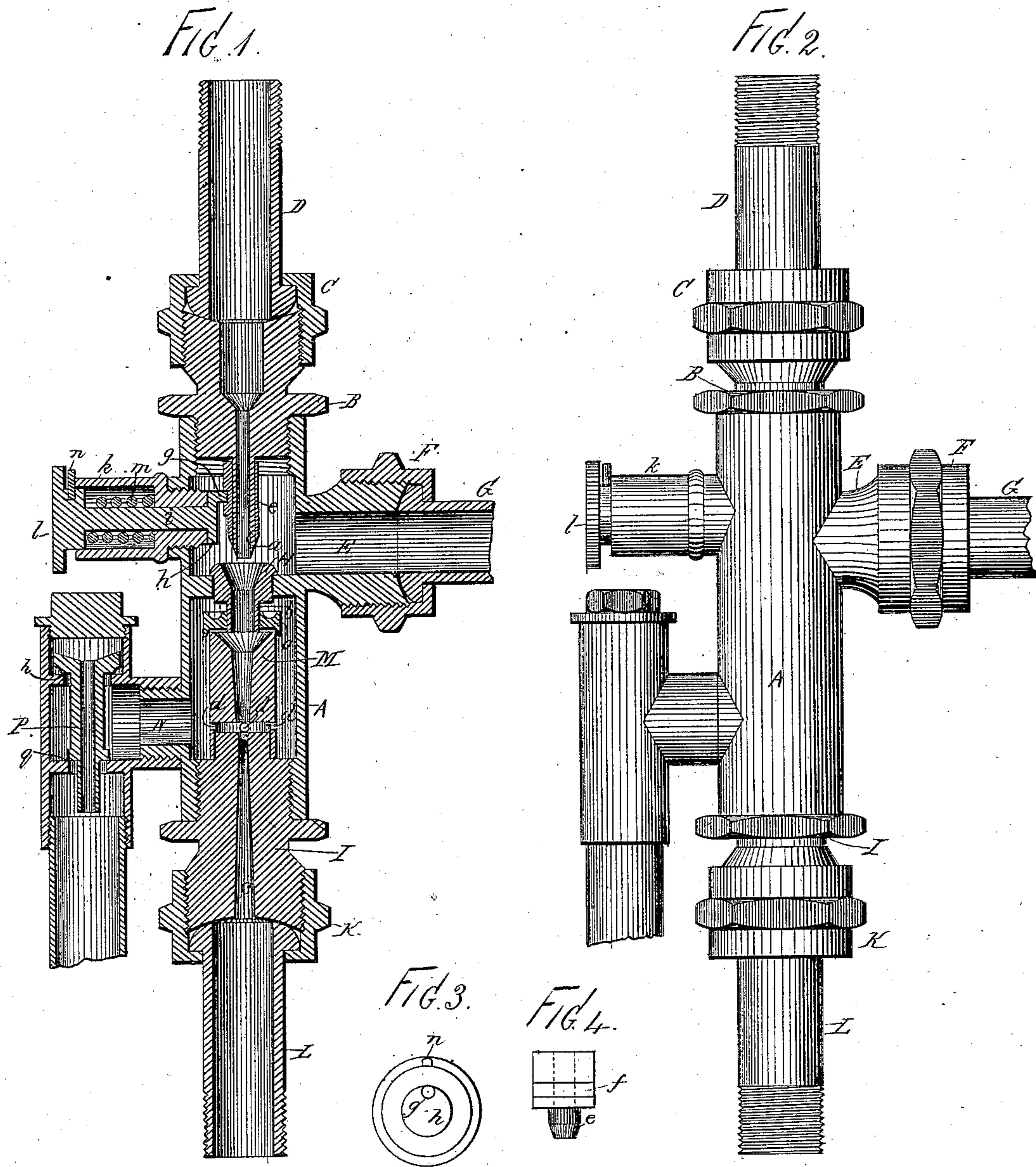


(Model.)

J. LOFTUS.
INJECTOR.

No. 300,092.

Patented June 10, 1884.



Witnesses:
John Buckler.
Henry Lieh.

John Loftus,
Inventor:
By North Ogden
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UNITED STATES PATENT OFFICE.

JOHN LOFTUS, OF ALBANY, NEW YORK, ASSIGNOR OF TWO-THIRDS TO
GEORGE W. RICHARDSON, OF BOSTON, MASSACHUSETTS.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 300,092, dated June 10, 1884.

Application filed September 11, 1883. (Model.)

To all whom it may concern.

Be it known that I, JOHN LOFTUS, of Albany, county of Albany, and State of New York, have invented certain new and useful Improvements
5 in Injectors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention has relation to that class of
10 devices employed for raising and forcing liquids or fluids, and ordinarily known as "injectors." These devices are most commonly used for feeding water to steam-boilers, but may be employed for any analogous purpose.

15 The object of my invention is to produce a simple, compact, durable, and efficient injector of few and simple parts, wherein steam may be employed economically to raise hot or cold water and deliver it in an unbroken current
20 at the desired point with certainty and rapidity of action, wherein the parts are not liable to become disarranged by any ordinary usage, which may be employed as a heater of feed-water or as an ejector of liquids or fluids, as
25 occasion may demand, wherein all the parts are easy of access, and wherein the quantity and pressure of the outgoing liquid or fluid and the quantity of the incoming water may be accurately controlled. To accomplish all
30 of this, my improvements involve certain novel and useful peculiarities of construction, relative arrangements or combinations of parts, and principles of operation, all of which will be herein first fully described, and then pointed
35 out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a central vertical section of an apparatus constructed and arranged for operation in accordance with my
40 invention, and Fig. 2 is an elevation or exterior view of the same. Fig. 3 is an end elevation of the crank employed for adjusting the regulating-nozzle applied upon the steam-inlet; and Fig. 4 is a front elevation of the
45 nozzle, showing the groove or slot therein for the reception of the crank-pin.

In all these figures like letters of reference, wherever they occur, indicate corresponding parts.

50 A is the shell or main body of the appa-

ratus, made of any suitable material, preferably of brass.

B is a plug threaded into the top of the shell, the same having a central perforation, and terminating in a stem, *a*, of small diameter, forming the inlet for steam. Upon the top of this
55 plug is a coupling, C D, of any character suitable for connecting with a steam-conduit.

E is the inlet for water, arranged to be coupled with a water-conduit by any suitable coupling,
60 as F G.

H is a cone, within which steam is projected from the inlet-tube, and this cone terminates in a small tube, *b*, called the "suction-tube."

I is the bottom plug, having a tapering opening therethrough, as shown at *c*, arranged to be coupled, as by the coupling K L, with any conduit leading to the point of delivery and constituting the delivery outlet or discharge
65 from the apparatus. Upon this plug is supported a short section of pipe M, reaching up to or nearly to the bottom of the suction-tube, perforated substantially as shown, and having overflow-outlet openings, as *d d*.

N is the overflow-outlet from the apparatus,
75 through which any excess of water is conducted away to any desired point.

At *e* is a regulating-nozzle, made to move up and down easily upon the steam-inlet *a*, and arranged to enlarge or contract the wa-
80 ter way or passage between the bottom of *a* and the top of the cone or the suction-tube. This nozzle is provided with a groove at one side, as at *f*, Fig. 4, in which groove rides a crank-pin, *g*, applied upon a flat disk, *h*, the latter
85 having a shaft, *i*, projecting through a plug, *k*, tapped through the side of the jacket or shell, and having a thumb-piece, *l*, by which it may be conveniently revolved. The disk *h* is pressed against its seat upon the inner end
90 of plug *k* by a suitable spring, *m*, so that at this point there can be no leakage of steam or water. By turning the thumb-piece *l* the nozzle *e* is raised or lowered, and the amount of water flowing into or from the apparatus thus
95 perfectly regulated. This means of adjusting the area of the water-inlet is simple, cheap, and not likely to get out of order.

Connected with the stem of the disk is an indicator-pin, *n*, in full view of the operator.
100

By noting the position of this pin the operator can readily determine the exact position of the regulating-nozzle within, and can thus accurately gage the supply of water to the apparatus.

5 *o* is a check-valve, made to move smoothly up and down upon the suction-pipe *b*, and resting at bottom upon the top of pipe *M*. When steam is turned on, it expands after escaping through the stem *a*, and, pressing upon the under side of valve *o*, will raise that valve, affording a free opening for the escape of steam into the chamber surrounding the combining-cone, from which chamber it passes off through the overflow outlet or passage. When the water is raised, the steam is condensed, so that the proper volume of steam and water is forced through the combining-cone, and at this time the valve will drop upon its seat upon the upper end of the combining-cone, so as to prevent entrance of water from the chamber surrounding the cone. Water finds admission to this surrounding chamber through the ordinary overflow-openings, *d d*, before the steam-pressure is sufficient to force the column of steam and liquid against the boiler-pressure; and if valve *o* did not close at the proper time, water would continue to circulate through the chamber and combining-cone without entering the boiler.

30 The suction-tube is shown as loosely mounted in its seat, so that when the valve *o* drops any excessive back-pressure in the chamber surrounding the combining-cone (which would result from an excessive overflow through *d d*) will cause this tube to rise, thus automatically contracting the area of the inlet for water, and consequently regulating the supply thereof to the apparatus, as may be required for its proper working. The top of the valve *o* is provided with two separate bearing faces or rings, as shown—one to abut against the narrow ledge on the suction-tube and the other to bear upon the stationary seat or guide for said tube. When the valve *o* is down, water-pressure upon the under side of the ledge upon the suction-tube will cause that tube to rise, as above explained. When the valve *o* is raised, as it is by steam-pressure, it closes against the stationary seat or guide for the suction-tube and also against said tube, thus preventing steam-pressure from raising the suction-tube to any such degree as to materially reduce the inflow of water, as will readily appear from a consideration of the construction shown. The suction-tube might be made stationary without interfering with the action of other parts.

60 Upon or in connection with the outlet is a check-valve, *P*, which should be made to stand vertical or nearly so, in order that it may operate by its own gravity. This has a seat, *p*, at top and a similar but smaller seat, *q*, at bottom, and will prevent outflow of liquid or fluid until displaced from its seat. Until the pressure of steam is sufficient to raise this

valve, (before which the apparatus will not force water,) steam cannot escape past it, and will therefore be compelled to enter the feed-pipe. This makes it convenient to employ the steam for heating the feed-water instead of wasting it through the overflow, as heretofore.

75 In many situations—as, for instance, upon locomotives—the injector is located below the level of water in the tank. In such cases the valve *P* operates also to automatically arrest the outflow of water from the tank through the injector when steam is shut off or the injector not in operation. The valve *P* has a central perforation and a hollow stem projecting slightly below the lower bearing-surface or seat, the purpose of which is to allow for an escape of any steam or water which may enter the chamber surrounding the top of the valve. This valve may be located at any convenient point in the overflow-pipe. When the current of steam and current of water are properly combined in the combining-tube, they are projected through the delivery-orifice, after the manner in steam-injectors now in use.

95 With the device above explained, instead of employing steam to raise and force water, it may force air or any liquid or fluid for any useful purpose; or any fluid or liquid under pressure may be employed for the motive agent and caused to move any other liquid or fluid. Instead of injecting liquids or fluids, the improved device may be employed primarily as an ejector—as, for instance, to exhaust any vessel of liquid or fluid.

105 The device constructed and arranged as above explained is found in practice to work well in connection with hot or cold water, not subject to breakage or interruptions of the column of water within the apparatus after the same is started, to start automatically after the supply has been interrupted, (as upon steam-vessels,) and generally to admirably answer the several purposes or objects of the invention, as previously stated.

115 Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an apparatus of the character herein set forth, the suction-pipe having the conical mouth or inlet and the cylindrical stem, the latter being provided with a movable valve, substantially as shown and described.

2. The steam-inlet pipe having the cylindrical stem, the movable nozzle applied thereon, means, substantially as explained, for raising and lowering said nozzle from the exterior of the apparatus, and the suction-pipe provided with a gravitating-valve, these several parts being arranged and combined substantially as shown and described.

3. In an injector, the hollow plug tapped through the wall or jacket, the nozzle, the disk carrying the crank-pin and mounted upon a shaft projecting through said plug, and a spring

for maintaining the disk in contact with the inner end of the plug, combined and arranged substantially as shown and described.

4. In combination with the shaft projecting
5 through the hollow plug upon the side of the injector, provided with a spring and carrying a disk and crank-pin for operating the regulating-nozzle, the indicator-pin projecting from said shaft, substantially as and for the purposes
10 set forth.

5. In an injector, the loose check-valve mounted upon the lower end of the suction-tube, and arranged to automatically close the space between the lower mouth of the said tube
15 and the upper mouth of the combining-cone, the parts being combined and arranged substantially as shown and described.

6. In an injector, the combining-cone having a check-valve resting upon its upper mouth
20 and overflow-outlets near its base, the same being combined with the suction-tube, delivery-tube, and overflow-tube, substantially as and for the purposes explained.

7. In an injector, the suction-tube arranged

to be adjusted automatically by back-pressure 25 upon its under surface, the same being combined with a check-valve and the combining-cone, substantially as and for the purposes set forth.

8. In combination with the overflow-tube of 30 an injector, an automatically-operating valve having the upper and lower seats, as explained, and adapted to operate, substantially as and for the purposes set forth.

9. The herein-described injector, having the 35 regulating-nozzle, means for operating the same, a check-valve applied upon the suction-tube, the combining-cone, delivery-tube, and overflow-tube provided with an automatically-operating valve, the whole arranged and com- 40 bined substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of two witnesses.

JOHN LOFTUS.

Witnesses:

JOHN BUCKLE,
WORTH OSGOOD.