

No. 759,162.

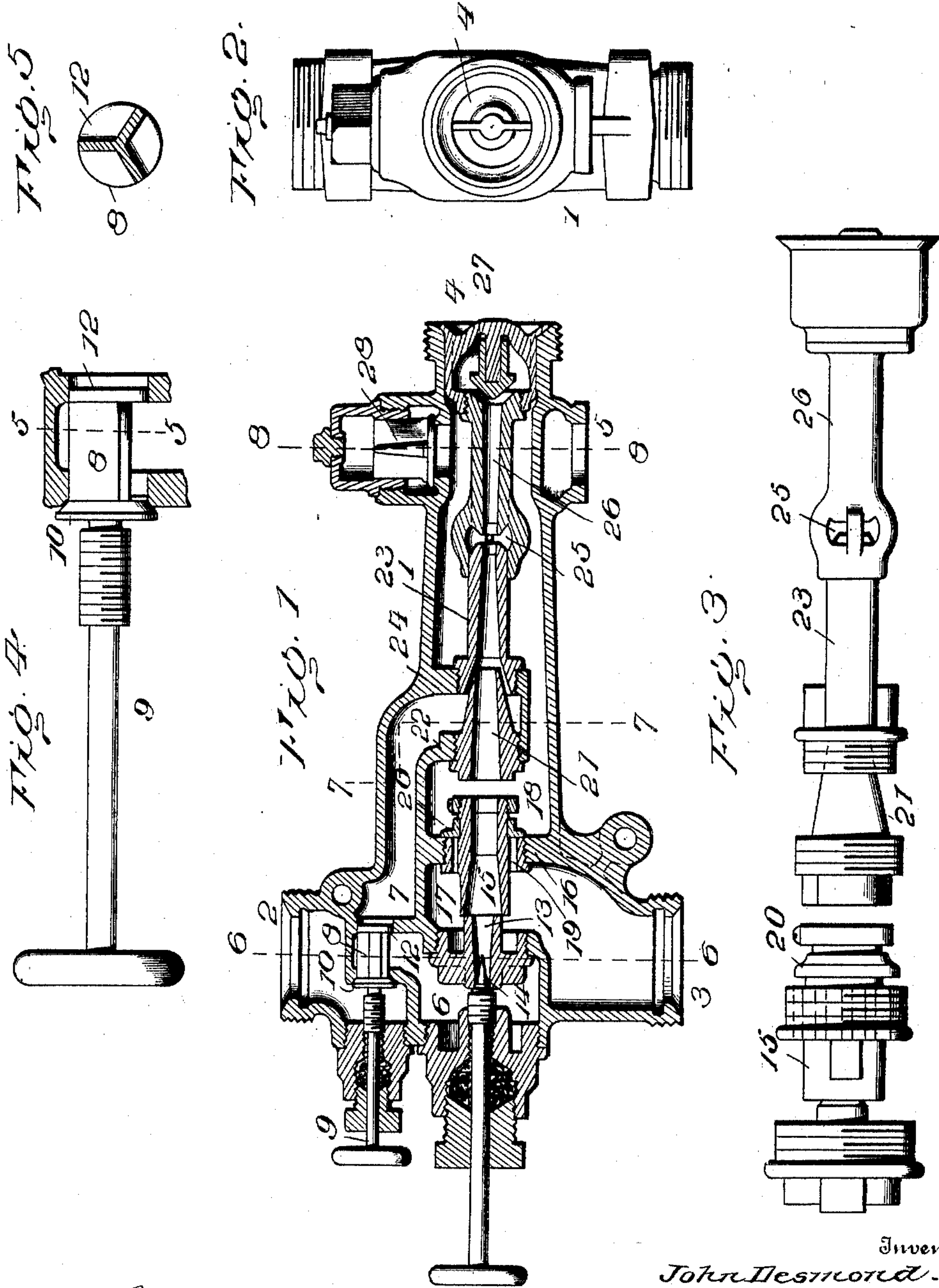
PATENTED MAY 3, 1904.

J. DESMOND.
STEAM INJECTOR.

APPLICATION FILED DEC. 24, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses

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2 SHEETS—SHEET 2.

FIG. 8.

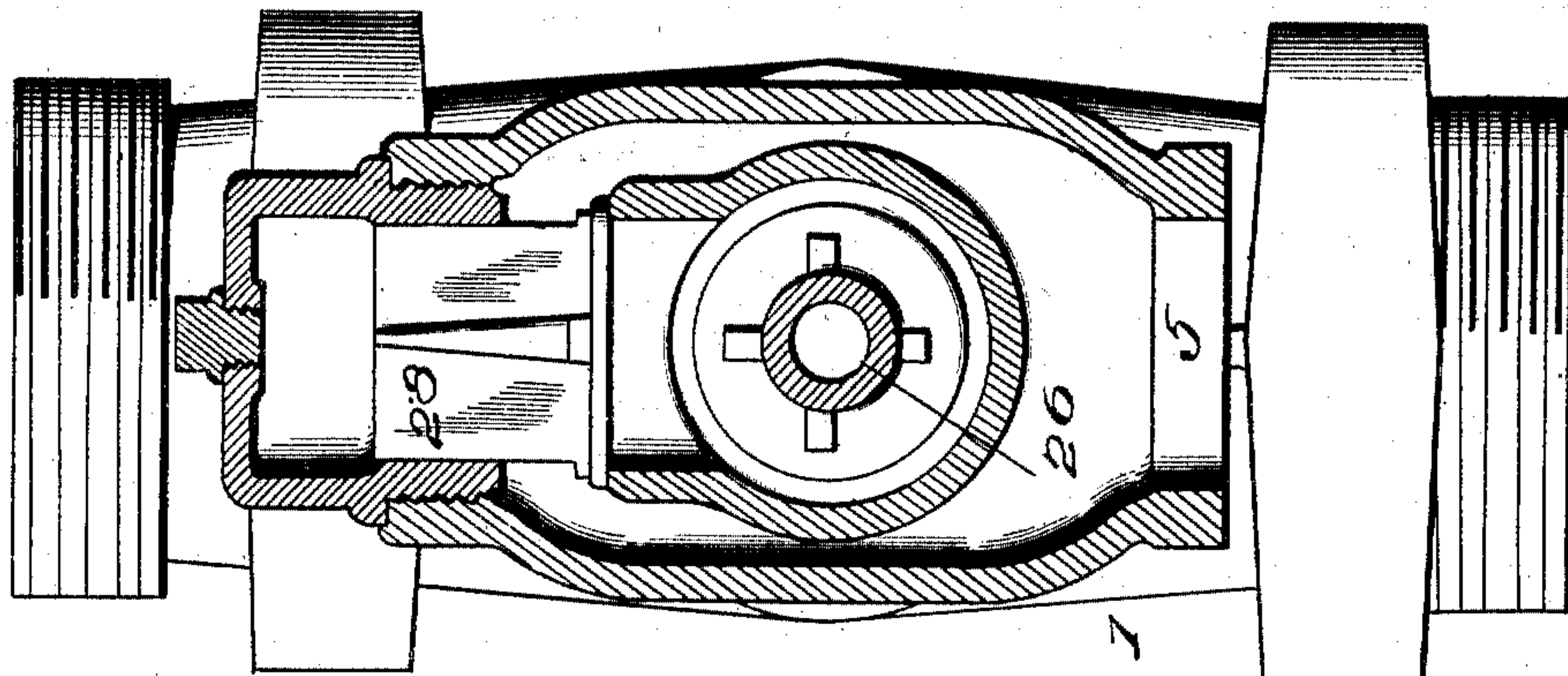


FIG. 7.

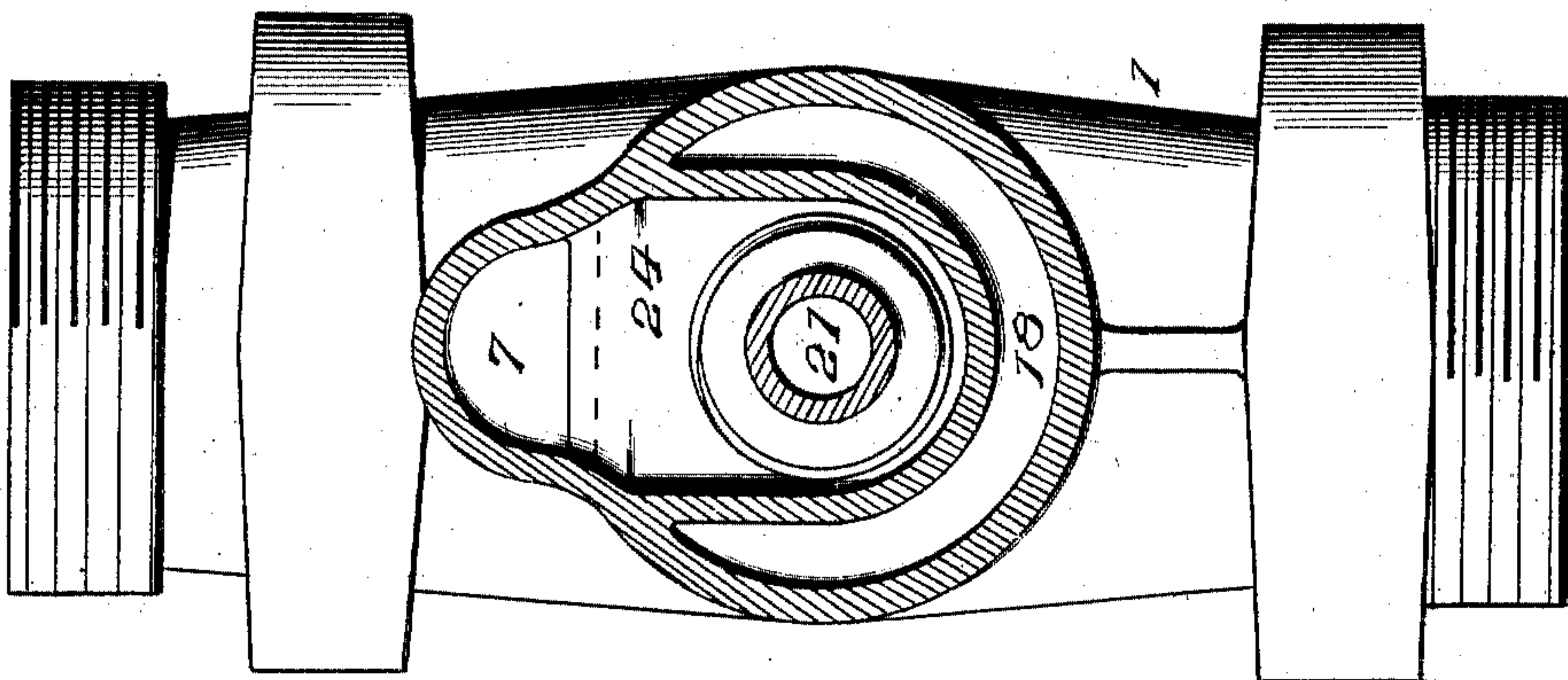
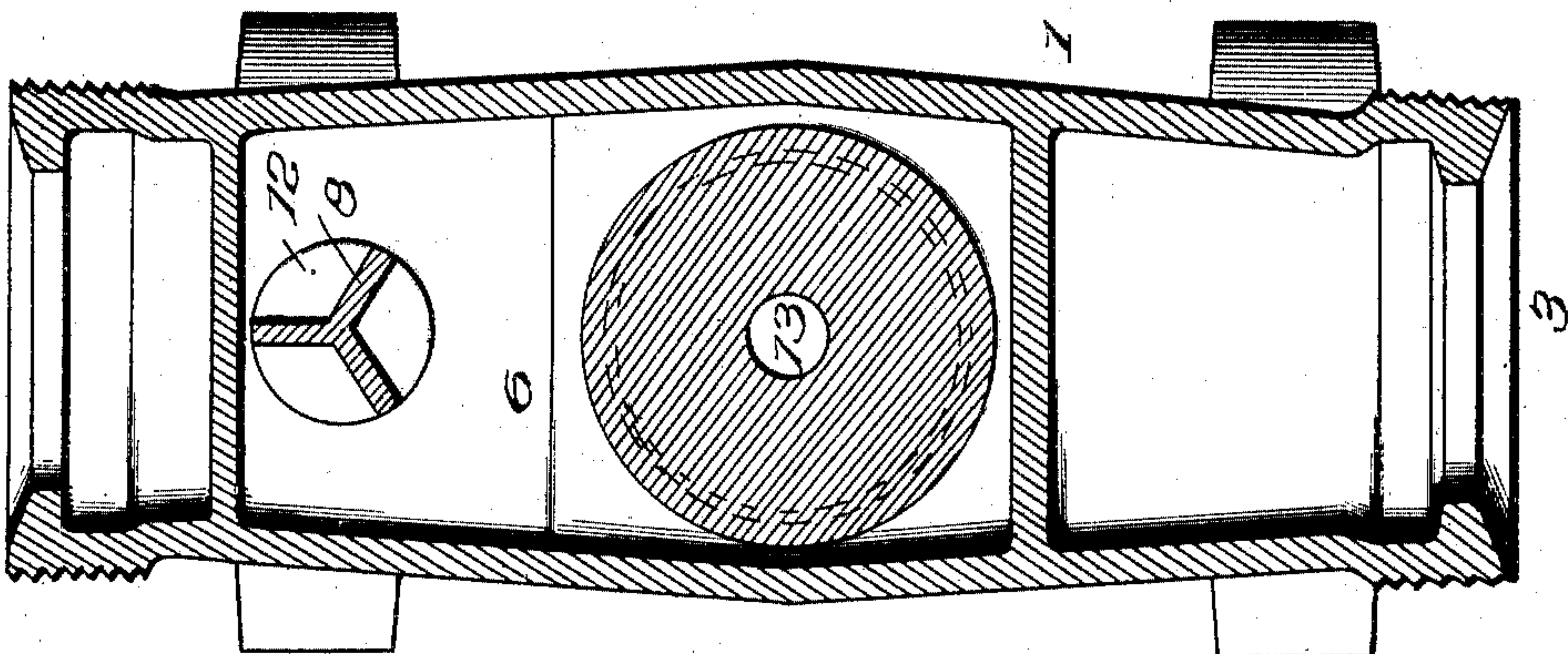


FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHN DESMOND, OF CINCINNATI, OHIO, ASSIGNOR TO THE WM. POWELL COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO.

STEAM-INJECTOR.

SPECIFICATION forming part of Letters Patent No. 759,162, dated May 3, 1904.

Application filed December 24, 1902. Serial No. 136,483. (No model.)

To all whom it may concern:

Be it known that I, JOHN DESMOND, of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful
 5 Improvements in Steam-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.

10 The primary object of this invention is to provide an automatic restarting lifting and forcing injector which may be worked under a maximum range of steam-pressure, enabling the water and steam to be so thoroughly mixed
 15 before reaching the combining-jet of the forcer that a less quantity of steam is necessary to resist the boiler-pressure in forcing the column of steam and water to the boiler.

20 A further object is to overcome all difficulties heretofore occasioned by the presence of lime in the water; and a further object is to greatly raise the standard of efficiency of open overflow-injectors.

25 The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view. Fig. 2 is an end view. Fig. 3 is a plan view of the
 30 two series of jets of the lifter and forcer removed from the casing. Fig. 4 is an enlarged view of the steam-controlling valve or valves. Fig. 5 is a cross-sectional view on line 5 5, Fig. 4. Figs. 6, 7, and 8 are respectively cross-
 35 sectional views on lines 6 6, 7 7, and 8 8, Fig. 1.

Referring to the drawings, 1 designates the casing; 2, the steam-inlet; 3, the water-inlet; 4, the boiler-outlet, and 5 the overflow-open-
 40 ing. The admission of steam to the lifter steam-chamber 6 and to the forcer steam-chamber 7 is controlled by a double valve 8. This valve, whose handled stem 9 projects through one end of the casing, is equipped with two
 45 disks 10 and 12, the former controlling the admission to the lifter steam-chamber and the latter the admission to the forcer steam-chamber. The two disks are connected together

by a winged portion, and the disk 12 is movable in an opening in a wall whose thickness 50 is greater than that of the disk, so that while the valve may be turned sufficiently to unseat disk 10 disk 12 will continue to keep closed the opening into the forcer steam-chamber; but a further turning of the valve will unseat 55 such disk and allow steam to pass to both chambers. The admission of steam to the lifter steam-jet 13 may be regulated by a throttle-valve 14.

The lifter combining-jet 15 is mounted in a 60 wall 16, separating the suction or water chamber 17 from the overflow and condensing chamber 18. Communication between these two chambers 17 and 18 may be had through ports 19 in the flange of jet 15, such ports being 65 closed in the initial lifting of the water by a sliding valve 20, which valve is drawn away from its seat by the vacuum created within the condensing-chamber after the column is established. This feature is fully disclosed by 70 my application for Letters Patent filed November 29, 1902, Serial No. 133,178.

The forcer steam-jet 21 is mounted in the wall 22 of the forcer steam-chamber in line with the lifter combining-jet, the space be- 75 tween it and the latter forming a relief-opening through which the initial steam will escape and later the water, such escape being into the chamber 18. This forcer steam-jet extends through the forcer steam-chamber 80 and well into the mouth of the forcer combining-jet 23, which latter is mounted in the second wall 24 of the forcer steam-chamber, there being no opening to the atmosphere at the mouth of such forcer combining-jet nor be- 85 tween the latter and the delivery end of the forcer steam-jet. By means of this arrangement I am enabled to force the water right into the forcer steam-jet, effecting a complete mixture of the steam and water, with the result that 90 the forcing steam which enters the forcer combining-jet from around the outside or exterior of the forcer steam-jet is proportionately less than would otherwise be required to resist the boiler-pressure. Hence the water can be de- 95 livered to the boiler at a temperature so low

as to absolutely overcome all difficulty from the presence of lime.

The usual spill-openings 25 are between the forcer combining-jet and the forcer delivery-jet 26. The outer end of the latter is normally closed by the ordinary check-valve 27. The overflow-opening from chamber 18 is controlled by an overflow-valve 28.

If from any cause the working of the injector should be interrupted, the steam instead of flowing through the suction or water chamber to the tank will find an outlet through the space between the jets 15 and 21 into chamber 18, and thus prevent heating the suction-pipe and allow of automatic restarting.

In practice valve 8 is turned sufficiently to unseat disk 10 to admit steam to the lifter steam-chamber, and such steam in passing through the jets of the injector and the chamber 18 upon reaching the overflow will effect the lifting of water into chamber 17. This water is taken up by the lifter combining-jet and forced into the forcer steam-jet and combining-jet, the passage-way through ports 19 being closed by the seating of valve 20 consequent upon the creation of the vacuum in chamber 17. As soon as the column is established valve 8 is further turned to unseat disk 12, allowing steam to pass into the forcer steam-chamber and pass from around the forcer steam-jet into the forcer combining-jet, effecting the forcing of the column through the latter and the delivery-jet and on to the boiler. There being no opening to the atmosphere between the mouth of the forcer combining-jet and the forcer steam-jet, water can be forced into the latter under pressure, thus effecting a complete mixture of steam and water before the same reaches the forcer combining-jet. The steam required for forcing is delivered on the outside of the water-column; but by reason of the thorough intermixing of the steam and water being effected before the same reaches the forcer combining-jet it is not necessary to use a maximum quantity of steam to resist the boiler-pressure. Hence the forcing steam does not drive as many units of heat into the water as is required in injectors as heretofore constructed, with the result that water is delivered to the boiler at a sufficiently low temperature to enable me to successfully overcome all difficulties from the use of water containing lime, which, as is well known, constitutes such a menace to the life and efficiency of steam-injectors. Through the space between the lifter combining-jet and the forcer steam-jet steam in starting will find outlet to the overflow-chamber 18, as will also the initial supply of water. In the event of a break in the column this same space forms a relief or blow-off, enabling the injector to exhaust its steam sufficiently to automatically restart. This would not be possible were the steam capable of blowing back into the suction or water

chamber, and thereby heating the suction-pipe.

I claim as my invention—

1. An automatic restarting lifting and forcing injector having the forcer steam-jet opening into the forcer combining-jet, walls of the casing preventing communication with the atmosphere at the mouth of the combining-jet, forcing steam being admitted to the established column of water at the outside thereof, and an overflow-chamber into which said forcer steam-jet is open at its receiving end, as set forth.

2. In an automatic restarting lifting and forcing injector, the forcer combining-jet mounted in one wall of the forcer steam-chamber, the forcer steam-jet being mounted in the other wall of such chamber and opening at one end directly into said combining-jet, the steam from such chamber entering the combining-jet from the exterior of the forcer steam-jet, and an overflow-chamber into which said forcer steam-jet is open at its other end, as set forth.

3. The combination with the steam-chambers of the lifter and forcer, and the overflow-chamber, of the lifter-jets and the forcer-jets, the lifter combining-jet emptying direct into the forcer steam-jet, such latter jet extending through the forcer steam-chamber and opening direct into the forcer combining-jet, the space between the lifter combining-jet and the forcer steam-jet opening into said overflow-chamber, as set forth.

4. An automatic restarting lifting and forcing injector having the forcer steam-jet in line with, but spaced apart from, the combining-jet of the lifter, the steam and water being forced into such forcer steam-jet under heavy pressure, the forcer steam-chamber for supplying steam to the column of water from the outside of the forcer steam-jet, and the overflow-chamber into which the space between the lifter combining-jet and the forcer steam-jet opens, as set forth.

5. The combination with the casing having separate steam-chambers for the lifter and forcer, of the lifter-jets, the combining-jet of which is mounted in a wall between the water and overflow chambers, the forcer steam-jet and forcer combining-jet mounted in opposite walls of the forcer steam-chamber and in line with the lifter-jets, said forcer steam-jet at its receiving end being spaced apart from the lifter combining-jet and at its other end extended through the forcer steam-chamber and into the mouth of the forcer combining-jet, said wall of the forcer steam-chamber wherein the forcer combining-jet is mounted preventing any communication being had with the atmosphere at the mouth of such forcer combining-jet, steam being supplied to said forcer combining-jet from around the outside of the forcer steam-jet, as set forth.

6. An automatic restarting-injector, having
a water-chamber, an overflow-chamber, and a
forcer steam-chamber, the lifter combining-
jet being mounted in the wall between the
5 water-chamber and the overflow-chamber, the
forcer steam-jet being mounted in one wall of
the forcer steam-chamber and spaced apart at
its receiving end from said lifter combining-
jet, such space opening into said overflow-
10 chamber, said forcer steam-jet being extended

through the forcer steam-chamber and into
the forcer combining-jet mounted in the other
wall of such latter chamber, as set forth.

In testimony whereof I have signed this
specification in the presence of two subscrib- 15
ing witnesses.

JOHN DESMOND.

Witnesses:

AUGUST WICKE,
WM. H. SCHWEIKERT.