(Model.)

W. T. MESSINGER.

INJECTOR.

No. 350,547, Patented Oct. 12, 1886.

Fig. 1.

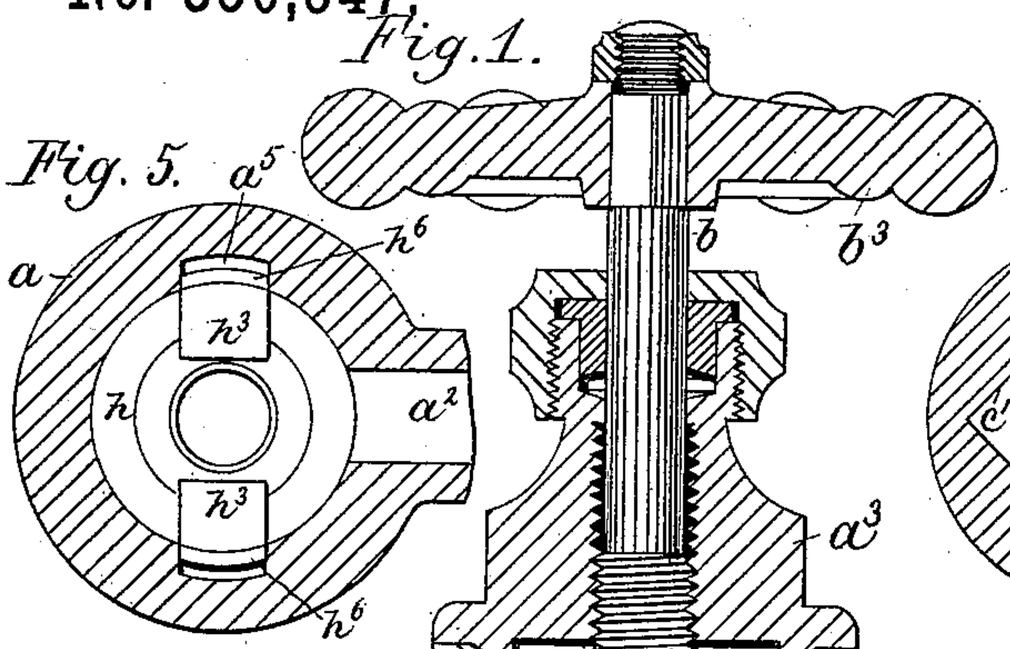


Fig. 2.

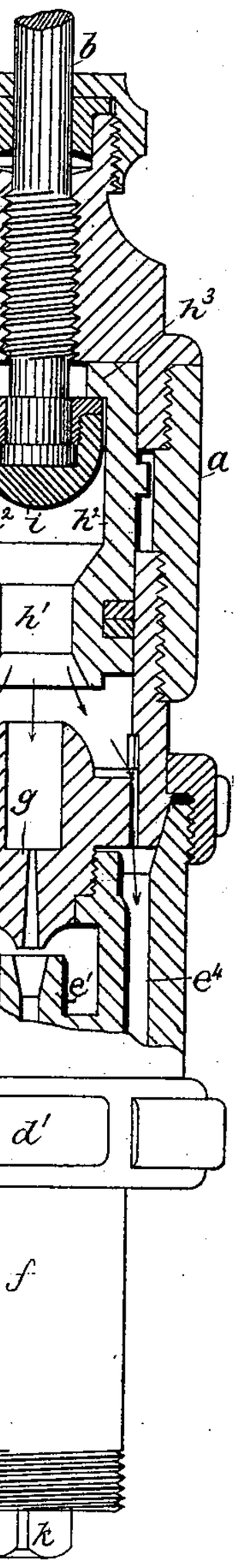


Fig. 5.

Fig. 3

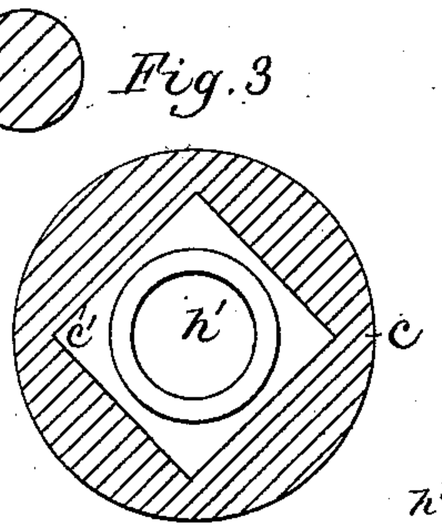


Fig. 6.

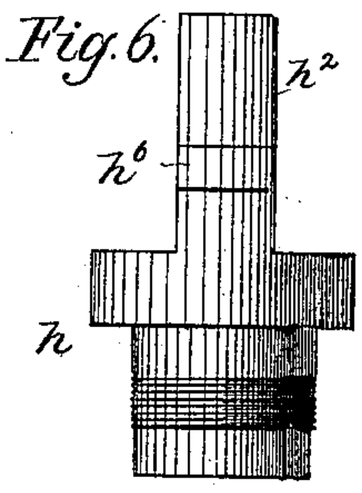
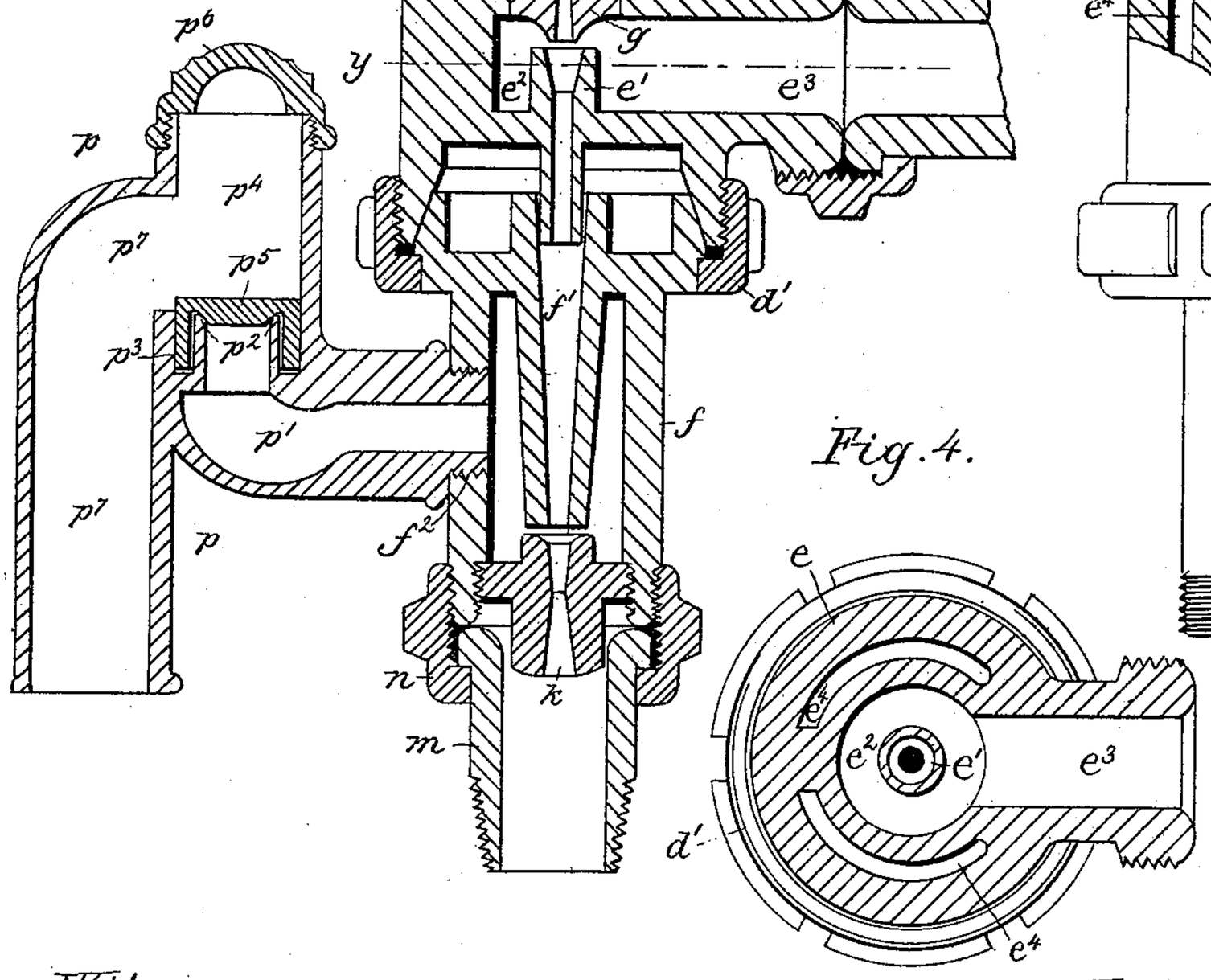


Fig. 4.



Witnesses.
a. O. Orne
J. J. Maloney.

Inventor,
William T. Messinger,
by Jos. P. Livermore
Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM T. MESSINGER, OF CAMBRIDGE, MASSACHUSETTS.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 350,547, dated October 12, 1886.

Application filed September 7, 1885. Serial No. 176,388. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM T. MESSINGER, of Cambridge, county of Middlesex, State of Massachusetts, have invented an Improvement in Injectors, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relating to injectors is embodied in an injector of the class shown in Letters Patent No. 281,385, dated July 17, 1883, and No. 302,273, dated July 22, 1884, the injector containing three nozzles, the first and third or rearmost and foremost of which may be placed in communication with a steam-inlet passage or chamber, and the intermediate one of which nozzles communicates at its base with a water-inlet chamber. The injector is shown and will be described as standing in a vertical position, receiving steam at its upper end and delivering the stream of liquid from its lower end.

The invention consists, essentially, in the novel construction of the valves or devices controlling the admission of steam to the first and third nozzles, the devices operating to admit steam to the first nozzle for a short period of time before it is admitted to the third nozzle in starting the injector, as in the patents referred to.

The invention further consists in details of construction of the overflow-chamber.

Figure 1 is a longitudinal section of an injector embodying this invention, shown with the valves closed in the position occupied when the injector is not in operation; Fig. 2, a similar section on a plane at right angles to that of Fig. 1, showing a somewhat modified construction of the valves, which are open, or in the position occupied when the injector is in operation; Figs. 3 and 4, transverse sections on lines *x* and *y*, respectively, Fig. 1; and Figs. 5 and 6, a plan view and side elevation, respectively, of the valve controlling the flow of steam to the third nozzle, Fig. 5 also showing the steam-chamber in section.

The injector comprises in its construction a piece or casting, *a*, provided with a steam-inlet passage, a^2, and closed at its end by a bonnet, a^3, which also constitutes the nut for the threaded valve-stem *b*. The said casting *a* has fastened to it a piece or casting, *c*, connected by a coupling-nut, *d*, with a casting, *e*, having the second or intermediate nozzle, *e'*, made integral with it, and having formed within it and around the mouth of the said nozzle a water-inlet chamber, e^2, provided with a water-inlet passage, e^3, the said casting also containing ports or passages e^4, (see Figs. 2 and 4,) passing longitudinally through it, and thus forming the connection between the steam-chamber *a'* in the casting *a* and the base or mouth of the third nozzle, *f'*, made in a casting, *f*, connected with the casting *e* by the coupling-nut *d'*. The casting *e* has attached to it, by screw-threads or otherwise, the first nozzle, *g*, which extends into the piece *c*, that forms a continuation of the steam-chamber, there being a sufficient space around the nozzle-piece *g* and within the piece *c* for the passage of steam to the ports e^4 and third nozzle, *f'*. The piece *c* is made separately from the piece *a*, in order that the coupling-nut *d* may be applied to it, and is tightly connected with the piece *a* by screw-threads or otherwise, the said piece *c* having an internally-projecting squared ridge, *c'*, (see Fig. 3,) to receive a suitable tool to hold it while being screwed tightly into the piece *a*, it never being intended to separate the pieces *a* and *c* after the injector is once put together. The pieces *a* and *c* are bored smoothly to form a cylinder or steam-chamber, *a'*, in which is tightly fitted a piston, *h*, having a passage, *h'*, through it, and co-operating with a seat around the mouth of the nozzle *g*, as shown in Fig. 1, in which position it prevents the passage of steam around the nozzle *g* to the passages e^4 and nozzle *f'*. The piston *h* thus constitutes a valve which controls the flow of steam to the third nozzle, and will be called the "secondary" valve, and is provided at its upper end with a seat for a valve, *i*, which, when seated thereon, prevents the passage of steam from the chamber *a'* into the passage *h'*, which leads directly to the passage in the nozzle-piece *g*. The valve *i* is connected with the stem *b* in such manner as to permit the said stem to turn independently thereof.

As shown in Fig. 1, the stem has a head, *b'*, grooved to receive a wire, b^2, passed through the valve *i*, and having its ends bent down in a groove surrounding the said valve. When the stem *b* is turned by its handle b^3, the main

valve *i* is unseated, permitting the steam to pass into the passage *h'*, and thence through the first nozzle, *g*, where it operates to produce a vacuum in the water-chamber e^2 and raise the water thereto in the usual manner. The secondary valve or piston *h* is provided with arms h^2, which extend up into and are guided by the lower portion of the bonnet a^3, which screws into the casting *a*, as shown in Fig. 2, the interior of the said bonnet being bored to the same size as the steam-chamber *a'*. The said arms h^2 have at their upper ends lateral projections h^3, which, after the valve *i* has been raised a certain distance from its seat, are engaged by the said valve, so that in the further movement of the valve-stem the piston *h* is drawn through the cylinder, raising its lower end from its seat around the nozzle *g*, and thus permitting steam to pass below its lower edge and around the said nozzle to the passages e^4, and thence to the nozzle *f'*, as shown by the arrows, Fig. 2.

As shown in Fig. 1, the seat on the nozzle-piece *g* for the lower end of the piston *h* is made of soft or somewhat yielding material, (shown at *g'* as held in a recess in the piece *g* by a suitable thimble, g^2,) and the seat for the valve *i* at the upper end of the piston *h* is of precisely similar construction. As shown in Fig. 2, the packing is dispensed with, and tight joints are insured by the contact of a curved with a conical or tapering surface, as will be readily understood from the drawings.

As shown in Fig. 2, the head of the valve-stem *b* is held in the valve *i* by a nut, b^3, instead of by a wire, as shown in Fig. 1. The piston *h* is provided with suitable packing where it operates in the cylinder, said packing being shown in Fig. 1 as consisting of a ring, h^4, of soft material, held in place by a nut, h^5, screwed onto the said piston, while, as shown in Fig. 2, the piston has a groove, in which rings h^{40}, of metallic packing, are sprung.

In order to retain the arms h^2 of the piston *h* at right angles to the steam-inlet a^2, or so that they will not close the said inlet, the said arms are provided with external projections h^6, which engage longitudinal grooves a^5 (see Figs. 2 and 5) in the steam-chamber *a'*, thus preventing the rotation of the piston *h* in the said chamber. The steam for both nozzles passes through the interior of the secondary valve instead of passing around the exterior thereof to the third nozzle, as in the patents referred to.

The construction of the castings *e* and *f* is substantially the same as in another application filed herewith, and the operation is substantially the same as in the patents hereinbefore referred to. The said casting *f* constitutes a chamber around the nozzle *f'*, which chamber may have screwed within it a discharge-tip, *k*, and is threaded at its outside to receive a coupling-nut, *n*, by which a suitable nipple, *m*, may be connected with the said casting *f*, serving to receive the pipe which conveys the stream of liquid forced by the injector to the boiler or other point where it is to be used.

The chamber *f* is provided with a lateral opening, f^2, (see Fig. 1,) and when used as an overflow-chamber will preferably have attached to the said opening an auxiliary overflow-chamber, *p*, having a passage, *p'*, terminating in a raised valve-seat, p^2, which has an annular depression or recess, p^3, around it. Above the valve-seat p^2 is a guide-passage, p^4, for the valve p^5, made as an inverted cup, the edges of which enter the annular recess p^3 when the valve is seated, and after the fluid has been flowing through the passage *p'* and valve-seat it will accumulate in the said annular recess, so that when the valve p^5 drops it will enter the liquid in the said annular recess, thus forming a tightly-sealed joint. The guide-passage p^4 is closed by a cap, p^6, after the valve has been inserted, and is provided with a lateral outlet or discharge-passage, p^7, through which the liquid escapes, the valve p^5 being raised by the said liquid above the mouth of the said passage p^7 or the lower edge thereof.

I claim—

1. An injector having three nozzles and a passage around the first and second leading to the third, combined with a cylindrical steam-chamber communicating with the first and third nozzles, and piston therein provided with a longitudinal passage and co-operating with a seat around the mouth or inlet of the said first nozzle, and a valve seating on said piston controlling the flow of fluid through the passage thereof, and adapted in its movement from its seat to engage the said piston and remove it from its seat, permitting fluid to pass through the passage of said piston and around the first nozzle to the third nozzle, substantially as described.

2. An injector having three nozzles and a steam-chamber communicating with the first and third, provided with a bonnet having an internally-threaded passage, combined with a secondary valve controlling the flow of fluid from the steam-chamber to the third nozzle, and a main valve co-operating therewith, controlling the flow of fluid to the first nozzle, the said secondary valve being provided with arms fitting within the bonnet of the steam-chamber, and having projections to be engaged by the main valve, substantially as described.

3. In an injector, the combination, with a main overflow-chamber provided with a lateral opening, of an auxiliary or external overflow-chamber having a passage communicating with the interior of the main or usual overflow-chamber, terminating in a raised valve-seat having an annular recess around it, a valve-chamber above the said valve-seat, and a cup-shaped valve therein, the edges of which enter the annular recess around the valve-seat, and a lateral discharge-passage from said valve-chamber, substantially as described.

4. An injector having three nozzles and a steam-chamber communicating with the first and third, provided with a lateral steam-inlet and with longitudinal guide-grooves, combined with a main and secondary valve controlling the flow of steam to the first and third nozzles, respectively, the said secondary valve being provided with arms having projections entering the guide-grooves of the steam-chamber and other projections to be engaged by the main valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WM. T. MESSINGER.

Witnesses:

JOS. P. LIVERMORE,

H. P. BATES.