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EXHAUST-NOZZLE FOR LOCOMOTIVES.

Application filed October 26, 1898. Serial No. 694,618. (No model.)

To all whom it may concern:

Be it known that I, DON SWENEY, a citizen of the United States, residing at Champaign, in the county of Champaign and State of Illinois, have invented certain new and useful Improvements in Exhaust- Nozzles for Locomotives, of which the following is a specification.

This invention relates to nozzles, and particularly to locomotive exhaust-nozzles.

The prime object of the invention is to provide means for utilizing or expediting the entire energy of the exhaust-steam in discharging gases through the smoke-stack of a locomotive.

A further object of the invention is to provide a nozzle of such peculiar and novel construction that the steam and gases are intermingled, the smoke-stack is filled with a mixture of steam and gas having a uniform velocity throughout, and a proper draft is produced with a lower back pressure at a consequent saving of fuel.

These objects and results are attained by passing the exhaust-steam through radial openings of special shape to form fan-like steam-jets, between which the gases are drawn, thereby utilizing the entire energy of the exhaust-steam for discharging the mixture into the stack, and by combining or operating the nozzle in conjunction with a stack which will assist in forming a proper vacuum with the least expenditure of energy.

Other objects and improved results accruing from the special features of my invention will be revealed in the specification and claims to follow.

In the accompanying drawings, forming part of this application, Figure 1 is an interior end view of a locomotive-boiler with my nozzle applied. Fig. 2 is a top view of the nozzle. Fig. 3 is a vertical section of one of the vanes on the line x x. Fig. 4 is a section on the plane indicated by the dotted line Y Y, Fig. 2. Fig. 5 is a modification in elevation. Fig. 6 is a further modification in section, showing a nozzle with a draft-regulating valve.

The same numeral-references denote the same parts throughout the several figures of the drawings.

The smoke-stack 1 has a hood 2, and my improved nozzle 3 is bolted or otherwise secured to the nozzle-stand 4, directly under the stack-hood. The nozzle 3 has a central passage, duct, or port 5, the wall of which is conical slightly or slants downwardly and inwardly from the top to the bottom, where said wall terminates considerably above the bottom of the nozzle. Said port 5 is connected with a pipe 6, projecting from the air-pump exhaust-60 pipe 6. A series of vanes 8 radiate or extend from the wall of the central port 5, with an interval or space 9 between the vanes for the passage of gases. The vanes 8 increase in 100 width from the top to the bottom, where they 65 merge into the exterior cylindrical surface of the nozzle 3 at the lower end of the said spaces 9, thus giving the vanes a wedge-shaped appearance and the spaces a V shape in cross-section. The top surface of the vanes increases in width from the wall of the central port 5 to their outer edge, which gives the said surface a V or wedge-shaped appearance. Each vane 3 has a separate and independent duct or port 10, which increases in width from the 75 top to the bottom and from the wall of the port 5 to the end wall of the vanes, thus diminishing the whole area of the ports 10 toward the top of the nozzle. This construction will gradually accelerate the velocity of the exhaust-steam from that of the exhaust-pipe to that of the discharge and forms the gas passages or spaces 9 into approximately proportional size to the size of the vane-ports 10.

Referring to Fig. 5, the vanes 11 are the same as those just described, except that the top surface 12 of each vane slants away from the central port to the edge of the vanes. This will tend to throw the column more direct and distribute it more completely in the stack.

Referring to Fig. 6, the top surface of the central port-wall 13 is straight, the top face of the vanes 14, near the periphery of the nozzle, is slightly curved at 15, enough to the jets to strike just inside and near the bottom or base of the stack. The portion of the top of the vanes between the curved portion 15 and the central port-wall 13 has a steep incline 16. The central port terminates in an orifice 6, having a regulating-valve 17, controlled by a spring 18, to regulate the draft as desired, the tension of said spring being proportioned in accordance with the exhaust-pressure. This valve may be employed in
the other forms, but when so employed the pipe 5* is dispensed with. This construction gives the velocity, direction, and form of each jet of steam simultaneously and in a comparatively short distance, thus avoiding long contracted passages.

It has been found that when the central port of the nozzle is left constantly closed the draft is not proper for all working conditions of the engine—that is, if the nozzle is constructed to give the proper draft under heavy working conditions it is not proper for light working conditions. Therefore the nozzle must be made to suit the normal working of the engine.

In these nozzles there is no increase in the velocity of the exhaust-steam until it reaches the ports.

The ports are of such form that the width is approximately proportional to the space between them, and as a result the force of the blast increases from the inner to the outer ends of the ports proportional to the quantity of surrounding gases, thus thoroughly mixing the gases with the steam and imparting a uniform velocity to the whole.

I do not wish to be understood as limiting myself to a nozzle with a valve, to any special shape or form of the nozzle-face or vane-surface, to any special size of nozzle, nor to any particular dimensions of the vanes or of the ports, as I desire to reserve the right to make such changes and alterations as will effect the best results in the practical application of the nozzle without departing from the spirit of my invention.

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

1. In an exhaust-nozzle, a series of vertical vanes the walls of which form the body of the nozzle, with a space between the vanes, and a separate and independent port in each vane, as set forth.

2. An exhaust-nozzle for locomotives, comprising a series of vertical vanes, each vane having an independent and separate vertical port, said vanes and ports increasing in width and breadth from the top to the bottom, as set forth.

3. A nozzle having a series of vertical hollow vanes increasing in size from the top to the bottom, a central independent port, and V-shaped spaces between the vanes forming gas-passages, as set forth.

4. An exhaust attachment for locomotives, comprising a nozzle having a central port, a series of wedge-shaped vanes radiating from the central port but separated therefrom, each vane having a wedge-shaped vertical duct or port of less width at the top than at the bottom.

5. A nozzle having vertical vanes which increase in size from the top to the bottom of the nozzle, a vertical port straight through each vane and terminating in a contracted discharge-opening.

6. A nozzle having a central port, a series of vertical vanes gradually increasing in size from the top to the bottom of the nozzle, each vane having a separate vertical port independent of the central port, and terminating at the top in the same plane with the said central port, as set forth.

In witness whereof I hereunto set my hand in the presence of two witnesses.

DON SWENLEY.

Witnesses:

W. H. VAN DERVOORT, 
JOHN N. BEERS.