(Model.)

W. T. MESSINGER.

INJECTOR.

No. 350,546. Patented Oct. 12, 1886.

Fig. 1.

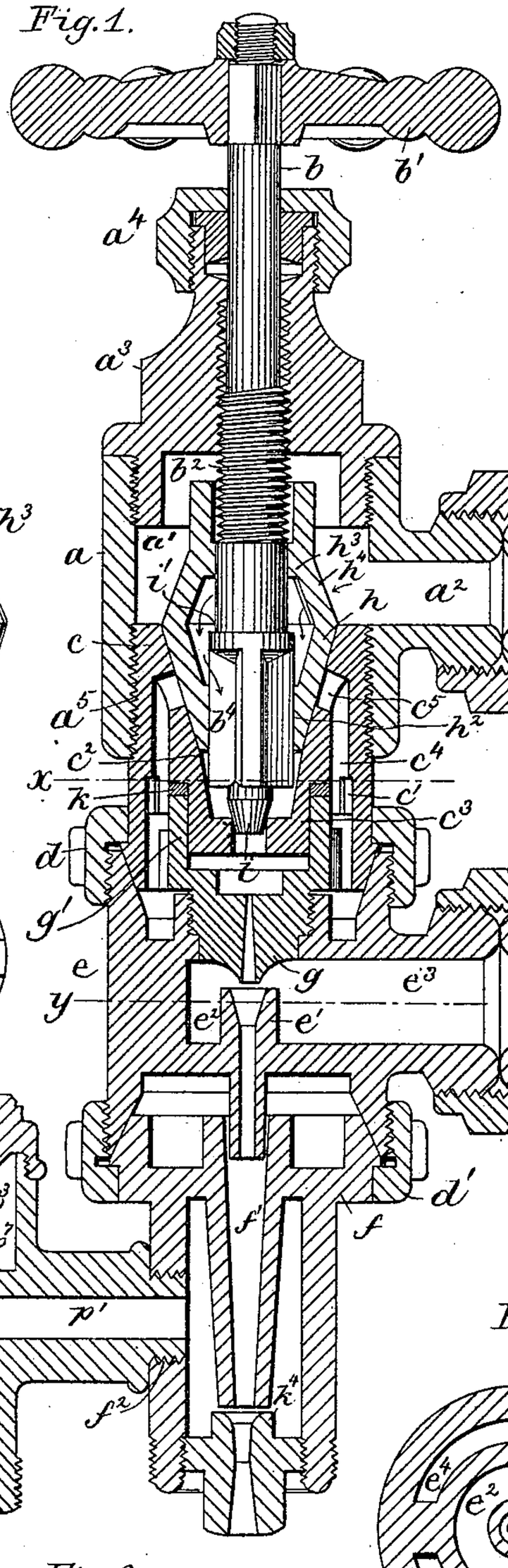


Fig. 2.

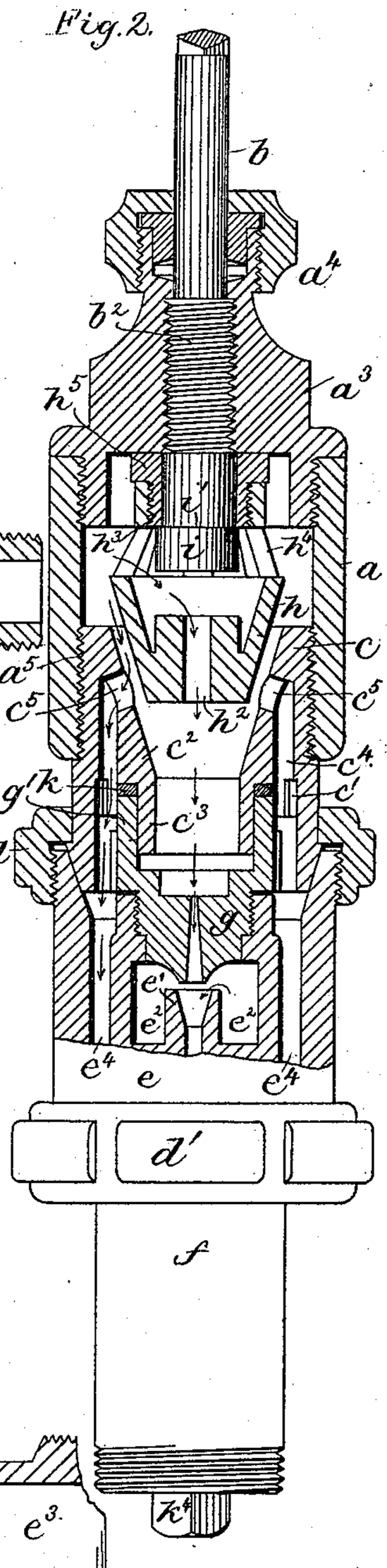


Fig. 5.

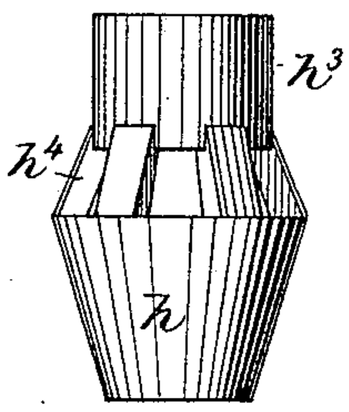


Fig. 6.

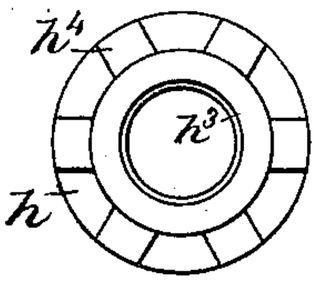


Fig. 4.

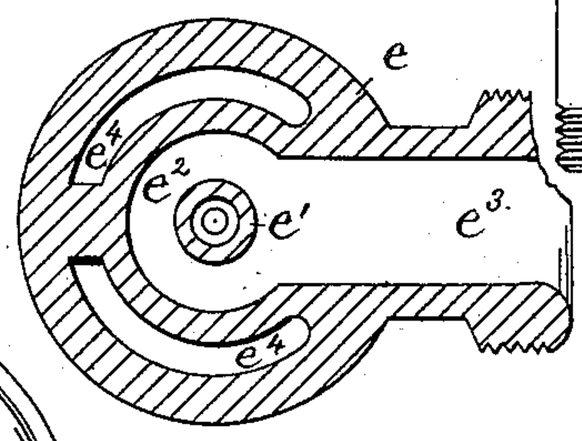
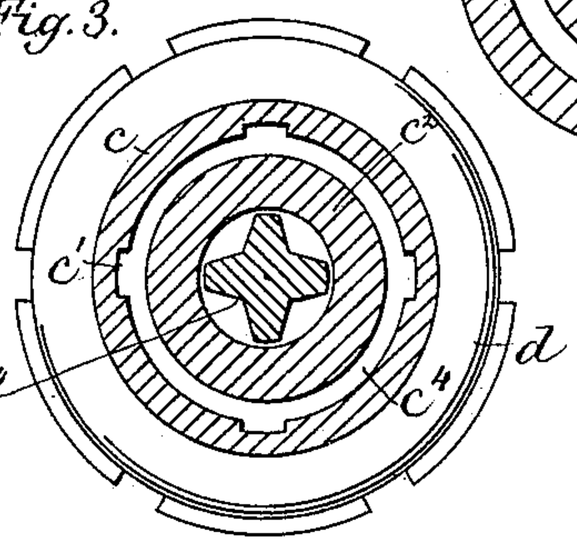


Fig. 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM T. MESSINGER, OF CAMBRIDGE, MASSACHUSETTS.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 350,546, dated October 12, 1886.

Application filed September 7, 1885. Serial No. 176,387. (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 shown 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, having three nozzles, the first or rearmost of which is a steam-nozzle, and the second or intermediate one of which communicates with the water-supply from which the water is raised or drawn by the action of the jet of steam in the first nozzle, and the third or foremost of which nozzles also communicates with the supply of steam and acts upon the stream of water issuing from the second nozzle.

The invention consists, partly, in a novel construction of the devices controlling the flow of steam to the first and third nozzles, which are supplied from a common steam-inlet passage, and also in details of construction of the overflow-chamber, this part of the invention being applicable to other injectors besides those containing three nozzles co-operating together, as described. The steam controlling mechanism operates to admit steam to the first nozzle for a short period of time before it is admitted to the third nozzle, thus permitting the jet issuing from the first nozzle to produce a vacuum in the water-chamber at the base of the second nozzle and raise the water thereto and deliver it from the second nozzle, and after the water is thus raised and delivered from the second nozzle the steam is admitted to the third nozzle, forcing the said stream of water from the latter or delivery nozzle of the injector with sufficient force to enter the boiler or overcome such other pressure as may be required. For convenience in description the injector will be spoken of as being in a vertical position, delivering the water from its lower end. The steam is admitted to a chamber at the upper end, which chamber may be in direct communication with the first nozzle, and is also connected by suitable passages in a case or shell surrounding the second nozzle, and the water-chamber with the third nozzle. In the present invention the portion of the steam-chamber connected with the casting containing the second nozzle, and passages leading to the third nozzle, and also having rigidly connected with it the first nozzle, has a tapering internal bore leading toward the first nozzle, and also has ports leading laterally from the said bore to the passages around the second nozzle, that lead to the third nozzle. A tapering valve seated in the said internal bore controls the flow of steam through the lateral ports to the third nozzle, and the said tapering valve has an internal passage leading to the first nozzle. The said tapering valve may be called, for distinction, the "secondary" valve, as its operation depends upon that of another or main valve provided with a suitable valve stem and handle or operating device, and controlling the flow of steam to the first nozzle. The main valve is so constructed that at the end of a considerable movement from its seat, during which movement steam is admitted to the first nozzle, it engages the secondary valve and removes it from its seat, thus admitting steam to the third nozzle at the proper time. Both valves are thus controlled and operated by a single valve-stem, and the movement of the main valve before the secondary valve is engaged occupies sufficient time to enable the steam passing through the first nozzle to raise the water so as to deliver a steady stream from the second nozzle, after which the steam is admitted to the third nozzle to force the said stream forward.

Figure 1 is a longitudinal section of an injector embodying this invention, being shown with both valves closed; Fig. 2, a similar section on a plane at right angles to Fig. 1, showing a modified construction of the valves, which are both open or in the position occupied when the injector is in operation; Figs. 3 and 4, transverse sections on lines x and y of Fig. 1, respectively; and Figs. 5 and 6, a side elevation and plan view of the secondary valve.

Steam is admitted into a steam-chamber, a', formed partly in a casting, a, provided with an inlet-passage, a^2, and closed at its upper end by a bonnet, a^3, in which the stem b of the valves operates, the said stem being provided with a suitable handle, b', and having a threaded portion, b^2, operating in a threaded passage in the bonnet a^3, the unthreaded portion

of said stem passing through a suitable stuffing-box, a^4. The casting a, which forms a part of the steam-chamber a', has connected with it, preferably by screw-threads a^5, a casting, c, shown as connected by a coupling-nut, d, with the casting e, which is provided with a water-inlet passage, e^3, and has preferably made integral with it the second nozzle, e', leading from the water-chamber e^2, which surrounds it and communicates with the passage e^3, the said casting e also having an outer shell, which surrounds the water-chamber e^2, providing a space or passage, e^4, (see Figs. 2 and 4,) between it and the water-chamber, said passages extending from end to end of the casting e, and conveying steam to the third nozzle, f', in a casting, f, connected with the lower end of the casting e by a coupling-nut, d'.

The casting e has screwed into it or otherwise connected with it the first nozzle, g, the orifice of which is opposite the mouth of the second nozzle, e', a jet of steam issuing from said nozzle g operating to produce a vacuum in the water-chamber e^2 and raise the water thereto, and deliver the said water in a stream from the nozzle e', in the usual manner. The casting c is provided with internal recesses, c', (see Fig. 3,) to receive a wrench or tool, so that it may be screwed tightly to the casting a, the two castings thus forming, practically, a single piece, being made separately only for convenience in construction and to enable the coupling-ring d to be applied, said coupling-ring being placed over the casting c before the latter is connected with the casting a. The two connected castings a and c thus form the steam-chamber a' or portion controlling the supply of steam to the injector proper, which is all below the coupling-nut d, and may be removed from the steam-controlling portion by unscrewing the said nut. The portion c of the steam-chamber has an internal portion, c^2, having a tapering bore forming a passage leading to the first nozzle, g, and the said portion c^2 has a projection, c^3, fitting into a tubular recess, g', at the base of the piece which forms the first nozzle, g, and a packing-ring, k, of lead or other somewhat yielding material, is placed between the pieces c and g, so that when the latter are drawn together by the coupling-nut d the packing-ring k is squeezed tightly between the parts c and g, making a steam-tight joint between them. The casting c has a recess or passage, c^4, between its outer shell and the inner portion, c^2, the said passage c^4 communicating with the space surrounding the first nozzle, and with the passages e^4 in the casting e, leading to the third nozzle, and also communicating at its upper end through lateral ports c^5 with the internal bore of the portion c^2. A tapering plug, h, is fitted to the tapering internal bore of the casting c, and when seated therein prevents the passage of steam from the chamber a' to the ports c^5, c^4, and e^4, leading to the third nozzle, f', the said tapering plug h constituting the secondary valve, which governs the admission of steam to the third nozzle, and which, when raised from its seat, as shown in Fig. 2, permits the steam to flow through the said passages to the third nozzle. The secondary valve h is made hollow or provided with an internal passage, h^2, through which steam may pass to the first nozzle, g, while the said secondary valve is seated, and preventing the passage of steam to the third nozzle, f'. The flow of steam through the said passage h^2 in the secondary valve to the first nozzle is controlled by the main valve i, connected with the valve-stem b, the said valve or its stem being provided with a shoulder, i', which, after the said valve has been moved a definite amount from its seat, will engage a collar, h^3, connected with the secondary valve h by a series of arms, h^4, between which the steam passes from the steam-chamber into the passage through the secondary valve, as indicated by the arrows, Fig. 1. As shown in Fig. 1, the valve i co-operates with a seat formed in the casting c, or it might be in the nozzle g, while in the construction shown in Fig. 2 the valve i co operates with a seat in the interior of the secondary valve h. In the construction shown in Fig. 1 the passage in the lower portion of the secondary valve h is large enough to permit the shouldered portion of the valve-stem to pass through it, the secondary valve being slipped over the upper end of the valve-stem before the handle b' is fastened thereon, and when in the injector having a free movement between its seat in the casting c and the under side of the bonnet a^3, being normally retained on its seat by gravity as well as by the pressure of steam in the chamber a'. The portion b^4 of the valve-stem between the shoulder i' and the valve proper, i, in Fig. 1 is grooved or made star-shaped, as shown in Fig. 3, to engage and guide the secondary valve, and at the same time permit the steam to flow between the said stem and the internal bore of the secondary valve. In the construction shown in Fig. 2 the secondary valve cannot be slipped over the valve-stem; and it is consequently provided with a nut, h^5, which forms part of the collar h^3, engaged by the shoulder i' in lifting the secondary valve. Suitable space is left between the shoulder i' and collar h^3 when both valves are seated, so that in operating the valve-stem by the handle b' to admit steam to the injector the main valve is unseated, admitting steam to the first nozzle for a suitable length of time before the shoulder i' reaches the collar h^3 and unseats the secondary valve, admitting steam to the third nozzle, thus affording sufficient time for the lifting of water to the chamber e^2 before the steam is admitted to the nozzle f'.

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-tube, k^4, and is threaded at its outside to receive a coupling-nut, by which a suitable nipple 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 shell surrounding the nozzle *f'* is provided with a passage, f^2, to which may be connected the usual waste-pipe, when the said shell is used as an overflow-chamber, or to which may be connected a waste-pipe containing a valve to permit the liquid to escape in starting the injector when no discharge-tube is employed, and preferably when used as an overflow-chamber the shell *f* will have connected with it a secondary overflow-chamber, *p*, having a passage, *p'*, leading from the interior of the shell *f* or main overflow-chamber, and terminating in a valve seat, p^2, controlled by a check-valve operating in a chamber, p^3, provided with a cap or bonnet, p^4, having a guide, p^5, for the stem p^6 of the valve p^7. Thus when liquid is discharged from the main overflow-chamber it passes through the passage *p'*, raising the valve p^7, and flows into the chamber p^3, which is provided with a discharging-passage, p^8, open to the atmosphere, but having its mouth over a passage, p^9, provided with screw-threads p^{10}, or otherwise adapted to have a waste-pipe connected with it, so that the overflowing liquid will be carried off. By having the passage p^8 open to the atmosphere, as shown, it can at once be seen whether or not liquid is escaping from the overflow-chamber, and the check-valve p^7 prevents the admission of air and dust to the interior of the injector when no liquid is escaping from the overflow-chamber.

I claim—

1. In an injector having three nozzles, the first and third of which receive the steam or actuating fluid, and the intermediate one of which receives the liquid to be forced, a steam-chamber having an internal passage communicating with the first nozzle, and a passage communicating with the third nozzle, and lateral ports connecting said passages, combined with a secondary valve seating in the internal passage, which controls the flow of fluid through the lateral ports to the third nozzle, and is provided with an internal passage leading to the first nozzle, and a main valve controlling the flow of fluid to the first nozzle and engaging and operating the secondary valve, substantially as described.

2. An injector comprising three nozzles, the first nozzle having a tubular recess at its base, combined with a steam-chamber having a projection entering the said recess, and packing interposed between the base of the first nozzle and the steam-chamber, which latter is provided with an internal passage leading to the first nozzle, and a surrounding passage leading to the third nozzle, and lateral ports connecting said passages, a secondary valve seating in said internal passage and controlling the flow of fluid through the said ports, and itself provided with a passage leading to the first nozzle, and a main valve controlling the flow of fluid to the first nozzle and engaging and operating the secondary valve, substantially as described.

3. In an injector, a main overflow-chamber surrounding the mouth of the discharge-tube, combined with an external auxiliary overflow-chamber having a passage communicating with the main overflow-chamber terminating in a valve seat, a valve-chamber and valve above the said seat, said valve-chamber being provided with a lateral outlet opening into the atmosphere, and a discharge-passage below the mouth of the said outlet, 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.