

(Model.)

F. BRUNBAUER
INJECTOR.

No. 362,247.

Patented May 3, 1887.

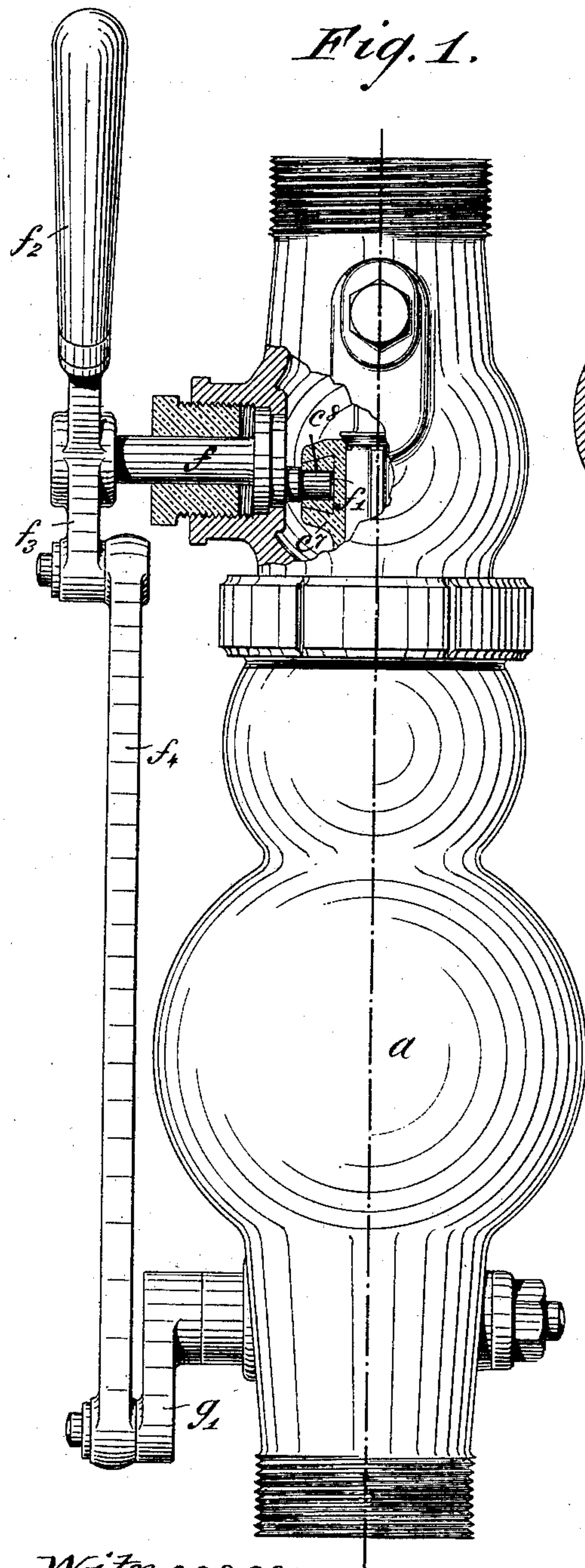


Fig. 3.

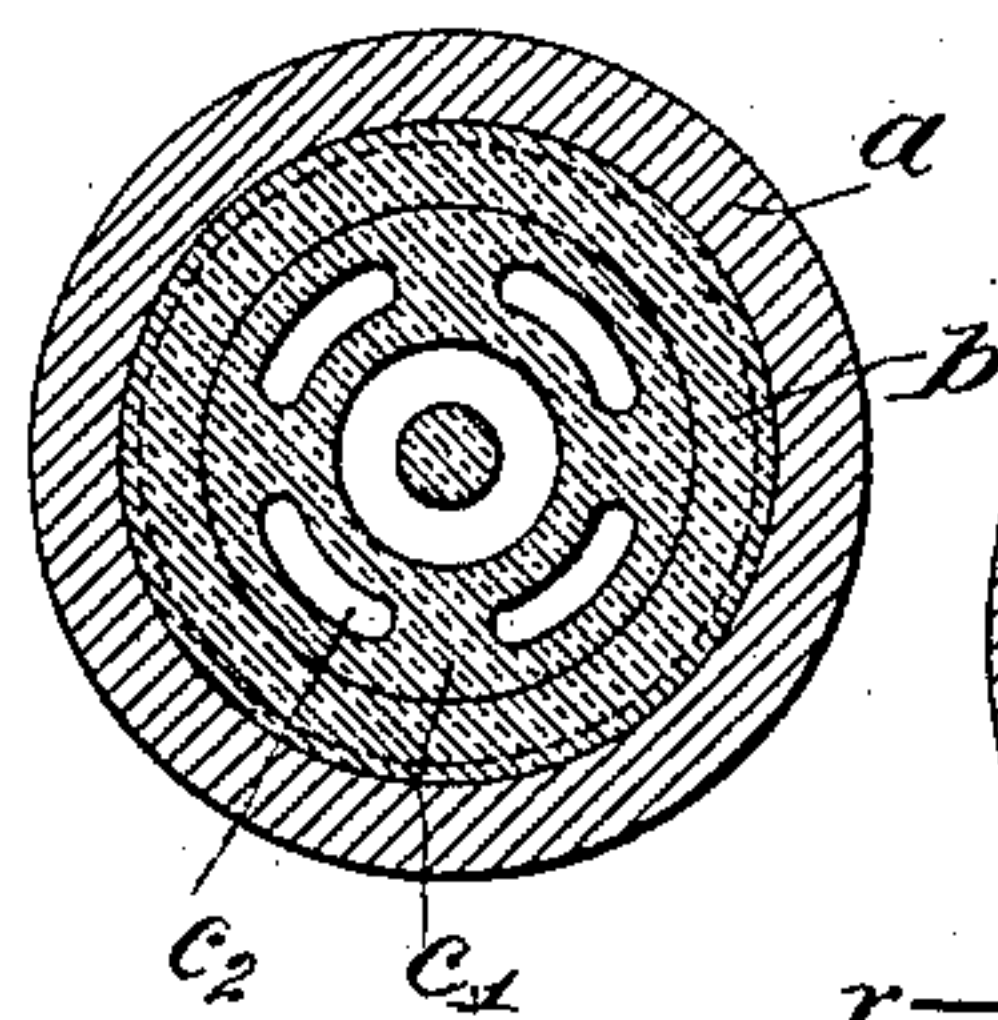
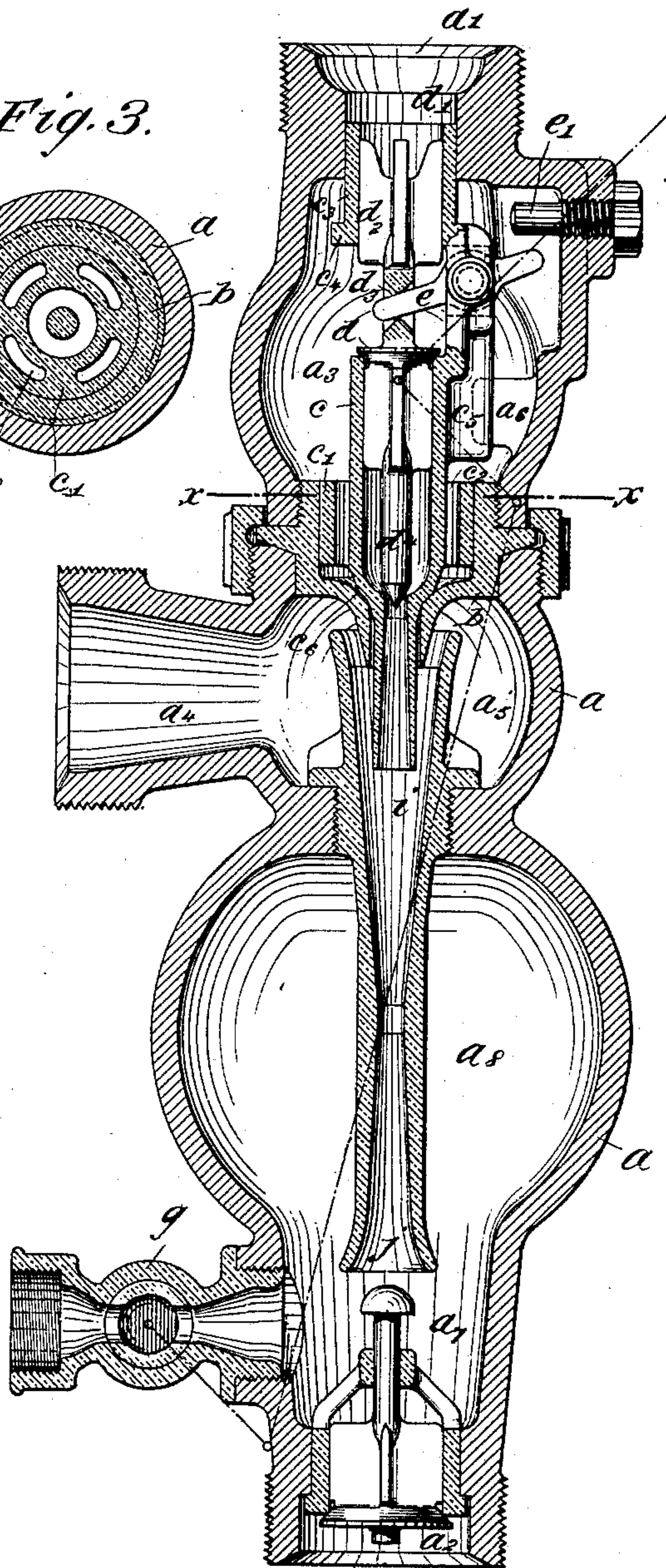


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

FERDINAND BRUNBAUER, OF VIENNA, AUSTRIA-HUNGARY.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 362,247, dated May 3, 1887.

Application filed August 11, 1885. Serial No. 174,119. (Model.)

To all whom it may concern:

Be it known that I, FERDINAND BRUNBAUER, engineer, 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; 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 or figures of reference marked thereon, which form a part of this specification.

As is known a certain skill is necessary for starting an injector in a convenient manner, so as to first cause the water to be sucked into the water-chamber and be carried along through the combining and the delivery tubes, or only carried along through said tubes, if the feed-water be under a certain pressure, and to afterward force the water into the boiler by fully opening the steam-discharging nozzle or steam-tube. Now, this invention has for its purpose to so construct an injector that the described gradual starting of the implement always takes place in whatsoever manner it may be operated. This end is obtained by arranging two steam-tubes concentrically inclosing one another, the outer of said steam-tubes, whose passage in consequence of the said arrangement is of annular section, is opened at the first angular displacement of a starting-lever, and operates the sucking-in or setting-in motion of the water, and only on the further displacement of the starting-lever steam is admitted to the inner or main steam-tube, by which the pressure and the velocity of the water are increased sufficiently to lift the check-valve of the boiler. In the second of the said two stages of the starting of the injector a stop-cock, through which the waste of water escapes during the first stage from the overflow-chamber of the outer shell or casing of the instrument, is closed by a system of cranks and links connected to the starting-lever. To allow the two concentric steam-tubes to be gradually operated, as described, one is made movable, and convenient ground-surfaces on the inside of the outer tube and the outside of the inner tube form a tight joint

when the injector is at rest. The discharge of steam through the outer steam-tube may cease when the discharge through the inner or main steam-tube begins, or it may continue.

Injectors embodying my invention are represented in the annexed drawings, as follows:

Figure 1 is a partly sectional side elevation of an injector having a movable central or main steam-tube and being adapted to discharge steam through its outer steam-tube during its whole function. Fig. 2 shows a vertical longitudinal section of the same injector in the state of rest. Fig. 3 is a horizontal transverse section of the same on line *x x*, Fig. 2.

In the Figs. 1 to 3, the casing *a* of the injector communicates by its upper aperture, *a'*, with the pipe conveying the boiler-steam, and its bottom aperture, communicating with the boiler, contains a valve, *a''*, kept closed by the pressure of the boiler. The diaphragm between the steam-chamber *a'''* and the lower water-chamber, *a''''*, (having an inlet-aperture, *a'''''*), has the fixed outer steam-tube, *b*, rigidly inserted in a corresponding opening. In the axis of said tube *b* the main steam-tube *c* is endwise movable. The central steam-tube, *c*, is guided by means of its collar *c'*, having steam-passages *c''* in the widened top portion of the tube *b*. Moreover, the tube *c* is guided by its upper extension, *c'''*, in the steam-admitting port *a'*, said extension *c'''* carrying a shoulder, *c''''*, by which the upward stroke of the steam-tube *c* is limited. To prevent the tube *c* from turning round its axis, it is provided with a radial wing, *c'''''*, extending between two inner projections, *a''''''*, of the casing *a*. When the injector is at rest, the main steam-tube *c*, in its lowermost position, tightly closes the outer or secondary steam-tube, *b*, by means of its conical face *c''''''* ground into a shoulder of the tube *b*, and the main steam-tube *c* itself is kept closed by a conical valve, *d*. The rod *d'* of the valve *d* is provided in its top portion with radial wings *d''*, which guide said rod in the upper extension, *c'''*, of the inner steam-tube, *c*. Into a slot, *d'''*, of said valve-rod catches one end of a two-armed lever, *e*, movable in a vertical plane, and having its pivot formed in the side of the tube *c*. With the other arm of said lever *e* there engages a tappet, *e'*, projecting

from the inside of the casing *a*. Consequently, as soon as the main steam-tube *c* is raised a certain distance, the outer end of lever *e* will be stopped, and on the further raising of the tube *c* said lever will be turned round its pivot, and will open the valve *d*. The lowermost portion of the valve-rod *d'* may have an enlargement, *d''*, provided with a conical rod, which forms a tight fit in a corresponding opening of the tube *c*. This arrangement may, however, be dispensed with.

For raising the main steam-tube *c* a crank-pin, *f*, is provided projecting from a short shaft, *f'*, which extends into the casing *a* through a stuffing-box. The crank-pin *f'* either catches directly into a guide, *c'*, formed in the steam-tube *c*, or is connected to a slide, *c''*, movable in said guide. On its outer end the shaft *f* carries a hand-lever, *f''*, and by means of a crank, *f'''*, and a connecting-rod, *f''''*, said shaft is connected to a crank, *g'*, rigidly fixed to the plug of a cock, *g*, giving issue to the water during the stage of sucking in or of setting the water in motion. When the hand-lever *f''* is turned about thirty degrees, the main steam-tube *c* is raised high enough to open the ring-shaped steamway, closed until now at *c''*, and in consequence thereof the sucking-in or the setting-in motion of the water begins. The water and the steam enter the combining-tube *i*, forming one piece with the delivery-tube *j*, and thence to the collecting-chamber *a''*, formed in the bottom portion of the casing *a*. From said chamber the water and condensed steam escape through the cock *g*, yet partly open. On the further turning about thirty degrees of the hand-lever *f''*, the valve *d* is opened and the cock *g* is closed, whereby the pressure in the casing *a* of the injector is raised sufficiently high to overcome the pressure in the boiler, so that the valve *a''* is forced down and the water fed into the boiler. The remaining thirty degrees of play

of the hand-lever *f''* afford possibility for regulating the section of the ring-shaped waterway in the combining-tube *i*, which is obviously done by more or less raising the steam-tube *c* in the conical combining-tube *i*. The combining-tube *i* and the delivery-tube *j* are inclosed in an air-chamber, *a'''*.

Having thus described my invention, what I claim as new is—

1. In an injector provided with two concentric steam-tubes adjusted endwise in relation to each other, and forming between them a steamway of ring-shaped section, and adapted to operate by their relative movement, and a cut-off valve in the inner tube, the combination, with said tubes having corresponding portions of the outer surface of the inner tube and of the inner surface of the outer tube shaped to form a tight fit, of means for the relative adjustment of said tubes, a conical valve closing the inner tube, a two-armed lever pivoted to said inner tube and having one end connected to the valve, and a tappet adapted to act upon the other end of said lever, substantially as and for the purpose set forth.

2. An injector consisting of the combination of a fixed outer steam-tube, a concentric endwise movable inner steam-tube forming a ring-shaped passage between them, adapted to be opened or closed by the movement of the inner tube, a valve arranged within the inner tube, connecting mechanism for operating this valve by the movement of the inner tube, a starting-cock, and devices, substantially as described, for connecting them with a single operating-lever, as set forth.

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

FERDINAND BRUNBAUER.

Witnesses:

EDMUND JUSSEN,
OTTO SCHEFFER.