No. 643,638. Patented Feb. 20, 1900.

T. M. EYNON.

DOUBLE TUBE INJECTOR.

(Application filed July 19, 1899.)

(Model.)

Fig. 1.

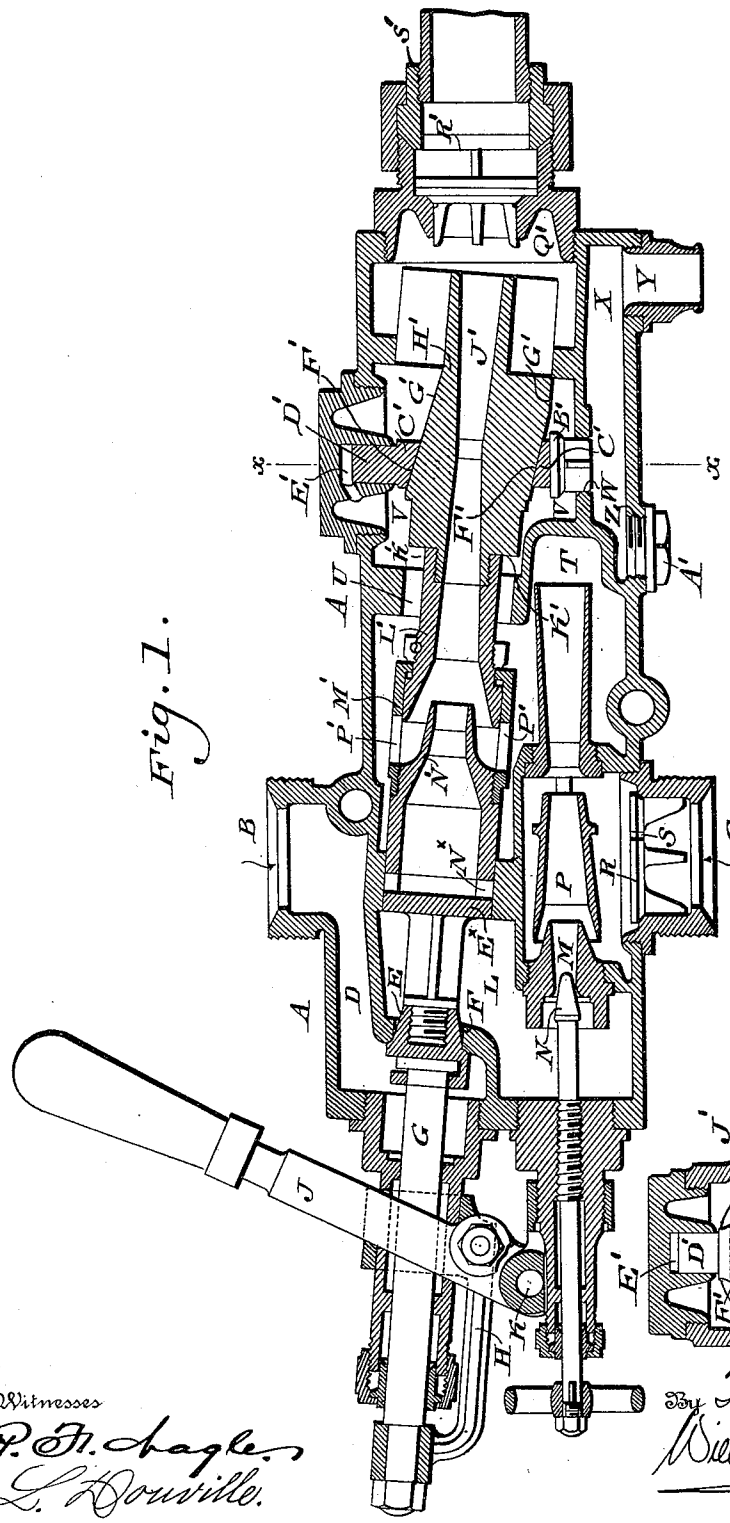
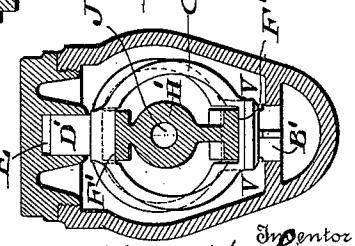


Fig. 2.



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UNITED STATES PATENT OFFICE.

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DOUBLE-TUBE INJECTOR.

SPECIFICATION forming part of Letters Patent No. 643,638, dated February 20, 1900.

Application filed July 19, 1899. Serial No. 724,434. (Model.)

To all whom it may concern:

Be it known that I, THOMAS M. EYNON, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Double-Tube Injectors, which improvement is fully set forth in the following specification and accompanying drawings.

There has heretofore existed great difficulty in designing double-tube injectors for locomotive practice owing to the fact that the dimensions given or required by the different railroads in order to work in their standard pipe connections on their locomotives are very rigid and will not be varied under any conditions; and the object of the present invention is to construct a double-tube injector in which the above requirements are all met and which can be readily adapted to standard engines now in use.

To the above ends my improved injector consists, primarily, of a set of stationary suction and movable forcing tubes, said forcing-tubes consisting of a steam-nozzle and a forcing combining-tube attached to said steam-nozzle, said combining-tube having a cut-off barrel and suitable construction on its outside, whereby the overflow-valve is automatically operated during the reciprocation of said forcing-tube, while the cut-off barrel at the proper time simultaneously cuts off the passage of the water from the suction-nozzle to the overflow, thus directing the water to the main outlet.

It also consists in the employment of a check-valve, constructed as hereinafter described, which prevents the steam from normally going back to the water-supply tank should the injector for any reason cease to work, said valve being provided with a port sufficiently large, so that in winter-time by pulling back the injector-handle to its full stroke sufficient steam will pass through said valve to prevent the freezing of the suction-pipe and also freezing of the water in the supply-tank.

It also consists of an inclined longitudinally-movable forcing steam-nozzle and an overflow-valve operative in unison with said nozzle.

It further consists in making the overflow and suction pipe connections removable and in providing the injector-casing with a plug and overflow-nozzle which are interchangeable.

It further consists of novel details of construction, all as will be hereinafter fully set forth, and particularly pointed out in the claims.

Figure 1 represents a longitudinal section of an injector embodying my invention. Fig. 2 represents a transverse section on line *x x*, Fig. 1.

Similar letters of reference indicate corresponding parts in the figures.

Referring to the drawings, A designates the casing of the injector, the same being provided with the steam-inlet B and water-inlet C.

D designates a passage leading to the valve E, which is adapted to rest on the valve-seat F, said valve being actuated by means of the rod G, which has the yoke H attached thereto at one end, the other end of said yoke being secured to the lever or handle J, which is fulcrumed at K to any suitable fixed point.

L designates a passage leading from the valve-seat F to the suction steam-nozzle M, which is controlled by the valve N, which is operated from the exterior by any suitable means and primarily controls the flow of steam to the nozzles M and P.

R designates a check-valve, which is mounted upon a suitable seat above the water-inlet C and is provided with a port S, which is made sufficiently large, so that in winter-time by pulling the handle J back to its full stroke sufficient steam will pass through said valve to prevent the freezing of the suction-pipes and water-supply tank. (Not shown.)

T designates a passage communicating with the nozzle P, said passage leading to the opening U and thence by the passage V to the passage W, which leads to the overflow-passage X, having the nozzle Y and the opening Z, which is closed by the plug A′, said nozzle and plug being interchangeable. The passage W is controlled by the valve B′, which has attached to its upper portion the yoke or frame C′, which has the stem or portion D′, which is guided in the recess E′. The yoke

C′ is also provided with inclined upper and lower ways F′, with which contact the substantially parallel inclined walls G′ of the body H′, said body, with the part L′, forming the forcing combining-tube having the passage J′ therethrough, said body H′ having a shoulder K′, which serves to throttle the passage U and at the proper time cut off the flow of water from the nozzle P to the overflow Y.

The forcing combining-tube, composed of the rigidly-attached parts H′ and L′, is secured to the forcing steam-nozzle N′ by means of sleeve M′, so that the two will move in unison, it being noted that the passage J′ communicates with the chamber T by means of the openings P′ between the forcing steam-nozzle and the forcing combining-tube. The opening through the nozzle N′ communicates with the steam chamber or passage L by means of the openings $N^{\times}$, which are open to steam after the valves E and $E^{\times}$ are unseated to the proper extent.

Q′ designates the outlet-passage from the injector, the same being controlled by means of the check-valve R′, which is movable between the coupling devices S′, as is evident, it being apparent that the lower or right-hand extremity of the passage through the cut-off barrel is normally substantially in alinement with the center of the outlet-passage controlled by the check-valve R′.

The operation is as follows: If we assume the parts to appear normally as seen in Fig. 1, it will be seen that a pull on the handle J will unseat the valve E, and steam will fill the passage L and pass thence through the suction steam-nozzle M and the nozzle P to the passage T, thence through the opening U and passage V, through the passage W to the overflow-chamber X and the overflow pipe or nozzle Y. Water will be drawn in through the suction-opening C and will flow through the nozzle P, passage T, opening U, passages V, W, and X to the overflow Y. If the handle J is now pulled farther to the left, the cut-off barrel K′ will move toward the opening U, and thus gradually throttle the same, thereby compelling the water to pass through the passages T, P′, and J′ to the outlet-chamber Q′. The handle J being moved farther to the left, the valve $E^{\times}$ will be unseated, and steam will flow through the port or openings $N^{\times}$ to the forcing steam-nozzle N′ and the forcing combining-tube passage J′ at substantially full pressure, and by this time the passage U being closed by the cut-off barrel K′ the water forced into the chamber T will flow through the openings P′ to the forcing combining-tube passage J′ to the chamber Q′ and thence through the valve R′ to the desired point.

By constructing the injector-casing as shown the overflow-nozzle Y and the plug A′ are interchangeable, it being understood that the threaded portions of said nozzle and plug are of the same diameter and similarly threaded. Also the short suction-pipe connection C, Fig. 1, can be replaced by a longer connection, thus making it possible with one body to adapt the injector to the two standard pipe dimensions now in general use.

It will be apparent that changes may be made by those skilled in the art which will come within the scope of my invention, and I do not therefore desire to be limited in every instance to the exact construction I have herein shown and described.

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

1. In a double-tube injector, a movable forcing steam-nozzle, a forcing combining-tube attached thereto and an overflow-valve in combination with means for operating said valve simultaneously with the reciprocation of said forcing steam-nozzle and forcing combining-tube.

2. In an injector, a movable forcing steam-nozzle, and a forcing combining-tube having a cut-off barrel constructed on its outside, said forcing steam-nozzle and combining-tube being inclined at an angle to the axis of the injector-casing, in combination with an overflow-valve and connections common thereto and to said barrel.

3. In an injector, the combination of a forcing steam-nozzle, a forcing combining-tube movable in unison therewith, a cut-off barrel constructed on the outside of said combining-tube, an overflow-valve and means for enabling said barrel to cut off the passage of the water from the suction-nozzles to the overflow at the proper period.

4. In an injector, a cut-off barrel constructed on the outside of the forcing combining-tube, means for reciprocating the latter, an overflow-valve and connections common to said barrel and valve whereby the latter is actuated in unison with said barrel.

5. In an injector, a forcing combining-tube, inclined at an angle to the injector-casing, inclined upper and lower faces on said combining-tube, a yoke surrounding said tube, and having inclined ways engaging said faces of the combining-tube and an overflow-valve engaging said yoke and operating simultaneously therewith.

6. In an injector, a suction-opening, a threaded coupling therein, and a check-valve seated in said coupling and having a port therein.

7. In an injector, an overflow-chamber, a plurality of openings therein, a plug and an overflow-nozzle engaging said openings respectively, said plug and nozzle being interchangeable with respect to each other.

8. In an injector, an overflow-valve, an inclined combining-tube having a cut-off barrel constructed on its outside, and means substantially as described for operating said barrel and valve in unison.

9. In an injector, a movable forcing combining-tube having a cut-off barrel and inclined upper and lower walls constructed on its outside, a yoke having inclined ways en-

gaged by said walls and an overflow-valve actuated in unison with said yoke.

10. In an injector, a casing, a forcing combining-tube provided with a cut-off barrel constructed on its outside, a forcing steam-nozzle and a steam-valve all inclined at an angle to the axis of said casing, in combination with an overflow-valve and means for operating the latter and said barrel in unison.

11. In an injector, a casing, an inclined forcing combining-tube, having a cut-off barrel and upper and lower inclined faces, a yoke engaging said tube, guiding devices for said yoke and an overflow-valve operated by said yoke.

12. In an injector, a casing, a cut-off barrel, a passage in said casing adapted to be throttled by said barrel, an overflow-valve and means for operating said valve and barrel simultaneously.

13. The combination of an injector-casing, and a check-valve located in the suction thereof, said valve having a port therethrough.

14. The combination of an injector-casing, a check-valve located in the suction thereof, said valve having a port therethrough, and means for permitting steam to flow through said port, whereby freezing in the suction-pipe and supply-tank is prevented.

15. In an injector, a casing, a longitudinally-movable forcing steam-nozzle, a forcing combining-tube attached thereto, said nozzle and tube being inclined relatively to the axis of said casing, an overflow-valve, and means located within said casing for operating said valve in unison with said tube.

16. In an injector, a casing, a longitudinally-movable forcing combining-tube inclined at an angle to the axis of said casing, an overflow-valve, connections common to said valve and tube, and means for actuating the latter.

17. In an injector, a casing, a longitudinally-movable forcing combining-tube, inclined at an angle to the axis of said casing, a passage through which said tube extends, a shoulder on said tube adapted to throttle said passage, and means for actuating said tube.

18. In an injector, a casing, a forcing steam-nozzle, a forcing combining-tube attached thereto, a yoke engaging said tube, an overflow-valve operated by said yoke, means for guiding the upper portion of said yoke, and means for operating said nozzle, tube, yoke and valve.

19. In an injector, a main steam-inlet valve E, a steam-valve $E^{\times}$, a forcing steam-nozzle $N^{\times}$, a forcing combining-tube, the above parts being connected together and movable in unison, suction steam-nozzles, an overflow-valve, and means for enabling said valve to move in unison with said forcing combining-tube.

20. In an injector, a casing, a longitudinally-movable forcing combining-tube, an overflow-valve, connections common to said valve and tube and located within said casing, and means for actuating said tube.

21. In an injector, an overflow-chamber, a plurality of threaded openings of the same diameter therein, a plug and an overflow-nozzle having threaded portions of the same diameter engaging said openings, said plug and nozzle being interchangeable according to requirements.

22. In a double-tube injector, a casing, a movable forcing steam-nozzle, a forcing combining-tube attached thereto and an overflow-valve in combination with means located interiorly of said casing for operating said valve simultaneously with the reciprocation of said forcing steam-nozzle and forcing combining-tube.

23. In a double-tube injector, a casing, a suction-opening therein, a check-valve seated in said opening and having a port therethrough, a movable forcing combining-tube having a cut-off barrel thereon, a handle, and means whereby when said handle is moved to its extreme position, sufficient steam will pass through said port to prevent freezing in the suction-pipe or supply-tank.

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