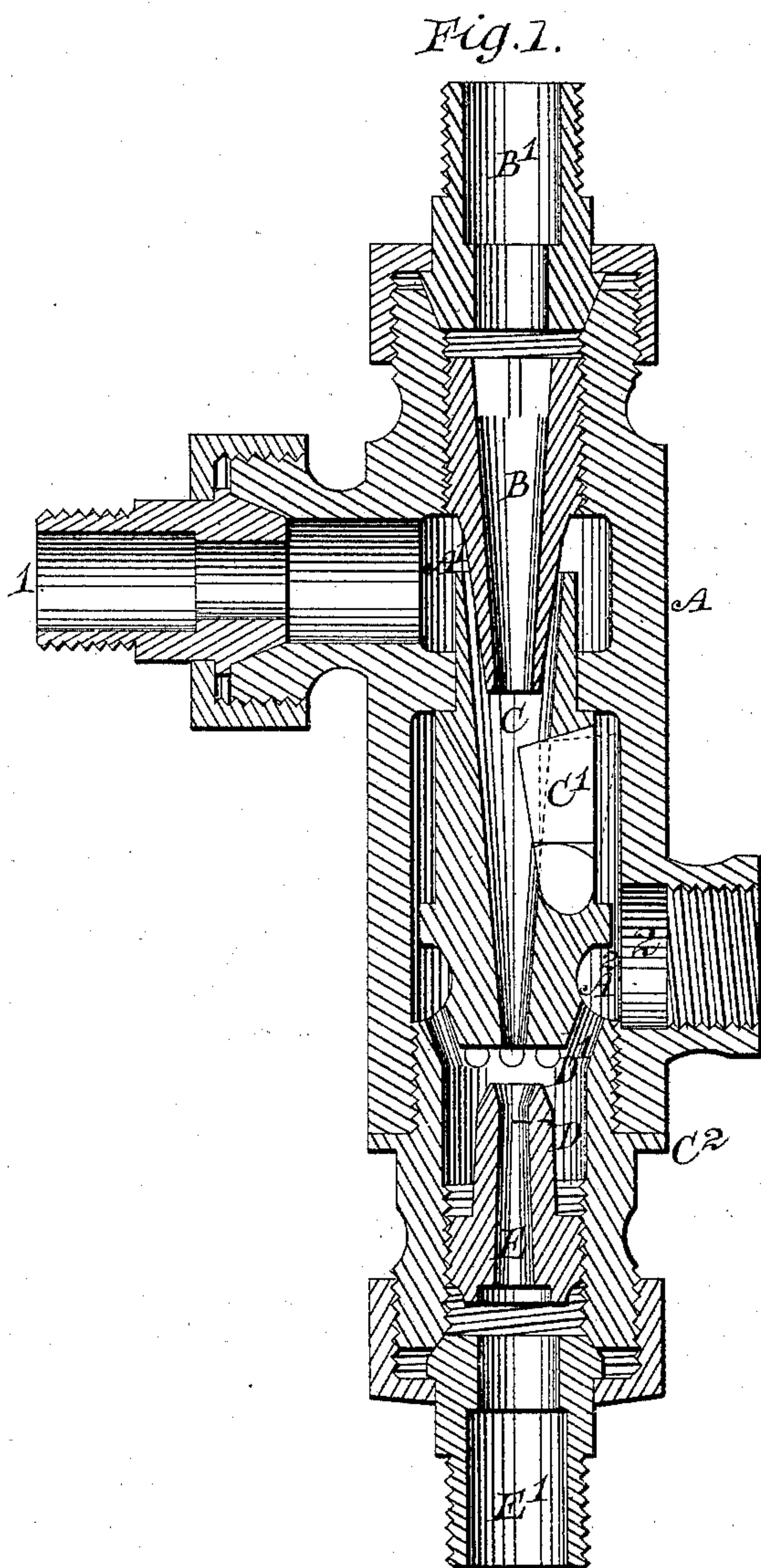


(Model.)

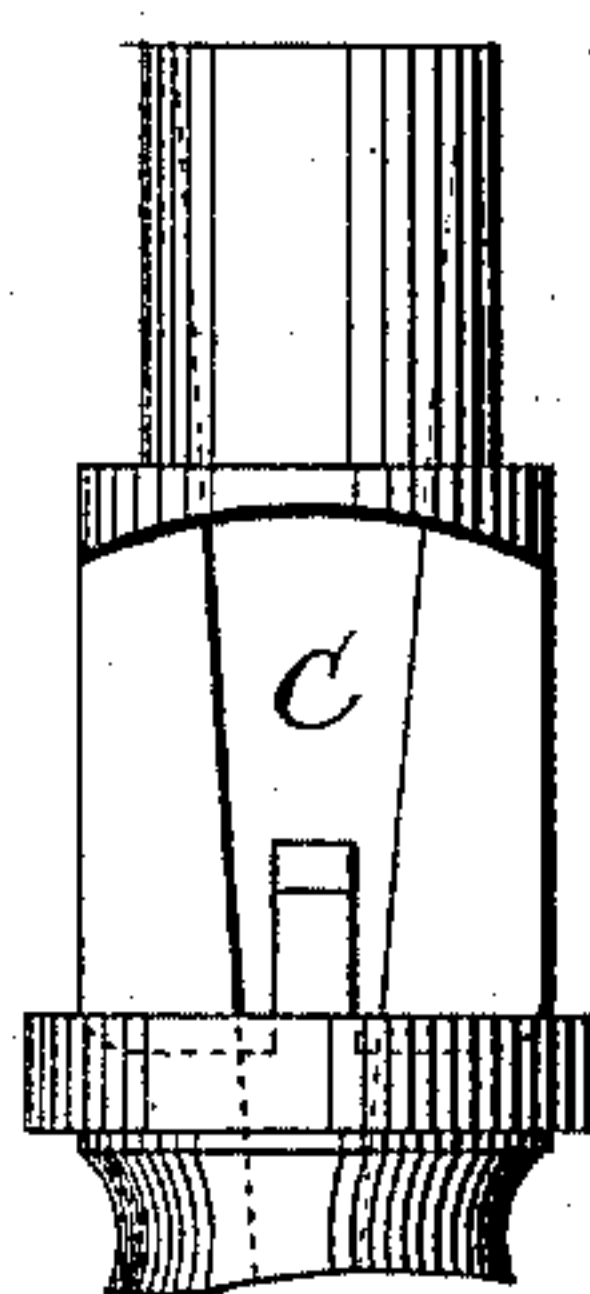
H. HOPKINSON.  
INJECTOR.

No. 489,813.

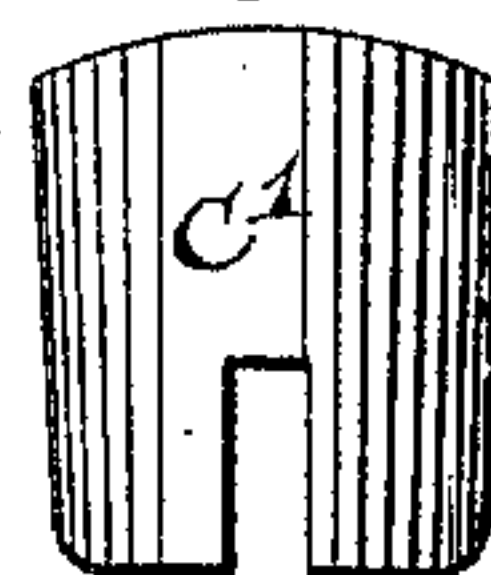
Patented Jan. 10, 1893.



*Fig. 1<sup>A</sup>*



*Fig. 1<sup>B</sup>*



Witnesses:

*H. W. Gough.*

*John Henry Gough.*

Inventor.

*Harry E. Hopkinson*



# UNITED STATES PATENT OFFICE.

HENRY HOPKINSON, OF NOTTINGHAM, ENGLAND.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 489,813, dated January 10, 1893.

Application filed June 27, 1892. Serial No. 438,184. (Model.)

*To all whom it may concern:*

Be it known that I, HENRY HOPKINSON, iron merchant and brass-founder, a subject of the Queen of Great Britain, and a resident of Nottingham, England, have invented certain new and useful Improvements in Injectors, of which the following is a specification, reference being had to the accompanying drawings.

Figure 1 shows a longitudinal sectional view of a liquid injector which may be worked by steam direct from a boiler. Figs. 1<sup>A</sup> and 1<sup>B</sup> show separate portions of the injector each severally referred to hereinafter.

I construct each injector with an outer case A forming two chambers A' A<sup>2</sup>. The chamber A' is supplied with liquid through an inlet pipe 1 leading from a well or reservoir.

B is an inlet cone supplied with steam direct from a boiler.

C is a cone provided at about the center of its length with one or more overflow outlets at the side each closed by a loose valve plate C' shown at Figs. 1 and 1<sup>B</sup>. A side view of the cone C is shown at Fig. 1<sup>A</sup> without the valve plate. When the valve plate is closed it forms a portion of the cone C. The lower end of the cone B and the upper end of the cone C are surrounded by the chamber A' of the outer case. The chamber A<sup>2</sup> which surrounds the lower portion of the cone C has a screw-threaded outlet orifice 2 which may be provided with a length of pipe to lead the overflow where required.

Below the cone C is a chamber D provided with perforations D' for further relieving the cones B and C of liquid. Within the chamber D is a delivery cone E screw-threaded at its lower end to allow of adjustment, through which the liquid may be injected. Below the perforations D' the cone C is screw-threaded exteriorly and provided with a flange C<sup>2</sup> below which flange the cone is formed with six or eight sides by which it may be screwed into the lower end of the outer case, or by which it may be withdrawn for examination without having to remove the outer case. The upper and lower ends of the outer case are screw threaded exteriorly to receive interiorly screw-threaded and flanged nuts by which the injector may be connected to the ends of a steam pipe B' and delivery pipe E'.

The action of the injector shown at Fig. 1 is as follows:—The liquid inlet pipe 1 being open steam is turned on passing through the cone B into and through the cones C and E. As it passes into the cone C it lifts the valve plate C' into the position shown by the dotted lines in the chamber A<sup>2</sup> at Fig. 1 passing into the chamber A<sup>2</sup> and escaping through the outlet 2. A portion of the steam also escapes through the perforations D' in the chamber D. The rush of steam produces a vacuum in the chamber A' causing it to be filled with liquid through the inlet pipe 1, the liquid being forced by the jet of steam through the cone C to and through the delivery cone E and delivery pipe E' to where required. As the liquid is forced by the steam jet through the cone C it forms a vacuum in the chambers A' A<sup>2</sup> and D closing the valve plate C' to form portion of the cone C and permit air to rush into the chamber D through the perforations D'.

By arranging the parts as above described an injector is produced which if stopped by concussion or an impediment in the delivery pipe if steam is kept on will automatically restrict itself upon the impediment being removed.

I am aware that injectors containing cones similar to those marked B C and E have been used before, but I am not aware that the cone C has been supplied with a loose valve plate or plates C' arranged so that the cones C and E and valve plate or plates may be withdrawn for examination or repairs without removing the outer case.

What I claim is:—

In an injector, the combination with the outer casing A having chambers A' A<sup>2</sup>, and the cones B and E, of the intermediate cone C having overflow outlets provided with loose valve plates C' and the chamber D surrounding the delivery cone E and provided with perforations D' between said cones C and E, substantially as described.

In witness whereof I have hereunto set my hand this 14th day of June, 1892.

HENRY HOPKINSON.

Witnesses:

H. W. GOUGH,

JOHN HENRY GOUGH.