2 Sheets—Sheet 1.

J. PROEGER.

INJECTOR.

No. 182,225.

Patented Sept. 12, 1876.

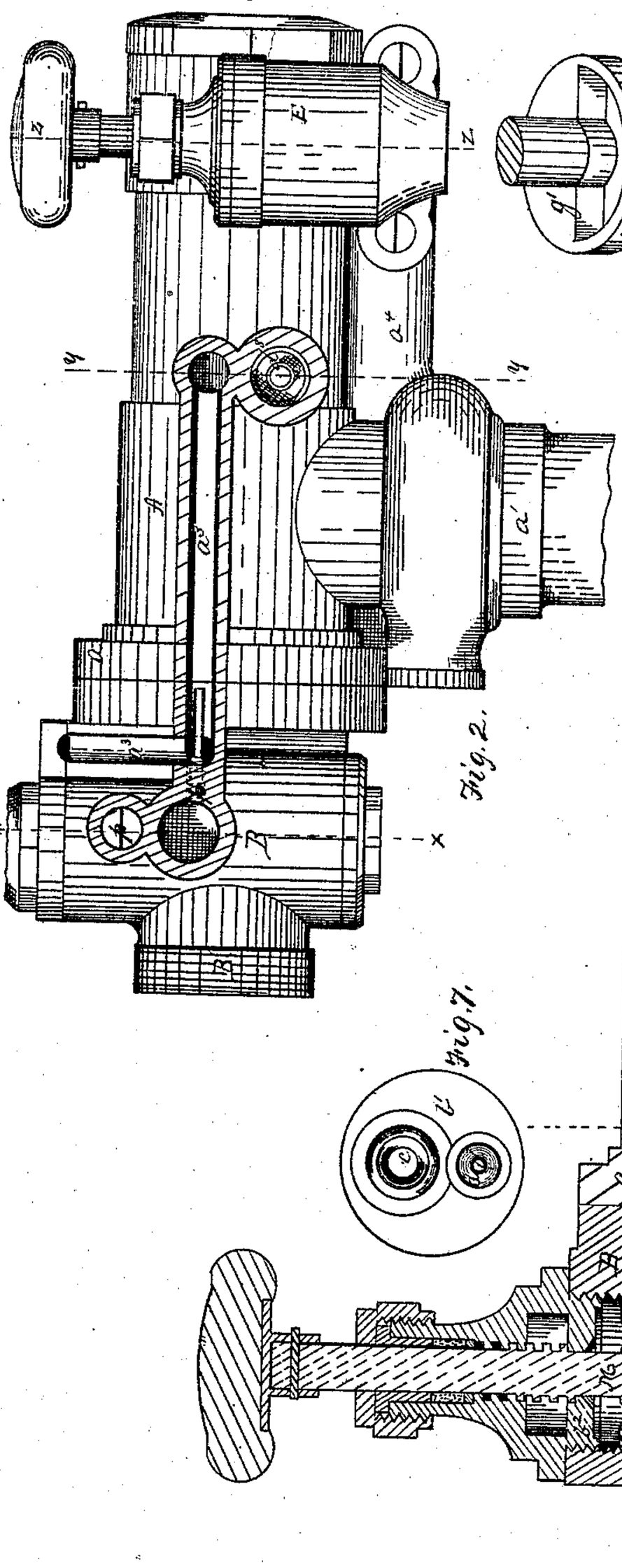

Fig. 2.

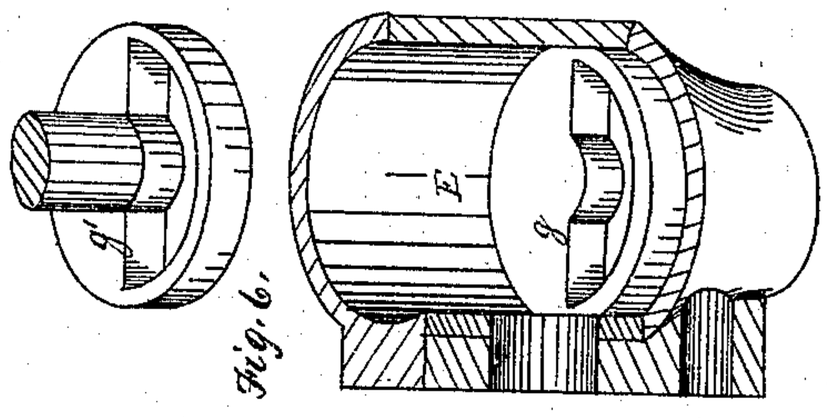

Fig. 6.

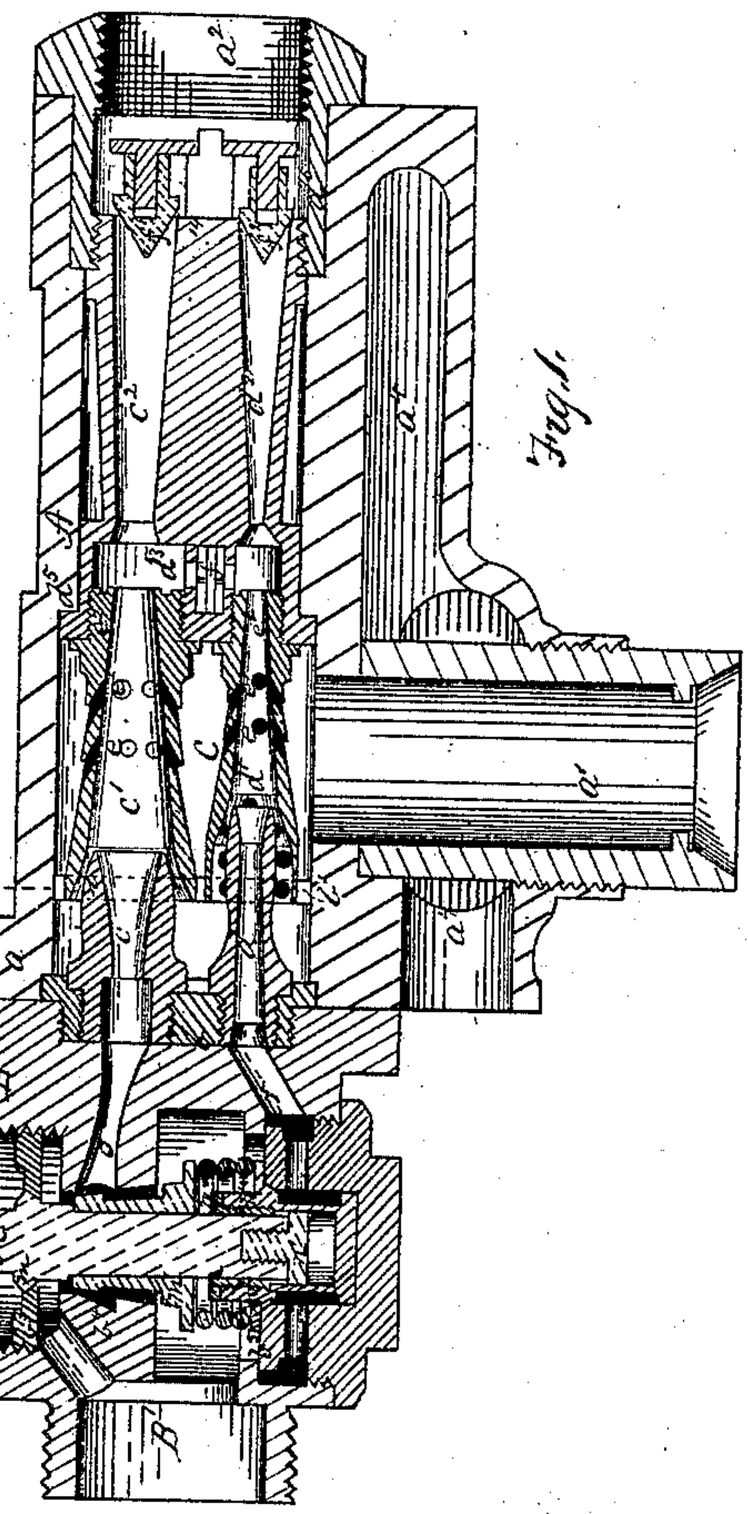

Fig. 1.

Fig. 7.

WITNESSES.

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2 Sheets—Sheet 2.

J. PROEGER.

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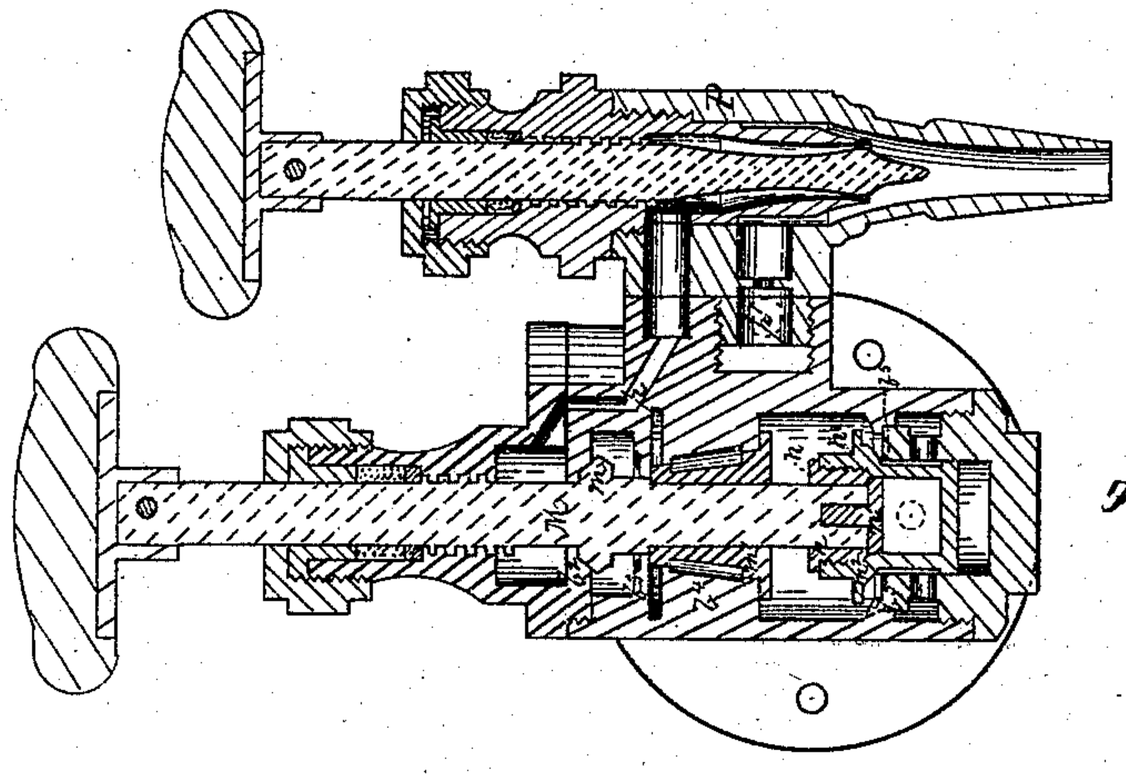

Fig. 3.

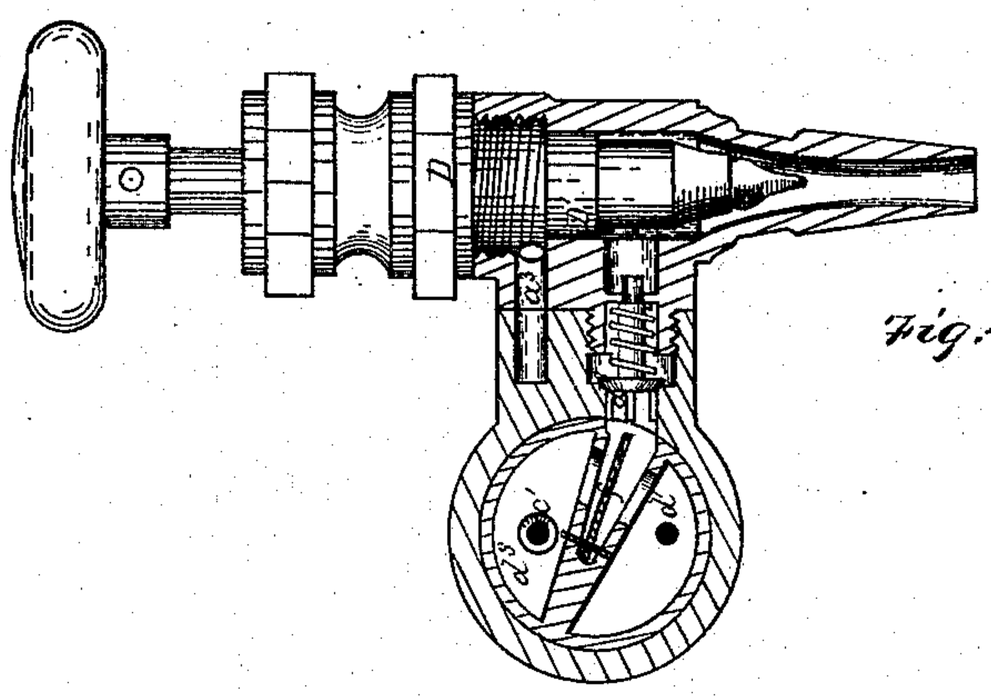

Fig. 4.

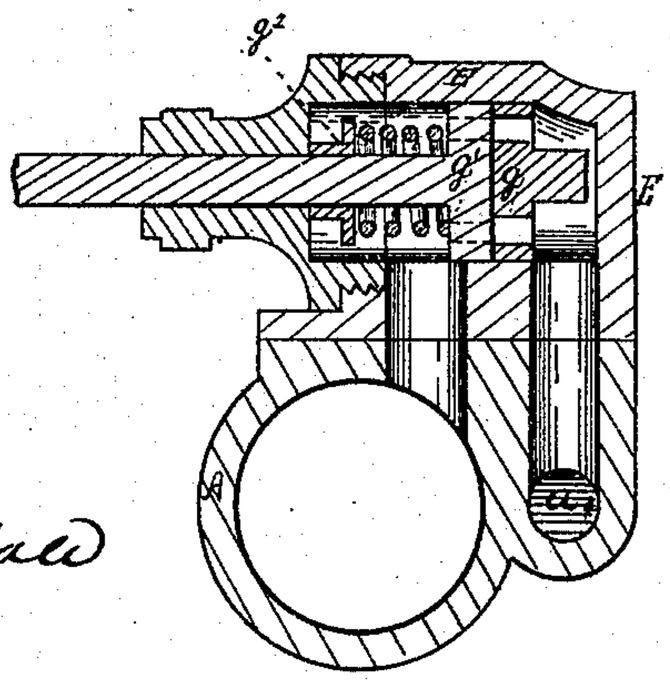

Fig. 5.

WITNESSES.

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UNITED STATES PATENT OFFICE.

JULIUS PROEGER, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **182,225**, dated September 12, 1876; application filed August 7, 1876.

To all whom it may concern:

Be it known that I, JULIUS PROEGER, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Injectors; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a longitudinal section of an injector embodying my improvements. Fig. 2 is an elevation, partly in section, showing the steam-port of the overflow. Fig. 3 is a transverse section on the line *x x*, Fig. 2. Fig. 4 is a similar section on the line *y y*, Fig. 2. Fig. 5 is a transverse section on the line *z z*. Fig. 6 is a detached view of the valve located on the feed-water-return pipe. Fig. 7 is a detached elevation of the guide-plate of the jet and combining tubes.

Like letters refer to like parts wherever they occur.

My invention relates to the construction and operation of injectors for raising and feeding water to steam-boilers, and for like purposes; and consists, first, in combining with a single head, two receiving, combining, and delivery tubes, of different capacities, so that the feed may be varied at pleasure without breaking the jet or otherwise deranging the action of the injector; secondly, in combining with an injector-head, having two receiving tubes or jets of different capacity, a valve-chamber provided with two delivery-ports, and two valves for guarding the same, whereby either receiving-tube may be employed at the will of the operator; thirdly, in perforating the combining-tube so as to insure an additional supply of water to, and the regular working of, the jet; fourthly, in forming the steam-port of the overflow in one with the head or main casting; fifthly, in the interposition of automatic valves between the combining-tubes and between the delivery tubes, so as to close the combining and delivery tubes not in use; sixthly, in arranging the overflow upon the side of the valve-chest and taking the steam directly therefrom; and, finally, in details of construction hereinafter more specifically set forth.

I will now proceed to describe my invention so that others skilled in the art to which it appertains may apply the same.

A indicates the injector-head or main casting, flanged as at *a*, or bushed for the attachment of valve chamber B, and provided with the usual water inlet and exit orifices a^1 a^2. In making and finishing this main casting or head, I form the steam-port a^3 of the overflow in one with the casting, continuing it through the same, so as to connect with the valve-chamber B; and I also form the feed-water-return passage a^4 in like manner, except as to connecting it with the valve-chamber, thus avoiding a series of independent pipes liable to become injured, and obtaining a compact head, A. *c d* represent two steam-jets or receiving-tubes secured in the head *b* of the valve-chamber, and projecting through a guide-plate or disk, b^1, likewise secured to head *b*. This guide-plate b^1 serves to center the jets or receiving-tubes *c d* with their respective combining-tubes, when the several parts of the injector are being put together. The steam-jets or receiving-tubes are of different sizes, the proportionate size being regulated by the variation in work required, and each is provided with its corresponding combining-tube and delivery-tube c^1 c^2 and d^1 d^2.

The forward end of the steam-jet is rounded or convex, as shown at *i*, and the receiving end or mouth of the combining-tube is formed with a reverse convexity or curve, so that when the jet and combining-tube are in position the water-way is constricted only at one point, and widens both ways therefrom. This construction reduces the friction and enables the combining-tube to take water more easily. The delivery-tubes d^1 d^2 are preferably formed in a single casting, as shown, with two heads, d^3 d^4, one of which, d^3, is flanged to seat upon a shoulder, d^5, formed in the head or main casting A, and the other, d^4, threaded to engage with a threaded sleeve or nut, d^6, by which the casting is drawn up to shoulder d^5 and held in position. The combining-tubes c^1 d^1, which are arranged in the water-chamber C, and, as before specified, correspond in size to their respective nozzles, are perforated at one or more points, *e* e^1, forward of the jet, so that, should the combining-tube fail from any cause to take sufficient water at the mouth,

an additional supply will enter through the perforations, and insure the perfect action of the injector. Tubes c^1 d^1 are threaded at their extremities, as shown at e^2, and are secured in position by screwing into the head d^3. In the head d^3, and between the extremities of the combining-tubes c^1 d^1, is a small passage leading to the overflow and guarded by a flap or other automatic valve, f, so arranged that it is seated by pressure upon either side. This valve serves to close the connection between the idle connecting-tube and the overflow, and between the two combining-tubes. In order to close the idle delivery-tube, valves f^1 f^2, having a similar function, are attached to the head d^4, and may be the usual flap, or, preferably, a sliding conical sleeve-valve, with a guide-pin, as shown in the drawing. D is the overflow-nozzle, provided with the usual check-valve d^8, controlled by a suitable spring. Within this nozzle is arranged the annular steam-nozzle or jet D′, which receives steam from the valve chest or chamber B through port a^3. The nozzle D′ is provided with the ordinary steam-plug, by means of which the steam to the nozzle may be cut off at pleasure.

E represents the chamber of the valve which controls the feed-water-return pipe. Said chamber is divided by a slotted diaphragm, g, below which is the orifice of the return-pipe and above which the valve-chamber connects with the feed-water-discharge pipe. This diaphragm g forms the seat of a valve or gate, g^1, similarly slotted and provided with a stem upon which is a loose sleeve, g^2, between which and valve g^1 is a coiled spring that forces the upper flange of the sleeve against the cap of the valve box or chamber, and forms an effective packing.

In order to control the supply of steam to the two steam-jets or receiving-tubes c d, and to the steam-jet of the overflow-nozzle D, a series of valves are required, which I shall next describe. The steam-chest or valve-chamber B is provided with a single steam-inlet, B′, and is divided by a series of partitions, b^2 b^3 b^4 b^5, through which are openings ground or otherwise finished to form seats for a series of valves, m m^1 m^2, arranged upon a common stem, M.

The upper valve m may be formed on the stem; but the middle valve m^1 is usually slipped loosely upon the stem and held up by a coiled spring which bears against the lower valve m^2, the latter being loosely attached to the stem by screw-sleeve n and screw n'. This construction permits the valve-stem M to move or rise through the valve m^1 when the stem is raised to open the valve m^2, while the spring retains the valve m^1 upon its seat; and it likewise takes up the slack and leaves room for end play between the stem and valve m^2, so that the stem can be turned down to force valve m^1 off its seat without jamming the lower valve.

The upper valve m has two seats and controls the port a^3 leading from the steam-chest or valve-chamber to the overflow-nozzle D. The middle valve m^1 controls port o, which conducts the steam to the larger jet or receiving-tube c, while the lower valve controls the port r, which supplies the smaller jet d.

I have shown and described, in connection with the above, an overflow-nozzle located in the usual position, and operated in the usual manner; but before proceeding to describe the operation of my devices, I wish to describe a preferred arrangement of the overflow-nozzle, which is illustrated in Fig. 3 of the drawing. P indicates said overflow-nozzle, provided with the annular steam-jet and plug, as usual. This I attach to the side of valve-box B, and take steam directly from the valve chest or box through a port, p. I close the connection of port a^3 with the valve-chest B, and connect said port directly with the overflow-nozzle P, as at p'. The usual check-valve may retain its former position, or may be attached to nozzle P. The advantages derived from this change of location are that the operator has it continually under his control and in sight, can manipulate it readily in starting the injector, and can always detect any defect in the action of the injector.

The operation of my devices is as follows: Steam having been admitted to valve-chamber B, the stem M is manipulated so as to throw valve m off of its seats and permit the steam to pass through port a^3 to the steam-jet of the overflow-nozzle D, thus creating a vacuum in the injector, and lifting the water into chamber C. As soon as this is accomplished the stem M is further manipulated to open one of the ports leading to the steam-jets or receiving-tubes. If a large supply of feed-water is required the stem M is turned down so that the collar thereon forces valve m^1 down off its seat, at the same time closing port a^3, and the steam passes through port o to the jet c, following the expansions and contractions of the jet, and forces the water through combining-tube c^1 and delivery-tube c^2 into the feed-water pipe. Owing to the form of the mouth of the combining-tube and the jet (both of which are clearly shown in the drawing, and are deemed important) the friction of both steam and water currents will be reduced to the minimum, thus facilitating the establishing and maintenance of a full stream of water; but if from any cause a deficient supply of water enters the receiving end of the combining-tube, any derangement in the action of the injector will be corrected by the additional supply of water entering through perforations e of the combining-tube.

The pressure of the water passing through the combining-tube c will force the automatic valve f over against its seat upon the smaller combining-tubes, and thus close the connection between the combining-tubes without disturbing the direct communication with the overflow-nozzle. The pressure, acting in a similar manner upon valve f^2, will close the end of the idle delivery-tube d^2.

If a supply of feed-water equal only to the capacity of the smaller jet and combining-tube is required, then the valve-stem M is raised so as to first lift the valve m off its lower seat, and permit the steam to pass through port a^3 to the overflow-nozzle D, so as to sustain the column of water in the injector during the changing of the valves. By continuing to raise the stem M the valve m^1 is allowed to seat itself, closing port o, and the valve m^2 is lifted off its seat, unclosing port r, and admitting a supply of steam to the steam-jet or receiving-tube d. By the time valve m^2 is fully open, valve m will have closed port a^3 by coming in contact with its upper seat. The further action of the injector (or tubes d d^1 d^2) is the same as that specified above for the larger series c c^1 c^2, and need not, therefore, be repeated. When it is necessary to use a volume of the supply-water intermediate to the supply of the two jets, &c., the larger series c c^1 c^2 are used, and the valve g^1 or gate of chamber E is turned so as to open so much of the slot in diaphragm g as will permit the escape of the surplus water by the return feed-water passage a^4, from which it is returned to the tender or other source of supply.

Where the overflow-nozzle is attached to and takes steam direct from chest B the operation will be as follows: When the steam causes a vacuum in the injector the water will flow from the injector through port a^3 of the main casting, which port is then simply a waste-water tube.

Among the advantages of my improvement are that the volume of feed-water may be varied through a great range without interfering with the perfect action of the injector, and any irregularity in the action of the injector can be quickly detected and remedied.

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

1. An injector provided with two jets or receiving-tubes and two combining and delivery tubes, substantially as and for the purpose specified.

2. The combination, in an injector, of two jets or receiving-tubes with a valve-chamber having suitable ports and two valves for controlling the admission of steam to the jets, substantially as specified.

3. In an injector, the combination of the two jets or receiving-tubes and the overflow-steam jet, with the three valves arranged upon a common stem, and suitable valve-seats and ports, substantially as and for the purpose specified.

4. In an injector, the combination of the independent guide plate or disk b^1 with the jet or receiving-tube and the combining-tube, substantially as and for the purpose specified.

5. The perforated combining-tube, substantially as and for the purpose specified.

6. The combination of the automatic valve with the two combining-tubes and the overflow-port, substantially as and for the purpose specified.

7. In an injector, the combination of the automatic valves f f^1 f^2 with the delivery-tubes, substantially as and for the purpose specified.

8. In an injector, the case or casting, having the port of a^3 formed therein, substantially as and for the purpose specified.

9. The combination of the jet or receiving-tube, having the rounded or convex nose, with the combining-tube, having the convex lip, substantially as and for the purpose set forth.

10. In combination with an injector the overflow-nozzle, arranged upon the valve-chest, and taking its steam directly therefrom, substantially as and for the purpose specified.

In testimony whereof I, the said JULIUS PROEGER, have hereunto set my hand.

JULIUS PROEGER.

Witnesses:

JAMES I. KAY,

F. W. RITTER, Jr.