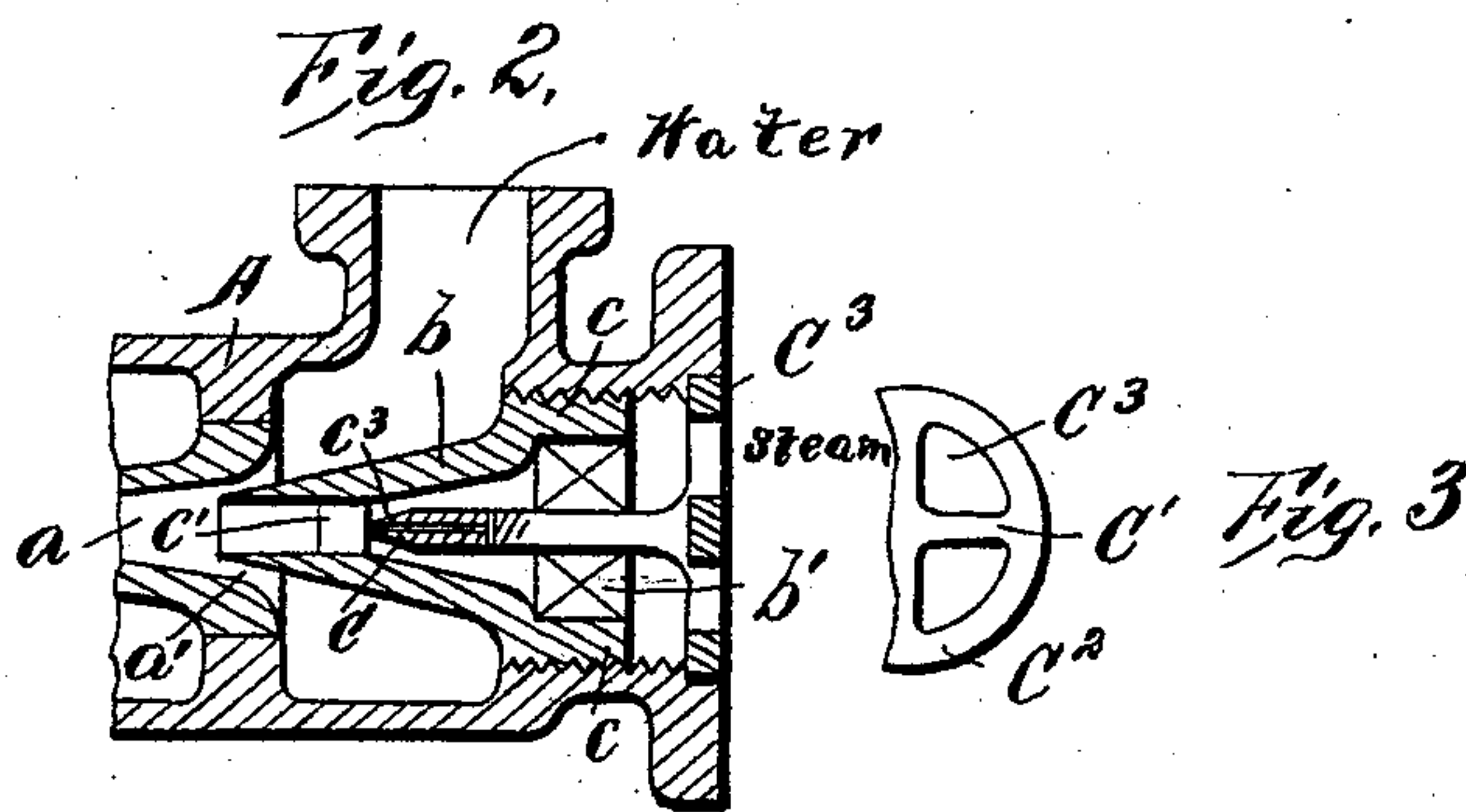
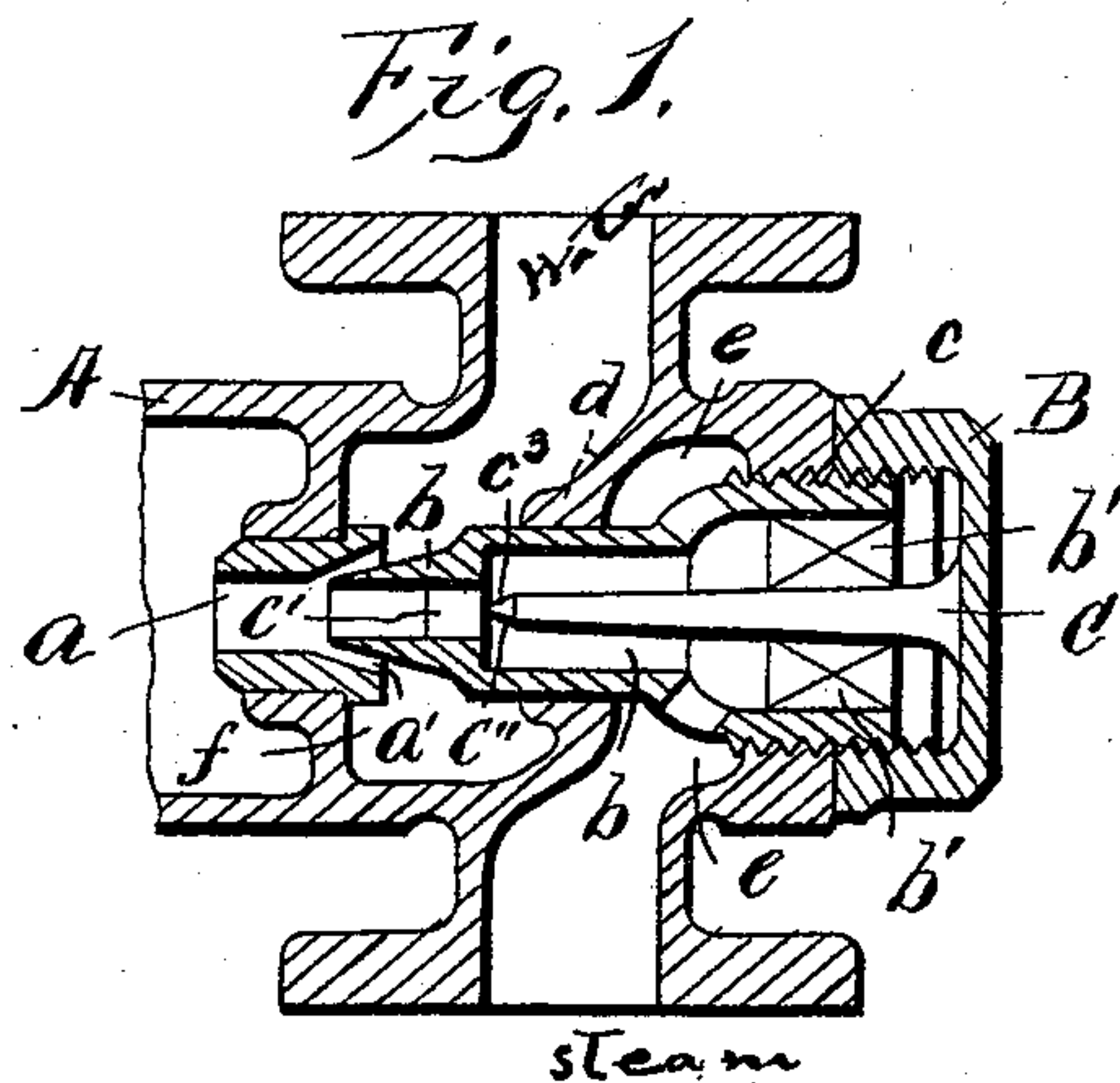


(Model.)

R. G. BROOKE.  
INJECTOR.

No. 523,926.

Patented July 31, 1894.



Witnesses  
*E. E. Duffy*  
*Chas. M. Werle*

Inventor.  
*R. G. Brooke*  
per *E. E. Duffy*  
Attorney



# UNITED STATES PATENT OFFICE.

ROBERT GRUNDY BROOKE, OF BLACKPOOL, ENGLAND.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 523,926, dated July 31, 1894.

Application filed April 21, 1894. Serial No. 508,507. (Model.) Patented in England May 26, 1888, No. 7,742; in France May 3, 1889, No. 197,959, and in Italy June 30, 1889, L. 457.

*To all whom it may concern:*

Be it known that I, ROBERT GRUNDY BROOKE, a subject of the Queen of Great Britain and Ireland, residing at Blackpool, in the county of Lancaster, England, have invented Improvements in Injectors, (for which I have obtained Letters Patent in Great Britain, dated May 26, 1888, No. 7,742; in France, dated May 3, 1889, No. 197,959, and in Italy, dated June 30, 1889, Reg. Att., Vol. L, No. 457,) of which the following is a specification.

This invention has reference to injectors of the type in which the steam nozzle is made longitudinally movable in relation to a fixed combining nozzle and spindle and is so proportioned and arranged in relation to the said combining nozzle and spindle that an internal area in said movable nozzle, and also the area between the exterior of that nozzle and the interior or the end of the combining nozzle, will be simultaneously altered by longitudinal movement of said steam nozzle alone so that regulation of both steam and water will be effected simultaneously, as for example in an injector of the kind described in the specification of Letters Patent of the United States granted to me dated May 10, 1892, No. 474,361.

My present invention relates to modified constructions of such an injector as will be hereinafter more particularly described and pointed out in the claims.

In the accompanying drawings, Figure 1 shows in section so much of an injector as is necessary to illustrate the application of my invention thereto. Fig. 2 is a similar view illustrating a modified construction. Fig. 3 is a detail view of part of the injector shown in Fig. 2.

Referring to Fig. 1, A is part of the body and casing of an injector of which *a* is part of the upper end of the combining nozzle. *b* is the steam nozzle screwed in the body at *c* and arranged so as to slide tightly in a bearing *d* between the steam chamber *e* and water chamber *f*. In this arrangement steam might if desired be admitted into the chamber *f* and water into the chamber *e*. The screwed part *c* of the nozzle *b* projects beyond the body of the injector so as to receive a cap B. Forming part of the cap B is a spindle C projecting down into that part of

the steam nozzle the diameter of which finally determines the admission of steam (or other fluid) through it into the injector. This portion of the nozzle I will call *c'* but its exact position in the nozzle depends upon the construction and shape of the nozzle. The spindle C has a conical end *c''* which projects more or less toward or into the nozzle at *c'* according to the position of the nozzle from time to time. In the drawings the nozzle is shown at a low point. The annular water area *a'* is shown at its least opening and the steam area *c<sup>3</sup>* at its greatest. This would be the requisite position of the parts under the circumstances where the steam pressure was at the lowest point at which it was intended the injector should work. The area of the steam space *c<sup>3</sup>* when the steam nozzle is at its farthest position from the end of the spindle is made sufficiently large for the lowest pressure at which the injector is intended to work. If a greater steam pressure than that just referred to should be employed, then more water and less steam would be required. This condition is attained by removing the cap B and screwing back the nozzle *b* sufficiently to give the increased water space required. When the cap B is replaced the spindle C resumes its original position, but as the nozzle *b*, and consequently its contracted part *c'*, has been moved toward the point of the spindle, the conical end *c''* of C becomes farther inserted into *c'* and so lessens the steam area. In this way the requisite regulation may be effected from time to time as required.

By the terms steam and water space is meant the area in a nozzle or between two nozzles by which the quantity of steam, water or other fluid entering through or between such nozzles for combination, is finally determined.

Figs. 2 and 3 illustrate an arrangement in which the cap shown in Fig. 1 is not employed. The steam cone *b* is screwed so as to move up or down in the same manner as in Fig. 1 and the spindle C which is made hollow for part of its length and formed with lateral inlets for steam for a purpose well understood, has, when in its place, a definite fixed position. For this purpose it is placed in a recess as shown so as to bear against the body of the



injector. But instead of forming part of a cap, the spindle is attached by means of arms C' (see Fig. 3) to a circular ring C<sup>2</sup>, and the steam passes through the spaces C<sup>3</sup> between these arms into the injector. The circular ring provides the means for attaching the spindle to the injector. The parts corresponding to similar parts in Fig. 1 are similarly lettered.

Thus it will be seen that by moving the steam nozzle longitudinally in a direction to partly withdraw it from the combining nozzle, the water space will be enlarged and the steam space lessened simultaneously by one movement, and moving the steam nozzle in the contrary direction has the effect of simultaneously enlarging the steam space and decreasing the water space.

The steam nozzle in each arrangement is formed at its upper and outer end with a square or other shaped hole b' designed to receive a key by which it can be easily rotated to effect its longitudinal adjustment.

The combining and steam nozzle may be those of an ordinary injector, or of an automatic self-starting injector as well understood.

What I claim is—

1. In an injector, the combination of a combining nozzle, a longitudinally adjustable steam nozzle and a spindle capable of being inserted in place and removed without moving said steam nozzle and having its inner end terminating at a point within said steam nozzle determined by the body of said injector substantially as herein described.

2. In an injector, the combination of a combining nozzle, a steam nozzle screwed within the body or casing of the injector so as to be capable of longitudinal adjustment therein, and a separately removable spindle normally fixed in a longitudinal direction but able to turn independently of said steam nozzle while being inserted in place and removed, and having its inner end terminating within said steam nozzle at a point determined by the body of the injector casing substantially as herein described for the purpose set forth.

3. In an injector, the combination of a combining nozzle, a longitudinally adjustable

steam nozzle, a spindle having its inner end terminating within said steam nozzle, and an annular screw-threaded holder whereby said spindle is held in place and which normally bears against a fixed part of the injector casing substantially as herein described for the purpose specified.

4. In an injector, the combination of a combining nozzle, a longitudinally adjustable steam nozzle screwed within the body of the injector and formed with lateral inlets for steam, and a separately removable spindle having its inner end terminating within said steam nozzle, and its outer end carried by a holder capable of being screwed into place and removed without moving said steam nozzle and the position of which is determined by a fixed part of the injector casing when said spindle is in position for use substantially as herein described for the purpose specified.

5. In an injector, the combination of a combining nozzle, a steam nozzle capable of rotation and having an externally screw-threaded part screwed into the body of the injector, and projecting outwardly beyond the same, and a spindle carried by a screw cap adapted to screw on to the projecting end of said steam nozzle and hold said spindle in a definite fixed position, substantially as herein described.

6. In an injector, the combination of a combining nozzle, a steam nozzle screwed into the body of the injector so as to project beyond the same and formed with a hole or device b', a bearing d located between the steam and water chambers and through which said steam nozzle can slide, and a spindle C carried by a screw cap adapted to screw on to the projecting end of said steam nozzle and hold said spindle in a fixed position substantially as herein described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT GRUNDY BROOKE.

Witnesses:

HAROLD ACKROYD,

EDWIN JONES,

Clerks with Richard Page, Notary Public,  
Manchester.