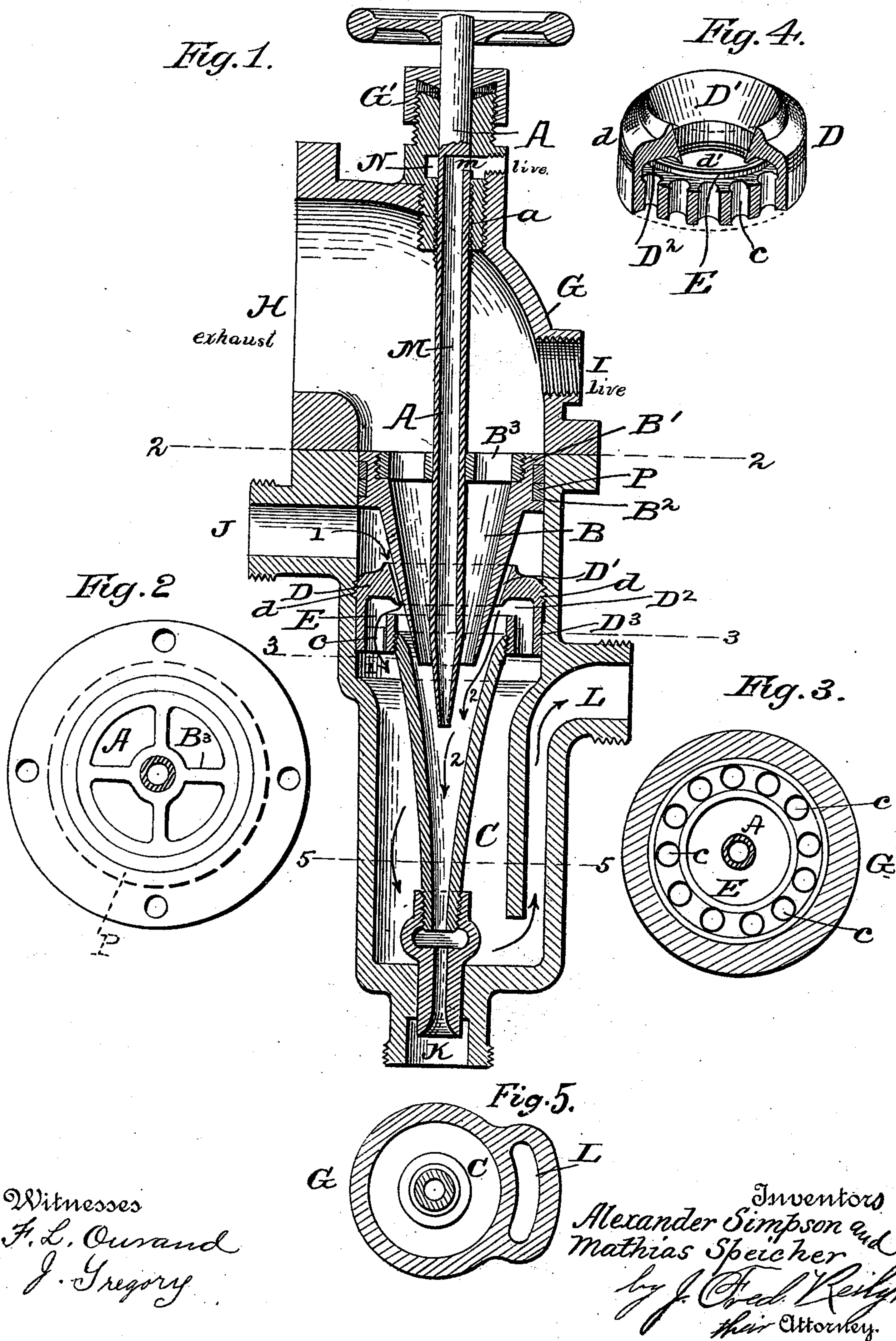


(Model.)

A. SIMPSON & M. SPEICHER.  
INJECTOR.

No. 516,231.

Patented Mar. 13, 1894.





# UNITED STATES PATENT OFFICE.

ALEXANDER SIMPSON, OF SCRANTON, AND MATHIAS SPEICHER, OF ARCHBALD, PENNSYLVANIA.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 516,231, dated March 13, 1894.

Application filed February 24, 1893. Serial No. 463,607. (Model.)

*To all whom it may concern:*

Be it known that we, ALEXANDER SIMPSON, residing at Scranton, and MATHIAS SPEICHER, residing at Archbald, in the county of Lackawanna, State of Pennsylvania, citizens of the United States, have invented certain new and useful Improvements in Injectors; and we 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 of reference marked thereon, which form a part of this specification.

Our invention consists in a new and improved combined exhaust- and live-steam injector, in which are comprised several novel and valuable features; and the invention will be hereinafter fully described and claimed.

Referring to the accompanying drawings, in which the same letters of reference indicate corresponding parts in the several views:—Figure 1 is a central longitudinal sectional view of our injector. Fig. 2 is a transverse sectional view, taken on the plane indicated by line 2—2 on Fig. 1. Fig. 3 is a transverse sectional view taken on the plane indicated by line 3—3, Fig. 1. Fig. 4 illustrates in detail the water tube. Fig. 5 is a transverse sectional view taken on the plane indicated by line 5—5, Fig. 1.

Referring to the several parts by their letters of reference, the shell or outer casing G of the injector is formed at its upper end with the flanged exhaust-steam opening H, and on the opposite side with the threaded live-steam opening I; the opening H being suitably connected to receive the exhaust-steam through a conducting-pipe having an ordinary cock, while the opening I is connected to receive the live-steam through a connecting-pipe having a cock; by which arrangement the injector can be worked either by exhaust- or live-steam.

J indicates the water-supply opening the injector being supplied with water from a street main or from a reservoir; L the overflow opening, C the body of the suction and combining tube, and K the delivery opening at the lower end of the shell.

The above parts are similar to those de-

scribed in our Patent No. 490,590, and need not therefore be described in detail.

D indicates our novel water-tube, which is threaded exteriorly at  $d$  to adapt it to be screwed into the shell G just below the level of the water-supply opening J, as shown, and is threaded interiorly at its lower end, at  $d'$ , where the threaded upper end of the combining tube C is screwed into it. This water-tube is formed at its upper end with the conical opening  $D'$ , and the hollow upper part  $D^2$ , while in its lower body-portion  $D^3$  are formed the annular series of openings  $c$ , while an annular flange, E, extends up at the inner side of said openings. It will further be seen that the lower inwardly-inclined end of the conical opening  $D'$  in the top of the water-tube extends in beyond the vertical line of the flange E, as clearly shown in the drawings.

The conical steam-tube, B, is formed with a cylindrical upper end,  $B'$ , adapted to fit, and be adjusted in, the cylindrical part of shell G just above the water-supply opening J; and a packing-ring P, is secured in an annular recess  $B^2$  formed in this upper end of the steam-tube, which effectually prevents the passage of steam down around the exterior of the adjustable steam-tube.

A indicates the dividing and steam spindle, which passes through a stuffing box  $G'$  at the top of the shell, and is threaded at  $a$ , where it passes through a threaded bearing, to adapt it to be adjusted up and down. The conical lower end of the steam-tube, B, passes down through the conical opening  $D'$  of the water-tube to a point near the bottom of said water-tube; and the tapering lower end of the spindle A passes down through the steam-tube into the conical upper end of the combining-tube C; and the upper end of the steam-tube B is connected by the arms  $B^3$  to the spindle A, so that the steam-tube can be raised or lowered by turning the spindle, and thus regulate the size of the opening between the conical steam-tube and the conical opening  $D'$  in the top of the water-tube; the steam tube thus forming a regulating-valve for the water tube.

It will now be seen, that before the working of the injector the water entering through



the supply-opening J will flow around the edge of the conical opening D' in the top of the water tube, as indicated by the arrows 1 on Fig. 1, and down through the openings c into the space surrounding the combining-tube C and thence through the overflow opening L; while as soon as the steam is turned on and a vacuum formed in the combining-tube, the water will be drawn through the conical opening D', around the conical lower end of the steam-tube, directly into the upper end of the combining-tube C, as shown by the arrows 2.

The spindle A is formed with a central opening, M, extending from its lower end up to a point *m* near its upper end, where it opens through the side of the spindle, as shown; the spindle at this point passing through a small live-steam chamber, N, formed on the top of shell G, and which is suitably connected by a conducting-pipe to receive the over-pressure of live steam when there is a boiler pressure of over one hundred pounds. It will be seen that by this construction we not only effectually prevent the backflow of steam through the injector, but that when the boiler pressure rises above one hundred pounds this surplus steam will pass down through the hollow spindle A and be discharged from the lower end of the same into the combining-tube C, thus assisting, instead of retarding, the operation of the injector.

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

1. An injector comprising the shell formed with the openings for both exhaust and live steam, the water-supply opening, the delivery opening, and the overflow, the combining tube, the conical steam-tube, and a dividing spindle, and the water-tube formed with the hollow upper part, the annular series of openings, the annular flange extending up at the inner side of said openings, and the conical top opening the lower end of which extends in beyond the vertical line of said annular flange, substantially as set forth.

2. An injector comprising the shell formed

with the openings for both exhaust and live steam, the water-supply opening, the delivery opening, and the overflow, the combining tube, the water-tube secured at the upper end of the same, the steam-tube, the live-steam chamber at the top of the shell, suitably connected with the boiler, and the hollow dividing spindle extending through said chamber and having its bore communicating therewith through a side opening, substantially as and for the purpose set forth.

3. An injector comprising the shell formed with the openings for live and exhaust steam, the water-supply opening, the delivery opening, and the overflow, the combining tube, the herein-described water-tube, the movable steam-tube having the conical lower part, and the adjustable dividing spindle extending through and connected with said movable steam-tube; substantially as and for the purpose set forth.

4. The herein-described injector, comprising the shell formed with the openings for both exhaust and live steam, the water-supply opening, the delivery opening, and the overflow, the combining tube, the herein-described water-tube, the movable steam-tube, the live-steam chamber formed at the upper end of the shell and suitably connected with the boiler, and the adjustable hollow dividing spindle, connected to said movable steam-tube, and passing through said live-steam chamber with the upper end of its bore opening into said chamber; substantially as set forth.

In testimony whereof we affix our signatures in presence of witnesses.

ALEX. SIMPSON.  
MATHIAS SPEICHER.

Witnesses as to the signature of Alex. Simpson:

C. S. VON STORCH,  
C. W. PEARCE.

Witnesses as the signature of Mathias Speicher:

JOHN BECK,  
PORTER ESTRUTH.