

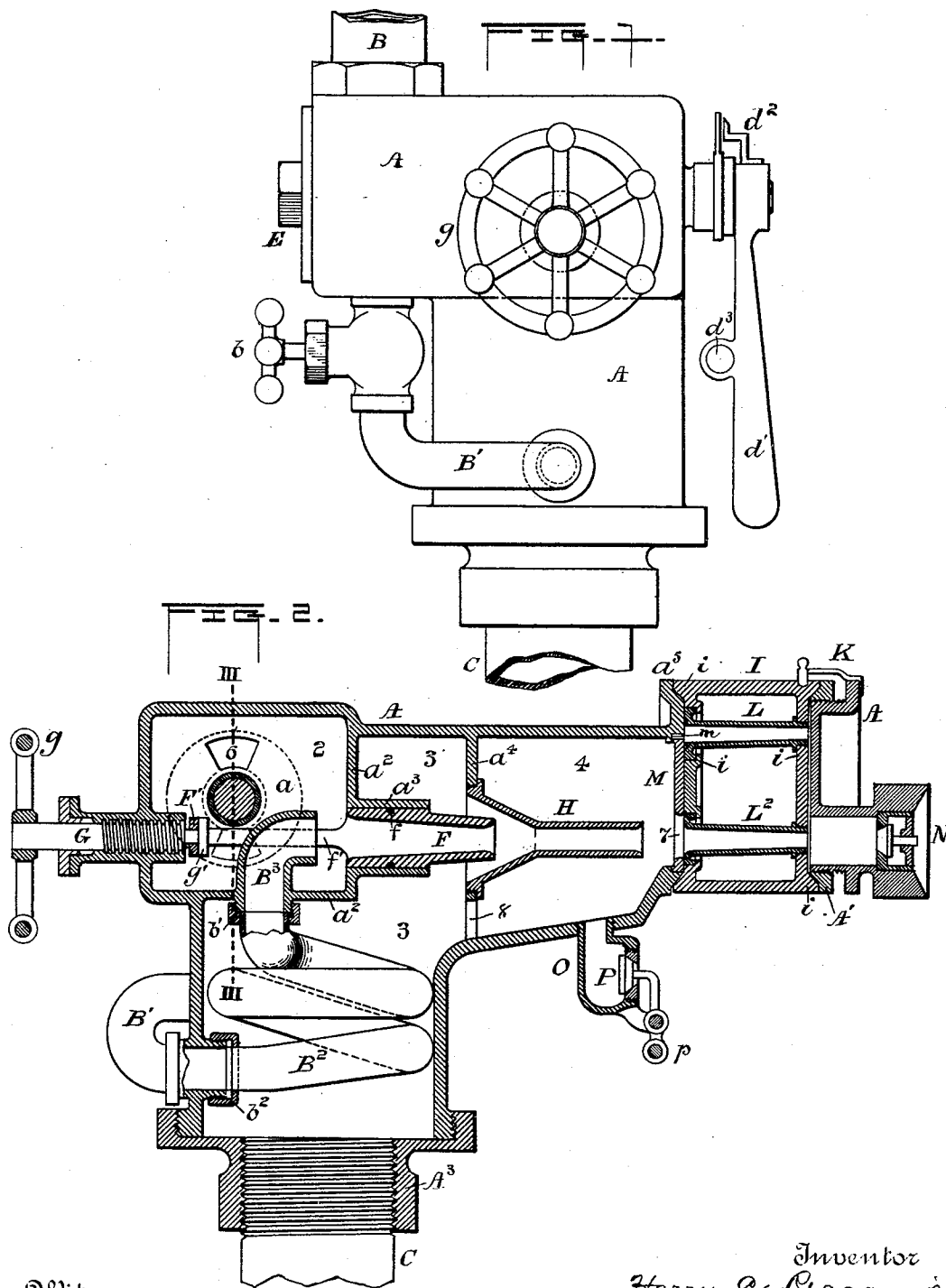
(Model.)

2 Sheets—Sheet 1.

H. C. REAGAN, Jr.
INJECTOR.

No. 480,784.

Patented Aug. 16, 1892.



Witnesses

L.A. Comm. Sec.
Chas. S. Sturtevant

Inventor

Harry C. Reagan, jr;
By J. P. Whitney
Attorney

(Model.)

2 Sheets—Sheet 2.

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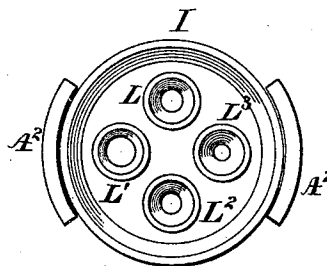
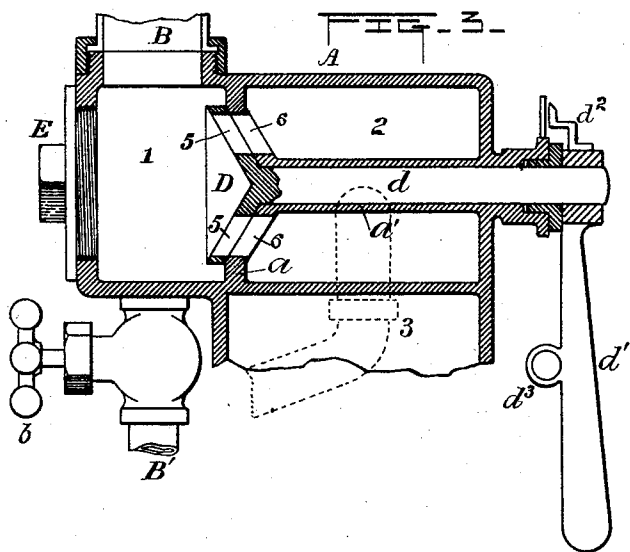


FIG. 4.

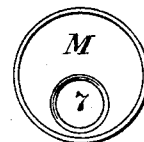


FIG. 5.

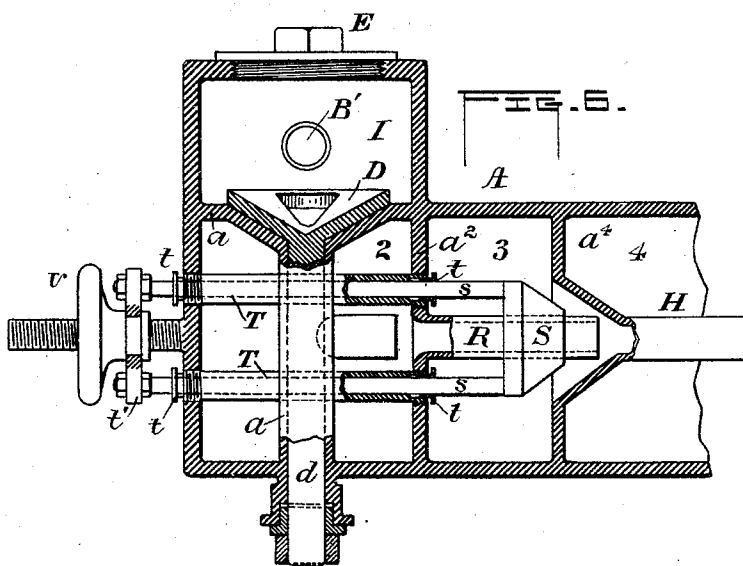


FIG. 6.

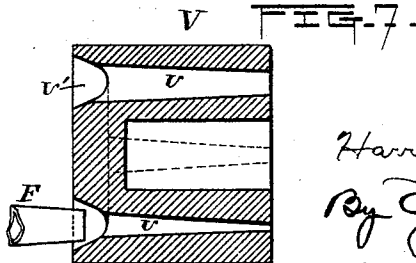


FIG. 7.

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UNITED STATES PATENT OFFICE.

HARRY CLIFTON REAGAN, JR., OF PHILADELPHIA, PENNSYLVANIA.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 480,784, dated August 16, 1892.

Application filed April 28, 1892. Serial No. 430,997. (Model.)

To all whom it may concern:

Be it known that I, HARRY CLIFTON REAGAN, Jr., a citizen of the United States, residing at West Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Injectors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to injectors; and its object is, first, to enable the capacity of the injector to be varied at will; second, to adapt it to force hot water into the boiler, and, finally, to improve certain details of construction.

I accomplish the first object by making the steam-nozzle adjustable, so as to control the water-supply, and also by providing a plurality of combining-tubes of different sizes arranged so that any one of them can be brought into operative position.

The second object is accomplished by cooling the steam just before it discharges into the water-space. It therefore has less heat to be absorbed by the water before it will condense, so that hot water is capable of condensing this cooled steam; but the steam loses none of its velocity and is able, therefore, to impart sufficient impetus to the water to force it into the boiler.

In the drawings, which show the most approved way of carrying my invention into effect, Figure 1 is a rear elevation. Fig. 2 is a longitudinal vertical section thereof. Fig. 3 is a vertical cross-section on line 3 3. Fig. 4 is a cross-section of the delivery-tubes. Fig. 5 shows the dash-plate. Fig. 6 is a horizontal cross-section of a modification. Fig. 7 illustrates a modified form of combining-tube. Fig. 8 is a plan view of the yoke and arms for moving the steam-nozzle.

The body A is divided internally by partitions into four chambers 1 2 3 4. The steam-pipe B enters the chamber 1 and the water-pipe C enters the chamber 3. The steam-valve D is conical and is tightly held by the steam-pressure against a conical seat formed in the partition *a* between the chambers 1 and

2. The valve and seat are provided with ports 5 6, respectively, which can be made to register or not by turning the valve-spindle *d*, which is inclosed in a sleeve *a'*, extending from the partition *a* to the end of the chamber 2. The valve-spindle projects outside of the body A and is provided with a handle *d'* and an index *d''*, as usual. The end of the chamber 1 opposite the valve D is closed by a screw-plug E, which affords ready access to the valve and valve-seat.

In the partition *a*² between the chambers 2 and 3 is an opening surrounded by a cylindrical neck *a*³, extending into the chamber 3. In this neck slides the steam-nozzle F, provided with a packing-ring *f*, sprung into a groove. The nozzle is operated by a screw-stem G, which meshes into a threaded boss in the end of the chamber 2 and has a hand-wheel *g* outside the injector. The inner end of the stem has a head *g'*, which engages a yoke or bail F', connected with the nozzle F by arms *f'*.

The combining-tube H is secured in the partition *a*⁴ between the chambers 3 and 4. It is funnel-shaped, as shown, and the nozzle F extends into its flaring mouth. By shifting the nozzle the annular space between it and the combining-tube is varied, thus varying the quantity of water passing into the combining-tube.

The delivery-tubes are several in number and all of different sizes. They are grouped in a cylindrical revoluble barrel I, which has at each end a beveled flange *i*, bearing at one end upon a similar flange *a*⁵, formed upon the body A, and at the other end upon a beveled ring A', screwing upon a threaded portion of the body A, whereby it can be adjusted to take up the wear of the flanges *i*. The body A is cut away at the point where the barrel I is inserted, leaving wings A² connecting the front end of the body with the main portion thereof and exposing the barrel to enable it to be manipulated.

A spring-detent K holds the barrel when adjusted. I have shown a barrel provided with four delivery-tubes L L' L² L³; but any number may be used. The barrel is hollow for the sake of lightness, and the tubes are screwed into holes provided for them in the ends of the barrel, having shoulders *l* to bear

against said ends. A dash-plate M is fitted into a seat in the body A, adjacent to the barrel, and is held stationary by a pin *m*. In the lower part of the dash-plate is a hole 7 in line with the combining-tube H and the lowest delivery-tube, the ends of the other tubes being covered.

The delivery-pipe is provided with the usual check-valve N. The chamber 4 has an overflow-pipe O, leading out of it, provided with an inwardly-opening valve P, fastened to a lever *p*, the end of which is connected by a rod (not shown) with the eye *d*³ on the handle *d'*, so that the opening of the steam-valve D will close the overflow-valve P. The partition *a*⁴ may have an opening 8 to permit the surplus water to run back into chamber 3 and be taken up again.

When it is desired to feed hot water, the steam is caused to pass through a pipe arranged in such a manner that it is in contact with the water. This may be accomplished in a variety of ways, such as by the use of concentric pipes; but I prefer the arrangement shown, in which the steam-pipe B', leading from the source of steam-supply and controlled by a valve *b*, enters the lower part of the chamber 3, where it is formed into a coil B² to expose a greater surface to the water, and then passes up into the chamber 2, terminating in a spout B³, opposite to the inner end of the steam-nozzle F. The steam entering the pipe B' at the temperature due to the boiler-pressure is cooled by the water surrounding the coil B² to a point where it is readily condensed by warm or hot water, but without losing its velocity or the efficiency due to said velocity for forcing the water into the boiler. The coil B² is removable, being coupled to the lower end of the spout B³ (which may be cast integral with the partition *a*²) by means of the flanged ring *b*¹ and by a similar ring *b*² to a threaded neck formed integral with the wall of the chamber 3 at the point where the pipe B' enters. The wide-mouthed coupling A³ permits the coil B² to be removed when the injector is to be used for cold water only; or in such case the injector may be made without the pipe B', coil B², and spout B³.

In the modification shown in Fig. 6 the movable steam-nozzle is dispensed with and a fixed nozzle R is used. Surrounding and sliding upon this nozzle is a frusto-conical valve S, whose surface is parallel with the flaring mouth of the combining-tube H, so as to form therewith a throttle-valve for the water. The valve S is operated by two rods *s*, which pass through stuffing-boxes *t* at the ends of the tubes T, which extend from the chamber 3 through the chamber 2 to the outside of the body A, where they connect with a yoke *t'*, swiveled upon a nut U, which can be traversed along a fixed screw-stud *u*, and thereby draw the valve S back and forth on the nozzle R.

In some cases it may be desirable to vary the size of the combining-tube, in which event

the modification shown in Fig. 7 is applicable. The barrel V contains several passages *v*, opening at one end into an annular groove *v'*, in which is received the end of the steam-nozzle F or R. The passages *v* are of different diameters, and one or another of them can be brought into line with the nozzle F by rotating the barrel.

It will be seen that my injector provides in several ways for varying the quantity of water to be delivered and is capable of very nice adjustment to its work.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an injector having the chambers 1 and 2, a conical-ported seat *a* between the chambers 1 and 2, a conical steam-valve D, fitting said seat and having ports, a stem for rotating said valve, and a sleeve *a'*, extending across the chamber 2 and inclosing said stem, substantially as described.

2. The combination, with the body A, having the partition *a*² and neck *a*³, of the sliding nozzle F, having a packing-ring *f* and arms *f'*, a yoke F', a screw-stem G, swiveled to said yoke, a steam-supply pipe located between the arms *f'*, and a combining-tube having a flaring mouth receiving the end of the nozzle, substantially as described.

3. In an injector, the barrel V, containing several combining-tubes *v* of different sizes, all opening into an annular groove *v'*, which receives the end of the steam-nozzle, substantially as described.

4. In an injector, the combination, with the body having a beveled flange *a*⁵, of a rotatable barrel having beveled flanges *i*, an adjustable beveled ring A' for taking up the wear on said flanges, and a plurality of delivery-tubes of different sizes carried by said barrel, substantially as described.

5. In an injector, the body A, cut away at one end to leave the wings A², and a rotatable barrel carrying delivery-tubes of different sizes, mounted between said wings A², substantially as described.

6. In an injector, the combination, with the body A, of the rotatable barrel carrying a plurality of delivery-tubes, a detent for holding said barrel when adjusted, and a dash-plate covering the inner ends of all of said tubes except the one in line with the combining-tube, substantially as described.

7. In an injector, the combination, with the body A, of the stationary dash-plate M, having an aperture 7, and the rotatable barrel I, carrying the removable delivery-tubes L, substantially as described.

8. An injector for forcing hot water, having its steam-pipe exposed for a portion of its length to the incoming water, whereby the temperature of the steam is lowered, substantially as described.

9. An injector for forcing hot water, having a part of its steam-pipe coiled in the water-chamber, substantially as described.

10. The combination, with the body A, having the chambers 1, 2, and 3, of a steam-pipe entering the chamber 1 and an auxiliary steam-pipe connected with said chamber and passing through the chamber 3 into the chamber 2, substantially as described.

11. The combination, with the body A, having the chambers 2 and 3, of a steam-pipe coiled in the chamber 3 and entering the chamber 2, said coiled portion being removable, substantially as described.

12. The combination, with the body A, having the chambers 1, 2, and 3, of the steam-pipe

B, entering the chamber 1, the steam-valve D between the chambers 1 and 2, the auxiliary steam-pipe B', containing the removable coil B², arranged in the chamber 3, and the cap A³ for giving access to the coil B², substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HARRY CLIFTON REAGAN, JR.

Witnesses:

A. L. MULHERN,
JOSEPH THOMASSON.