

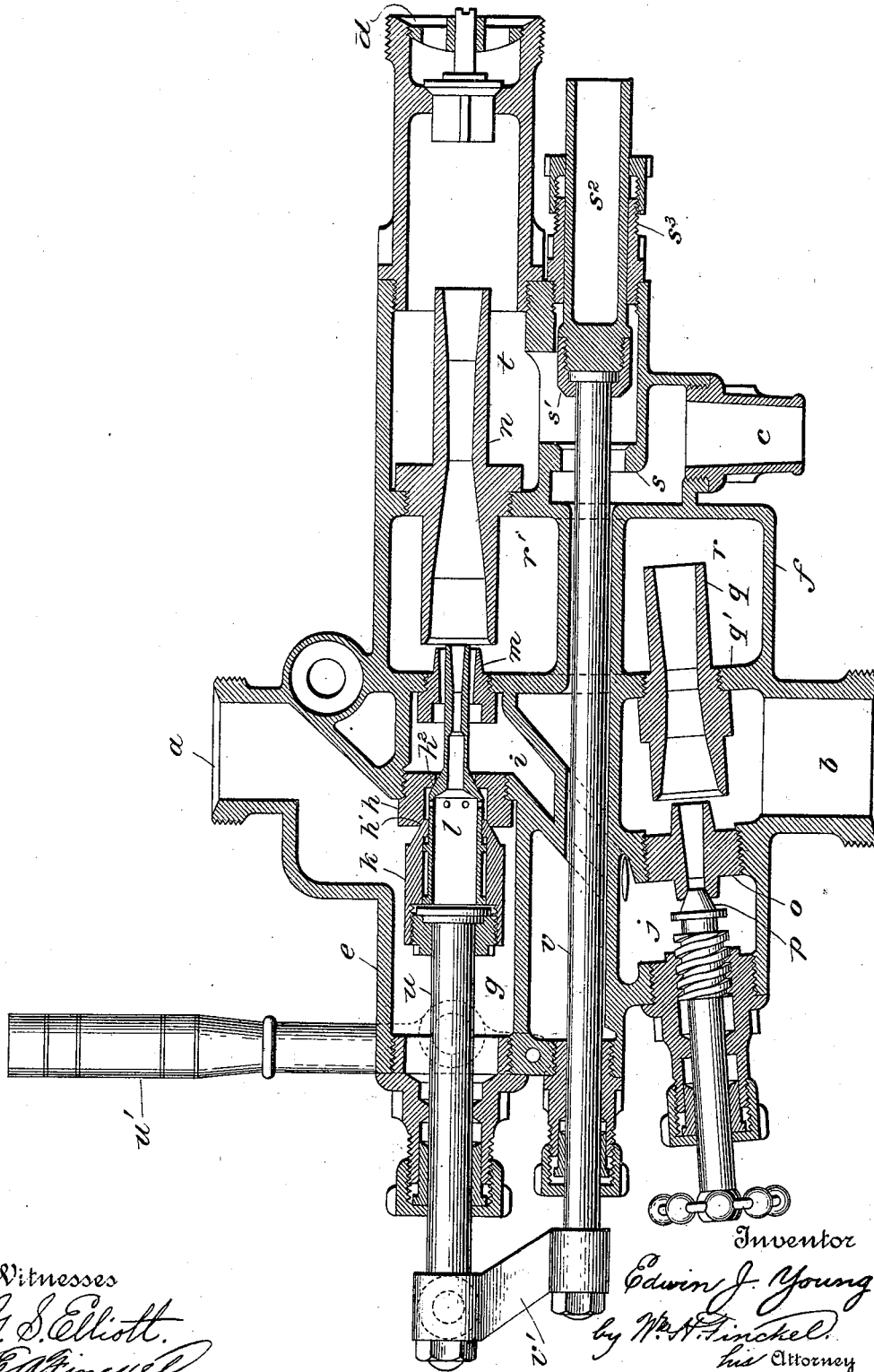
No. 649,265.

Patented May 8, 1900.

E. J. YOUNG.  
DOUBLE TUBE INJECTOR.

(Application filed Oct. 25, 1899.)

(Model.)



Witnesses  
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# UNITED STATES PATENT OFFICE.

EDWIN J. YOUNG, OF WADSWORTH, OHIO, ASSIGNOR TO THE OHIO  
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## DOUBLE-TUBE INJECTOR.

SPECIFICATION forming part of Letters Patent No. 649,265, dated May 8, 1900.

Application filed October 25, 1899. Serial No. 734,736. (Model.)

*To all whom it may concern:*

Be it known that I, EDWIN J. YOUNG, a citizen of the United States, residing at Wadsworth, in the county of Medina and State of Ohio, have invented a certain new and useful Improvement in Double-Tube Injectors, of which the following is a full, clear, and exact description.

This invention relates to that class of injectors in which a double tube is employed and which are especially designed for use on locomotives.

The invention consists of a double-tube injector in which there is no communication between the water-chamber and the delivery-chamber excepting through an interposed forcing-tube, as I will proceed now more particularly to set forth and finally claim.

In the accompanying drawing I have shown a longitudinal vertical section of my improved injector.

The steam-inlet is represented at *a*, the water-inlet at *b*, the overflow at *c*, and the boiler connection at *d*. The steam-inlet opens into the upper tube *e*, and the said upper tube is provided with the overflow and the boiler connection. The water-inlet opens into the lower tube *f*. The steam-chamber *g* of the upper tube has a valve-seat *h*, beyond which is a passage *i*, which affords communication between the steam-chamber *g* of the upper tube and the steam-chamber *j* of the lower tube. The valve-seat *h* has the seat *h'* for the valve *k* and the seat *h''* for the teaser *l*, which is arranged within the valve *k* and has a certain amount of loose play therein, as in my Patent No. 495,286, dated April 11, 1893.

*m* is the steam-jet, and *n* the forcing-tube. *o* is a steam-jet which is interposed between the chamber *j* and the water-inlet and controlled by a valve *p*.

*q* is the lifting-tube, which is arranged in a wall *q'* in the tube *f* and affords communication between the water-inlet and the water-chamber, part of which, *r*, is in the tube *f* and the other part, *r'*, in the tube *e*.

The overflow is provided with a diaphragm *s*, in which is a valve-seat to receive a valve *s'*, and an opening is made above the diaphragm into the delivery-chamber *t* of the tube *e*. A guide-piece *s''*, arranged in a suit-

able stuffing-box or bearing *s'''*, is applied to the valve *s'*.

The valve *k* and its teaser are operated by a rod *u*, which is supplied with a hand-lever *u'*, and the valve *s'* is simultaneously operated by a rod *v*, which is connected by a yoke *v'* with the rod *u*.

So far as I know all previous double-tube injectors have a valve between the chambers *r r'* and *t*—that is to say, between the water-chamber and the delivery-chamber—and this valve is opened for the exhaust or escape of steam while the injector is lifting the water, because the forcing-tube is not large enough to let all the steam escape from the water-chamber or lifting-chamber to the delivery-chamber and thence out at the overflow. When the water is lifted in these injectors, the steam from the lifting steam-jet *o* is condensed, and then the valve between the chambers *r'* and *t* is closed and the forcing steam-jet *m* is put on and the water is forced to the boiler. When my injector is working, the lifting-jet delivers the water to the forcing-jet or to the chamber *r r'*, where the forcing-jet receives it the same as in other double-jet injectors; but, and herein my invention differs from others, I avoid the use of the relief-valve which is usually placed between the chambers *r r'* and *t* and in some cases works automatically and in others is worked by hand. The objection to this relief-valve is that it is impossible to keep it from leaking hot water back from the delivery-chamber to the water-chamber to be worked over again—an operation which interferes with the injector working hot water. In my injector the water is lifted in starting the injector by means of the teaser *l*. It will be observed that in the operation of my injector the valve *k* uncovers its port *h'* before the teaser uncovers its port and that the steam which passes the valve *k* cannot pass outside of the teaser *l* and so into the passage *i*, but passes inside of the teaser *l*, through the holes therein, and thence escapes through the nozzle of the teaser and into the forcing-tube *n*. The steam thus admitted exhausts through the said forcing-tube and out at the overflow until the water is raised, and this water so raised is drawn through the lifting-tube *q*

into the chamber  $r r'$  and then forced through the forcing-tube  $n$  solely by the steam of the teaser until water appears at the overflow, and when the water appears at the overflow the valve  $k$  is drawn back until the teaser is unseated, and then steam escapes through the passage  $i$  to the chamber  $j$  and operates at both the lifting-jet  $o$  and the forcing-jet  $m$ , it being assumed that the valve  $p$  has been unseated or opened. Now the lifting-jet  $o$  begins to lift the water and deliver it to the chamber  $r r'$ , where the forcing-jet receives it and forces it through the forcing-tube into the boiler.

The valve  $s'$ , as already noted, is connected and moves with the main steam-valve and is closed by the same movement that opens said main steam-valve and puts on the forcer. The valve  $p$  is used to throttle the steam to the lifting-jet and serves thereby to grade or reduce the quantity of water delivered.

In prior constructions of double-tube injectors the injector is started by first admitting steam to the lifting-jet  $o$ , which lifts through the lifting-tube  $q$  and exhausts through the valve between the water-chamber and delivery-chamber until water is raised, at which time this steam is condensed and said valve closed, because the water and condensed steam can be put through the forcing-tube  $n$ , but the live steam from the lifting-jet cannot be put through the forcing-tube. In my machine I do away with this large volume of live steam by using the teaser to raise the water, which condenses the steam from the lifting-jet when said jet is put on.

What I claim is—

1. A double-tube injector, having a lifting-jet, a forcing-jet, a steam-valve, and a teaser

which lifts through the forcing-tube before steam is admitted to the lifting-jet, substantially as described.

2. An injector, having a forcing-jet, a lifting-jet, a water or lifting chamber, a delivery-chamber, a forcing-tube forming the sole means of communication between the said chambers, a steam-inlet and a double steam-valve, one member of which admits steam solely to the forcing-tube and the other by a further movement thereof admits steam to the forcing-jet and the lifting-jet, substantially as described.

3. In a double-tube injector, a steam-chamber, a valve therein composed of a main valve and a teaser, the main valve having a movement independent of the teaser and a further movement conjointly with the teaser, a lifting-chamber, a delivery-chamber, a forcing-tube forming the sole means of communication between said lifting-chamber and delivery-chamber, an independent steam-chamber adjacent to the lifting-chamber, a lifting-jet opening out from said steam-chamber, a throttle-valve for said lifting-jet, and a steam-passage between the steam-chambers of the two tubes, which passage is closed during the initial movement of the main steam-valve and until the water is raised and is opened upon the further movement of the main steam-valve for lifting the water, substantially as described.

In testimony whereof I have hereunto set my hand this 23d day of October, A. D. 1899.

EDWIN J. YOUNG.

Witnesses:

JOHN H. DURLING,  
E. S. PURDEE.