

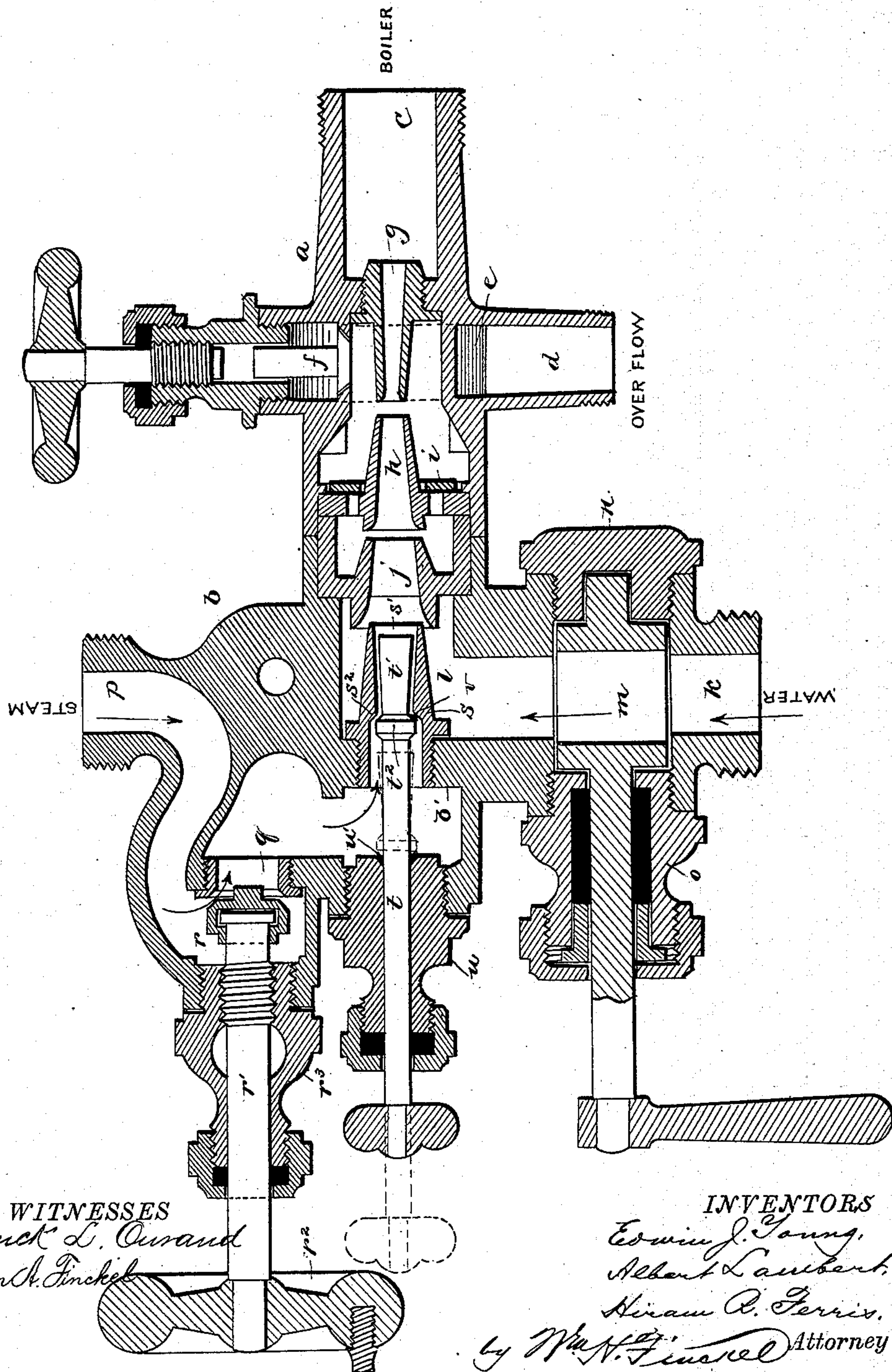
(Model.)

E. J. YOUNG, A. LAMBERT & H. R. FERRIS.

INJECTOR.

No. 384,666.

Patented June 19, 1888.





# UNITED STATES PATENT OFFICE.

EDWIN J. YOUNG AND ALBERT LAMBERT, OF WADSWORTH, AND HIRAM R. FERRIS, OF CLEVELAND, ASSIGNORS TO THE GARFIELD INJECTOR COMPANY, OF WADSWORTH, OHIO.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 384,666, dated June 19, 1888.

Application filed October 26, 1887. Serial No. 253,450. (Model.)

*To all whom it may concern:*

Be it known that we, EDWIN J. YOUNG and ALBERT LAMBERT, citizens of the United States, residing at Wadsworth, in the county of Medina and State of Ohio, and HIRAM R. FERRIS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Injectors, of which the following is a full, clear, and exact description.

This invention relates to the construction of an injector whereby it may subserve all the functions of an injector, and also operate as a water-heater.

To this end the invention consists in providing such an arrangement of valvular devices, of the construction hereinafter fully set forth, that the steam and water supply may be regulated and adjusted in all kinds of weather, as we will now proceed to particularly set forth and claim.

In the accompanying drawing, illustrating our invention, the preferred form of injector is shown in longitudinal section, with the steam-regulating plug in elevation, and its two positions shown respectively in full and dotted lines.

The injector may comprise any desired arrangement of tubes—such, for example, as that shown in Kremer's patent, No. 335,227, or the others therein referred to, though we do not limit the invention to any special type of injector.

In the example shown herein the shell or casing is made of two sections, *a* and *b*, the former containing the boiler-connection *c*, the overflow *d*, having an annular passage, *e*, provided with the valve *f*, the delivery-tube *g*, the combining-tube *h*, and the check-valve *i*, the suction or lifting tube *j* being interposed between the sections *a* and *b*. The section *b* is made or provided with the water-inlet *k*, leading into the suction-chamber *l*, as usual, and this water-inlet is provided with a straight-way rotary plug or cock, *m*. The cock *m* is fitted steam and water tight in the water-inlet in any usual or approved fashion, the drawing clearly illustrating, without detailed de-

scription, such an arrangement, *n* being a seat or step for the foot of the plug, and *o* being a glandular and packed bonnet for its stem, both being tapped into the water-inlet for purposes of ready removal and insertion of the cock. By the employment of this cock the water-supply may be readily regulated or adjusted. The section *b* is also provided with the steam-inlet *p*, in which is arranged a valve-seat, *q*, crossing the steam-passage, substantially as in a globe-valve, a steam-valve, *r*, co-operating with this valve-seat to admit steam to and cut it off from the injector. The valve *r* has a screw-stem, *r'*, provided with a grip, *r''*, and arranged in a steam-tight bonnet, *r'''*, tapped in the section *b*.

The steam-jet or forcing-tube *s* is arranged in a septum, *b'*, in the section *b*, which septum divides the steam-chamber from the suction-chamber, as usual. This forcing-tube is made with a forwardly-flaring passage, *s'*, and with a contracted throat, *s''*. A plug, *t*, is arranged to freely slide in a steam-tight bonnet, *u*, tapped in the section *b* in longitudinal central coincidence with the steam-jet *s*, and said plug terminates within the steam-jet in a head, *t'*, of similar shape to, but of considerably less diameter than, the passage of the said steam-jet, and back of the head is a collar or shoulder, *t''*, correspondingly fitting the throat *s''*. In the bottom of the bonnet *u* is arranged a valve-seat, *u'*, which receives the collar *t''* as a valve to close the bonnet against the escape of steam along the plug when said plug is pulled out into the dotted-line position. As appears from the drawing, and as will be understood, the plug is of such size and shape as to be bodily movable into and out of the forcing-tube *s*. The sides of its head *t'* therefore are not exactly parallel with the sides of the passage *s'* of said tube, but only approximately, or nearly so. A stop, *v*, of metal, leather, or other substance, is arranged upon the collar *t''* to prevent it from seating in and thus closing the throat *s''*.

The section *b*, by preference, contains the steam-valve, water-cock, and plug as parts thereof, instead of as separate appliances, and to this extent greatly simplifies the construc-



tion and cheapens the cost of production without in the least detracting from efficiency; on the contrary, there being by this construction fewer joints, the injector becomes much tighter and more durable than were these parts simply appliances thereto.

The operation and advantage of this construction of injector will be appreciated best, probably, by examining it in connection with its use on a locomotive. In locomotive-injectors difficulty occurs in lifting or exhausting at the overflow the hot water that accumulates in the suction or supply pipe from leaking valves and from using the injector as a heater in a single-jet machine. On the occurrence of such difficulties, if the plug *t* be put into the full-line position shown in the drawings and steam turned on, the steam will pass through the tube *s* in the form of a tube or tubular column, and in this form make such distinctive impact upon and through the suction or lifting tube *j* that the water will be discharged at the overflow. The relative arrangement of the steam-jet plug terminating therein and the lifting-tube as we have shown it, we believe to be the most, if not the only, practicable way of delivering the steam in an unbroken tubular column. As soon as the flow is established at the overflow the plug is pulled out of the steam-jet into its inoperative dotted-line position, and the work of the injector as such proceeded with uninterrupted. Obviously the pressure of the incoming steam acting against the collar *t*<sup>2</sup> will keep the plug in position, and so, also, when the plug is withdrawn into the dotted-line position for using the injector as such the steam acting upon the other side of the collar will seat and hold the collar against the seat *u*' in the bonnet. Thus seating the plug in the bonnet prevents the backflow or leakage of steam, so annoying to engineers in constructions heretofore common.

What we claim is—

1. In an injector having a steam-inlet, water-supply connections, a suction or lifting tube, *j*, and a steam-jet or forcing-tube, a solid steam-spreading plug provided with a collar and stop and held in place in said jet or tube by the pressure of the steam to throw the steam in a flaring hollow or tubular form into the suction or lifting tube, substantially as described.

2. In an injector having a steam-inlet, water-connections, and suction or lifting tube *j*, a forcing-tube having a forwardly-flaring passage opening into the suction or lifting tube,

combined with a plug fitted to work in said forcing-tube and make in it an annular passage-way, so as to give a distinctive impact to the outgoing tubular column of steam against the suction or lifting tube and thereby clear the pipes of accumulated water, and provided with a collar and stop against which the steam acts to hold said plug in place, substantially as described.

3. In an injector having a steam-inlet, water-supply connections, a suction or lifting tube, *j*, and a steam-jet or forcing-tube arranged substantially as shown, a plug arranged in the steam-jet and provided with a collar against which the steam acts to hold the said plug in positions of use and disuse, substantially as described.

4. The combination, with the plug *t*, having the collar *t*<sup>2</sup>, of a bonnet provided with a seat to receive the plug's collar, the said plug being held to its seat by steam-pressure and at the same time excluding the waste and leakage of steam through the bonnet, substantially as described.

5. The section *b*, provided with a steam-valve seat and also a water-valve seat, combined with and receiving in itself the steam-valve, water-valve, or cock, the forcing-tube, and the plug *t*, substantially as set forth.

6. In an injector, a lifting-tube, *j*, and a forcing-tube aligned with said lifting-tube, and a plug of less diameter than and of substantially or approximately the same contour as the steam passage in the forcing-tube and stopping short of the outlet of said forcing-tube, whereby is insured the delivery of the steam to the lifting-tube in a tubular column, substantially as described.

7. In an injector, a combining-tube, a separate lifting-tube, *j*, and a forcing-tube, all arranged in alignment, in combination with a plug arranged in the forcing-tube and of less diameter and substantially or approximately the same contour as the passage in said forcing-tube and stopping short of the outlet of said forcing-tube, substantially as and for the purpose set forth.

In testimony whereof we have hereunto set our hands this 13th day of October, A. D. 1887.

EDWIN J. YOUNG.

ALBERT LAMBERT.

HIRAM R. FERRIS.

Witnesses:

MILTON E. OPLINGER,

JOHN A. CLARK.