J. PROEGER.

INJECTOR

No. 189,259. Patented April 3, 1877.

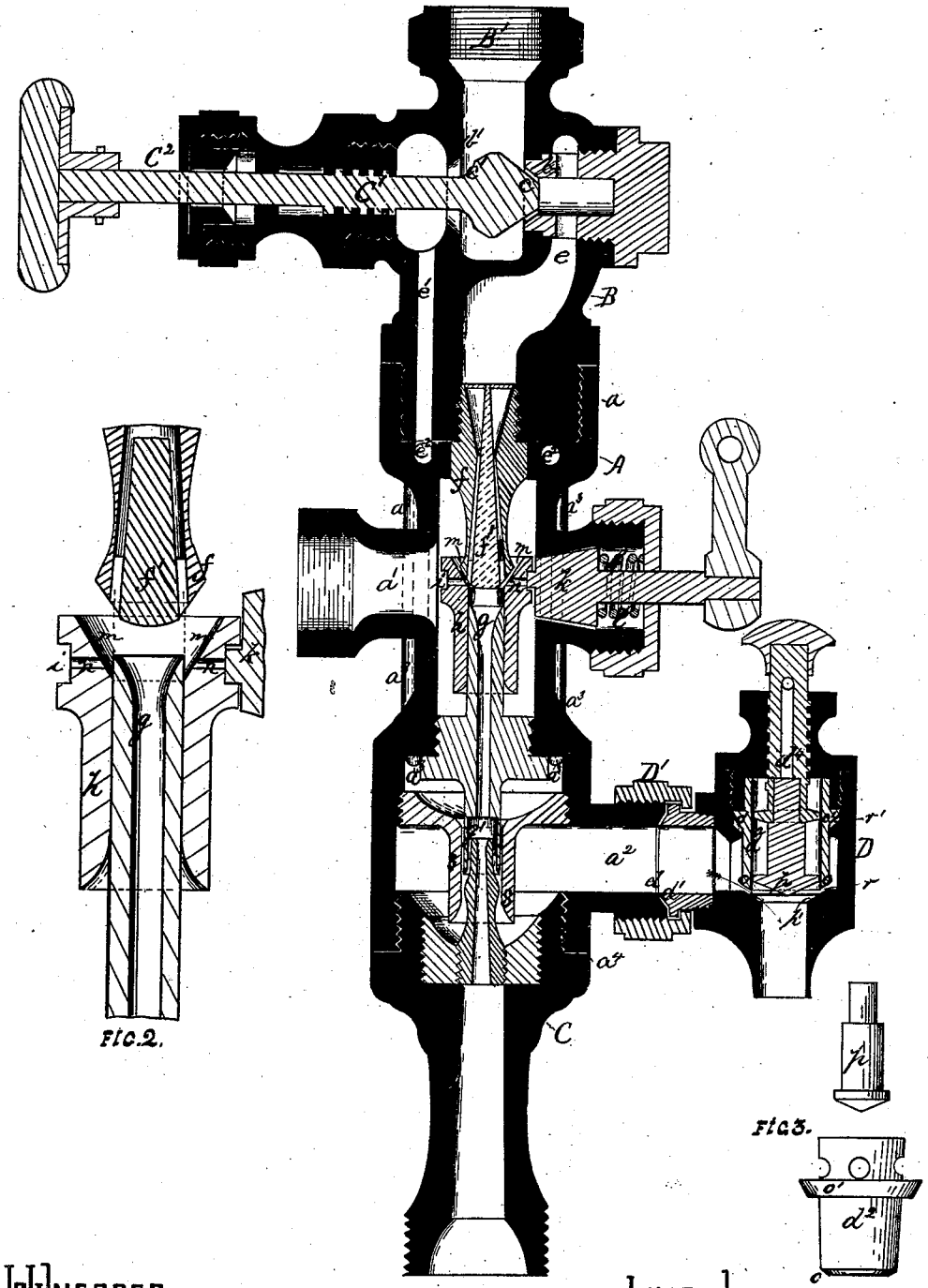

FIG. 2.

FIG. 1.

FIG. 3.

WITNESSES.

J. K. Smith

F. M. Reese.

INVENTOR.

Julius Proeger,

by Bakewell & Kerr

Atty's

# UNITED STATES PATENT OFFICE.

JULIUS PROEGER, OF PITTSBURG, PENNSYLVANIA.

## IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **189,259**, dated April 3, 1877; application filed March 10, 1877.

*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 drawings, forming part of this specification, in which—

Figure 1 is a longitudinal central section of an injector embodying my improvements. Fig. 2 is a detached enlarged view of the jet, combining-tube, and reducing-cylinder. Fig. 3 is a detached view of the valve of the overflow-nozzle.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of injectors, for feeding water to steam-boilers, and for like purposes wherever injectors are employed.

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

A is the injector-head or main casting, either flanged or tapped, as at *a*, for the attachment of the valve-chamber B, and also as at $a^4$, for the attachment of the delivery-tube C, provided with the usual water-inlet and overflow-exits, $a^1$ $a^2$, and having the steam passage or passages $a^3$ of the overflow formed in the casting and continuing through the same, so as to connect with the valve-chamber B, the last-named construction being a feature of a former patent to me.

B is the valve-chamber or steam-chest, provided with the steam-inlet $B^1$, and divided by partitions *b* $b^1$, through which are openings, ground or otherwise finished, to form seats for valves *c* $c^1$, secured to or formed on a common stem, $C^1$, which works through a stuffing-box, $C^2$, on the steam-chest or valve-chamber B. The valve *c* controls the port or passage *e*, which conducts steam to the jet, while the valve $c^1$ controls a passage, $e^1$, which connects, by an annular or other passage, $e^2$, with the passages $a^3$ of the overflow.

Secured to the valve-chamber or steam-chest B, and projecting into the main casting or injector-head A, is a steam-jet, *f*, preferably formed with a central cone, $f^1$, so as to obtain an annular discharge-orifice. *g* is the combining-tube, arranged within the head A, and secured thereto by a thread tapped in the casting. The combining-tube *g* is extended somewhat at its discharge end, and cupped, as at $g^1$, to receive the end of the delivery-tube C, and to form therewith an annular water-way or channel, which connects with the overflow. Surrounding the discharging end of the combining-tube and the receiving end of the delivery-tube, and projecting into the overflow port or channel, is a steam nozzle or jet, *s*, secured in the main casting in like manner to the combining-tube. This jet receives steam from the chest B through the port or ports $a^3$, and forms, with the combining-tube, &c., a lift which will act as effectually with hot feed-water as with cold.

When the injector (jet and combining tube) is used as a lift, it becomes necessary to reduce the capacity of the inlet between the jet and combining-tube or the water-way; but in order to work effectively, it is also desirable to reduce the size of the jet. For the above purpose a reducing-cylinder, *h*, having an annular recess, *i*, is slipped upon the receiving end of the combining-tube, and is made adjustable by means of the eccentric *k* or other suitable means. When the eccentric is employed, it may be held against the sleeve or reducer by means of a spiral spring, *l*, as shown.

The reducing-cylinder *h* is formed with a bell or funnel mouth, *m*, so shaped and arranged, relatively to the jet *f*, that when the bell-mouth *m* of the cylinder is pushed against the jet it will reduce the steam-exit one-half, one-third, or other desired amount, as indicated by dotted line, Fig. 2; and in order to admit the water to the combining-tube when *h* is in the position specified, the reducing-cylinder is perforated, as at *n*. By the above or equivalent means I am enabled to reduce the amount of water entering the combining-tube, while retaining the full jet, or to reduce both jet and water-supply, at pleasure. The delivery-tube C is of the usual form, with the exception that, in order to obtain the best results, I taper the receiving end, and extend it within the cupped end of the combining-tube and its jet.

D indicates the overflow-nozzle, which I se-

cure to the main casting or injector-head by a swivel-nut, $D^1$, the parts $d$ $d^1$ being ground to fit closely, so that by loosening the said nut the nozzle may be changed to any desired position, according as the injector is placed vertically or horizontally.

Within the overflow-nozzle is the valve $d^2$, the same being a hollow cylinder, beveled at two or more points, $o$ $o^1$, and ground to fit seats $r$ $r^1$, one above and the other below the overflow-port, the pressure which lifts the valve being exerted below the upper seat, and the discharge being direct, as indicated by arrow, and not tortuous, as is common. In order to close the nozzle, when the injector steam is to be forced back into the feed-water tank, a stem, $d^4$, passes centrally of the nozzle D and cylindrical valve $d^2$, and is furnished at its lower end with a valve, $p$, which has its seat $p^1$ in the nozzle below those of the cylindrical valve, which provision enables the overflow to be closed without forcing the cylindrical valve upon its seat, and without liability of defacing or injuring said valve.

For the purposes of the hollow cylindrical valve the stem $d^4$ may be solid, and the valve $p$ formed thereon; but as it is sometimes desirable in non-lifting injectors to change the overflow-valve, (shown for a central sleeve and poppet-valve,) I preferably form the stem $d^4$ and valve $p$ in two pieces, the upper being hollow, or having a port passing through it, and the lower being detachable, for reasons that will hereinafter appear.

In cases where the injector draws its feed-water from a head, or is a non-lifting injector, the construction of the valve of the overflow may be varied by fitting within the nozzle a hollow cylinder or sleeve, whose upper end serves as a seat for a disk or poppet valve, the hollow cylinder serving as the discharge-tube. When such a valve is to be substituted for the valve first mentioned the valve $p$ is detached from stem $d^4$, and cylindrical valve $d^2$ is replaced by the sleeve and disk. The port through stem $d^4$ will relieve the disk-valve of pressure, so that it can act freely, and when the overflow-nozzle is to be closed the same can be accomplished by screwing down stem $d^4$ until it forces the disk upon its seat. Instead of the hollow stem $d^4$ a port may be made in the nozzle above the disk for use with the last-named valve.

The operation of my devices is as follows: Steam is admitted to valve-chamber B, and the stem $C^1$ manipulated to uncover port $e^1$ and permit the steam to pass by passage $a^3$ to jet $s$, surrounding the adjacent ends of combining and delivery tube, thus creating a vacuum in the injector and lifting the feed-water, either hot or cold. When the water appears at the overflow-nozzle, indicating that the injector is full, the valve-stem $C^1$ is manipulated so as to close passage $e^1$ and open passage $e$, when the steam, passing by jet $f$, will cause the injector to operate in the usual manner. When it is desirable to lift the feed-water, or start the injector by the jet $f$, which can only be done advantageously where the feed-water is cold, the reducer $h$ is moved against the jet $f$ by the eccentric $k$ until the steam is reduced the desired amount to pass freely through the combining-tube, and create a draft or vacuum, the water entering the combining-tube through the perforations $n$ of the reducing-cylinder. When the water appears at the overflow the reducing-cylinder can be drawn back, to give more steam and water supply to feed into the boiler.

The advantages arising from my invention are, that either hot or cold feed-water can be lifted to any practicable height. The water can be delivered regularly, as in supplying a boiler by a pump, and the combining-tube and delivery-tube being fixed at a given distance apart, where they work to best advantage, the volume of water can be reduced without disturbing their relation.

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

1. In combination with the steam-jet and combining-tube of an injector, the reducing-cylinder, movable on the combining-tube, substantially as and for the purpose specified.

2. In an injector, the combination of the jet, the combining-tube, and the perforated reducing-cylinder, movable on the combining-tube, substantially as and for the purpose specified.

3. The combination of the auxiliary jet with the discharge end of the combining-tube and the delivery-tube, and inclosing the same, substantially as and for the purpose specified.

4. In an injector, the hollow cylindrical double-seated overflow-valve, substantially as and for the purpose specified.

5. In combination with the double-seated hollow cylindrical overflow-valve, the central valve for closing the overflow-nozzle, substantially as specified.

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

JULIUS PROEGER.

Witnesses:
F. W. RITTER, Jr.,
FRANK W. SMITH.