R. G. BROOKE.

STEAM INJECTOR.

APPLICATION FILED FEB. 27, 1912.

**1,030,714.**

**Patented June 25, 1912.**

3 SHEETS—SHEET 1.

Fig. 1.

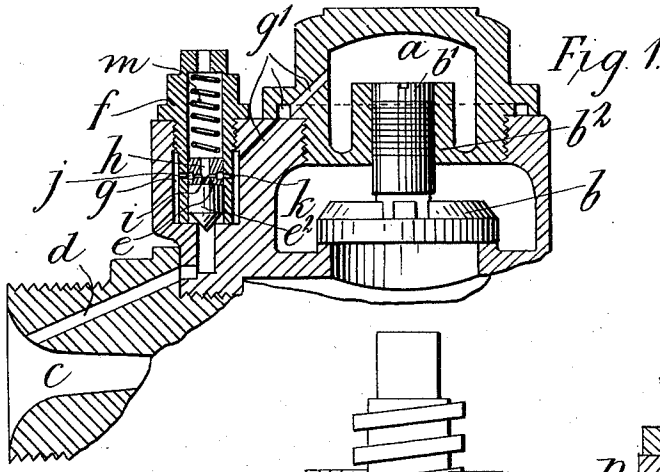



Fig. 2

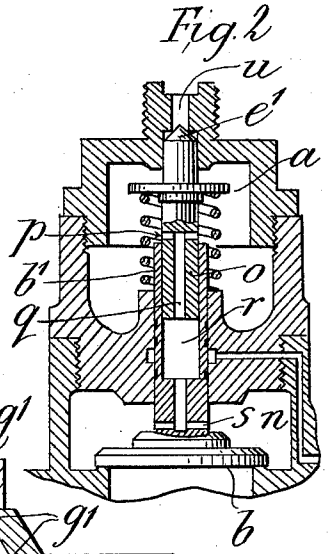



Fig. 3




Witnesses:
E. R. Peck
C. P. Wright Jr.

Inventor:
Robert G. Brooke
by Herbert C. Peck
Atty

R. G. BROOKE.

STEAM INJECTOR.

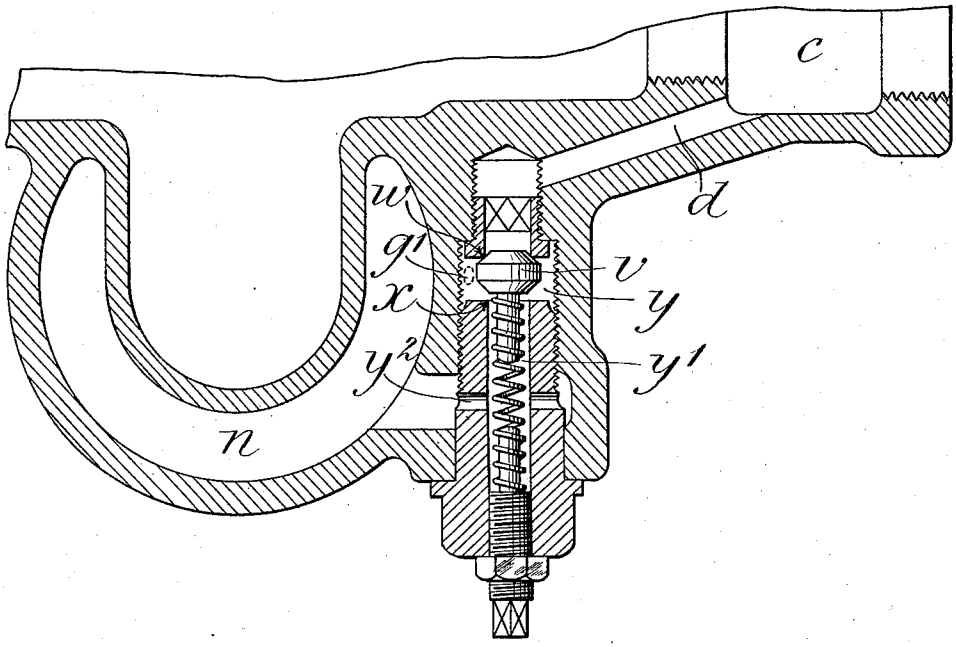
APPLICATION FILED FEB. 27, 1912.

1,030,714.

Patented June 25, 1912.

3 SHEETS-SHEET 2.

Fig. 4.




Witnesses:
E. R. Peck
C. P. Wright Jr.

Inventor:
Robert G. Brooke
by Hulbert & Peck
Atty

R. G. BROOKE.

STEAM INJECTOR.

APPLICATION FILED FEB. 27, 1912.

**1,030,714.**

Patented June 25, 1912.

3 SHEETS—SHEET 3.

*Fig. 5.*

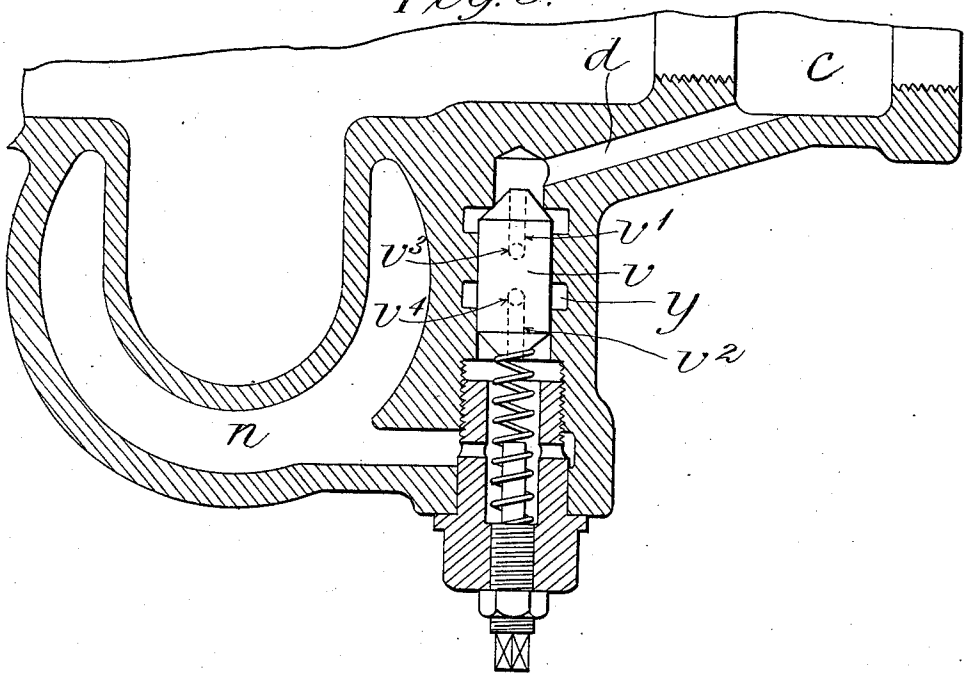
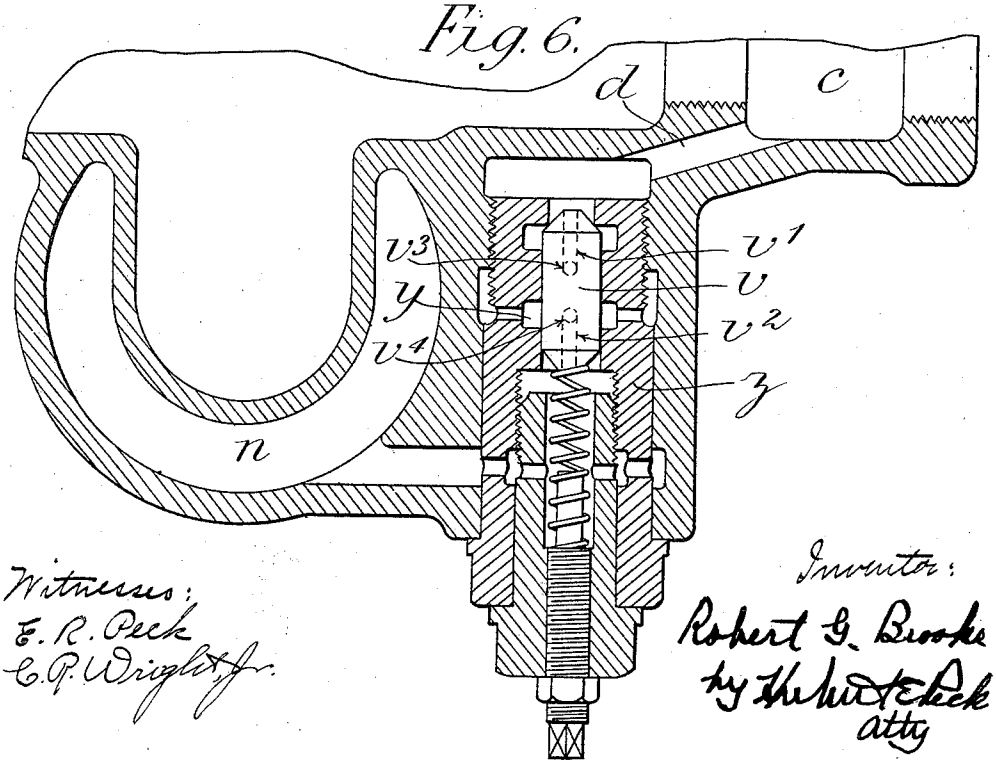



*Fig. 6.*




Witnesses:
E. R. Peck
C. P. Wright, Jr.

Inventor:
Robert G. Brooke
by Herbert E. Peck
atty

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

ROBERT GRUNDY BROOKE, OF MACCLESFIELD, ENGLAND.

## STEAM-INJECTOR.

1,030,714. Specification of Letters Patent. Patented June 25, 1912.

Application filed February 27, 1912. Serial No. 680,204.

*To all whom it may concern:*

Be it known that I, ROBERT GRUNDY BROOKE, a subject of the King of Great Britain and Ireland, residing at Macclesfield, in the county of Chester, England, have invented Improvements Relating to Steam-Injectors, of which the following is a specification.

This invention relates to injectors having an overflow valve or valves adapted to be closed or, after having been closed, to be prevented from opening until required, by the pressure of a fluid acting directly thereon or transmitted thereto indirectly.

In the specification of my Letters Patent No. 978,000, I have described various injector arrangements embodying means for preventing premature closure of the overflow valve due to pressure values in the delivery chamber at starting. This is highly important but it is also equally important that the first movement of the overflow valve at starting should not be opposed. This ordinarily will not happen with the injector arrangements according to the above mentioned Letters Patent but it is nevertheless, in certain circumstances, possible for some fluid to remain imprisoned in the pressure chamber pertaining to the overflow valve sufficiently long to offer some slight resistance to opening of the overflow valve.

The object of the present invention is to prevent such possibility of resistance to opening by providing means which, when the injector is not at work, places the pressure chamber freely in communication with a space where pressure is not in excess of that of the atmosphere. The arrangements are such that the said communication is interrupted during the time that the overflow valve is being maintained closed by the fluid in the pressure chamber while the injector is at work.

The invention may be carried into effect in various ways a few of which will now be described by way of example, with reference to the accompanying drawings, of which—

Figure 1 is a sectional elevation of part of an injector illustrating one arrangement. Fig. 2 is a similar view of another arrangement. Fig. 3 is a vertical section and Fig. 4 a section on the line A A of Fig. 3 illustrating a modified construction. Figs. 5 and 6 are views similar to Fig. 4 of other modifications.

Where, as is contemplated in Fig. 1, the pressure chamber $a$ pertaining to the overflow valve $b$ is connected to the delivery $c$ of the injector by way of a passage $d$ and the latter is interrupted at some point in its length by a spring loaded valve for the purpose of preventing premature closure of the overflow valve $b$ the said loaded valve may be made as a piston $e$ adapted, when it is closed to establish free communication between the pressure chamber $a$ and the atmosphere and, when opened, to interrupt such communication. The overflow valve $b$ is provided with a stem $b^1$, that works through the wall $b^2$ and constitutes valve closing means. Conveniently, the piston $e$ may slide in the hollow part of a sleeve $f$ adapted to be screwed into a housing in the injector body in such a way as to leave an annular space $g$ that communicates with the pressure chamber $a$ through passages $g^1$. The interior of the sleeve $f$ may be open at its outer end to the atmosphere as shown, and the control piston $e$ be provided with a longitudinal passage $h$, lateral ports $i$ and, it may be, an annular groove $j$, adapted, when the piston valve is closed to the delivery of the injector, as shown, to co-act with say lateral ports $k$ in the sleeve $f$, and thus vent the pressure chamber $a$. When the injector is at work, the fluid under pressure from the delivery $c$ of the injector will move the piston valve along the sleeve in a direction away from the valve seat until the inner end $e^2$ of the piston valve uncovers the ports $k$, and so may pass into the annular space $g$ around the sleeve $f$ and thence into the pressure chamber $a$. The venting passage $h$ will be closed when the piston valve $e$ moves to admit fluid under pressure into the pressure chamber $a$. The spring $m$ for loading the piston valve $e$ may as shown, be disposed in the sleeve behind the piston.

Where as shown in Fig. 2, a spring loaded valve $e^1$ controlling the communication between the delivery of the injector and the pressure chamber $a$ is located in the latter and telescopes within say the stem $b^1$ of the overflow valve $b$, the telescoping parts may constitute a valve which, when the injector is not at work, places the pressure chamber $a$ in free communication with the overflow outlet $n$ of the injector. For this purpose the stem $o$ of the loaded valve may be formed with lateral ports $p$ leading to a longitudinal passage $q$ that opens into the hollow part

$r$ of the overflow valve stem, such hollow part likewise having lateral ports $s$ leading to the overflow outlet $n$. In order to insure that the lateral ports $p$ in the stem $o$ of the loaded valve $e^1$ shall be closed when the injector is at work and the overflow valve $b$ closed, the said loaded valve is formed as a piston or plunger so that it has to retract some distance before the communication between the pressure chamber $a$ and the delivery of the injector by way of the passage $u$ is established.

Figs. 3 and 4 illustrate a modified construction wherein the valve $v$ controlling the passage $d$ between the pressure chamber $a$ and the delivery $c$, is double acting and associated with two seats $w$, $x$, the arrangement being such that when the injector is not at work and the valve is upon the seat $w$, as shown, the pressure chamber $a$ is in communication with the overflow outlet $n$, by way of the passage $g^1$ space $y$, passage $y^1$ and lateral ports $y^2$. When on the other hand the valve $v$ is upon the seat $x$ the communication to the overflow outlet $n$ is closed and the pressure chamber $a$ connected to the delivery $c$ of the injector.

In Fig. 5 the arrangement differs from that of Figs. 3 and 4 only in that the valve $v$ is made as a piston and has passages $v^1$, $v^2$ terminating in lateral ports $v^3$, $v^4$ adapted to alternatively place the space $y$ that leads to the pressure chamber $a$ respectively into communication with the delivery $c$ and overflow outlet $n$.

In Fig. 6 the several described elements of Fig. 5 are contained in a sleeve $z$ that is bodily removable from the injector casing in a similar way to the sleeve $f$ of Fig. 1.

What I claim is:—

1. In a steam injector, the combination with an overflow valve, means for closing said valve, a fluid pressure chamber in communication with the valve closing means and a connection for conducting fluid from the delivery of the injector to the pressure chamber, of a mechanically loaded fluid intercepting valve adapted, when closed, to vent the pressure chamber.

2. In a steam injector, the combination with an overflow valve, means for closing said valve, a fluid pressure chamber in communication with the valve closing means and a connection for conducting fluid from the delivery of the injector to the pressure chamber, of a spring loaded valve adapted in one position to intercept fluid tending to pass from the delivery to the pressure chamber with momentary increase of pressure in the delivery, prior to formation of the jet, to values equal to the maximum derivable after the formation of the jet, and simultaneously vent the pressure chamber.

3. In a steam injector, the combination with an overflow valve, means for closing said valve, a fluid pressure chamber in communication with the valve closing means and a connection for conducting fluid from the delivery of the injector to the pressure chamber, of a spring loaded valve in such connection adapted in one position to intercept passage of fluid from the delivery to the pressure chamber and simultaneously establish communication between the latter and the overflow of the injector.

4. In a steam injector, the combination with an overflow valve, means for closing said valve, a fluid pressure chamber in communication with the valve closing means and a connection for conducting fluid from the delivery of the injector to the pressure chamber, of a mechanically loaded fluid intercepting valve arranged in such passage and having ports adapted to permit fluid from the pressure chamber to be vented through one end of the valve.

5. In a steam injector, the combination with an overflow valve, means for closing said valve, a fluid pressure chamber in communication with the valve closing means and a connection for conducting fluid from the delivery of the injector to the pressure chamber, of a mechanically loaded fluid intercepting valve arranged in such passage and adapted in one extreme position to vent the pressure chamber and in the other extreme position to arrest the venting.

Signed at Manchester, England, this ninth day of February 1912.

ROBERT GRUNDY BROOKE.

Witnesses:
ERNALD SIMPSON MOSELEY,
MALCOLM SMETHURST.