2 Sheets--Sheet 1.

G. H. LITTLE.

Injector.

No. 165,843. Patented July 20, 1875.

Fig. 1.

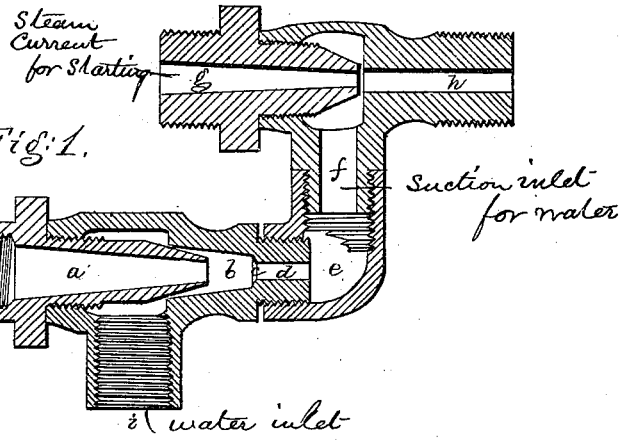


Fig. 4.

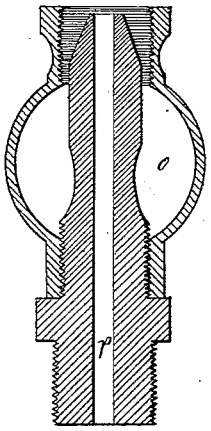
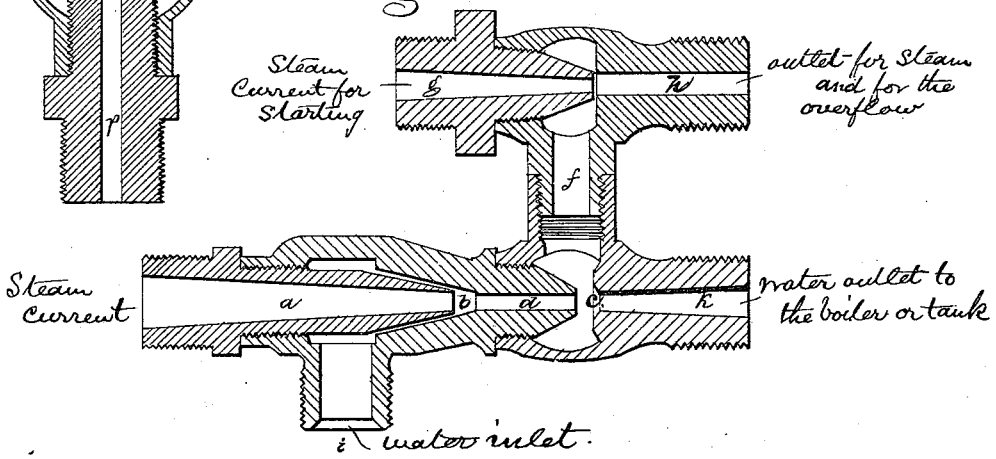


Fig. 2.



Witnesses.
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Chas. R. Abell.

Inventor.
George H. Little.
per John J. Halsted
Atty.

2 Sheets--Sheet 2.

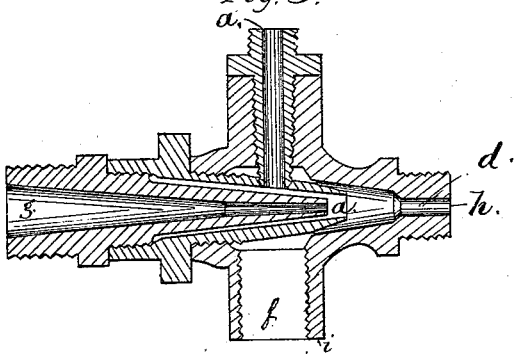
G. H. LITTLE.

Injector.

No. 165,843.

Patented July 20, 1875.

Fig. 3.



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UNITED STATES PATENT OFFICE.

GEORGE H. LITTLE, OF PEABODY, MASSACHUSETTS.

IMPROVEMENT IN INJECTORS.

Specification forming part of Letters Patent No. **165,843**, dated July 20, 1875; application filed August 29, 1874.

To all whom it may concern:

Be it known that I, GEORGE H. LITTLE, of Peabody, in the county of Essex and State of Massachusetts, have invented an Improvement in Injectors of Jet-Pumps; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention, sufficient to enable those skilled in the art to practice it.

My improvement relates to apparatus to be worked by a current of steam, or of compressed air or liquids, to create a vacuum and raise liquids, in connection with other apparatus to feed the water or liquids so started into boilers or tanks, or to introduce air or steam, or air and steam, or exhaust steam, into steam-pipes for increasing the power of the engine.

The present improvement consists in a means for passing currents of steam at two different places in the apparatus, the one being for creating a vacuum and drawing the water at the start, and the other for forcing the same after such drawing, and in certain modifications thereof.

Figure 1 represents an apparatus embodying my invention as adapted for using two currents of steam, but through one outlet, and designed for raising water to a great height to supply tanks, &c. Fig. 2 represents the invention as adapted for admitting two currents of steam, one for creating a vacuum, and the other for throwing the water against press ure, whether of pressure in feeding a boiler, or of pressure in supplying a tank at a considerable height. Fig. 3 is a modification, in which the currents of steam are taken by two tubes, one within the other, instead of by two independent steam-tubes, and capable of producing the same results, as stated in regard to Fig. 2. Fig. 4 is a priming-chamber.

In the drawings, (see Fig. 1,) *a* is the main steam-inlet tube for passing the current of steam, having, as seen, a tip tapering on its exterior, and also a tapering bore. B is a portion of the tube, having a funnel-shaped opening, *c*, at the receiving end of the tubular passage *d*, this passage being of uniform diameter and discharging into an elbow, *e*, upon the top of which is attached by screw-thread the auxiliary or drafting apparatus *f g h*, in which *f* represents the suction or water-inlet, *g* the tapering inlet for steam-current, having also a tapering exterior at its tip, and the straight tube *h* of uniform diameter, the only discharge or outlet, and through which all the water passes. The diameter of the bore of the tube *h* is designedly made larger than the smaller end of the tapering tube *g*, in order to exhaust the air from *f*, and to allow the exhausted air commingled with the steam to pass through. Appropriate threads and adjusting-nuts may be used to admit of changing the positions of the parts *a*, *b*, *g*, and *h*, to graduate the admission of water and facilitate the operation, provided I should desire to throw a great quantity of water; but for the purpose of creating a vacuum the parts, being first placed in proper position, require no adjustment. The part *f* being screwed into the elbow *e*, the apparatus is then ready for use, the steam-currents entering both at *a* and *g*, and the water at *i*, and passing through *f*. At the commencement of the operation, (the entrance of steam at *a* being first cut off by an appropriate cock,) the steam passing in at *g*, will, by reason of its creating a vacuum as it passes through *g* and *h*, lift water up through *i f h*, until the water is properly lifted, after which the steam-current is admitted at *a*, and cut off at *g*, and the course of the steam and water will be through *d h*, and the supply of water kept up without the further use of the auxiliary steam-current inlet *g*. But both *a* and *g*, if desired, may now be used together, the effect of such joint use being to increase the power of forcing or driving the water. In Fig. 2 there are two outlets, viz: *h* and *k*, *h* being the outlet of the auxiliary steam-tube for starting the water until it is properly drafted, and *k* being the outlet leading to the boiler or tank to supply either of these vessels (as the case may be) after the water has been sufficiently drafted to keep up the supply through the agency of the steam-current passing in at *a* only, and after this stage, the steam supply at *g* being cut off, the current or route of the water will be only through *i d k*, and no longer through *i d f h*. The exit-mouth of *d* and the inlet-mouth of *k* should be of the same size. In Fig. 3, the tube *g* is the steam-tube, and the

connected tubes *a* take steam. The inner tube *g*, in this case, does the drafting, and when the steam is admitted to the other tube *a*, it will work against pressure, the water being admitted at *f*, as in Figs. 1 and 2, and passing out with the steam at *d* and *h*. The priming-chamber, shown in Fig. 4, it to be attached, when desired, to the water inlet at *i*, in either of the described modifications, either directly or by a connecting-nipple. As will be seen, it consists of an annular chamber, *o*, surrounding the water-inlet passage *p*, and permits a supply or priming of water to be always ready in the chamber *o*, and in near proximity to the current of steam passing through the injector, so as to be ready for prompt use in starting the apparatus. It will be seen that I avail myself of the advantage due both to the priming-chamber and to the auxiliary steam-tube, both serving to start the supply of water. The auxiliary steam-tube *f g h*, by forcing air into a steam-pipe, or exhaust steam into steam-pipes, tank, or cylinder, serves to increase the power of the engine, the air in the one case becoming suddenly expanded to a great degree by the heat of the steam, and thereby adding a great increase of power without adding to the expense, and the exhaust steam in the other case being, by reason of the vacuum, drawn away from the cylinder, relieves the piston of the engine of back pressure, and to that extent increases the efficiency of the engine.

I claim—

1. In combination with an injector, an ejector, *g f h*, constructed as shown, with the bore *h* of continuous larger diameter than the smaller end of the continuously-tapering bore *g*, the ejector being applied and arranged in relation to the injector, as shown and described.

2. In combiuation, the steam-tube for forcing water, the auxiliary tube for drawing water at starting, and the priming-chamber *o*, all substantially as shown, and for the purpose described.

GEORGE H. LITTLE.

Witnesses:
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