

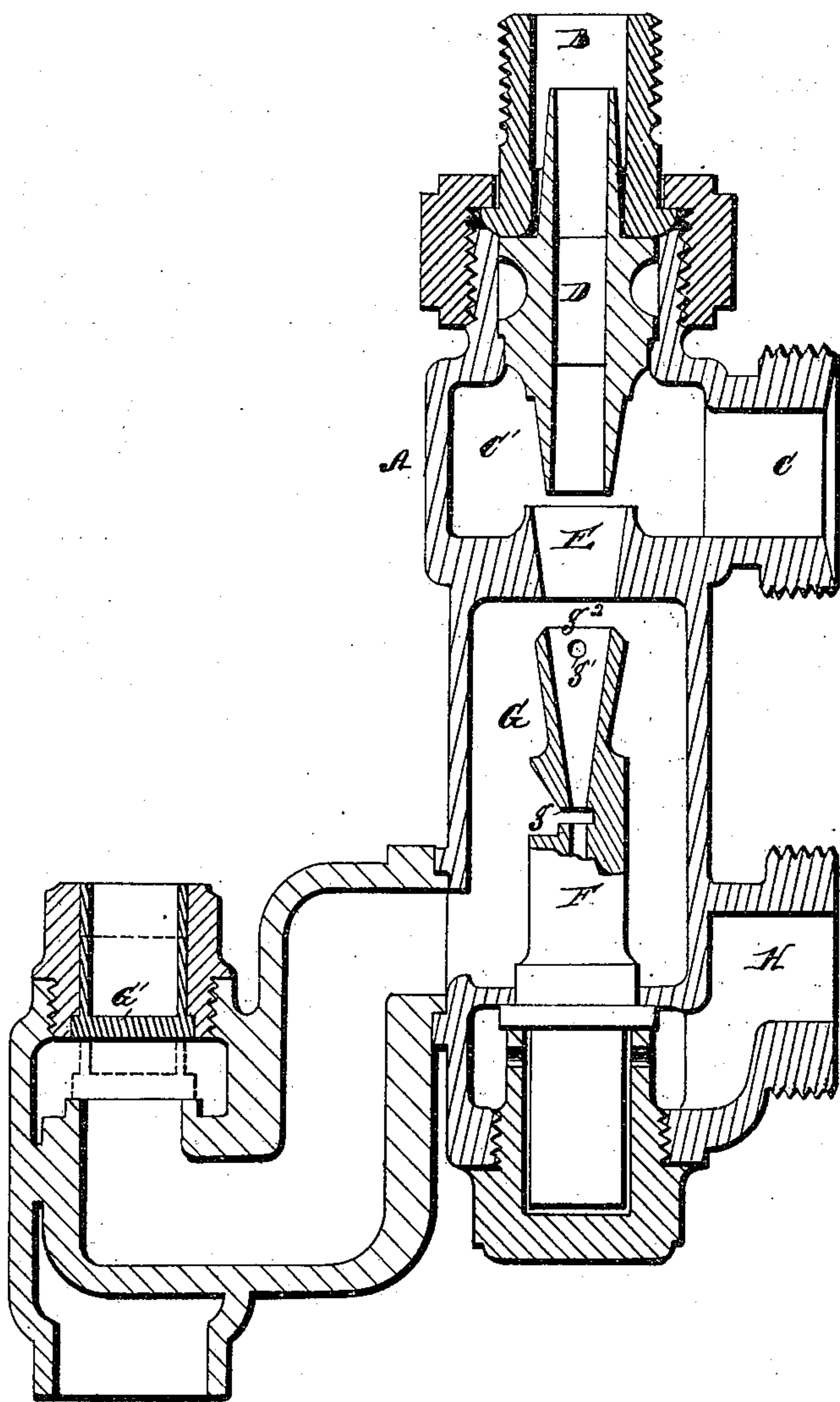
(Model.)

H. B. MURDOCK.

INJECTOR.

No. 334,266.

Patented Jan. 12, 1886.



WITNESSES

*H. B. O'Gherty*  
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# UNITED STATES PATENT OFFICE.

HORACE B. MURDOCK, OF DETROIT, MICHIGAN, ASSIGNOR OF ONE-HALF TO  
JOHN TRIX, OF SAME PLACE.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 334,266, dated January 12, 1886.

Application filed September 21, 1885. Serial No. 177,722. (Model.)

*To all whom it may concern:*

Be it known that I, HORACE B. MURDOCK, of Detroit, county of Wayne, State of Michigan, have invented a new and useful Improvement in Injectors; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawing, which forms a part of this specification.

My invention consists of the combinations of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

In the drawing is presented a sectional view of an injector embodying my invention. A is the shell. B is the steam-inlet port; C, the water-inlet opening. D is the forcing-tube, E the combining-tube, and F the delivery-tube. G is the lifting-chamber. G' is the overflow-chamber; G', the overflow-valve or relief water-valve. H is the delivery-port. The openings  $g$   $g'$  and the free space  $g^2$  above the delivery-tube are all overflow-passages whereby excess of water is disposed of.

The principal feature of the invention is the peculiar location of the relief-valve G'. This valve is designed to be lifted by the weight of the column of water, so as to permit the water to escape beneath the valve, and to close automatically as soon as the column of water has wasted sufficiently that it will no longer serve to lift the valve. If, therefore, the valve is located too high, the effect is to raise the column of water within the chamber G to such a height that it will be above the top of the delivery-tube F. The result of such a state of affairs is to cause the water to circulate around and around within the tube F, thence out of the opening  $g$ , up the outside through the space  $g^2$  and the opening  $g'$ , and down again through the tube, and so defeats the proper operation of the injector.

This invention has therefore for its principal object the relative construction and location of this water-relief valve G' at such a point below the top of the tube F that it will always open by the pressure of the column of water before it can rise to the top of the said tube F, and so render the above defective operation impossible.

It is apparent that this improvement is applicable to all injectors and to only such as have a delivery-tube with openings  $g'$  located within the overflow-chamber, so that water therefrom might otherwise rise so as to flow into the entrance end of the delivery-tube.

The forcing-tube may be made single, if desired; but I prefer, generally, to make it reversible. For this purpose the bearings  $d$   $d'$  are provided, one being a little nearer to its adjacent end than the other bearing is to its adjacent end. Thus when the forcing-tube is in the position shown in the drawing its end is quite close to the entrance-mouth of the combining-tube, and so limits considerably the area through which water may enter the combining-tube. When the forcing-tube is reversed, however, the end of the forcing-tube is caused to stand at a point farther removed from the combining-tube, and the said area for admission of water is increased about twenty-five per cent., more or less. The reversible tube therefore gives to the injector two distinct measures of capacity without other change than to reverse this tube. In my improved injector it will therefore be observed that the construction and location of the escape-valve are such that it will open and permit an escape therefrom whenever the pressure within the overflow-chamber is equal to or exceeds that which would be produced by a column of water the level of which is a little below the entrance end of the delivery-tube. Therefore it would, in starting the injector, open automatically by the pressure of steam, and permit steam to escape until water has been raised into the injector. The flow of steam into the overflow-chamber will then cease, and the valve will automatically close. Then water will overflow into this chamber, and the valve will remain closed until the level of the water has risen to a point a little below the entrance end of the force-tube. The valve will then automatically open under this pressure, and will permit all excess of water to escape, but will close and remain closed as soon as the injector has been brought into action, thus wasting the water below the said level.

What I claim is—

1. In an injector, a delivery-tube constructed with its entrance end and relief orifices open-



ing into the same overflow-chamber, and in connection therewith an escape-valve located below the entrance to said tube, said valve constructed to open automatically under the  
5 pressure of water in the overflow-chamber when the same has risen to a level a little below the entrance end of the delivery-tube, and to automatically close when the water has  
10 wasted below said level, substantially as described.

2. An automatic injector consisting of the combination, with a force-tube and a combining-tube, of a delivery-tube having its entrance end and relief orifices opening into said  
15 overflow-chamber, and a single escape-valve, said valve constructed to automatically open whenever the pressure within the overflow-chamber equals or exceeds that exerted by a  
20 column of water at a level a little below the entrance end of the said delivery-tube, and to automatically close and remain closed whenever there is less pressure within said chamber, substantially as described.

3. The combination, with an injector having an overflow-chamber, G, a steam-inlet, B, 25 a water-inlet, C, and a vertical delivery-tube, F, provided with an entrance end and an opening,  $g'$ , located within the overflow-chamber, of an escape-valve,  $G'$ , arranged below the upper entrance end to said delivery-tube 30 and automatically opened by the column of water before the latter can rise to said upper entrance end, substantially as described.

4. In an injector, a reversible forcing-tube adapted by reversing the tube to present its 35 discharge end at a different distance from the mouth of the combining-tube, substantially as and for the purposes described.

In testimony whereof I sign this specification in the presence of two witnesses.

HORACE B. MURDOCK.

Witnesses:

M. B. O'DOHERTY,  
SAMUEL E. THOMAS.