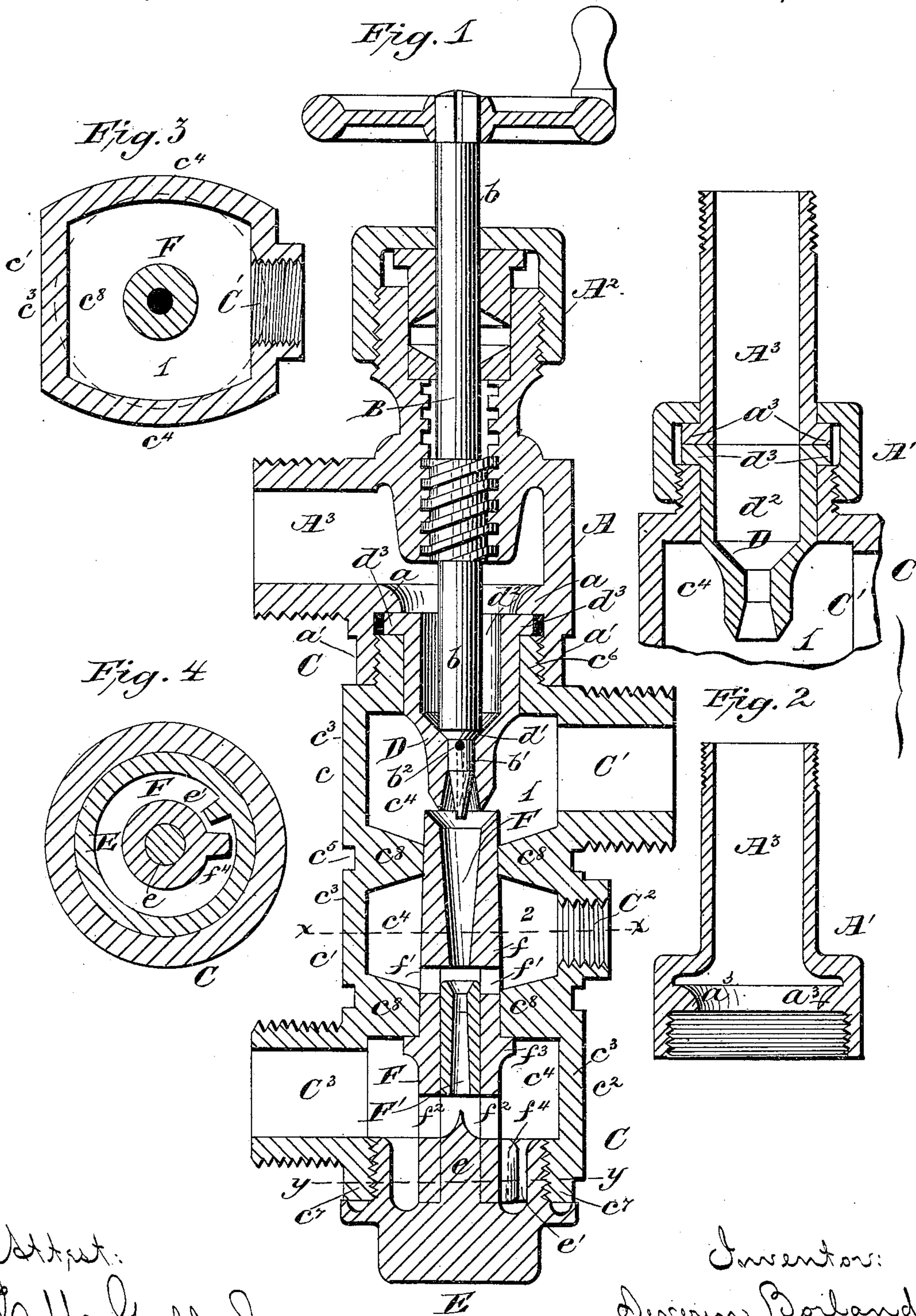


(Model.)

S. BORLAND.  
INJECTOR.

No. 354,176.

Patented Dec. 14, 1886.



Attest:

B. M. Gallagher.

W. Edison Coulter

Inventor:

Derwin Poilands

Henry Orth

At the



# UNITED STATES PATENT OFFICE.

SEVERIN BORLAND, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 354,176, dated December 14, 1886.

Application filed November 21, 1885. Serial No. 183,554. (Model.) Patented in England November 8, 1884, No. 14,729.

*To all whom it may concern:*

Be it known that I, SEVERIN BORLAND, a citizen of Great Britain, residing at Manchester, in the county of Lancaster and Kingdom of Great Britain, 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.

This invention relates to improvements in the construction of injectors for steam boilers, or for other purposes; and it consists in the construction of the casing of the injector and in the construction and arrangement of the internal parts thereof, substantially as herein-after fully described, and as shown in the accompanying drawings, in which—

Figure 1 is a longitudinal section of my improved injector. Fig. 2 is a sectional view of a screw-cap adapted to be connected with the injector to convert the same from a lifting to a non-lifting injector. Figs. 3 and 4 are transverse sections taken on lines *xx* and *yy* of Fig. 1.

My invention has for its object to simplify the construction of this class of apparatus without thereby affecting the efficiency thereof, and to give to the casing of the injector such a form as to require but very little finishing, thereby effecting a very material saving in time and labor.

The invention has for its further object to provide simple means whereby the connecting of the parts that constitute the injector with or their removal from or out of the injector-casing is greatly facilitated.

The invention has for its further object to so construct the injector as to adapt it for use either as a "lifting" or a "non lifting" injector.

In the above drawings, C indicates the injector-casing, which is cast or formed of one piece, the sections *c*, *c'*, and *c''* whereof have opposite plane curvilinear or convex outer faces, *c'' c''*, as more plainly shown in Fig. 4. In one of the plane surfaces of the sections *c* *c'* *c''* are formed, respectively, the water-branch C', the overflow-branch C'', and the combined steam and water branch C''', and between each

two sections is formed an annular groove or throat, *c''*.

It is obvious that when the injector-casing is of the outer form, as described, it requires but very little labor in finishing, much less so than is the case with injector-casings as heretofore constructed, and can therefore be made at considerably less expense.

The outer cylindrical end, *c''*, of the casing C is screw-threaded exteriorly, and the like inner end, *c'*, is screw-threaded interiorly.

When the injector is used as a lifting-injector, it is provided at its outer end, *c''*, with a cap or casing, A, screwed thereto, and which, like casing C, has plane and convex outer faces, respectively, and an annular recess or throat, *a'*. The cap or casing A has an axial screw-threaded passage for the reception of and in which works the screw-spindle B, the stem *b* of which projects through a suitable stuffing-box, A'', of casing A, in one of the plane surfaces of which is also formed the steam-branch A'. The inner conical end of the spindle B is constructed in the usual manner to act as a cone valve or plug to cut off the steam when fully screwed into its seat *d'* in the axial passage *d* of the steam-cone D. The inner tapering portion, *b'*, of the spindle is hollow, and has a port, *b''*, communicating with the said hollow portion, to admit the steam thereto and through said hollow portion to the steam-cone D when the spindle is screwed out sufficiently to bring the port *b''* clear of the seat *d'* into the enlarged portion *d''* of the steam-cone D.

When the injector is used as a non-lifting injector, the cap or casing A is removed and the cap or casing A', Fig. 2, is applied, which has simply a steam-branch, or by means of which the steam-branch A' is secured into position, the spindle B being here dispensed with, as is well understood.

As the caps are made interchangeable, it is obvious that the injector can readily be converted from a lifting to a non-lifting injector, and vice versa, as circumstances may require.

It will be observed that the steam-cone D has an annular flange, *d''*, on its enlarged portion *d''*, and is seated upon the outer end, *c''*, of the casing C, where it is held in position by a corresponding interior flange, *a*, formed in the cap or casing A, when the latter is screwed on said outer end of casing C. A similar flange may be formed in the cap or



casing A', if desired, or the steam-branch A<sup>3</sup> may terminate in a flange, a<sup>3</sup>, that seats upon flange d<sup>3</sup> of the cone D, and is securely held thereon by the screw cap or casing A', as shown in Fig. 2.

The casing C is divided into three chambers by the partition-walls c<sup>8</sup>, that taper inwardly, said walls having conical axial openings forming seats for the combining and discharging cones, and by a screw-plug, E, screwed into the inner end, c<sup>7</sup>, of casing C. The chamber 1 communicates with the water-branch C', the chamber 2 with the overflow-branch C<sup>2</sup>, and the chamber 3 with the combined steam and water branch C<sup>3</sup>, that leads to the boiler.

F indicates the combining and discharging cone. It is fitted and seated in the axial openings of the partitions c<sup>8</sup>, and has an annular flange or shoulder, f<sup>3</sup>, that limits its movement toward the steam-cone D, where the parts are fitted together, and holds the combining end f in proper relation to said steam-cone.

The combining and discharging cone F is securely held in position by the screw-plug E, that is provided with a cone-pin, e, that projects into the axial passage of said combining and discharging cone, as plainly shown in Fig. 1.

The combining and discharging cone F has ports f', communicating with the overflow-chamber 2, and ports f<sup>2</sup>, communicating with the discharge-chamber 3, for purposes well understood.

The axial passage of the combining and discharging cone F is cylindrical from its inner end to the portion f thereof, that forms the combining cone proper, as shown, to receive the cone-pin e of the screw-plug E, and a discharging-cone, F', that is fitted into the end of cone F, so that the discharge end of said cone F' will be flush with the discharge-ports f<sup>2</sup> and its receiving end in proper relation to the overflow-ports and the discharge-end of the combining portion f of cone F.

I have found that in injectors where the internal parts are so fitted as to be readily removed it is very difficult to remove the same when the injector has been in use for some time, the parts binding or sticking fast to the casing or their seats in said casing. To more readily remove such parts without the necessity of tools, that may more or less injure them, I form on the end of the cone F a radial lug or tooth, f<sup>4</sup>, with which engages a corresponding lug or tooth, e', on the inner periphery of the screw-cap E, as more plainly shown in Fig. 3.

It will be readily seen that when it is desired to remove the internal parts of the injector the cap E can be first loosened by a wrench or key, as it can nearly make a complete revolution before its tooth e' will engage the tooth f<sup>4</sup> of the cone F, and will then rotate the said cone as the cap is being unscrewed, thus loosening the cone in its seat. By means of this construction the cone is also more readily inserted, as a rotary motion will

be imparted thereto by the lug on the cap when the latter is screwed onto the casing C.

Having thus particularly described my invention and how the same is performed, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described casing C for injectors, having the opposite plane and convex faces, c<sup>3</sup> c<sup>4</sup>, and annular grooves or throats c<sup>5</sup>, and divided interiorly by partitions c<sup>8</sup> into three chambers provided with a water-branch, an overflow-branch, and a combined steam and water branch, respectively, said casing being constructed with an exterior screw-threaded portion at one end and an interiorly screw-threaded portion at the other, as described, for the purpose specified.

2. An injector convertible from a lifting-injector to a non-lifting injector, and vice versa, by means of interchangeable parts, substantially as described.

3. The combination, in an injector with the casing having water, overflow, and discharge branches and the steam combining and discharging cones, of the casings or caps A and A', adapted to be interchangeably connected to the injector casing, for the purpose specified.

4. The combination, substantially as herein described, with the injector-casing having its inner end, c<sup>7</sup>, screw-threaded interiorly and provided with an axial seat, of a discharging-cone, open at both ends, fitted in said seat and provided with a shoulder abutting against such seat, and a screw-cap adapted to be screwed in the end of the casing provided with a pin fitting into one of the open ends of the discharging-cone, for the purpose specified.

5. The combination, substantially as herein described, with the injector-casing having its inner end, c<sup>7</sup>, screw-threaded interiorly and provided with an axial seat, of a discharging-cone open at both ends, fitted in and having a shoulder that abuts against the said seat, and provided with a radial lug, f<sup>4</sup>, and a screw-cap constructed to be screwed in the end c<sup>7</sup> of the casing, said cap being provided with an axial pin or plug fitting into the end of the cone, and a radial lug, e', adapted to engage the lug f<sup>4</sup> of said cone, for the purpose specified.

6. The combination, with the casing C, having partitions c<sup>8</sup>, the combining cone F, having a portion of its axial passage made tapering outwardly, and the other portion thereof made cylindrical and provided with overflow and discharge ports, of a discharging-cone cylindrical in cross-section, having a tapering axial passage, and seated within the cylindrical portion of the axial passage of the combining-cone, for the purpose specified.

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

SEVERIN BORLAND.

Witnesses:

PETER J. LIVSEY,  
JAMES WOOD.