(Model.)

W. T. MESSINGER.

INJECTOR.

No. 302,273. Patented July 22, 1884.

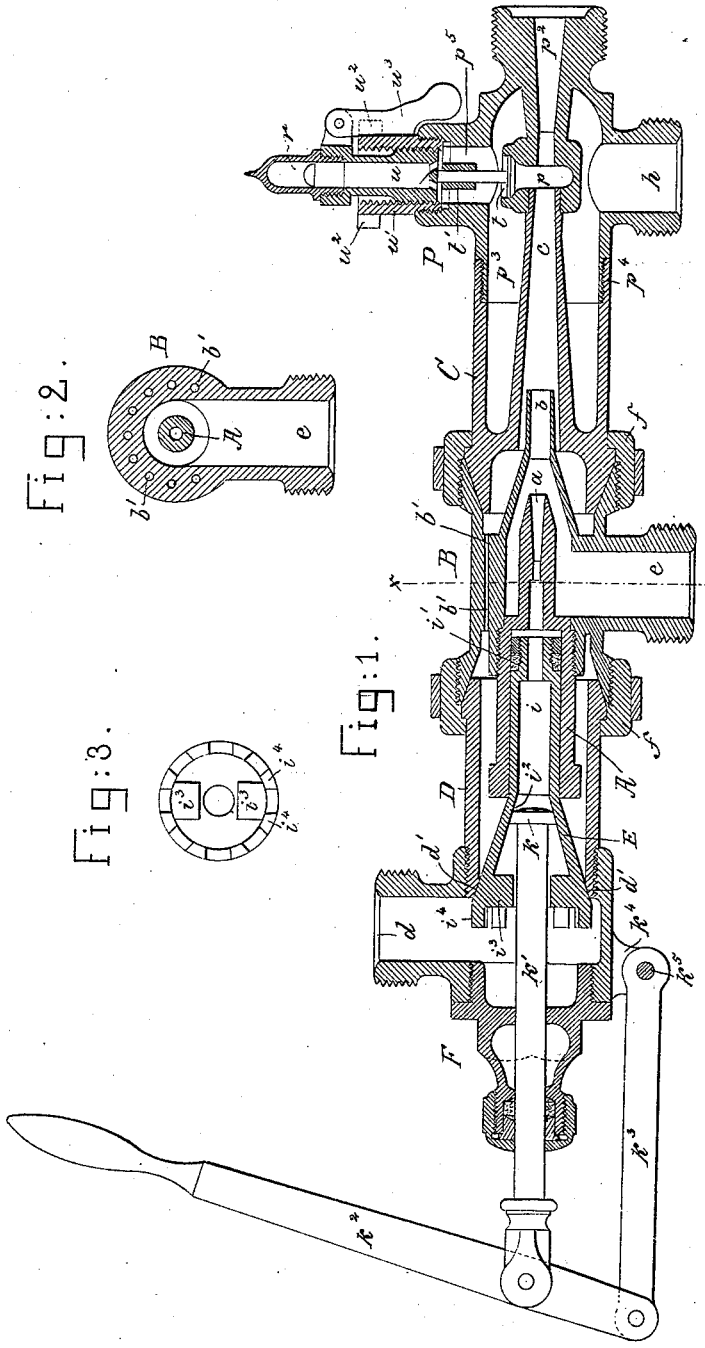

Fig: 1.

Fig: 2.

Fig: 3.

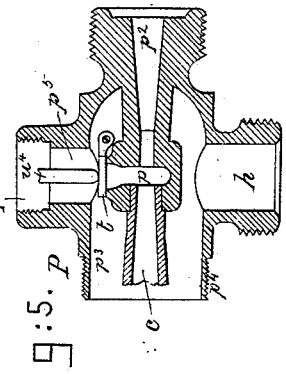

Fig: 5.

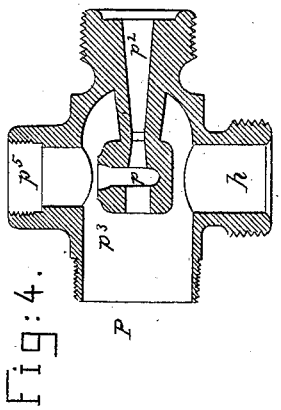

Fig: 4.

Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM T. MESSINGER, OF CAMBRIDGE, MASSACHUSETTS.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 302,273, dated July 22, 1884.

Application filed February 4, 1884. (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 similar to the one previously invented by me, for which Letters Patent No. 281,385 were granted July 17, 1883, portions of the present invention being especially applicable to an injector of that type, and other portions of the invention being applicable to most, if not all, injectors now in use. In the said patent an injector was shown having three nozzles, the first or rearmost of which communicated with the supply of steam, the second or intermediate one with the water-supply, and the third or foremost one with the supply of steam.

The present invention consists, partly, in a novel construction of the devices controlling the flow of steam to the first and third nozzles, and also in novel construction of the overflow-chamber, it having a small internal chamber between the ends of the combining-tube of the injector and the delivery-tube, and a larger or external chamber surrounding the said internal chamber and communicating with the usual waste-pipe leading from its lower portion, and having a second outlet leading from its upper portion into the atmosphere.

The invention also consists in the combination of the overflow-chamber of an injector with an alarm or signaling device indicating its operation, as hereinafter described; also, in the combination of an overflow-chamber composed of an internal chamber and external inclosing case or chamber with an automatic or self-closing valve controlling the communication between the said internal and external chambers; also, in the combination of the overflow-chamber and valve with a locking device, by which the self-closing valve may be fastened or held down when closed; also, in various combinations of the parts hereinafter described.

Figure 1 is a longitudinal section of an injector embodying this invention; Fig. 2, a transverse section thereof on line *x x*; Fig. 3, an end elevation of the device for controlling the flow of steam to the injector; Fig. 4, a sectional view of the overflow-chamber detached, and Fig. 5 a similar view showing a modification of the self-closing valve.

The main portion of the injector consists, essentially, of three nozzles, *a b c*, the former and latter communicating with an inlet-passage, *d*, for steam, and the intermediate nozzle, *b*, communicating with an inlet-passage, *e*, for the water-supply, operating in substantially the same manner as described in my former patent hereinbefore referred to.

The piece or casting B, containing the nozzle *b* and inlet *e*, is threaded at both ends, and connected with the adjacent castings C and D by couplings *f*, thus attaining greater uniformity in construction and convenience in putting together the injector and connecting it with the boiler or parts with which it is to be used, as by this means the inlet-passages *d* and *e*, as well as the outlet-passage *h*, of the overflow-chamber may be set at any desired position with relation to one another for convenience in attaching to the different pipes. The casting B, containing the intermediate nozzle, *b*, is provided with a passage or passages, *b'*, surrounding the rear end of the said nozzle *b*, and communicating with the interior of the casting or cylinder D, through which the steam is admitted to the said passages *b'*, and then to the rear end of the nozzle *c*, as described in my former patent. The casting A, containing the first nozzle, *a*, is screwed tight into the rear end of the casting B, thus tightly closing the rear end of the nozzle *b*, and making a tight vacuum-chamber between the said nozzles *a b*, which is not affected by any lack of tightness in the joint between the casting B and D.

As described in my former patent, it is desirable, in starting the injector, to admit the steam to the nozzle *a* without admitting it to the nozzle *c* until the vacuum is formed and the water raised in the inlet *e*, so as to form a combined jet in the nozzle *b*. This was accomplished in the before-mentioned patent by means of a single valve or device for controlling the admission of steam to the apparatus, the said controlling device consisting of a pis-

ton having a longitudinal movement in the cylinder D, and preventing the admission of steam to the nozzle *c* until after it had moved wholly through the said cylinder D and by the inlet *d* thereof. In the present construction the cylinder or chamber D, forming the inlet to the nozzle *c*, is provided at its rear end with a seat, *d'*, for a valve, E, shown as tapering or conical in shape, and provided with a tubular guide portion, *i*, fitting in the cylindrical rear end of the casting A, and provided with packing *i'*, for maintaining a tight fit in the said cylindrical portion. The valve has a passage through it leading to the nozzle *a*, and when the said valve is seated at *d'* it closes the passage through the cylinder D, passages *b'*, and to the nozzle *c*. The said valve E is provided with an internal seat, i^2, shown as tapering or conical, and controlled by a valve, *k*, the stem *k'* of which passes through a suitable cap or bonnet, F, and is connected with a handled lever, k^2, having its fulcrum at one end of a link, k^3, pivoted in a lug, k^4, by a removable pin or screw, k^5, so that by removing the said screw the handle and valve may be readily withdrawn from the injector at any time by unscrewing the bonnet F. The valve *k* controls the passage through the valve E to the nozzle *a*, and the said valve has a free movement from its seat for a certain distance sufficient to fully open the passage to the said nozzle *a*, at the end of which movement it engages lugs i^3 (see Figs. 1 and 3) at the interior of the said valve E, so that in the further movement of the valve *k* produced by the handle k^2 the valve E will be caused to accompany it, thus being removed from its seat *d'*, and admitting steam through the cylinder D and passage *b'* to the nozzle *c*. The valve E will be retained upon its seat *d'* by the pressure of the steam until positively moved therefrom by the valve *k*, and in setting the injector in operation the attendant will first move the valve *k* until it engages the lugs i^3, which engagement will be felt by the operator, after which the steam will be permitted to flow through the nozzle *a* alone until the water is raised, when the handle k^2 will be further moved, unseating the valve E and admitting steam to the nozzle *c*. The valve E has a series of projections, i^4, which, when it is withdrawn from its seat, engage the inner end of the bonnet F, limiting its movement, while the steam has a free passage between the said projections to the interior of the valve, and thence to the nozzle *a*. The valve *k* forms a head or projection at the end of its stem *k'*, and the said head may be inserted into the valve E by passing it through the space at the side of the lugs i^3 (see Fig. 3) when out of the injector; but when in the injector, the said valve-stem *k'* and valve E being in line with one another, the valve *k* cannot pass the said lugs.

The third nozzle or delivering-cone, *c*, of the injector enters the overflow-chamber composed of a casting, P, having a small internal chamber, *p*, between the end of said nozzle *c* and that of the discharge-tube p^2 from the said chamber. The internal chamber, *p*, opens into a large inclosing-chamber, p^3, surrounding the said internal chamber, *p*, both the said chambers being formed in the casting P, fastened to the casting C by suitable screw-threads, p^4, or a coupling device, the end of the nozzle *c* entering a suitable opening in the internal chamber, *p*.

In injectors as usually constructed the opening provided for the overflow of water is the only passage for the escape of steam when starting the injector, and as the said opening is usually connected to a waste-pipe for carrying off the water, the escaping steam is more or less retarded thereby, tending to destroy the vacuum required to raise the water to the injector, and also having a tendency to heat the injector and render it inoperative. In the present invention the internal chamber, *p*, has a passage or opening into the external chamber, p^3, which is provided with a passage, *h*, to be connected to the waste-pipe for the escape of overflowing water, and also has at its upper side a passage, p^5, leading directly to the atmosphere, thus affording a free escape for the steam when starting the injector, thereby insuring the most perfect vacuum possible and preventing heating. When the water escapes from the internal chamber, *p*, into the external chamber, p^3, it will naturally flow downward and escape through the passage *h* and waste-pipe. By this construction of the overflow-chamber I am able to start the injector much more quickly, and to avoid all those delays from heating which are common with the various injectors now in use. After the water has been raised to the overflow-chamber and the proper velocity given to it by the steam, it will be forced into the discharge-tube p^2 of the overflow-chamber, and thence delivered, as usual, to the pipes leading to the boiler or elsewhere.

It sometimes happens that in consequence of an insufficiency of water in the reservoir or from other causes the supply of water to an injector is broken and the steam collects in the injector and pipes, so that the parts become heated and must be cooled before the operation of the injector can be restored, the most vexing and often serious delays frequently resulting from this cause. It is obvious, however, that by my improved construction of the overflow-chamber this difficulty is overcome, as, in case the supply of water is broken, the steam passing through the injector will escape into the atmosphere through the upper opening, p^5, of the outer chamber, instead of being forced back into the injector and pipes. The appearance of steam issuing from the said upper opening, p^5, will also indicate instantly to the eye any such irregularity in the operation of the injector. In like manner, in starting the injector, when the water has been lifted to the overflow-chamber, the issue of steam at

the upper opening will cease, and such will indicate instantly to the eye that the water has been lifted to the overflow-chamber, whereas in the use of an ordinary overflow-chamber it is necessary to ascertain such fact either by watching the end of the waste-pipe or applying the hand to pipes, or other equally inconvenient and uncertain methods.

In order that any irregularity in the operation of the injector, and also, when starting, the fact that the water has been lifted, may be instantly indicated to the ear in case from any cause the said upper opening in my overflow-chamber cannot be seen, I employ an audible signal, *r*, shown as a whistle, for sounding an alarm, which is connected to the said upper opening, p^5, of the outer chamber, p^3, so that the escaping steam will act upon it. Thus, when starting the injector in the dark or in a fog, or when from any cause the upper opening of the overflow-chamber cannot be seen, the escaping steam will sound the alarm, and the cessation of the alarm will instantly indicate to the ear that the flow of water is established. In like manner, if the supply of water should be broken, the escaping steam will cause the alarm to sound and instantly give warning of the condition of the injector.

I have found it desirable, though not absolutely essential, to use a valve, *t*, shown in Fig. 1 as an upright or puppet valve, and in Fig. 5 as a flap-valve, in combination with the opening of the internal chamber, *p*. In either case the valve is arranged to open or rise upward off its seat by the pressure of the steam or water, and it will fall and close itself when the injector is in proper operation without surplus of water or escape of steam. Thus it is evident that when starting the injector, or if any irregularity occurs while it is in operation, the valve will be raised from its seat by the pressure of the steam or water, allowing the steam or water to escape, as described; but when the injector is in proper operation the valve will close itself upon its seat and prevent the admission of air, dust, or other substances to the column of water passing from the delivery-nozzle *c* of the injector into the discharge-tube p^2 of the overflow-chamber. In either form of construction shown in Figs. 1 or 5 it will be seen that the action of the valve would be the same, and when a valve is employed in either form of construction the opening of the internal chamber, *p*, is provided with a suitable valve-seat to receive the valve, as shown, and when the upright valve is employed a suitable guide, *t'*, is inserted into the upper opening of the chamber, which, while it serves to guide the valve as it rises from or falls into its seat, is so constructed as not to prevent the passage of the steam through said opening when the valve is raised. When the flap-valve is employed, this guide may be dispensed with.

In some cases, and particularly when in use on locomotives, it is desired at times to close the outlet of the overflow-chamber, and thus prevent the lifting of the water and the regular operation of the injector, in order that the steam may be forced or "blown back" through the water-induction pipe *e*. For this purpose I employ a locking device, by which the valve in my overflow-chamber may be fastened or held down to its seat, thus preventing the escape of the steam at that point and forcing it back into the water-induction pipe, as desired. This locking device is connected to or screwed into the upper opening, p^5, of my overflow-chamber, and consists of two parts, the inner part, *u*, being provided on its outer periphery with a quick screw-thread, which works in a corresponding thread cut in the inside periphery of the outer part or shell, *u'*, so that when the part *u* is turned within the part *u'* it will be raised or lowered relatively thereto, so that the lower end of the said inner part, *u*, may be pressed down upon the stem of the valve *t*, holding it on the opening of the internal chamber, *p*, so that the said valve cannot be lifted from its seat by the pressure of the steam, and by turning the said inner part in the opposite direction the valve will be released, so that it can rise and perform its usual function. The outer part or shell, *u'*, is provided with projections or wings u^2, having slots to receive a suitable arm, u^3, pivotally attached to the inner part, *u*, so that by inserting said arm into the slots the part *u* may be held in proper position to release or to lock the valve *t*, as may be desired. The lower end of the inner or movable part, *u*, may be provided with a projection or stem, u^4, of the requisite length to reach either the upper surface of the flap-valve or the top of the stem of the upright valve, as the case may be, and this movable inner part is also made hollow and with openings through its lower end to allow the free passage of the steam through it.

When the valve-locking device is employed in combination with the overflow-chamber and valve, the whistle or audible signal may be connected to the upper end of the said locking device, as shown; but if the locking device were not used the whistle might be screwed directly into the passage p^5.

I claim—

1. In an injector, an overflow-chamber consisting of an internal chamber communicating with the combining-cone or delivery-nozzle of the injector and with the discharge-tube, combined with an external chamber communicating with the said internal chamber and having upper and lower outlet-openings, the former communicating with the atmosphere and the latter with a waste-pipe, substantially as and for the purpose described.

2. In an injector, an overflow-chamber having an outlet-passage to the atmosphere, combined with an audible signal, substantially as and for the purpose set forth.

3. In an injector, an overflow-chamber comprising an internal chamber and an external chamber inclosing it, the said internal chamber having a passage to the said external chamber, combined with a valve controlling the said passage, substantially as described.

4. In an injector, an overflow-chamber comprising an internal and external chamber, the former provided with an opening or passage into the latter, combined with a valve controlling the said passage, and a locking device for the said valve, as and for the purpose set forth.

5. In an injector, the three nozzles and common inlet for supplying steam to the first and third, combined with the valve controlling the flow of steam to the third or foremost nozzle, and having a passage communicating with the first or rearmost nozzle, and the valve controlling the said passage, and adapted to operate the first-mentioned valve, substantially as described.

6. The three nozzles and cylinder D, leading to the third or foremost nozzle, combined with the valve E, having lugs i^3 and projections i^4, and a passage through it to the rearmost nozzle, and the valve k, controlling the said passage and adapted to operate the valve, substantially as described.

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

WILLIAM T. MESSINGER.

Witnesses:

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