

I. P. MAGOON.

Exhaust Nozzles for Locomotive Steam-Engines.

No. 149,048.

Patented March 31, 1874.

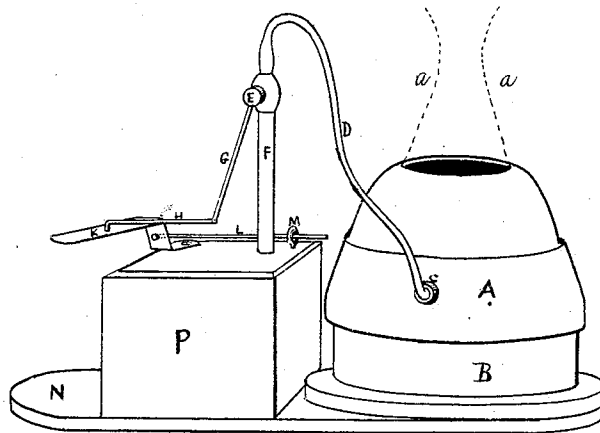


Fig. 1

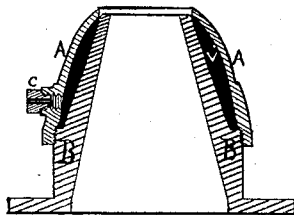


Fig. 2

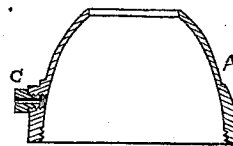


Fig. 3

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# UNITED STATES PATENT OFFICE.

ISRAEL P. MAGOON, OF ST. JOHNSBURY, VERMONT, ASSIGNOR OF ONE-HALF HIS RIGHT TO CHARLES A. SHAW, OF BOSTON, MASS.

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

Specification forming part of Letters Patent No. **149,048**, dated March 31, 1874; application filed February 16, 1874.

*To all whom it may concern:*

Be it known that I, ISRAEL P. MAGOON, of St. Johnsbury, in the county of Caledonia, State of Vermont, have invented a certain new and useful Improvement in Exhaust-Nozzles for Locomotive Steam-Engines, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which my invention appertains to make and use the same, reference being had to the accompanying drawing forming a part of this specification, in which—

Figure 1 is a perspective view, showing my improvement. Fig. 2 is a vertical section of the nozzle and cap of the exhaust-pipe. Fig. 3 is a vertical section of the cap.

Like letters refer to like parts in the different figures of the drawings.

My invention relates to means for preventing the cinders and finer carbonaceous particles in the chimney and smoke-box of a locomotive steam-engine from entering the exhaust-pipe, the object being to avoid the destruction of the valves, valve-seats, and cylinders, and also to prevent the insulator or closed steam-chamber from becoming clogged up or filled with cinders where a feed-water heater is used in the stack, as hereinafter more fully set forth and claimed.

In Fig. 1, B represents the nozzle of the main exhaust-pipe, which, it will be understood, is arranged centrally in the smoke box or arch, and discharges the exhaust steam into the chimney to promote the draft of the engine. A is a conical cap or thimble, interiorly threaded at the base and screwed upon the nozzle B, as shown in Fig. 2, the cap and nozzle being so formed that when the cap is in position, there is a space or chamber, V, extending entirely around the nozzle. The cap is also provided with a circular opening at its top, slightly larger than the opening in the nozzle B, so that when it is in position on the nozzle, the top of the cap is not quite in contact with the top of the nozzle, but there is a narrow circular opening or space between the two at that point. P represents a section of the cab, and N the platform on which the engineer stands, it being understood that the boiler is located between the cab and the

smoke-box, in which the nozzle B is disposed. D is a steam-pipe, connected with the cap A by the plug C, and also with the pipe F, which takes steam directly from the boiler. K is the throttle-valve lever, and L the throttle-valve rod, working in the guide M. A valve, E, is disposed in the steam-pipe F, and connected with the lever K by means of the jointed rods G H.

From the foregoing the nature and operation of my invention will be readily understood by all conversant with such matters.

When the valve E is opened, live steam will pass from the boiler through the pipes F and D into the chamber V, and be discharged through the narrow circular opening between the top of the cap A and nozzle B. The walls of the chamber V being inclined inwardly from the base to the vertex, the steam, when discharged from the chamber, as aforesaid, will form a hollow cone above the nozzle, as represented by the dotted lines *a a*, Fig. 1.

The throttle-valve rod L and valve-rods G H are so combined and arranged with the throttle-valve lever K and their respective valves that the operation of shutting off steam from the cylinders to stop the engine lets it into the chamber V through the pipes F D, the mechanism being also so timed or arranged that steam will always be let into the chamber V in advance of being shut off from the cylinders, and before the exhaust steam ceases to be discharged through the nozzle B.

In Fig. 1 the throttle-valve lever is represented as pulled, steam being shut out of the chamber V, but let into the cylinders to operate the engine. Now, if the lever K be pushed, the valve E will be opened sufficiently in advance of the closing of the throttle-valve to let live steam into the chamber V before the exhaust steam ceases to be discharged through the nozzle B.

The object of this arrangement will be apparent to all practical engineers and locomotive-builders, to whom it is well known that when steam is shut off from the cylinders a vacuum is created therein, and the cinders and fine carbonaceous particles from the stack and smoke-box of the engine are drawn through the exhaust-pipe into the cylinders, by which

the valves and valve-seats are rapidly cut out and destroyed. In locomotive steam-engines in which the feed-water passes through a coiled pipe inclosed in an insulator disposed in the stack, and the water is heated on its way to the boiler by means of the exhaust steam discharged through a branch pipe into such insulator, cinders fall or are drawn into the main exhaust-pipe when steam is shut off, and when it is let on are forced through the branch pipe into the insulator, soon clogging it up, and rendering it inoperative.

These difficulties are entirely obviated by my invention. Live steam under full pressure being let into and discharged from the chamber V before steam is shut off from the cylinders, as described, the nozzle B is practically closed to cinders, the force of the escaping steam from the chamber V being far greater than necessary to overcome the pressure of the atmosphere, which tends to rush through the nozzle and exhaust-pipes into the cylinders to supply the vacuum created in stopping the engine. The rod H is arranged to be readily disconnected from the lever K, so that the valve E may be closed independently of said lever, if desired, when the engine is to remain stationary for any great length of time; or a separate rod and valve may be used to close the pipe F under such circumstances.

It will be seen that the nozzle of the exhaust-pipe is compound, or composed of the two parts A B. The part A extends above the part B, so that the upper end of the part A or cap forms the end of the nozzle, the opening in the top of the cap, when the cap is in place, being the exterior opening of the nozzle—that is to say, the two sections A B have corresponding openings in the top, except as to size, the section A rising above the section B, so that, when steam is let into the chamber V, it passes out of the nozzle through the opening in A, but covers the opening in B.

In all locomotive steam-engines there is a "blow-pipe" for creating a draft when the engine is stationary. This pipe is located centrally in the smoke-box, and discharges live steam up the chimney of the locomotive from the vicinity of the ordinary exhaust-nozzle; but the steam so discharged is not let on or shut off in said pipe by the action of the throttle-valve lever; neither does it prevent cinders from entering the exhaust-pipe, the jet of live steam not covering or filling the nozzle, as in my invention, in which the pipe D takes the place of such blow-pipe. I therefore lay no claim to a blow-pipe when in and of itself considered. I sometimes leave off the cap A, and carry the pipe D through the walls of the nozzle B, so as to discharge the live steam directly from said nozzle, and this can be done, and also one or more pipes may be arranged and used in that manner, without departing from the spirit of my invention; but I prefer to use the cap A, and to discharge the live steam in the form of a cone, as described, as less steam is then required, and the operation is more effective.

I designate steam taken directly from the boiler, and which has not been used in the cylinders, as "live steam," and that which has been used as "exhaust steam."

Having thus described my invention, what I claim is—

1. The cap A, pipe D, and nozzle B, combined to operate substantially as and for the purpose specified.

2. The throttle-valve lever K, rod L, rods G H, pipes F D, and valve E, arranged to operate, in combination with the throttle-valve and exhaust-pipes of a locomotive steam-engine, substantially as and for the purpose specified.

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Witnesses:

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