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By Connelly Bros.  
ATTORNEYS.

# UNITED STATES PATENT OFFICE.

DAVID FERGUS, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN INJECTORS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **218,510**, dated August 12, 1879; application filed June 11, 1879.

*To all whom it may concern:*

Be it known that I, DAVID FERGUS, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Injectors for Steam-Boilers, &c.; and I do hereby 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figures 1 and 3 are vertical longitudinal sections of an injector with my improvement applied thereto, and Fig. 2 is a transverse vertical section of the same.

My invention has for its object to provide means whereby, by a single motion of a lever, the valve of a steam-supply pipe may be opened to supply steam to an injector, and the steam-nozzle of said injector may be moved within the latter to the proper position for feeding water to the boiler.

My invention accordingly consists in the combination, with an injector having a sliding steam-nozzle, and with a valve located within a pipe for supplying steam to such injector, of a suitable connection whereby the movement of a lever forming part of said connection in one direction will effect, first, the partial opening of said valve, and, secondly, the further opening of the latter and the movement of said steam-nozzle into the required position for feeding the boiler.

Referring to the accompanying drawings, A indicates an injector constructed in substantial accordance with Letters Patent of the United States Nos. 151,440 and 162,368, though the improvement hereinafter described is equally applicable to and embraces any form of injector which comprises as one of its parts a sliding steam-plug or delivery-nozzle. B shows the steam-nozzle in the injector, which is caused to slide longitudinally within the latter by rack and pinion *b b'*, its forward movement (in the direction of the arrow) uncovering the perforated disk C and admitting steam to the said plug or nozzle in volume sufficient to effect the feeding of water to the boiler. D is a check or globe valve in a pipe, E, which supplies steam to the injector

A. The stem of said valve is formed with a yoke, *d*, through which passes a crank or cam shaft, F, so that when said shaft is revolved its cam or crank *f* will move the valve D to open or close it, as hereinafter set forth. Said crank-shaft extends outside the valve, as shown, and has secured to it a lever, G. The spindle H, on which the pinion *b'* is mounted, also extends outwardly, as shown, and has secured to it by means of a set-screw, *i*, an arm, I, which is connected to the lever G by a pitman or link, K. Said link has a round opening, *k*, for the reception of a screw, *g*, whereby it is secured to the lever G, and a slot, *k'*, for the passage of screw *i'*, which secures it to the arm I.

The operation is as follows: The parts being as in Fig. 1, the valve D is shut, preventing the passage of steam to the injector, and the rear end of the nozzle B is pressed upon the disk C, closing all the openings *c* in said disk save the central opening, *c'*, which communicates with the jet-pipe C'. Now, on moving the lever G in the direction of the arrow 2 until it reaches the position indicated in dotted lines in said figure, the valve will be opened far enough to permit the passage through it of sufficient steam to fill the jet C' and raise water through the inlet L into the injector. The plug or nozzle B during this movement of the lever and valve remains undisturbed, by reason of the link K sliding the length of its slot *k'* on the screw *i'*. Continuing the motion of the lever G in the direction suggested, the valve is fully opened or opened to any desired extent, and the nozzle or plug simultaneously moved away from the disk C, uncovering the openings *c* and admitting steam to said nozzle in quantity or volume sufficient to feed water into the boiler to which the injector is applied.

To stop feeding water, the handle G is merely moved in the reverse direction, thereby closing the valve D and returning the nozzle B to its position of impingement on the disk C.

I have shown and described a fixed jet-pipe, C; but the improvement herein described is not limited thereto, as in some forms of injectors—for example, those which force or feed without lifting—such jet-pipe and the central opening, *c'*, communicating therewith, are not

required. So, too, I have illustrated and specified the link K as being formed with a slot, *k'*, which permits "lost motion" on the screw *h'*; but in cases where such lost motion is not necessary or desired, a round opening may be substituted for said slot, thereby causing the valve D to be opened and the nozzle B to be slid forward simultaneously on moving the lever G, as already suggested.

It will be noted that as the valve D and nozzle B move in opposite directions, the water-inlet (or annular space around the tapered end of said nozzle) is diminished as the steam-inlet opening is increased, and vice versa. The special importance of this arrangement has reference to the varying pressure of the steam—the lower the pressure the smaller the inlet required, while as the pressure increases the steam-inlet requires to be diminished and the water-inlet increased in area or extent. This corresponding control of the water and steam inlets is effected, by the connections described, through a single movement of the lever.

What I claim as my invention is—

1. The combination, with an injector having the sliding steam-nozzle B, and with a valve in the steam-supply pipe of such injector, of a lever and connections between said nozzle and valve, whereby the movement of said lever in one direction will open said valve and slide said nozzle into position to cause the injector to feed water, substantially as described.

2. The combination, with an injector having the sliding steam-nozzle B, and with a valve in the steam-supply pipe of such injector, of a lever and connections between said nozzle and

valve, whereby on moving said lever in one direction said valve will be partly opened, and the movement of said lever being continued in the same direction, said valve will be further opened and said nozzle moved into position to cause the injector to feed water, substantially as set forth.

3. The combination, with steam-nozzle B, spindle H, and arm I, of valve D, crank or cam shaft F, lever G, and pitman or link K, connecting said lever and arm, substantially as and for the purpose set forth.

4. In combination with a lever, G, secured to a crank or cam shaft, F, for actuating a valve, D, and an arm, I, secured to a spindle for moving a nozzle, B, a link, K, forming a connection between said lever and arm, said link being slotted at *k'*, whereby said lever may be moved in one direction to partly open said valve without disturbing said nozzle, and, being further moved in the same direction, will further open said valve and cause the nozzle to slide, substantially as and for the purpose set forth.

5. In an injector, means, substantially as described, for regulating the relative extent or areas of the water and steam inlets, according to the steam-pressure, by the movement of a lever, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 29th day of May, 1879.

DAVID FERGUS.

Witnesses:

M. D. CONNOLLY,

S. J. VAN STAVOREN.