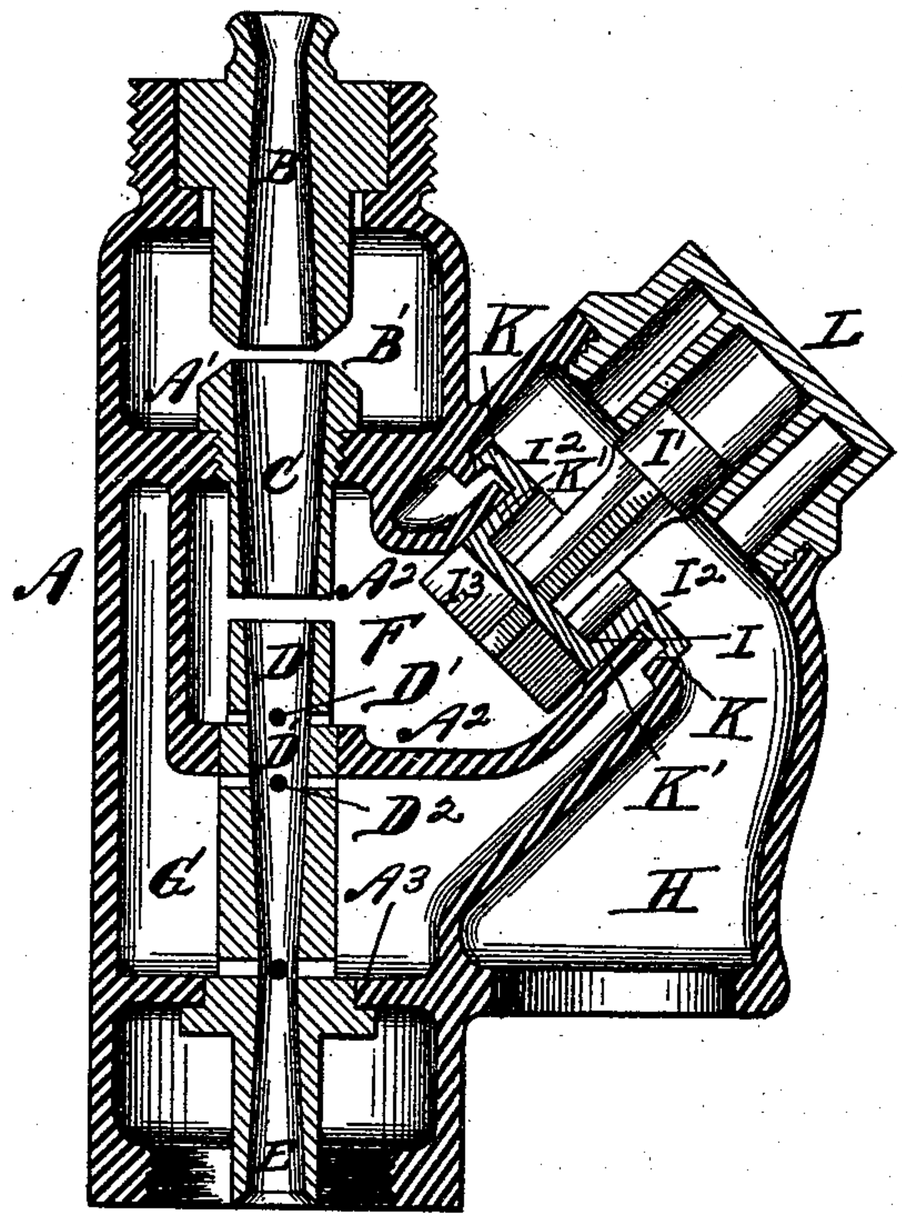
(Model.)

J. TRIX.

INJECTOR.

No. 488,099. Patented Dec. 13, 1892.



WITNESSES

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JOHN TRIX, OF DETROIT, MICHIGAN, ASSIGNOR TO THE AMERICAN INJECTOR COMPANY, OF SAME PLACE.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 488,099, dated December 13, 1892.

Application filed April 22, 1892. Serial No. 430,220. (Model.)

To all whom it may concern:

Be it known that I, JOHN TRIX, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Injectors, of which the following is a specification.

This invention relates to improvements in the well-known Giffard injector for charging boilers with water by the action of a current of steam; and it consists in the introduction of a double-seated valve to control both the upper or suction-pipe overflow and the lower or combining and delivery overflow, which while the outflow from the upper overflow is closed by the suction of the lifting-jet shall yet be sufficiently open to permit the escape of water through the second overflow when the current is unformed or has been broken.

In the annexed drawing the entire injector is shown in a single vertical section.

A is the shell, cast in one piece with diaphragms A′, A^2, and A^3 to form internal chambers and sustain the jet-tubes common in this class of machines—viz., B, the steam-inlet tube; C, the suction-tube; D, the combining-tube, and E the delivery-tube. Overflow-openings are made in tube D, one at D′ above diaphragm A^2 and the other at D^2 below the said diaphragm. As these parts are familiar to all skilled in the art, they need no further description.

The chamber F, formed by the diaphragms A′ A^2 and the shell, incloses the overflow-space between the suction-tube C and the combining-tube D. The chamber G is formed by the shell and the diaphragms A′, A^2, and A^3. The chamber H is formed by the walls of the shell, which are so arranged that the water or stream from both the upper and lower overflows shall discharge into the one delivery-chamber H. A valve I, formed as shown, has two seating-surfaces, one on the barrel or body of the valve and the other on the under side of the flange I^2, which is underhung on the periphery and seated at K on a flange on the part of the wall which forms the exterior of the discharge leading from chamber G to the discharge-chamber H. The barrel or body of the valve is turned to fit the finished interior surface of the tubular discharge formed by diaphragm A^2 and leading from the suction-chamber F to the discharge-chamber H, which surface forms the valve-seat K′.

The lower end of the valve I below the barrel-formed portion is formed with wings I^3, which afford a bearing on the seat K′ when the solid portion of the valve is lifted beyond the mouth of the discharge-opening of chamber F. The valve is guided and kept in position by a stem I′, which, as shown, is piston-headed and moves in a chamber in the cap L. Any other guide will answer the same purpose.

The operation of the injector is as follows: In starting, the steam is turned on through tube B and driven into the suction-tube C, entraining the air in the inclosing chamber B′, into which the water-pipe is arranged to discharge until a sufficient vacuum is created in said chamber to cause the water to flow into the chamber and through the space between the steam and suction tube. The steam when it passes out of the tube C cannot at first force its way through the tubes D and E and escapes at the upper overflow into chamber F. It is very soon followed by the stream of water, and, pressing upon the under side of valve I, forces it upward until the barrel portion of the valve is raised entirely above the seat K′, the valve being held in place by the wings I^3, the water or steam passing out through the delivery-chamber H. When the water is supplied to the combining-tube D, it drives the air before it, and at first escapes through the lower overflow into chamber G, and thence through the annular discharge into chamber H. When the air has been entirely driven out and a current is established, the current passing from tube C to tube D entrains the air in chamber F and establishes a vacuum or minus pressure therein, and the external atmospheric pressure upon the upper surface of valve I drives it down, so that the barrel or body of the valve enters seat K′, cutting off communication between the chambers H and F. The water still escaping at the lower overflow into chamber G passes through the annular discharge leading into chamber H. As soon as the current is established through the delivery-tube E a condition of minus pressure is established in chamber G,

and the external pressure on valve I drives the flange I^2 down upon the seat K and the machine is in full operation. Should a break occur in the water-jet, the water will instantly begin to flow out of the lower overflow and lift the flange I^2 of the valve from its seat K sufficiently to allow the water to flow out until the current is re-established, when the valve will close again and the proper operation of the injector be repeated, its operation being entirely automatic after steam is turned on.

I have shown the valve made in one piece and also made integral with its stem. It is obvious, however, that the valve can be made to slide on its stem, which in that case would be stationary; also, that the valve may be made in sections so combined as to act in the same manner, one section governing the eduction from chamber F and the other that from chamber G, precisely in the same manner as herein accomplished by a valve made in one piece. Therefore in speaking of the valve I as a "single piece" I do not limit myself to a valve so formed, but include any valve, whether single or sectional, which operates to close the outlet from the upper overflow-chamber or keep it closed while the outlet from the lower overflow-chamber is open, and also to close them both when the injector is in full operation.

The feature which distinguishes my invention from those injectors which employ independent openings out of the overflow-chambers, each controlled by an independent automatic valve, is the use of two overflow-chambers connected by contiguous outlets with a single discharge-chamber, and a double-seated solid or sectional valve acting automatically on the contiguous outlets to close one or both independently or successively in establishing or re-establishing the current.

With this injector I can inject hotter water than with one which has independent valves placed on the discharge from both the upper and lower overflows. As the water injected rises in temperature the tendency to break increases, the current at the lower overflow lifting the valve and permitting the water to escape. In my injector the seat-face of the valve which acts on the lower overflow is held on its seat by an additional pressure, due to the condition of minus pressure established in chamber F, and consequently it will remain closed and hold the current unbroken with a feed-water temperature which would break the current when independent valves are employed on the two overflows.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a steam lifting and forcing injector, the combination, with the upper and lower overflow-chambers provided with contiguous escape-openings, of a single discharge-chamber and an intermediate double-seated valve, the elements of which act on the respective openings successively, substantially as set forth.

2. In combination with the casing of a lifting and forcing injector, which together with the internal diaphragms form overflow-chambers F and G, the outlet-orifices of which are concentric, the chamber H, and the intermediate valve I, and seats K and K′, formed around said orifices on which the elements of the valve are seated successively, substantially as set forth.

3. In a lifting and forcing injector, concentric escape-openings provided with valve-seats, and a valve made up of cylindrical and flat faces, also concentric, the outer acting only after the inner has been closed, substantially as set forth.

4. In an injector, a valve with two seat-faces, in combination with the outlet-openings from the chambers F and G, the arrangement being such that the valve is pressed upon the opening from G with a pressure increased by that of the external atmosphere produced by a condition of minus pressure created in F, substantially as set forth.

In witness whereof I have hereunto subscribed my name in the presence of two attesting witnesses.

JOHN TRIX.

Witnesses:
R. MASON,
M. A. HOWEY.