April 16, 1929. T. F. DWYER, JR 1,709,065

SOOT BLOWER

Filed Sept. 27, 1926

Fig. 1.

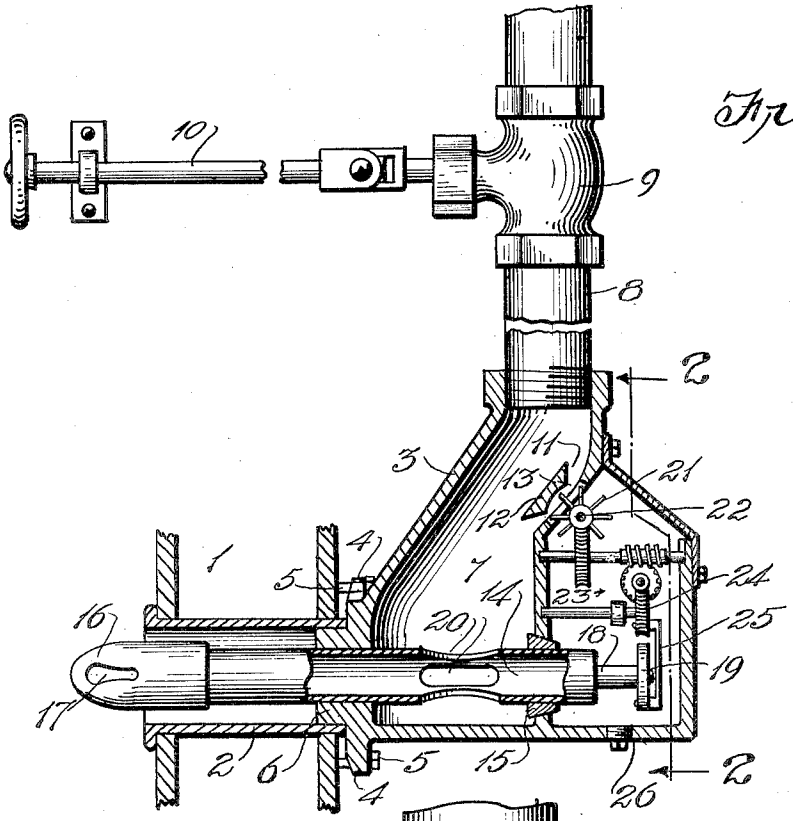
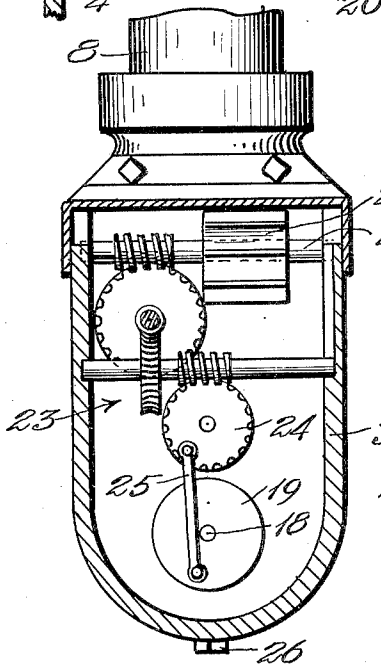


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SOOT BLOWER.

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This invention relates to improvements in soot-blowers for locomotives in which a nozzle apparatus is employed for sweeping a steam jet across the flue-sheet and ends of the fire-tubes to dislodge the soot accumulations. In previous blowers of this type, so far as I am aware, the nozzle-pipe is turned by mechanism actuated by hand to sweep the jet across the flue-sheet. The principal object of the present invention is to provide a power-driven motor to oscillate the nozzle-pipe, steam-pressure from the locomotive boiler being utilized to drive the motor, so that manual operation of the controlling valves is the only work required on part of the attendant during a cleaning operation. The particular apparatus whereby this object is obtained is hereinafter described in detail and illustrated by the accompanying drawing.

In the drawing, in which similar reference characters designate corresponding parts,

Figure 1 is a vertical view of an apparatus embodying the invention, the section being taken in a plane through the axis of the nozzle-pipe. Fig. 2 is a side elevation of the blower with the cover plate removed to show the speed-reducing mechanism.

In actual practice one of the blowers is mounted on each side of the locomotive and as both devices are alike in construction and operation, a description of one will suffice for both.

Referring to the drawings in detail, in the opposite walls of the water-leg 1 is seated the horizontal stay-tube 2, positioned to the rear of the furnace flue-sheet (not shown). Exterior of the water-leg and opposite to the stay-tube is mounted the casing 3 carrying the several operative parts of the device. Projecting from opposite sides of the casing are lugs 4 through which bolts 5 pass into the outer wall of the water-leg to hold the casing in place. Extending from the inner side of the casing is a nipple 6 fitting the stay-tube 2 with the bore of the nipple concentric with the axis of the stay-tube. Extending into the casing is a conduit 7, with which communicates a pipe 8 leading from the steam-dome (not shown) of the boiler. This pipe is controlled by a valve 9 operated by a rod 10 extending to the cab (not shown) of the locomotive. In the conduit 7 is a by-pass 11 formed by the transverse wall or abutment 12 and the opposite wall of the casing. The opening into the upper end of the by-pass is comparatively large and it is gradually contracted toward the intermediate part of the by-pass, as at 13, from which part it is gradually expanded toward the lower end of the by-pass. By this construction a nozzle is formed so that pressure-fluid entering the upper end of the same, after passing the restricted intermediate part 13, is expanded to a lower pressure, thereby acquiring high velocity and kinetic energy.

Extending across the lower part of the conduit 7 is the nozzle pipe 14 journaled in the nipple 6 and in the conical bearing 15 seated in the wall of the casing opposite to the nipple. Pressure-fluid in the conduit tends to seat the conical bearing in the opening in the wall of the casing to close the same against leakage. The nozzle pipe extends through the nipple 6 into the stay-tube 2 and on its end is fixed the nozzle-head 16 with an elongated orifice 17 to project a fan-like stream. The nozzle-head extends into the firebox (not shown) and as it remains permanently therein, it is formed of any of the known alloys that will withstand the heat and chemical action of the products of combustion. The end of the nozzle-pipe extending outside of the conical bearing 15 is closed and has an axial stem 18 on which is fixed the wheel 19, the purpose of which will be explained further on. That part of the nozzle-pipe 14 within the conduit 7 is provided with ports 20 so that pressure-fluid entering the conduit 7 can pass into the pipe and be projected through the orifice 17 of the head 16.

In the casing 3 is mounted a turbine or rotor 21 with a short arc of its vanes extending into the by-pass 11, just below the restricted part 13, so that rotor will be driven by the nozzle effect of the pressure-fluid passing through the by-pass. The rotor is fixed on the shaft 22 and the drive of this shaft is transmitted to the wheel 19 to oscillate the nozzle-pipe 14. As the speed of the rotor would be too great for the required oscillation of the nozzle-pipe, a step-down or speed-reducing mechanism is interposed between the shaft 22 and the wheel 19. This mechanism comprises a series of worms and worm gears designated as a whole by 23, the last element of the series being the worm gear 24, which is rotated at a much reduced speed as compared with the rotation of the rotor. The gear 24 is connected by the double crank-arm

25 with the wheel 19, the radius of the wrist-pin connection with the gear 24 being less than the radius of the wrist-pin connection with the wheel 19 so that a complete rotation of the gear 24 imparts only an oscillatory movement to the wheel 19 with a consequent oscillation of the nozzle-pipe 14. In the base of the casing 3 is outlet 26 to permit the escape of any water formed by the condensation of any steam that may escape into the casing through the opening therein through which the rotor projects into the by-pass.

In the operation of the device, when it is desired to clean the flue-sheet and fire tubes of the locomotive, the engineer opens the valve 9 and steam-pressure flows through the pipe 8, conduit 7 and the ports 20 into the nozzle-pipe 14 and thence through the nozzle-head 16 and the orifice 17 and enters the fire-box in a fan-like stream. Part of the steam-pressure entering the conduit 7 flows through the by-pass 11 and drives the rotor 21. Through the intervening speed-reducing mechanism the nozzle-pipe 14 is oscillated. The position of the nozzle-head 16 on the nozzle-pipe is such that the orifice 17 projects the fan-like jet of steam against the face of the flue-plate and the ends of the fire tubes. The extent of oscillation of the nozzle-pipe and the projecting direction of the nozzle orifice are such that the jet sweeps the flue-sheet from top to bottom and extends somewhat beyond half way across the flue-sheet. By observing the discharge from the stack the engineer can determine when the operation is completed. When the operation is started the discharge from the stack is noticeably black, as it is loaded with soot blown from the flues; when the discharge becomes clear, it is an indication that the operation is completed and the engineer closes the valve 9. After the blower on one side is operated to clean one side of the flue-sheet, then the blower on the other side can be operated to clean the other side. It is an advantage to operate one blower at a time, so that too great a quantity of steam will not be drawn from the boiler as would happen should both blowers be operated simultaneously. It is obvious, however, that suitable steam connections may be provided so that a single control could be used with both blowers so that both could be operated simultaneously. As the areas cleaned by the two blowers overlap, the entire surface of the flue-sheet will be cleaned. In the operation of the blower the best results are obtained on the road as the engine works, as the usual exhaust from the engine through the stack can be utilized to aid the cleaning operation; however, the blower can also be used while the engine is standing, but under this condition the stack blower and superheater damper must be wide open.

From the foregoing it is seen that the only manipulation required of the engineer is the opening and closing of the valve 9, for the oscillation of the spraying nozzle is effected by the motor driven mechanism.

What I claim is:

1. In a soot-blower for locomotives, the combination with a casing having a pressure-fluid conduit provided with a by-pass contained within the casing, said by-pass being open for the passage therethrough of part of the pressure-fluid entering the conduit, a turbine mounted in the casing with its vanes registering with the by-pass, a nozzle-pipe rotatable in the casing and having a port to communicate with the conduit, and speed-reducing mechanism for transmitting the drive of the turbine to the nozzle-pipe to rotate the latter.

2. In a soot-blower for locomotives, the combination with a casing having a pressure-fluid conduit provided with a by-pass contained within the casing and open for the passage therethrough of part of the pressure-fluid entering the conduit, said by-pass being restricted in cross-area at an intermediate part to form a nozzle, a turbine mounted in the casing with its blades registering with the nozzle part of the by-pass, a nozzle-pipe rotatable in the casing and having a port to communicate with the conduit, and speed-reducing mechanism including an oscillative connection with the nozzle-pipe for transmitting the drive of the turbine to the nozzle-pipe to oscillate the latter.

3. In a soot-blower for locomotives, the combination with a casing having a pressure-fluid conduit extending therethrough, an abutment in the casing extending across the conduit adjacent the inlet of the latter, said abutment forming with the opposite wall of the casing a nozzle by-pass for the passage therethrough of part of the pressure-fluid entering the conduit, a nozzle-pipe rotatable in the casing and having a port to communicate with the conduit, a turbine mounted in the casing with its blades registering with the nozzle part of the by-pass, and speed-reducing mechanism including an oscillative connection with the nozzle-pipe for transmitting the drive of the turbine to the nozzle-pipe to oscillate the latter.

In testimony whereof I affix my signature.

THOMAS FRANCIS DWYER, JR.