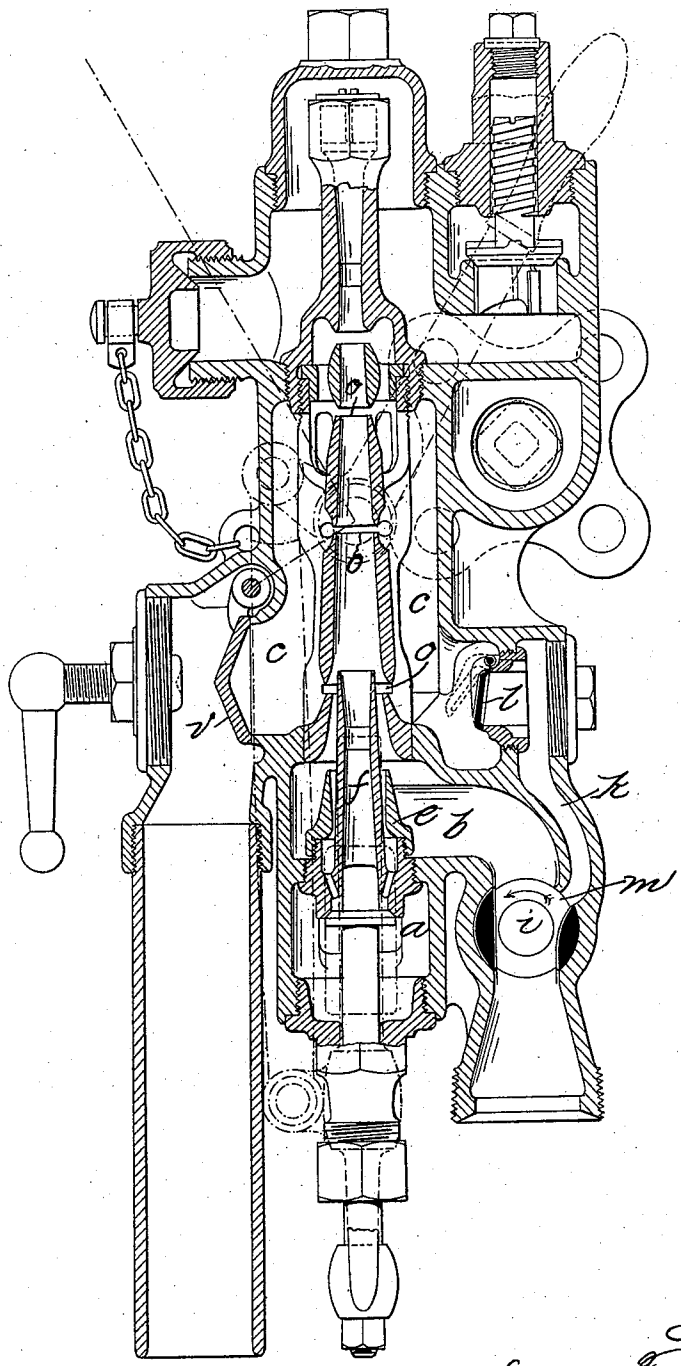
(Model.)

L. FRIEDMANN.

INJECTOR.

No. 588,676. Patented Aug. 24, 1897.



Witnesses
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UNITED STATES PATENT OFFICE.

LOUIS FRIEDMANN, OF VIENNA, AUSTRIA-HUNGARY.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 588,676, dated August 24, 1897.

Application filed April 9, 1897. Serial No. 631,435. (Model.) Patented in Hungary May 5, 1896, No. 6,964; in Germany May 5, 1896, No. 89,751; in France May 5, 1896, No. 256,122; in Austria May 28, 1896, No. 46/2,115; in Switzerland September 18, 1896, No. 13,062, and in Belgium September 18, 1896, No. 123,573.

To all whom it may concern:

Be it known that I, LOUIS FRIEDMANN, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Injectors, (for which I have obtained patents in Austria, dated May 28, 1896, No. 46/2,115; in Hungary, dated May 5, 1896, No. 6,964; in Germany, dated May 5, 1896, No. 89,751; in France, dated May 5, 1896, No. 256,122; in Switzerland, dated September 18, 1896, No. 13,062, and in Belgium, dated September 18, 1896, No. 123,573;) 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The object of the present invention is an improvement in injectors supplying water to steam-boilers, by means of which improvement the amount of water supplied is considerably increased without any increase in the consumption of steam. This is effected by admitting, after having started the injector, water from the water-supply chamber of the said injector into the overflow-chamber, said water being taken up by the fully-charged water-jet before it enters the delivery-nozzle. The result of this arrangement is that the pressure under which the feed-water is introduced into the boiler is smaller, but the quantity of water introduced is much larger.

The accompanying drawing is a section of an injector, showing the communication between the water-supply and overflow chambers, said communication serving for the purpose of subsequent and additional pumping.

a is the steam-supply chamber, *b* the water-supply chamber, and *c* the overflow-chamber, of the injector. *e* and *f* are two concentric steam-nozzles, the former surrounding the latter, which nozzles, however, may be replaced by a single steam-nozzle.

It is a well-known fact that the fully-charged water-jet passing through the nozzles of an injector acts as an exhauster, and that consequently in every properly working injector a vacuum is formed in the overflow-chamber *c* when the overflow-valve *v* is closed. This exhausting action is utilized in the present improved injector to supply to the already fully-charged water-jet additional water which enters through the lateral openings *o o o* in the forcing combining-tube as well as through the gap in the forcing-nozzle. For this purpose there is provided a chamber *k*, which communicates on one side with the overflow-chamber *c* and on the other side with the water-supply chamber *b*, from which latter, however, it can be shut off under certain circumstances. The communication between the overflow-chamber *c* and the chamber *k* remains closed by a flap-valve *l*, (which may be replaced by any other valve,) opening into the chamber *c*, as long as the pressure in the chamber *c* exceeds that in the chamber *k*. The chamber *k* communicates with the water-supply chamber *b* by means of a passage *m*, leading into the casing of the water-cock. By turning the plug *i* of this cock in the direction of the arrow said communication may be interrupted without interrupting the communication between the water-supply chamber and the nozzles.

The working of the injector is as follows: When the injector is first started, the steam escaping into the atmosphere through the overflow-chamber keeps the flap-valve *l* closed. When the injector begins to draw water, the fully-charged water-jet induces a vacuum in the overflow-chamber, as the overflow-valve *v* prevents the air from entering. The result of this is that the valve *l* opens and the feed-water enters the overflow-chamber, from which it is carried by the fully-charged water-jet into the boiler. With this arrangement and the steam-pressure being that generally used on locomotives (ten to thirteen atmospheres) the quantity of water fed into the boiler is increased by twenty per cent. without any increase in the consumption of steam. If it is desired to reduce the quantity of water fed into the boiler, the admission of water into the chamber *c* through the passage *m* and the chamber *k* is first in-

terrupted by turning the cock-plug *i*, and then by turning it a little more the admission of water into the water-supply chamber *b* is throttled or reduced. The possibility of stopping the admission of water into the overflow-chamber is necessary for the safe working of the injector. It is only owing to this possibility of stopping the admission of water into the overflow-chamber that the invention becomes a thoroughly-practical one, as it insures the reliability of the feeding apparatus, which is the first condition of safe working. If the valve *l* became jammed in its open position or did not close properly, owing to dirt, sand, or the like being deposited between it and its seat, the steam at the starting of the injector would pass from the overflow-chamber into the water-supply chamber, thus preventing the pumping of the feed-water. The injector therefore could not be used at all if it were not for the possibility of closing the communication between the overflow and the water-supply chamber by turning the plug *i*.

The flap-valve *l* may be completely dispensed with, in which case it is sufficient to close the communication between the chamber *k* and the water-supply chamber *b* by turning the plug *i* when starting the injector, whereby the steam is prevented from entering the water-supply chamber. Such an arrangement would, however, make the manipulation of the injector complicated, as it would necessitate turning the cock before and after the starting.

I claim—

1. In an injector for steam-boilers, the combination with the water-supply branch or chamber and the overflow-chamber, of a by-path connecting the two, and a valve therein controlled by pressure variations in said overflow-chamber, for the purpose set forth.

2. In an injector for steam-boilers, the combination with the water-supply branch or chamber and the overflow-chamber, of a by-path connecting the two, a valve at the outlet of said by-path adapted to open and close under pressure variations in said overflow-chamber and a cut-off valve at the inlet of said by-path, for the purpose set forth.

3. In an injector for steam-boilers, the combination with the overflow-chamber and the water-supply branch or chamber, of a by-path connecting the two, a cut-off valve adapted to close the inlet to the by-path without closing the inlet to the water-chamber, and a valve at the outlet of said by-path adapted to open or close said outlet under pressure variations in the overflow-chamber, for the purpose set forth.

4. In an injector for steam-boilers, the combination with the overflow-chamber, an outwardly-opening valve in the outlet thereof and the water-supply branch for the water-chamber, of a by-path connecting said overflow-chamber with the water-supply chamber, a valve at the junction of said by-path and branch adapted to close the inlet of said by-path without closing said branch and to close both, and an outwardly-opening valve at the outlet of the by-path adapted to open and close under pressure variations in the overflow-chamber, for the purpose set forth.

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

LOUIS FRIEDMANN.

Witnesses:
HARRY BELMONT,
KARL HÜTTER.