(Model.)

J. DESMOND.

INJECTOR.

No. 536,922. Patented Apr. 2, 1895.

Fig. 1.

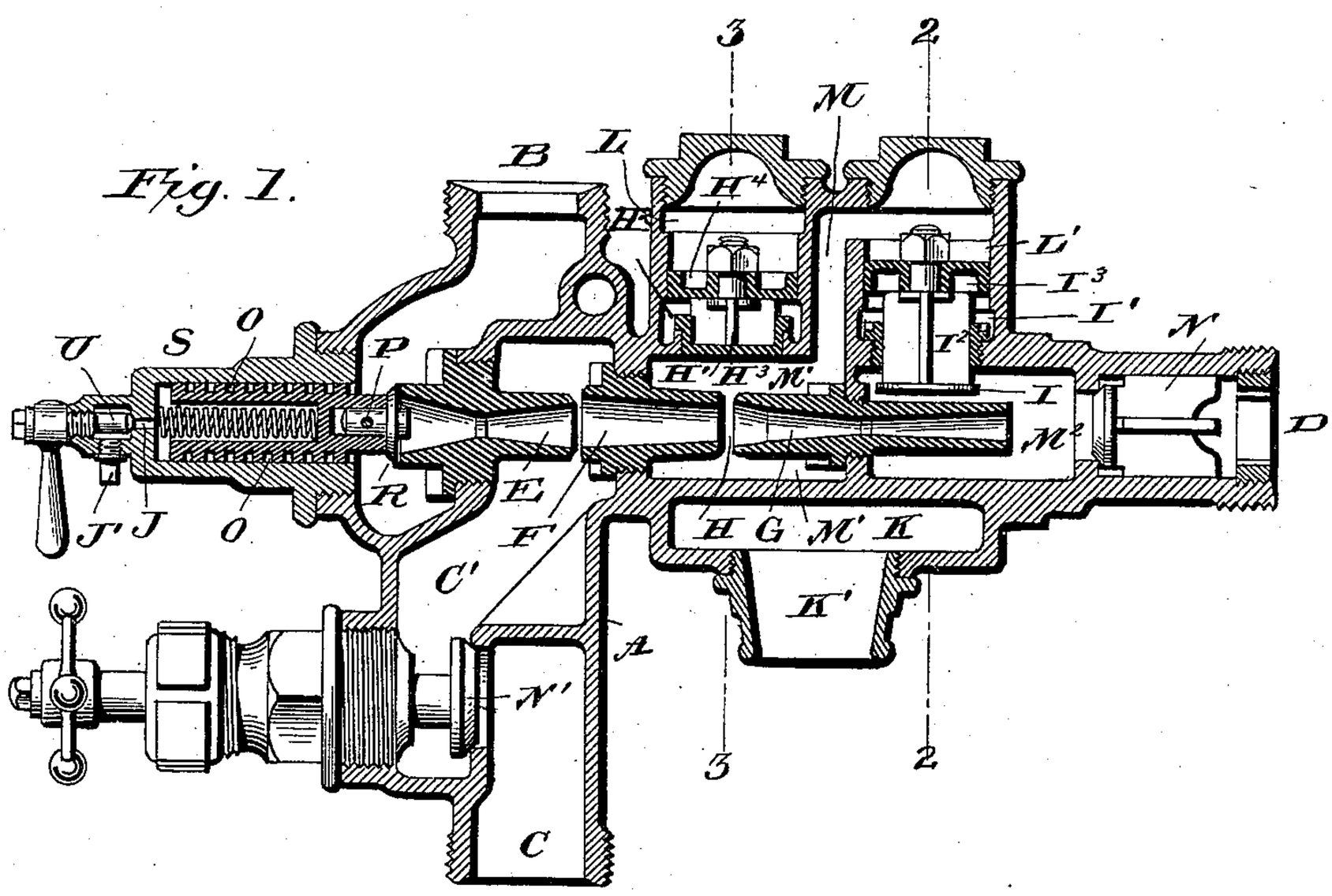


Fig. 2.

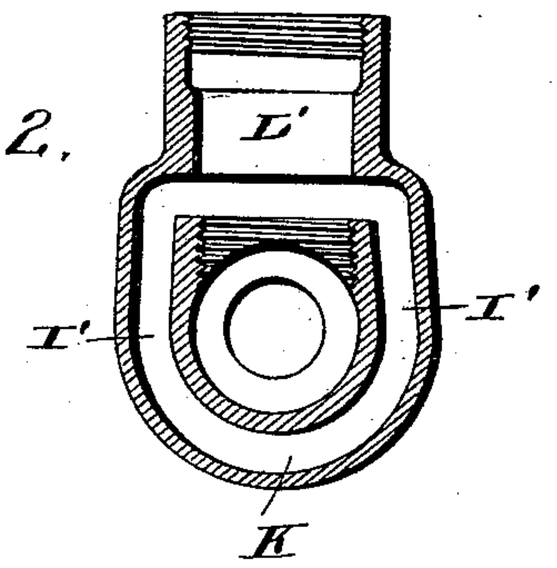
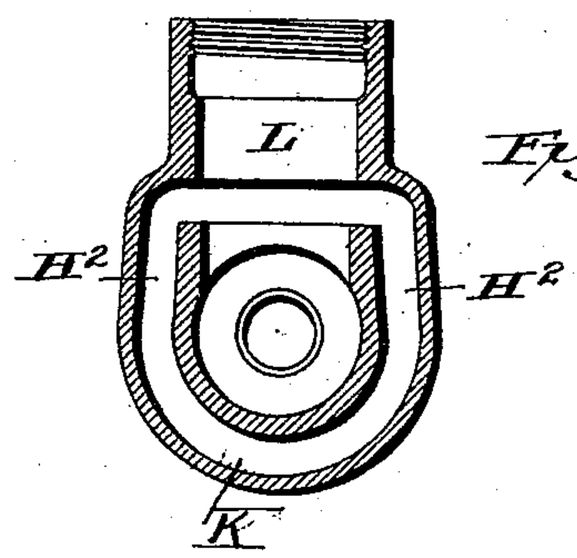


Fig. 3.



Witnesses:

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by Marcellus Bailey

his Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN DESMOND, OF NEW YORK, N. Y., ASSIGNOR TO THE NATHAN MANUFACTURING COMPANY, OF SAME PLACE.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 536,922, dated April 2, 1895.

Application filed January 12, 1895. Serial No. 534,661. (Model.)

To all whom it may concern:

Be it known that I, JOHN DESMOND, a citizen of the United States, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Injectors, of which the following is a specification.

My invention relates in the main, to injectors, provided with two overflows. One of these, which I will term the "primary" overflow, is located in the usual overflow or vacuum chamber of the casing of the injector, while the other, which I will term the "secondary" overflow, is located in the delivery or pressure chamber of the instrument, which, by means of proper pipe connections, communicates directly with the boiler which is to be supplied with water by the injector. Each of these two overflows is provided with valves. It is well known to those skilled in the art, that by closing these valves against the atmosphere, the range of an injector may be widened very materially. The injector will work at higher pressures, and with feed water of a higher temperature, than would an instrument, in which these overflows (more especially the "secondary" overflow) are open, or kept closed only by atmospheric pressure, as against the partial vacuum produced in the overflow chamber by the action of the injector. My invention in this direction has relation to automatically restarting injectors or injectors in which the overflow valves are arranged to automatically open and close at the proper time.

I am well aware of the fact that it is not new, broadly speaking, to close the overflows of an injector automatically and to keep them closed, while the instrument is in operation, by means of steam pressure, spring actuated valves, or by the pressure of the steam-forced water, which is about to be injected into the boiler, but the means heretofore used for this purpose have proved inadequate and unreliable.

One of the objects, therefore, of my invention is to provide simple, effective and reliable means toward that end, means which at the same time are to be durable and inexpensive.

A further object of my invention is to produce a novel, simple and effective starting mechanism, for the admission of the operating steam into the instrument in place of the usual lever or screw attachments, this mechanism being applicable to an injector whether of the particular construction hereinafter described, or not.

With these ends in view, my invention consists in certain features of construction, and combination of parts which will be found described hereinafter, and more particularly pointed out in the accompanying claims.

The invention may be more fully understood by reference to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section of the injector. Fig. 2 is a cross section of the casing on line 2—2 of Fig. 1, omitting all other parts. Fig. 3 is a cross section of the casing on line 3—3 of Fig. 1, omitting all other parts.

In the drawings, A represents the casing or shell of the injector. B, C, and D, are the usual threaded necks for the proper steam, water and delivery pipe connections.

E is the steam nozzle; F, the lifting nozzle; G, the condensing and delivery nozzles combined.

H is the primary overflow opening between the lifting and the condensing nozzle; H′, the cup or plunger-shaped primary overflow valve, controlling the overflow passage H^2.

I is the secondary overflow valve, controlling the overflow passage I′.

Both of the overflow passages unite in a common chamber K, and have their final outlet in a common overflow branch K′. The primary overflow valve H′ is provided with wings H^3, to the top of which is attached a piston H^4, by means of a stud and nut. The secondary overflow valve I is provided with wings I^2, to the top of which is attached piston I^3, which I make of larger area than the bottom disk of valve I. These pistons move and are guided in extensions L, and L′ of the overflow chambers H^2 and I′.

M is a passage, by means of which I establish communication between the top of piston I^3 and the vacuum chamber M′.

M^2 represents the delivery chamber.

N is the usual check valve between the boiler and the injector, and N′ the usual wa-

ter valve, to regulate the admission of the feed water into the injector.

Irrespective of the starting mechanism for the admission of steam into the instrument, which I shall describe later, the operation of the injector is as follows: The natural position of the overflow valve is shown in Fig. 1, valve H′ seating by gravity, and valve I opening by gravity. Steam being admitted to nozzle E, by means of the starting mechanism, as illustrated, or by any other suitable means, passes through nozzle F and escapes partly through opening H, lifting the valve H′, and passes around through passage H^2 into overflow branch K′. A portion of the steam shoots through nozzle G and through overflow branch K′ into the atmosphere. The steam also passes upward into passage M, exerting a pressure on top of piston I^3. The area of this piston I^3 being larger than the bottom disk of valve I, this valve I will be kept open at this stage of the operation of the injector. The steam thus finding a free outlet into the atmosphere exhausts the air from the water inlet chamber C′ and chamber M′, and the water will be drawn into the instrument even from a considerable depth. As long as the jet is not properly established, the water will pass through the same channels as did the steam before, and no higher than atmospheric pressure can prevail in the delivery chamber, since this chamber is in open communication with the atmosphere through the open valve I. When the jet is finally established, a vacuum will form in chamber M′, and valve H′ will drop to its seat. A vacuum will also arise in chamber M, and above the piston I^3, producing a differential pressure as between the top of this piston I^3, and the bottom of valve I, sufficient to raise valve I, and thus to close the communication between the atmosphere and the delivery chamber. Now the jet will have attained sufficient force and velocity to open check valve N and to enter the boiler, while valve I will be kept on its seat by the full boiler pressure now prevailing in chamber M^2. Should the jet be broken, for example by an interruption of the water supply, the vacuum in chamber M′ will be destroyed, and steam pressure, then prevailing in chambers M and M′, will open valves H′ and I, and re-establish communication with the atmosphere. The instrument will pass through the same process as in starting, and the jet will re-establish itself automatically, as soon as the water is again within reach of, and supplied, to the instrument.

I give a plunger-like shape to valve H′, so that, in restarting, the steam shall exert pressure on top of piston I^3, before valve H′ is fully open. The plunger form will also cause valve H′ to close down gradually, allowing the jet the necessary time to properly establish itself. The piston on top of valve H′ will act as a cushion, or dash-pot, in opening and closing.

The starting mechanism consists of a spring-actuated piston O, to which is attached (by means of a pin P) a valve R, seating on the steam nozzle E. This piston O moves in a casing S, which, back of the piston, communicates with the atmosphere by means of passages J and J′. Passage J is controlled by a valve U, which is provided with screw-threads and a suitable handle to manipulate it. The spring is just strong enough to help re-seating the valve R, when necessary, but is not to be of sufficient strength to resist even the lowest steam pressure, at which the injector is expected to operate. The area of the piston is slightly larger than that of valve R. When valve U is open, the pressure between the piston and the back of the casing S, and caused by the leakage of steam past the piston and into the space at rear between the piston and the casing S, will be relieved, and steam pressure from B will force back the piston, open valve R and admit the steam to nozzle E. On closing valve U, and thus allowing steam pressure to accumulate back of the piston, the spring will re-seat valve R, and stop the admission of steam to the instrument, since the pressures in front and at the back of the piston will then be equalized.

The last above-described feature is described in connection with an automatically restarting injector, but, as hereinbefore stated it is equally useful with, and applicable to, other types of injectors. I have also shown the particular construction preferred by me for carrying my improvements into effect, but it will be evident, that the same may be varied, more particularly in the direction of the construction and arrangement of the several valves, without thereby departing from the spirit and scope of my invention. For this reason I do not desire to limit myself strictly to the construction herein set forth, but

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

1. In an injector, a primary overflow valve located in the vacuum chamber of the instrument, opened by the force of the primary overflow and closed by atmospheric pressure, when the jet is properly formed, a secondary overflow valve located in the pressure or delivery chamber, and a by-pass or communicating passage between the vacuum chamber and a space above the said secondary overflow valve, whereby the latter will be opened by the force of the primary overflow, closed by the pressure of the steam forced water on the bottom of the valve, aided by the vacuum above the valve, substantially as and for the purposes set forth.

2. In an injector, a primary overflow valve, opened by the force of the primary overflow and closed by atmospheric pressure, when the jet is formed, and a secondary overflow valve opened by the force of the primary overflow, and closed by the pressure of the steam forced water, the two valves being disconnected and separate from one another, located in sepa-

rate chambers, and operating entirely independently of each other, substantially as set forth.

3. In an injector, the combination with the vacuum and pressure chamber and primary and secondary overflow valves, of an open passage between the vacuum chamber and the top of the secondary overflow valve, substantially as and for the purposes hereinbefore set forth.

4. In an injector, the combination with the vacuum chamber of a plunger-shaped primary overflow valve H′ having a piston H^4, which acts as a cushion, preventing the too sudden opening or closing of the valve, substantially as described.

5. In an injector, the combination with the pressure or delivery chamber, of a secondary overflow valve, having a piston I^3 of larger diameter than the valve-disk, and a passage between the vacuum chamber of the injector and the top of said piston, as and for the purposes set forth.

6. In an injector, the combination, with primary and secondary overflow valves, and the pistons attached thereto, of the cylinder extensions L and L′ to serve as guides for the pistons, substantially as specified.

7. In a starting mechanism for injectors, the combination with the piston O, of a valve R of smaller diameter, a spring, relief opening T and valve U, substantially as described and specified.

In testimony whereof I have hereunto set my hand this 10th day of January, 1895.

JOHN DESMOND.

Witnesses:
CHARLES JUDGE,
ADOLPH BARGEBUHR.