netting extending in a
60 curved plane from the draft-plate L to the top of the smoke-box, as clearly shown. The damper R, (shown at Figs. 3 and 4,) which is located in the stoking-door of the fire-box, is fourteen inches in diameter and is provided
65 with draft-openings of one-eighth of the circle and provided with revoluble wings for opening or closing the same. The interior

lining or wall S of the damper is formed, as shown at Fig. 4, to constitute a deflector to direct the incoming air in a downward direc- 70
tion toward the fire.

In lieu of the nozzle stand and tip made separately and joined together, as described, the ordinary nozzle-stand may be used; but in such event the tip should be longer and ta- 75
pered, so that the choke or smallest cone shall be about one and a half inches from the top, which should roll outwardly in a curved plane.

The purpose of the damper in the stoking-door of the fire-box is to admit pure air above 80
the fire in sufficient quantity to mix with the carbon rising from the coal in the form of smoke and is designed as auxiliary to the dampers in the ash-pan for admitting air to the fire from below the grates. 85

By reference to Fig. 2 it will be seen that I employ a full extension-front, not as a receptacle for cinders, but as a means for equalizing the vacuum-pressure created in the stack through the medium of the combination and 90
arrangement of the petticoat or convey pipe between the top of the nozzle and the base of the stack, with lateral draft-spaces at the top and bottom and the obliquely-arranged draft or diaphragm plate with its hinged lower sec- 95
tion and means for operating the same.

My invention is based upon the theory that it is desirable to control the exhaust-steam to proportion rather than force it to proportion by the nozzle and that it is desirable to have 100
a nozzle as large if not larger in area than the steam-ports.

I have shown the damper in the stoking-door as means auxiliary to the choked stack and the combination and arrangement of de- 105
vices in the smoke-box; but I do not wish to be confined to the use of such damper, as the other devices may be used effectively without the same. I, however, prefer the use of such damper as a means for promoting a more 110
thorough combustion within the fire-box, thus securing economy in the use of fuel.

In the drawings I have not shown the cab or rear end of the locomotive, because it will be readily understood that the rod for oper- 115
ating the lower hinged section of the draft-plate constitutes no particular part of my invention and that it may be arranged in any manner suitable for the purpose for which it is designed. 120

Having described the construction and operation of my improved draft appliances, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with the exhaust-nozzle 125
and petticoat arranged a predetermined distance apart within the smoke-box, and exhaust-tubes leading from the cylinders to the exhaust-nozzle, the stack provided with a gradually-tapering choke-ring terminating 130
at, and contracting the final exit area of the smoke-stack, substantially as and for the purpose set forth.

2. In combination with the stack having a

choke-ring located within its exit, and with the nozzle-stand, nozzle-tip and petticoat within the smoke-box, the draft-plate L, with hinged section, M, and an operating-rod N, leading
5 to the cab, substantially as and for the purpose set forth.

3. The combination and arrangement of the stack having a choke-ring within its exit, the petticoat, nozzle-tip and nozzle located
10 within the smoke-box, and a diagonally-arranged draft-plate with hinged bottom sec-

tion, provided with means for operating the same, an air-damper arranged in the stoking-door, and provided with a downwardly-inclined deflecting-wall, substantially as and
15 for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH A. ESON.

Witnesses:

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