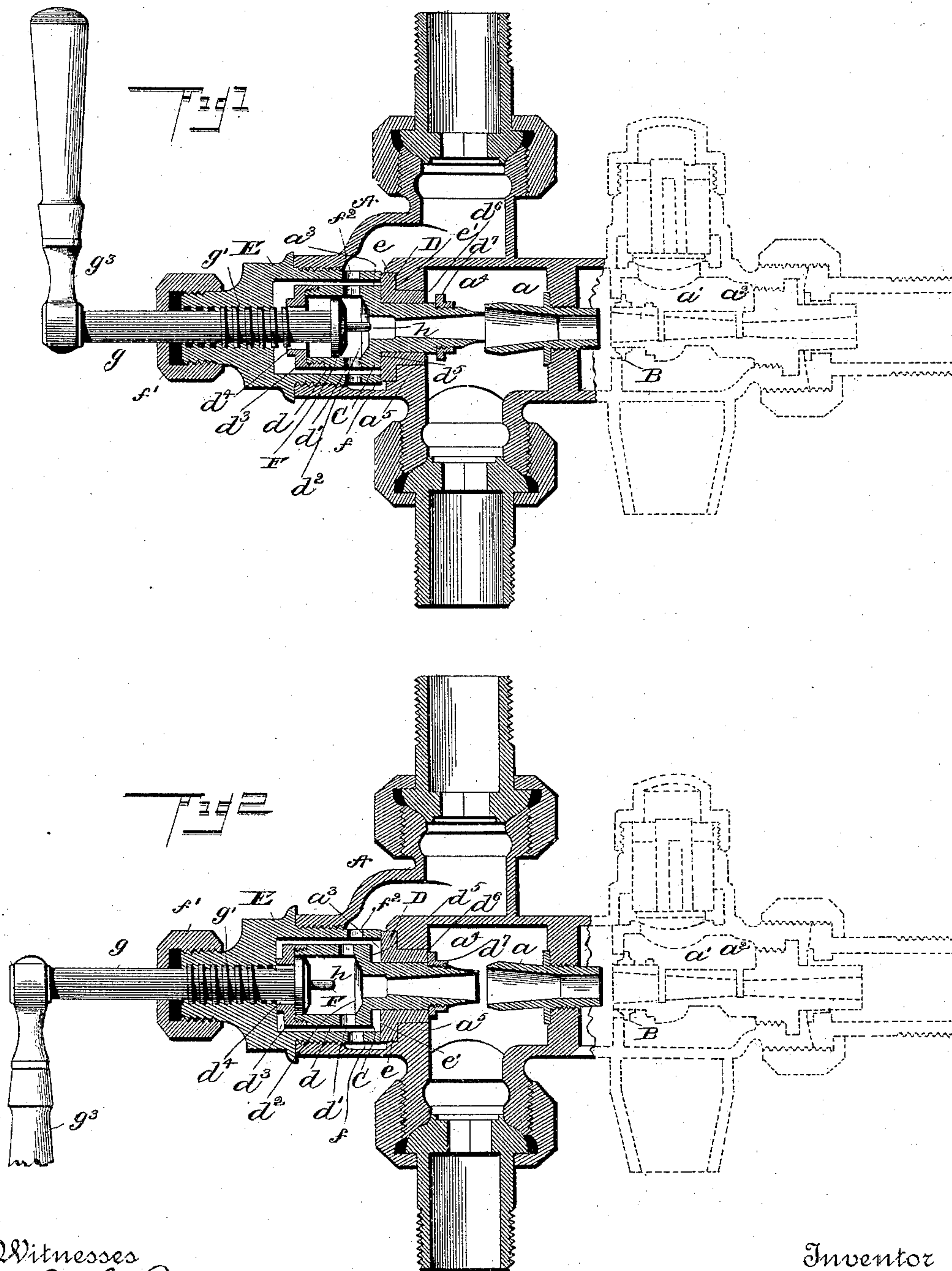


(Model.)

J. DESMOND.  
STEAM INJECTOR.

No. 445,831.

Patented Feb. 3, 1891.



Witnesses

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# UNITED STATES PATENT OFFICE.

JOHN DESMOND, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE HAYDEN & DERBY MANUFACTURING COMPANY, OF NEW YORK, N. Y.

## STEAM-INJECTOR.

SPECIFICATION forming part of Letters Patent No. 445,831, dated February 3, 1891.

Application filed October 11, 1890. Serial No. 367,792. (Model.)

*To all whom it may concern:*

Be it known that I, JOHN DESMOND, a citizen of the United States of America, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Steam-Injectors, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention pertains to certain improvements in steam-injectors, having for its object the production of a high and low pressure injector, whereby the lifting qualities are greatly improved and two different ranges of steam-  
15 pressure are secured in an automatic injector wherein the regulation of the water-supply is automatically effected by the steam-inlet tube and steam-valve.

The invention consists, essentially, in controlling the water-supply to the injector at two ranges or degrees—namely, high and low steam pressure—at one range of which the space or opening between the steam-inlet tube and the lifting-tube is enlarged, so that an increased quantity of water is admitted, and the same will condense the steam at a much higher pressure than when the opening between said tubes is decreased, as when low pressure is being used.

30 To this end the invention comprises a movable steam-inlet tube and a steam-inlet valve having two ranges of movement by which high and low pressure of steam are secured.

35 The invention also comprises a steam-inlet valve for securing high and low pressure steam directly in the steam-inlet tube.

40 The invention also comprises a movable steam-inlet tube having two seats, against one of which it is automatically held by the steam-pressure, said seats being at opposite sides of the wall or diaphragm between the steam and vacuum chambers.

45 The invention further comprises a steam-inlet valve provided with a circular pin or extension projected centrally into said steam-inlet tube and capable of being partially or entirely withdrawn therefrom.

50 The invention also comprises the detail construction, combination, and arrangement of parts, substantially as hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is

a vertical longitudinal sectional view of an injector constructed in accordance with my invention, parts being in dotted lines, and showing the same set for low-pressure steam. Fig. 2 is a view showing the position of the parts for high-pressure steam.

Referring to the drawings, A designates the casing;  $a$ , the suction or lifting tube;  $a'$ , the combining-tube;  $a^2$ , the delivery-tube;  $a^3$ , the steam-chamber;  $a^4$ , the vacuum-chamber, and  $a^5$  a wall or diaphragm between said chambers. B is a sliding valve. Parts of these features are shown in dotted lines, since they do not enter into my present invention, but are or may be similar to the form embraced by Letters Patent No. 404,262, granted to me May 28, 1889.

70 C is the movable steam-inlet tube, having at one end an enlarged cylindrical extension  $d$ , wherein is formed a series of holes or ports  $d'$ , adjacent which is a valve-seat  $d^2$ . A cap  $d^3$  is secured to the outer end of extension  $d$  and is provided with a central hole or opening  $d^4$ .

80 D is a sleeve or bushing rigidly secured in wall or diaphragm  $a^5$  of the injector and provided at one end with a continuous circular flange  $e$ , against which bears the inner end of a circular extension  $f$  of an end plug E, screwed into the end of the casing and provided with a packing-nut  $f'$ . A series of holes or ports  $f^2$  is formed in this extension  $f$ . The flanged end of sleeve or bushing D forms a seat  $e'$  for the continuous shoulder  $d^5$  of tube C when the injector is in position for low-pressure steam, as shown in Fig. 1, while the other end of said sleeve forms a seat  $d^6$ , against which bears a nut  $d^7$ , screwed on tube C, said nut bearing against said seat when the tube is drawn back and held for high-pressure steam, as shown in Fig. 2. The steam-inlet tube is held automatically against seat  $e'$  by the steam-pressure.

95 F is the steam-inlet valve, which is provided with a stem  $g$ , having a thread  $g'$ , engaging a corresponding thread in end plug E, said stem being projected through the central opening  $d^4$  of cap  $d^3$ . To the outer end of this stem is secured an operating-handle  $g^2$ . I do not confine myself to this means for operating the valve, since a lever may be used with like results.

The valve F is preferably provided on its



outer face with a short circular pin or extension  $h$ , which is either secured thereto or formed integral therewith, although it may be a reduced portion thereof. This pin or extension is designed to extend centrally into the steam-inlet tube, from which it may be partially or entirely withdrawn. The thread on the valve-stem is or may be so formed that a one-half revolution of the stem by its handle will place the valve in the position shown in Fig. 1, with the pin entirely withdrawn for low-pressure steam, while a three-fourths movement of said stem will bring the valve tight against the end cap of the steam-inlet tube, and a full or complete revolution of the stem will draw said tube away from its seat  $e'$ , and will bring the nut  $d'$  against the seat  $d^6$  for high-pressure steam.

In operation, when the injector is required to start very low—i. e., on low steam—and the low-pressure range is desired, the valve-stem is turned sufficiently to draw the pin or extension  $h$  of valve  $F$  entirely out of tube  $C$ , as shown in Fig. 1, and enable water to be forced into the boiler at a low pressure. The pressure of the steam on the steam-tube holds the latter firmly against its seat  $e'$ , making a tight joint at every point. As the steam increases in pressure, the lifting qualities of the machine decrease. Hence when it is desired to use the same injector on a high steam-pressure or use the high range the valve-stem is further turned until the valve proper engages the end cap  $d^3$ , forces the steam-inlet tube back from its seat  $e'$ , and firmly seats the same against seat  $d^6$ . In thus drawing back the steam-inlet tube the space or opening between the inner end of the latter and the suction or lifting tube is enlarged, thus admitting an increased quantity of water, which will condense the steam at a much higher pressure than when said space or opening is decreased, as when the injector is being worked at low pressure. Immediately upon releasing the steam-inlet valve the same will fly back to its seat  $e'$  and be firmly held by the steam-pressure thereon. In addition to thus securing a high pressure by increasing the space or opening between the steam-inlet and the lifting tubes, I am also enabled to obtain results somewhat similar, although not of as high order, by reducing the steam-jet in the steam-inlet tube. This is accomplished by adjusting the valve and placing the pin or extension  $h$  farther in the steam-tube, which results in reducing the size of the jet and enabling the water lifted to condense the steam at a much higher steam-pressure than by giving the full area of steam, as when the parts are in position for low pressure; but while my invention is applicable to the use just stated, yet this is merely ancillary to the main object, which is to secure in an automatic injector two different degrees or ranges of steam-pressure, one high and the other low. Hence, although better

results are secured by having the steam-inlet valve provided with a pin or extension, yet the same is not absolutely essential, and may, if desired, be dispensed with. Other slight changes may be made without departing from the spirit and scope of my invention.

The advantages of my invention will be apparent to those skilled in the art, and it will be especially observed that by providing two valve-seats in the wall or diaphragm for the steam-inlet tube all packing around said tube is dispensed with, such packing being impracticable in steam-injectors.

I claim as my invention—

1. In a steam-injector for high and low pressure steam, a movable steam-inlet tube having forward and back seats between the steam and vacuum chambers, and a steam-valve having a seat in said inlet-tube and designed to vary the range or degree of the steam-supply in the steam-inlet tube and to secure an increased water-supply, as set forth.

2. In a steam-injector, a movable steam-inlet tube having two seats, against one of which it is automatically held by steam-pressure, said seats being at opposite sides of the wall or diaphragm between the steam and vacuum chambers, as set forth.

3. In a steam-injector having a double-seated wall or diaphragm between the steam and vacuum chambers, the movable steam-inlet tube having double seats designed to engage those of said wall or diaphragm, said tube being automatically held against one of said seats by the steam-pressure and against the other seat when held back, as set forth.

4. A steam-injector for high and low pressure steam, having a movable steam-inlet tube provided with double seats, and a steam-valve for withdrawing said tube, so as to secure a high pressure and an increased water-supply, as set forth.

5. In a steam-injector having the wall or diaphragm, the sleeve or bushing secured therein having double seats, and the movable steam-inlet tube having a shoulder to engage one of said seats and a nut to engage the other of said seats, as set forth.

6. In a steam-injector having the wall or diaphragm, the sleeve or bushing secured therein and having a continuous flange at one end, the end plug having a cylindrical extension bearing against said flange and provided with a series of holes or ports, the movable steam-inlet tube designed to be seated against either end of said sleeve or bushing, and the steam-inlet valve located in said steam-inlet tube and designed to retract the same, substantially as set forth.

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

JOHN DESMOND.

Witnesses:

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HOWARD H. KNAPP.