(Model.) 2 Sheets—Sheet 1.

W. McELROY & H. CONNETT.

INJECTOR.

No. 362,298. Patented May 3, 1887.

Fig. 1.

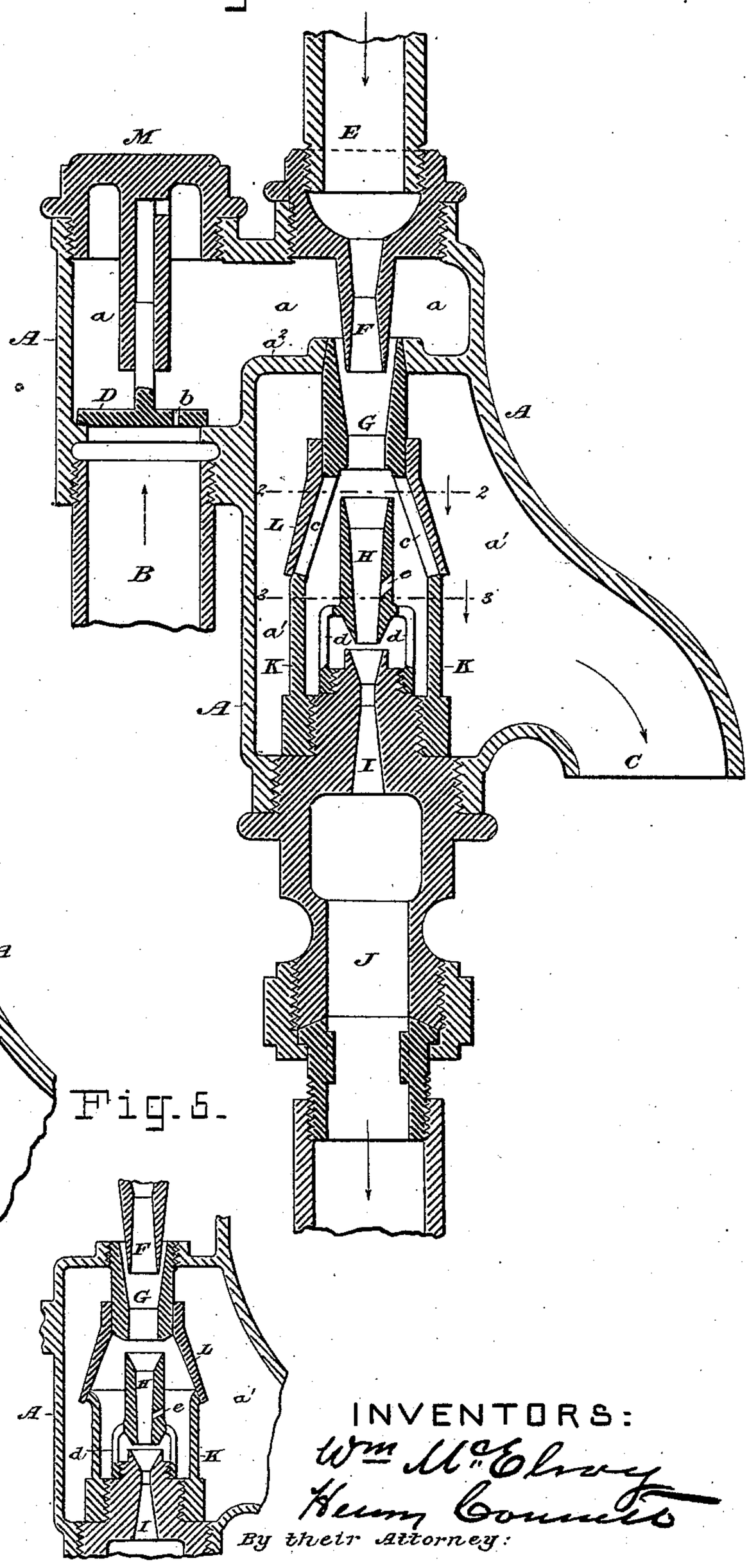

Fig. 2.

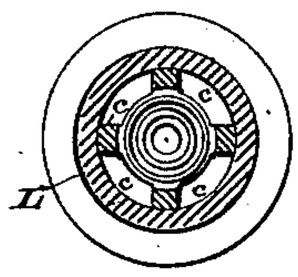

Fig. 3.

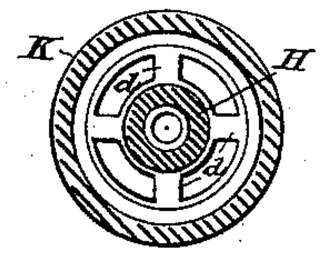

Fig. 4.

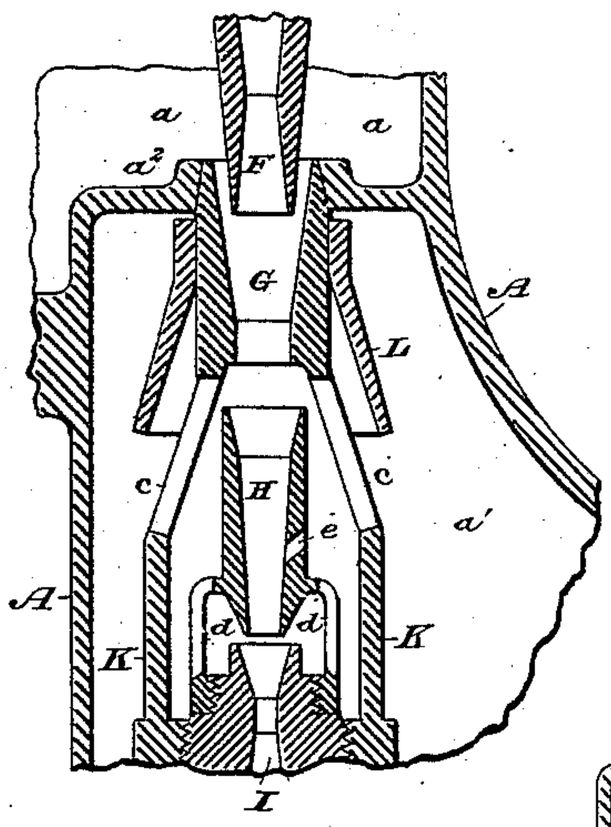

Fig. 5.

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(Model.) 2 Sheets—Sheet 2.

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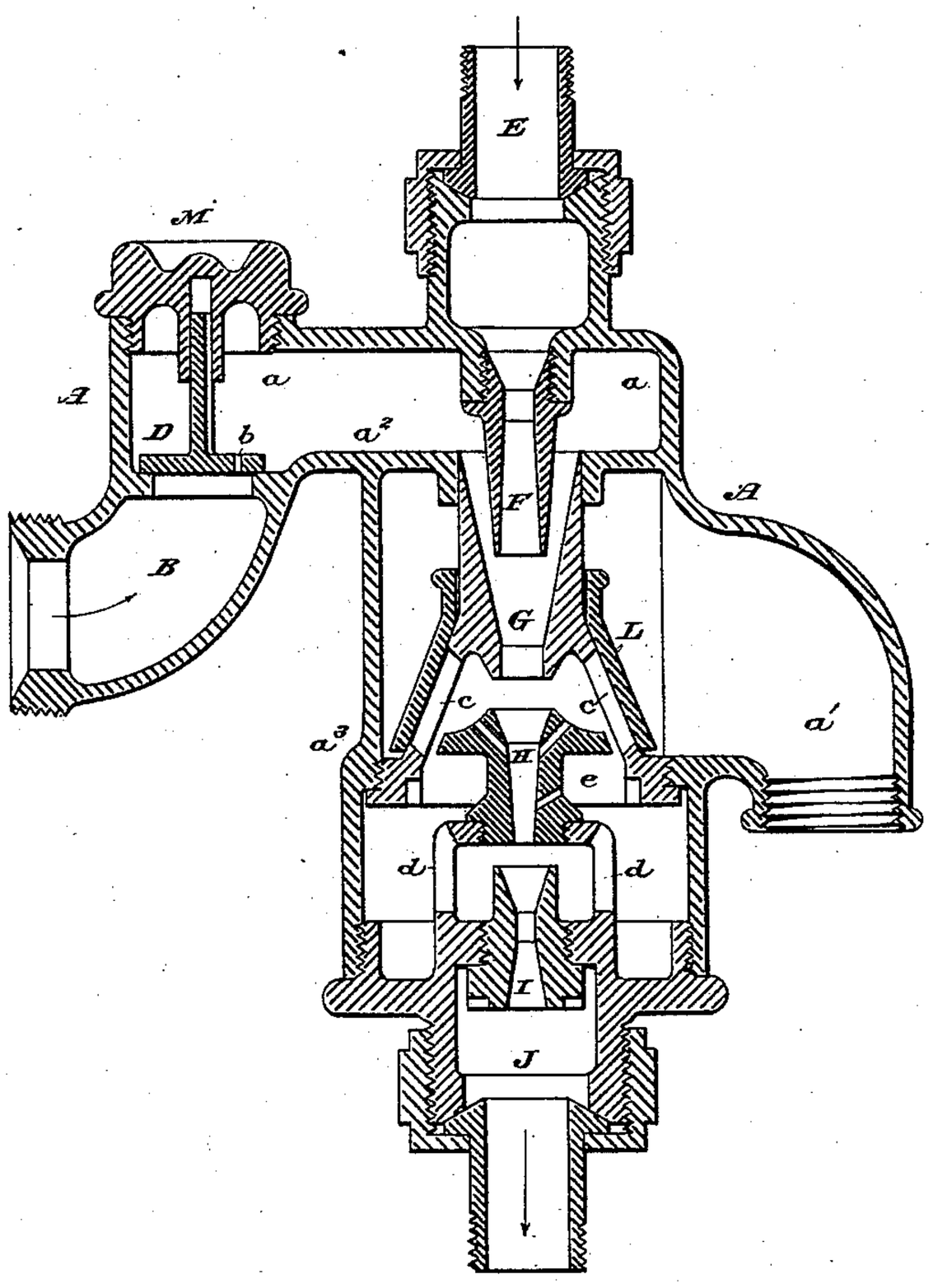
Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM McELROY AND HENRY CONNETT, OF BROOKLYN, NEW YORK.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 362,298, dated May 3, 1887.

Application filed September 8, 1886. Serial No. 213,034. (Model.)

To all whom it may concern:

Be it known that we, WILLIAM MCELROY and HENRY CONNETT, both citizens of the United States, and residents of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Injectors, of which the following is a specification.

Our invention relates to injectors belonging to the class of lifting-injectors wherein the injector at starting first produces a vacuum and raises the water, and then, when the proper velocity is attained, forces the water into the generator.

The object of our invention is to provide an improved lifting-injector having an automatically-operating valve arranged between the overflow branch or outlet and the combining, lifting, and discharging nozzles, whereby, when the steam is first turned on, it opens said valve and allows the steam and water to overflow at the said overflow-branch; but when the proper velocity is established in the combining and discharging cones this valve closes and prevents the admission of air from the overflow-branch.

Another feature of our injector is the arrangement of a drip check-valve to control the admission of water, whereby, should the vacuum break, the water is prevented for the time from flowing back, or until the vacuum is reestablished.

Our invention will be hereinafter fully described, and its novel features carefully defined in the claims.

In the drawings which serve to illustrate our invention, Figure 1 is a longitudinal axial elevation of the injector. Figs. 2 and 3 are cross-sections of same, taken, respectively, in the planes indicated by lines 2 2 and 3 3. Fig. 4 is a fragmentary section similar to Fig. 1, but showing the automatic valve lifted or open. Fig. 5 illustrates a slight modification, which will be hereinafter described. Fig. 6 also illustrates a slight modification or variation in the mechanical construction of the injector, that will be hereinafter described.

A is the injector-casing, in which are constructed the water-receiving chamber *a* and the overflow-chamber *a'*, the two being separated by a partition, a^2.

B is the inlet-branch for the water, opening into chamber *a*, and C is the overflow-branch, opening out from chamber *a'*.

D is a lifting check-valve in the receiving-chamber *a*, arranged to check the outflow of water from said chamber at branch B in case the vacuum breaks. This valve has a small perforation or aperture, *b*, which permits the water to gradually drain from chamber *a* after the injector has been stopped. This is designed to free said chamber of water, and thus prevent freezing in cold weather. It is only necessary that the chamber *a* shall have such a drainage-aperture, and we prefer to make it in the valve, as shown; but it might be arranged under the valve or otherwise.

E is the steam-inlet from the generator. F is the steam-cone connecting with said inlet. G is the lifting-cone into which the steam-cone enters. H is the combining-cone. I is the discharging-cone, and J is the injector-outlet leading to the generator.

Around the combining and discharging cones H and I is arranged a casing, K, which is coned at its upper part and connected integrally, by preference, with the lifting-cone G. In the coned upper portion of this casing K are formed large ports or openings *c c*, and over these ports fits a cone-shaped valve, L, the upper part of which fits on and may slide over the lifting-cone G, which is made cylindrical exteriorly.

The combining-cone H is connected by supports *d d* with a ring, which is screwed onto the discharging-cone I. The casing K is also screwed onto the discharging-cone, and the latter is formed, by preference, integrally with the outlet-branch J, which is screwed into the bottom of the injector-casing A. The upper end of the lifting-cone G fits snugly in an aperture in the partition a^2.

It will be seen that when the valve L is in the position seen in Fig. 1 it closes the ports or openings *c c* in casing K, and the overflow-chamber *a'* and overflow-branch C are entirely cut off from the passage through the several cones; but when said valve is raised, as in Fig. 4, the communication between said passage and the overflow is fully established.

The operation is as follows: When steam is admitted to the injector it passes into the casing K through the lifting-cone, and, acting on

the flared inner face of valve L, raises the same and blows out through the ports *c c* and overflow-branch C. This establishes a vacuum. Water rises through inlet-branch B by raising valve D, passes through the lifting-cone and ports *c c*, and overflows at branch C. As soon as a current with the proper velocity is established in the injector, the valve L will drop and close, and the water that may have collected in casing K will be drawn into the discharging-cone I. The valve L prevents the entry of air to casing K from branch C. Should the vacuum break for the moment, check-valve D will instantly close and prevent the sudden outflow of the water from chamber *a*, and the water will thus be held in said chamber until the vacuum is again established.

It will be seen that casing K forms a chamber in which is housed the passage through the cones, and this passage is cut off from the overflow-outlet by the valve L, which is normally closed, and which opens only when the back-pressure from the inside is sufficient to lift it. This employment of a normally-closed valve has the advantage that, if it should stick from any cause, it will assuredly be raised by the inside pressure before a current is established through the cones at starting; and if the vacuum breaks for an instant, the valve only rises high enough to emit a very little steam. In practice we find that there is a minimum emission of steam at the overflow-outlet and very little overflow of water thereat.

The construction of our injector is very simple and inexpensive. In a screw-cap, M, is formed a guide for the stem of valve D, and said valve may be inserted at the opening closed by said cap. The enlarged base of steam-cone F screws into casing A, and is provided with a female screw to receive the end of the steam-pipe from the generator. The outlet-branch J, carrying all of the interior parts except the steam-cone, is passed into the bottom of casing A and screwed fast therein.

Where the injector stands with its axis vertical, as in Figs. 1 and 4, we do not usually employ extraneous means for closing the valves D and L; but if the injector be placed in other positions, springs may be arranged back of them to close them.

We sometimes construct a port, *e*, in the side of the combining-cone H, to enable the water to escape from said cone the more freely; but this we have not found essential in the smaller sizes of injectors.

In Fig. 5 a slight modification is shown. In this construction the lifting-cone is screwed into the partition a^2, and a space is left between its lower end and the upper end of the cylindrical part of casing K, the conical ported portion of said casing being entirely cut away or omitted. The valve L slides on cone G and seats on the upper end of casing K, thus closing the annular aperture or space between cone G and casing K.

In Fig. 6, which is an axial section similar to Fig. 1, we have shown the injector as slightly modified in its mechanical structure, but not in the least altered in principle. In describing this modification it will be necessary only to indicate wherein the mechanical construction differs from that seen in Figs. 1 and 5. The water-inlet B is turned or directed outward and constructed to receive a coupling or "union," as is also the steam-inlet E. The cone F is screwed into the casing from the inside. The casing K is screwed directly into the casing A at a^3. The cone I is not formed integrally with the cap that closes the bottom of casing A, but screws into the same. The support *d* is formed integrally with the cap closing the bottom of the casing, and the cone H is screwed into said support. The overflow-outlet is provided with a female screw to receive a waste-pipe, if such should be needed. The operation of this injector is the same as that already described.

We are fully aware that it is not new to arrange a check-valve in the overflow-branch or outlet of an injector, and this we do not claim; nor do we claim, broadly, the insertion of a check-valve in the water-inlet. Such a valve has been proposed; but it has not been provided with a drip-aperture.

We are also aware that in one form of lifting-injector the combining and discharging cones are connected and arranged to slide to and fro, so as to serve as a valve, and this we do not claim. In this latter form of injector the passage to the overflow controlled by the sliding cones is normally open, while in our injector it is normally closed; but

What we do claim is—

1. In an injector, the conbination of an overflow-chamber having an outlet, the lifting-cone G, the combining-cone H, the discharging-cone I, the coned and ported casing K, embracing or housing said cones G, H, and I, and the valve L, mounted on the cone G and controlling the ports in the casing, substantially as set forth.

2. In an injector, the combination, with a lifting-cone, G, and coned and ported casing K, of a coned valve, L, mounted on said casing and controlled by the force of a jet of steam or by the combined force of steam and water to automatically open the ports in said casing K, and combining-cone H, arranged within said casing, substantially as set forth.

3. In an injector, the combination, with an overflow-chamber, *a'*, having an outlet, of the lifting-cone G, the conical or flaring valve L, mounted on said cone G, the ported casing K, constructed integrally with the cone G, and the combining-cone H, arranged within said casing K, substantially as herein set forth.

4. In a lifting-injector, the receiving-chamber provided with a check-valve to prevent the sudden outflow of the water when the vacuum breaks, said chamber being provided with a small drainage-aperture, substantially as set forth.

5. The combination, with the receiving-

chamber *a*, of the valve D, mounted therein over the inlet and provided with a drainage-aperture, *b*, substantially as set forth.

6. The combination, with a casing, A, divided by a partition, a^2, into two chambers, *a* and *a'*, of the discharging-cone I, screwed into the bottom of chamber *a'*, the casing K, formed integrally with cone G, provided with ports *c c* in its coned upper part and screwed onto the discharging-cone, the lifting-cone G, its upper end fitted into partition a^2, the valve L, mounted on cone G and casing K, and the combining-cone H, mounted on cone I within casing K, as set forth.

7. In an injector, the combination, with the shell divided by a partition into a receiving-chamber and an overflow-chamber for the water, of the lifting-cone, the combining-cone, and the discharging-cone arranged in said overflow-chamber, a casing, K, arranged in said overflow-chamber, and an automatically-operated valve, L, arranged in said overflow-chamber, said valve controlling a passage from the interior of said casing K to the overflow-chamber exterior thereto, as set forth.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

WILLIAM McELROY.
HENRY CONNETT.

Witnesses:
FRANK MOULIN,
JOHN CAPLINGER.