

(Model.)

J. DESMOND.  
INJECTOR.

No. 330,964.

Patented Nov. 24, 1885.

Fig. 1.

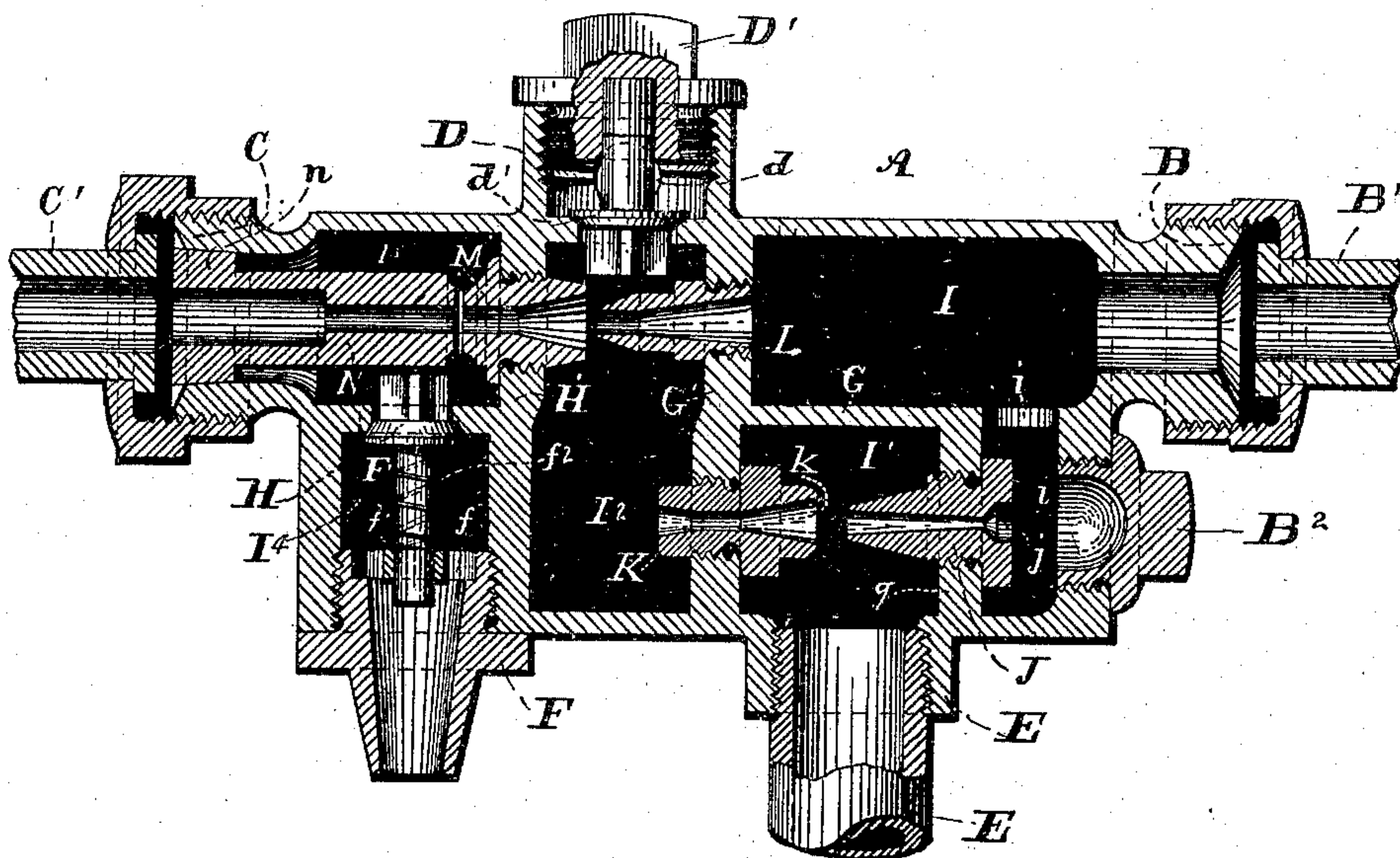
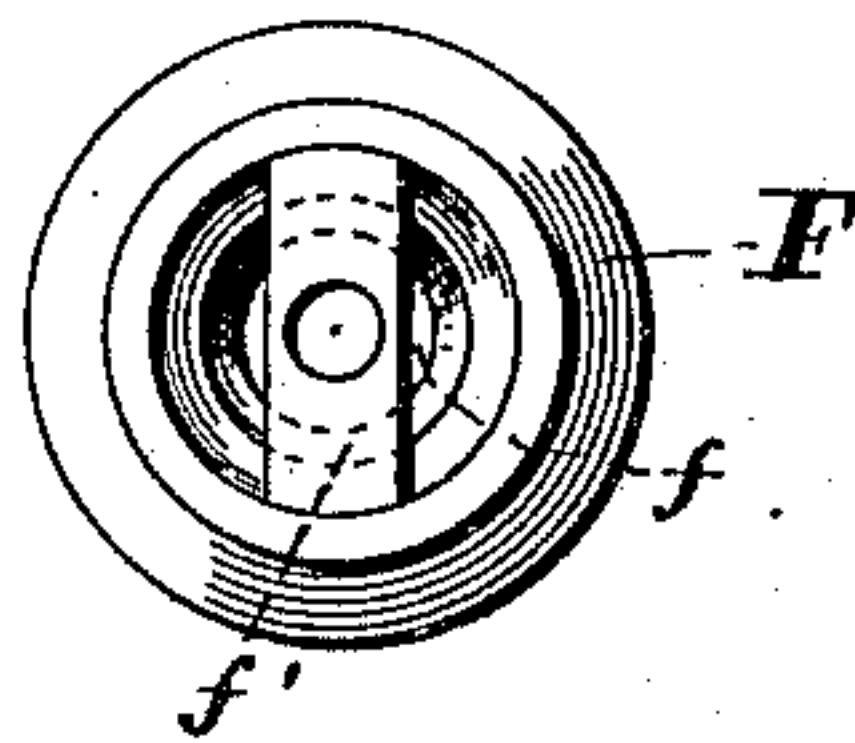


Fig. 2.



Witnesses:

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# UNITED STATES PATENT OFFICE.

JOHN DESMOND, OF CLEVELAND, OHIO, ASSIGNOR OF ONE-HALF TO WILLIAM R. GERRARD, OF SAME PLACE.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 330,964, dated November 24, 1885.

Application filed February 6, 1885. Serial No. 155,083. (Model.)

*To all whom it may concern:*

Be it known that I, JOHN DESMOND, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Injectors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to improvements in injectors for steam-boilers, the object being to provide check-valves for the hot and cold water overflow, that open outward and operate automatically, being opened at first by the pressure of steam from within, and are afterward closed by atmospheric pressure from without, to the end that with the exception of the stop-valve in the steam-pipe the injector in all its parts is made automatic.

My invention also consists in the details of construction hereinafter described.

In the accompanying drawings, Figure 1 is a side elevation, in section, of my improved injector. Fig. 2 is a plan view of the plug F and cross-bar  $f'$ .

A represents the body of the injector, that in cross-section is rectangular with rounded edges. At the ends are respectively the nozzles B and C. To the former is attached a steam-pipe, B', leading from the boiler and provided with a stop-valve. To the latter is attached the feed-water pipe C', leading to the boiler and provided in the usual manner with a check-valve. By the side of the nozzle B is an opening secured by the plug B<sup>2</sup>, by removing which access is had internally to this part of the injector. On top is the nozzle D, secured by the plug D'. This nozzle has lateral openings  $d$ , known as "cold-water relief or overflow." Below is the nozzle E, to which is secured the suction or cold-water pipe E', and an opening secured by the hollow plug F, the opening through the plug forming the hot-water relief or overflow  $f$ . Internally are the longitudinal central walls, G and H, that join, respectively, the transverse diaphragms G' and H' and divide the injector in the main into the five chambers I, I', I<sup>2</sup>, I<sup>3</sup>, and I<sup>4</sup>, and the diaphragm  $g$ , extending from the wall G to the outer wall of the injector, and between

this diaphragm and the plug B<sup>2</sup> is the small chamber  $i$ , and by means of an opening,  $i'$ , through the wall G this chamber is in open relation with the chamber I. Through the wall H is an opening closed by the check-valve F', opening outward, the stem of which passes through a small cross-bar,  $f'$ , attached to the plug F, and forms a guide for the valve. This valve is balanced by the coil-spring  $f^2$ . From the inside of the nozzle D an opening leads into the chamber I<sup>2</sup>, and is closed by the check-valve  $d'$ , opening outward, and the stem of the valve operates in the bore of the plug D, that serves as a guide for the valve. A plug, J, screws into an opening in the diaphragm  $g$ , and has a small bore,  $j$ , the end of the bore terminating in the chamber  $i$  being slightly flaring and funnel-shaped. In line with the plug J is the plug K, that screws into the diaphragm G', and has a bore,  $k$ , somewhat larger than the orifice  $j$ . The adjacent ends of the plugs J and K are separated a short distance, and the intervening space is about midway over the pipe E'. A hollow plug, L, is screwed into the diaphragm G' between the chambers I and I<sup>2</sup>, the end of the orifice presenting toward the chamber I being slightly flaring. In line with the plug L, and separated from it but a short distance, is a plug, M, screwed into an opening in the diaphragm H'. The bore of this plug is larger than the bore in the plug L, and is funnel-shaped at the end next the plug L.

N is a tube, with a bore of the same diameter as the cylindrical part of the bore in the plug M. This tube and plug almost come in contact, being separated perhaps one-hundredth part of an inch, more or less. The outer end of the tube fits in the nozzle C, and has a shoulder,  $n$ , that abuts against a corresponding shoulder in the nozzle, and is held in place from the outside by the coupling of the feed-pipe that abuts against the end of the tube.

In starting the injector by means of the valve in the steam-pipe a small quantity of steam is first admitted, and is received first into the chamber I, and from thence a portion of the steam passes direct through the plug L to the chamber I<sup>2</sup>, and the balance



of the steam passes through the orifice  $i'$  and through the plugs J and K to the chamber  $I^2$ . Some of the steam also passes through plug M and tube N and into the feed-pipe as far as the check-valve therein, and a small portion of the steam finds its way through the slight opening between the plug and tube into the chamber  $I^3$ . The admission of steam expels the air from the injector, forcing it out first by opening the more accessible valve  $d'$ , and afterward, as the pressure increases, by opening the valve  $F'$ . The expulsion of the air produces a partial vacuum in the injector, which, together with the action of the steam in passing from the plug J to the plug K across the mouth of the suction-pipe  $E'$ , raises the water, which is carried by the current of steam through the plug K into the chamber  $I^2$ . The momentum of the water, and urged along perhaps more or less by the current of steam, carries it through the valve  $d'$  and out through the overflow-openings  $d$ , and more or less condensed hot water finds its way through the opening between the tube and plug into the chamber  $J^3$ , and is discharged through the valve  $F'$ . The introduction of the water causes a condensation of steam that produces a partial vacuum that results in the closing of the valves  $d'$  and  $F'$  by atmospheric pressure from without, the valve  $d'$ , being in the immediate vicinity of where the greater part of the condensation takes place, closing first. The steam continuing to flow through the steam-pipe as the pressure increases, a current of steam is established through the plugs and tubes L, M, and N, that draws the water in with it and forces it along the feed-pipe to the boiler.

In operating this injector there is but the one valve to manipulate, (the valve in the steam-pipe,) all the other parts operating automatically.

No skill is required. An ordinary workman can learn in a few minutes to operate this injector as well as an expert.

The injector will start promptly and with

certainty, and will continue to act as long as the supply of steam and water is furnished.

I am aware that a double injector is not new, and also that it is old to provide an injector with two automatically - operating relief-valves; hence I make no claim, broadly, to these constructions; but

What I claim is—

1. In an injector for steam-boilers, the combination, with the chambers  $I$  and  $I^2$  and hollow plugs L, M, and N, forming a direct passage-way through the injector from the steam-pipe to the feed-pipe, of the chambers  $I'$  and  $i'$ , and hollow plugs J and K, forming a second passage-way parallel and in open relation at either end with the first passage-way, relief-valves opening outward and connected with the first passage-way, and a suction-pipe connected with and at right angles to the second passage-way, with the ports arranged substantially as described.

2. In an injector for steam-boilers, the combination, with a direct passage-way through the injector from the steam-pipe to the feed-pipe thereof, a second passage-way leading across the mouth of the suction-pipe parallel and in open relation with the first passage-way, each passage-way provided with a succession of hollow plugs with spaces between, arranged substantially as indicated, of cold and hot water reliefs or overflows, each provided with a valve opening outward, the former arranged above, so that water will escape therefrom by pressure from within, and the latter arranged below, so that water will escape therefrom by gravity, substantially as shown.

In testimony whereof I sign this specification, in the presence of two witnesses, this 30th day of January, 1885.

JOHN DESMOND.

Witnesses:

HENRY C. CROWELL,  
G. W. SHUMWAY.