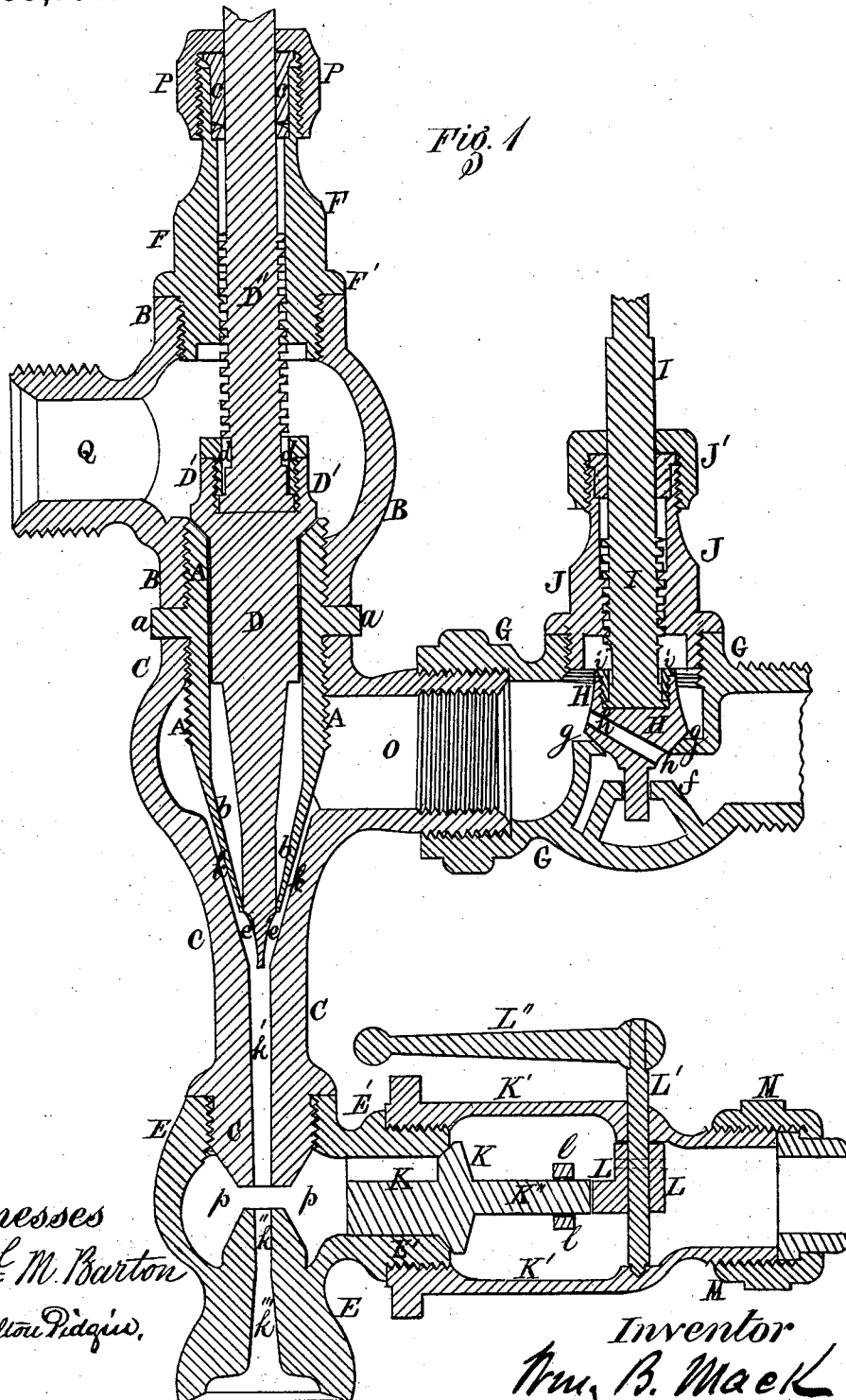


W. B. MACK.

Injectors.

No. 155,163.

Patented Sept. 22, 1874.



Witnesses
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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **155,163**, dated September 22, 1874; application filed May 6, 1874.

To all whom it may concern:

Be it known that I, WILLIAM B. MACK, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Injectors, of which the following is a specification:

The accompanying drawing represents a central longitudinal section of my improved injector.

The present invention relates to that class of steam injectors or ejectors having a solid stem or spindle connected to a suitable steam-valve, or arranged to work independently of the same.

My improvements consist in a combination-cone having a peculiar arrangement of passages, to be hereinafter described; in a water-valve formed with a tapering orifice, and arranged and operated as will be explained in due course, so that, when the valve is closed, sufficient water will be admitted through the orifice to allow the ready and reliable adjustment of the injector to work on ranges of steam-pressure under fifty or sixty pounds; and in a cam or eccentric arranged and operating in connection with an overflow-valve, as will be hereinafter more fully explained, so as to destroy the action of the lifting water when the valve is closed, and force the steam down the feed-pipe into the feed-tank, making the injector a feed-water heater, and preventing the freezing of water in the feed-pipe and tank, all of which I will now proceed to describe, and point out in the claims.

In the drawing, A represents a steam-cone, having an exterior collar, *a*, separating exterior screw-threads, which receive screw ends of a valve-body, B, and combining-cone C of an injector or ejector. The lower or inner end of the combining-cone C is flanged and formed with screw-threads on its exterior periphery, to receive a delivery-cone, E. The steam-cone A, at its inner extremity, is formed with a tapering tunnel-shaped nozzle, *b*, inclined on the exterior and interior, at the angle and distance shown, and formed with an annular opening or mouth, that forms a seat for the lower portion of a valve-spindle, D, formed solid, and at its inner extremity, from the seat or mouth of the nozzle *b* downward, formed with a concavely-curved tapering termination, *c*. The

outer or other end of the spindle D, at its entrance into the valve-body B, is formed or connected with a valve, D', that has a seat on the outer or upper end of the cone A, and is formed with a screw-socket to receive a screw stuffing-ring, *d*, flanged at the top to fit over the top of the valve-socket; or the valve may be otherwise constructed or arranged to hold, so as to allow the release of, a stem, D'', flanged at the bottom, or otherwise formed to receive the screw-ring *d*, or to connect with the steam-valve, and formed on the exterior periphery with screw-threads, that engage with screw-threads formed on the interior periphery of the lower or inner portion of a stand, F, formed on the exterior with screw-threads, that mesh with interior screw-threads of the outer end of the valve-body B, which forms a seat for an exterior shoulder formed on the lower portion of the stand F, whose upper exterior periphery is formed with screw-threads to receive a screw-cap, P, and on the interior is formed with a shoulder to serve as a seat for a suitable stuffing-ring, *e*, or otherwise arranged to prevent leakage at the top of the stand F. The valve-body B is formed on one side with a water connection or inlet, O, formed with screw-threads to receive a screw end of a valve-body, G, formed with an interior bearing, *f*, and a seat, *g*, for a water-valve, H, formed with a screw-socket in its top to receive a screw-ring, *i*, or other suitable packing, and the bottom end of a stem, I, flanged or otherwise formed to receive and be held or be readily released by the screw-ring *i*, or otherwise connected with, so as to be held to or released from, the valve H. The exterior periphery of the lower portion of the stem I is formed with screw-threads, that mesh with screw-threads formed on the interior of a stand, J, formed with a screw end that receives a screw-cap, J', and provided with a screw-ring or other suitable packing. The combining-cone C and delivery-cone E are formed with central annular tapering passages *k k' k'' k'''* of the diameters, angles, and distances shown, and the valve H is formed with a diagonal or inclined tapering orifice or passage, *h*, tapered in proportion to the taper of the passages *k k'* of the combining-cone C. The distances and angles of the several tapering passages *k, k'*,

k' , k'' , and h should be in the proportion shown, as they are very essential to the perfect operation of the injector, it having been found, in practice, that, with these tapers, the injector is capable of working from a very low to a very high pressure of steam, and vice versa, without any adjustment of its cones, which adjustment of the cones has heretofore been necessary, and found to be unreliable and objectionable. The spindle or stem I is provided with an outer crank or universal joint or other suitable operating device. The delivery-cone E is formed with a vacuum-chamber, p , and on one side is formed with an overflow-connection, E' , formed with exterior screw-threads to receive a screw end of a valve-body, K' , beveled on the interior of its outer end, or otherwise formed, to serve as a seat for an overflow-valve, K , having a stem, K'' , supported so as to have a back-and-forth movement in a central annular ring, l , projecting from the interior periphery of the valve-body K' . Located on a transverse shaft, L' , supported in and extending through one side of the valve-body K' at the rear of the valve-stem K'' , is an eccentric or cam, L , that is brought to bear or released from the stem K'' by the operation of the shaft L' , which, on the outside, is provided with a crank or lever-handle, L'' , or other suitable operating device. The valve-body K' is curved or otherwise contracted at its outer end, and formed to receive a suitable coupling, M , to connect a wastewater pipe, to prevent the spreading or spattering of the water to the detriment of the engine or machinery. Opening into the valve-body B above and on the opposite side of the water-inlet O is a steam-inlet, Q, connecting with the boiler.

I form the injector with the stand F, which, being arranged as hereinabove described, is readily unscrewed from the valve-body B, and allows the spindle D' and valve D to be readily removed to give access to the interior of the injector for the purpose of cleaning or removing any obstructions therefrom, as will be evident, on reference to the drawing, without further explanation.

To operate an injector as ordinarily constructed, to work at ranges under fifty pounds steam-pressure, would require a valve without the tapering orifice to be handled with the greatest care and precision of adjustment to obtain anything like a satisfactory result, and would not be at all times reliable.

By my improved arrangement the orifice h allows a sufficiency of water to pass through the valve H, when the latter is closed and the spindle closed in the position shown, to give a uniform action to allow the injector to work from fifteen or less to fifty or sixty pounds of steam-pressure, and, when the valves are opened to admit more water and steam, to produce the best results or the highest pressures of steam without any adjustment of the cones.

Thus, by my improvement, the valve H, when open, will allow the injector to work from about sixty to two hundred and fifty pounds pressure, and, as above described, is readily adjusted to allow the injector to work at as low a range as fifteen pounds, or less, of steam-pressure without losing any water at the overflow.

When a locomotive or other engine is exposed in a low temperature the water of the feed-pipe is apt to freeze and render the injector inoperative. Ordinarily, to obviate this trouble, an auxiliary pipe is attached to the feed-pipe to blow steam from the boiler into it and the tender. This method is objectionable on account of the time, labor, and inconvenience caused, and is remedied by my improvement as follows: The eccentric L is turned by the shaft L' , whose lever or crank L'' is conveniently arranged to be operated readily by the operator, so as to bear against the end of the valve-stem and press in and hold the valve K on its seat, thereby preventing the action of the lifting water, and causing the steam to pass backward and naturally seek the first outlet, which is the feed-water outlet leading to the tender or tank, thus forming a water-heater and preventing the freezing of the water in the feed-pipe without the use of any auxiliary pipe, as heretofore.

By turning the crank or lever L'' in the opposite direction the eccentric or cam L is relieved from the valve-stem K'' , and the valve K is permitted to work as usual.

Having thus fully described my improvements, what I claim as my invention, and desire to have secured to me by Letters Patent, is—

1. A valve, H, formed with a tapering inclined orifice, h , and arranged and operating as described, in combination with the water-inlet of an injector or ejector, substantially as and for the purpose specified.

2. The eccentric or cam L, having the shaft or stem L' and crank or handle L'' , in combination with the sliding valve K, having stem K'' , the latter bearing against the cam L, substantially as described, for the purpose specified.

3. The combining-cone C and delivery-cone E, having the annular tapering passages k k' k'' k''' , the same having the proportions and arrangement shown and described, in combination with the valve H, having the diagonal or inclined tapering orifice or passage h , tapered in proportion to the taper of the passages k k' of the combining-cone, substantially as described, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM B. MACK.

Witnesses:

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