(Model.) 2 Sheets—Sheet 1.

W. T. MESSINGER.

INJECTOR.

No. 302,272. Patented July 22, 1884.

Fig: 1.

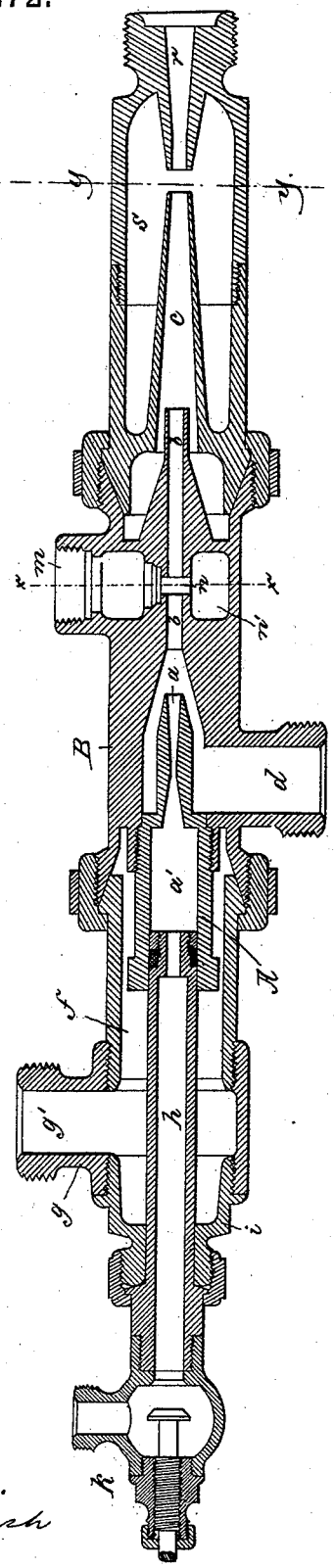


Fig: 5.

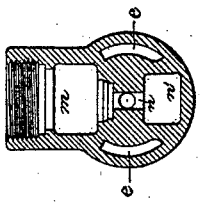


Fig: 4.

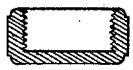


Fig: 3.

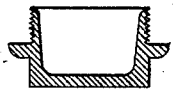
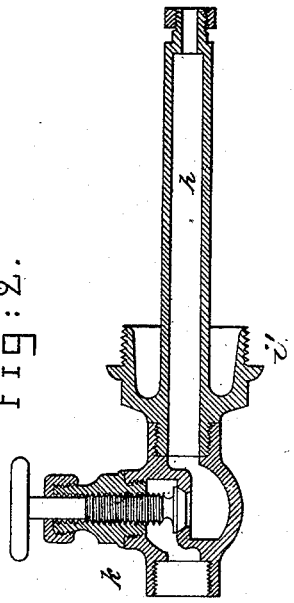


Fig: 2.



Witnesses.
Arthur Lippenken.
Henry Marsh

Inventor.
William T. Messinger.
by Crosby & Gregory Attys

(Model.)

2 Sheets—Sheet 2.

W T. MESSINGER.

INJECTOR.

No. 302,272. Patented July 22, 1884.

Fig: 7.

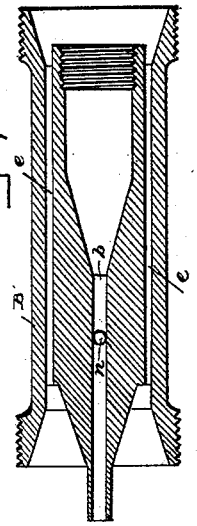
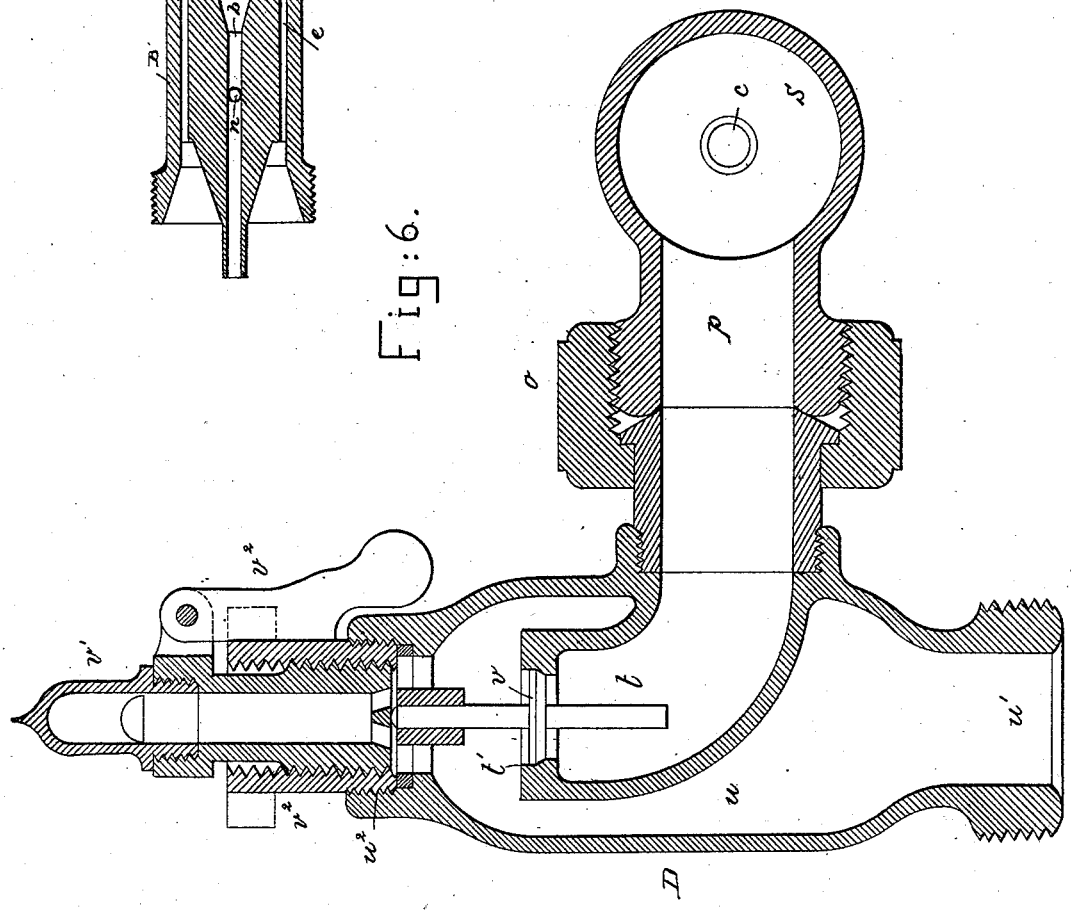


Fig: 6.



Witnesses.

Arthur Lipperlen.

Henry Marsh

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William T. Messinger.

by Crosby & Gregory attys.

UNITED STATES PATENT OFFICE.

WILLIAM T. MESSINGER, OF CAMBRIDGE, MASSACHUSETTS.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 302,272, 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 relates to an injector of that class shown in Letters Patent No. 281,385, granted to me July 17, 1883, the injector comprising three nozzles, the first or rearmost and third or foremost of which are supplied with steam or other actuating-fluid, and the intermediate one of which is connected with the supply of water or fluid to be forced, and forms the combining-tube for the jet issuing from the first nozzle. In the said patent the steam was shown as applied to both nozzles from a common inlet-chamber at the rear of the first nozzle, and the passage through which the steam passed from the said chamber to the foremost nozzle was formed in the cylinder or casting containing the second nozzle or combining-tube. The casting forming the first steam-nozzle is tightly screwed into the casting containing the second nozzle and vacuum-chamber, the two castings apparently forming a single part, which, in the present instance, is provided with screw-threads at both ends, to enable it to be connected by coupling devices with the casting containing the third nozzle at the forward end and the steam-inlet chamber at the rear end. In the former patent the said steam-inlet chamber was common to both first and third nozzles, and a device was employed for admitting the steam to the former, independently of its admission to the latter. It is sometimes desirable to employ steam from different sources for the first and third nozzles; and the present invention consists partly in a device for affording an independent supply to the said nozzles, the said device being readily applied to the injector without changing the construction of its parts, it being interchangeable with the device employed for controlling the admission to both nozzles from a common source.

The invention further consists in a novel construction of the casting comprising the second or intermediate nozzle, whereby a more nearly perfect vacuum is produced, as is required when the liquid has to be raised from a great depth below the injector.

The invention also consists in the novel construction of an overflow-chamber at the end of the third nozzle or delivering-tube of the injector.

Figure 1 is a longitudinal section of an injector embodying this invention; Fig. 2, a modification of the detachable inner tube of the first nozzle; Figs. 3 and 4, details to be referred to; Fig. 5, a transverse section on line *x x*, Fig. 1; Fig. 6, an enlarged transverse section on line *y y*, Fig. 1; and Fig. 7, a longitudinal section of a portion of the injector on a plane at right angles to that of Fig. 1.

The injector consists, essentially, of three nozzles, *a b c*, the first entering the rear of the second, which communicates with an inlet-passage, *d*, for the liquid to be raised and forced, and the latter of which, *c*, communicates through passages *e*, (see Fig. 5,) around the intermediate nozzle, *b*, with the steam-inlet chamber *f*, at the rear of first nozzle, substantially as in the former patent referred to. The first nozzle, *a*, forms part of a casting, A, having a cylindrical portion, *a'*, entering the rear end of the nozzle *a*, the said casting being screwed into rear end of the casting B, containing the second nozzle, *b*, water-inlet *d*, and passages *e*.

The steam-inlet chamber *f* is connected with a fitting, *g*, having an inlet-passage, *g'*, through which steam may be admitted to the said chamber *f*, which chamber and the cylinder *a'* are the same as shown in the said patent, they being adapted to receive an inlet-controlling device common to both the said nozzles *a* and *c*. In case, however, it is desirable to adapt the apparatus to be used with steam taken from different sources for the first and third nozzles, as from different boilers at different pressures, or when one is to be supplied with exhaust-steam and the other with live steam, the said inlet-controlling device shown in the said patent will be removed and an inlet-tube, *h*, having its forward end fitted to enter the cylinder *a'* and provided with suitable packing, will be inserted in a bonnet,

i, at the end of the injector, the said bonnet being shown in Fig. 1 as provided with a coupling to receive the said tube *h*, while in Fig. 2 the tube *h* and bonnet *i'* are shown as made in a single casting. In either case the extremity of the tube *h* outside the injector may be provided with a suitable valve, *k*, to control the admission of steam to the nozzle *a*.

In case it is desired to remove the tube *h* and employ steam from a common source for both nozzles without a device for controlling its admission to the said nozzles independently, the said tube may be readily detached and withdrawn, and in the combination shown in Fig. 1, where the tube is connected by a coupling, a cap such as shown in Fig. 4 may be screwed upon the end of the bonnet *i*, to close the end of the injector; or, if the construction shown in Fig. 2 were employed, a bonnet such as shown in Fig. 3 might be screwed in the fitting *g*.

In cases where it is desired to raise a liquid from a considerable distance below the injector, it is necessary to be able to form as nearly as possible a perfect vacuum in the chamber surrounding the nozzle *a*, at the rear of the nozzle *b*. As the free escape of the steam from the said chamber is conducive to the production of such a vacuum, the casting B is in such cases provided with an opening, *m*, in its side communicating with the interior of the tube or nozzle *b* by a transverse passage, *n*, the said casting preferably having formed in it, by coring, a recess or chamber, *n'*, below the opening *m*, to enable a file or other tool to pass through the passage *n*, to properly smooth its sides.

In another application, No. 119,775, filed herewith, I have shown an injector made with three nozzles, and having at the end of the foremost nozzle an overflow-chamber of peculiar construction, containing an internal chamber having an opening into an external chamber, which latter is provided with an opening in its lower portion, connected with the usual waste-pipe, for carrying off water in starting the injector, and also an opening in its upper portion to the atmosphere for the free escape of steam in starting the injector, or in case the column of water should be broken. A chamber constructed on this principle may be employed with any injector; but it would in most cases necessitate the reconstruction of such injector. In the present invention the overflow-chamber D, (shown in Fig. 6,) which may, for the sake of distinction, be called an "outer" or "auxiliary" overflow-chamber, may be applied to the ordinary overflow-chamber of an injector without altering the construction of the said injector, it being adapted to be attached by a suitable coupling or connection, *o*, with the outlet-passage *p*, with which the waste-pipe is commonly connected.

The delivery-nozzle *c* of the injector (see Fig. 1) and the discharge-tube *r*, having a space between their adjacent ends, are inclosed in a chamber, *s*, which is the equivalent for the usual overflow-chamber of an injector having an outlet-passage, *p*, commonly connected with a waste-pipe for the discharge of steam and air and steam and water when setting the injector in operation. The said passage *p*, having connected with it the novel overflow-chamber D, as described, enters an upwardly-turned internal passage, *t*, inclosed within and forming the internal chamber of the said chamber D, and having an opening, *t'*, into the outer chamber, *u*, the said opening being preferably controlled by a valve, *v*, as described in my other application.

The main body of the overflow-chamber D stands substantially vertical, and is provided with an outlet-opening *w'* at its lower end, to be connected with the usual waste-pipe for the discharge of water, which will seek the said opening by its own weight, and it is provided at its upper end with a second opening, w^2, leading to the atmosphere, which opening may be provided with an alarm, *v'*, and a valve-locking device, v^2, substantially as described and claimed in my other application.

It will be seen, referring to Fig. 1, that the opening *m* from the intermediate nozzle corresponds with the opening w^2 in the overflow-chamber, and may be provided with an alarm or other appliance, such as employed in the overflow-chamber.

The passage *n* may also, if desired, be provided with a valve opening outwardly to the passage *m*.

I claim—

1. In an injector, the three nozzles and steam-inlet chamber at the rear of the first or rearmost nozzle communicating with the third or foremost nozzle, and the independent detachable inlet-tube passing through the said chamber, substantially as and for the purpose described.

2. In an injector, the three nozzles, the first and third of which are supplied with the actuating-fluid, and the intermediate one of which is connected with the supply of fluid to be moved, and is provided with a lateral outlet for the free escape of the actuating-fluid before a combined jet has been produced, substantially as described.

3. In an injector, the combination, with the usual overflow-chamber, of an outer or auxiliary overflow-chamber having an internal passage or chamber adapted to be connected with the outlet or waste-pipe passage of the usual overflow-chamber, and the outer inclosing case or chamber having outlet-passages at its upper and lower ends, the former opening into the atmosphere, 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:

JOS. P. LIVERMORE,

B. J. NOYES.