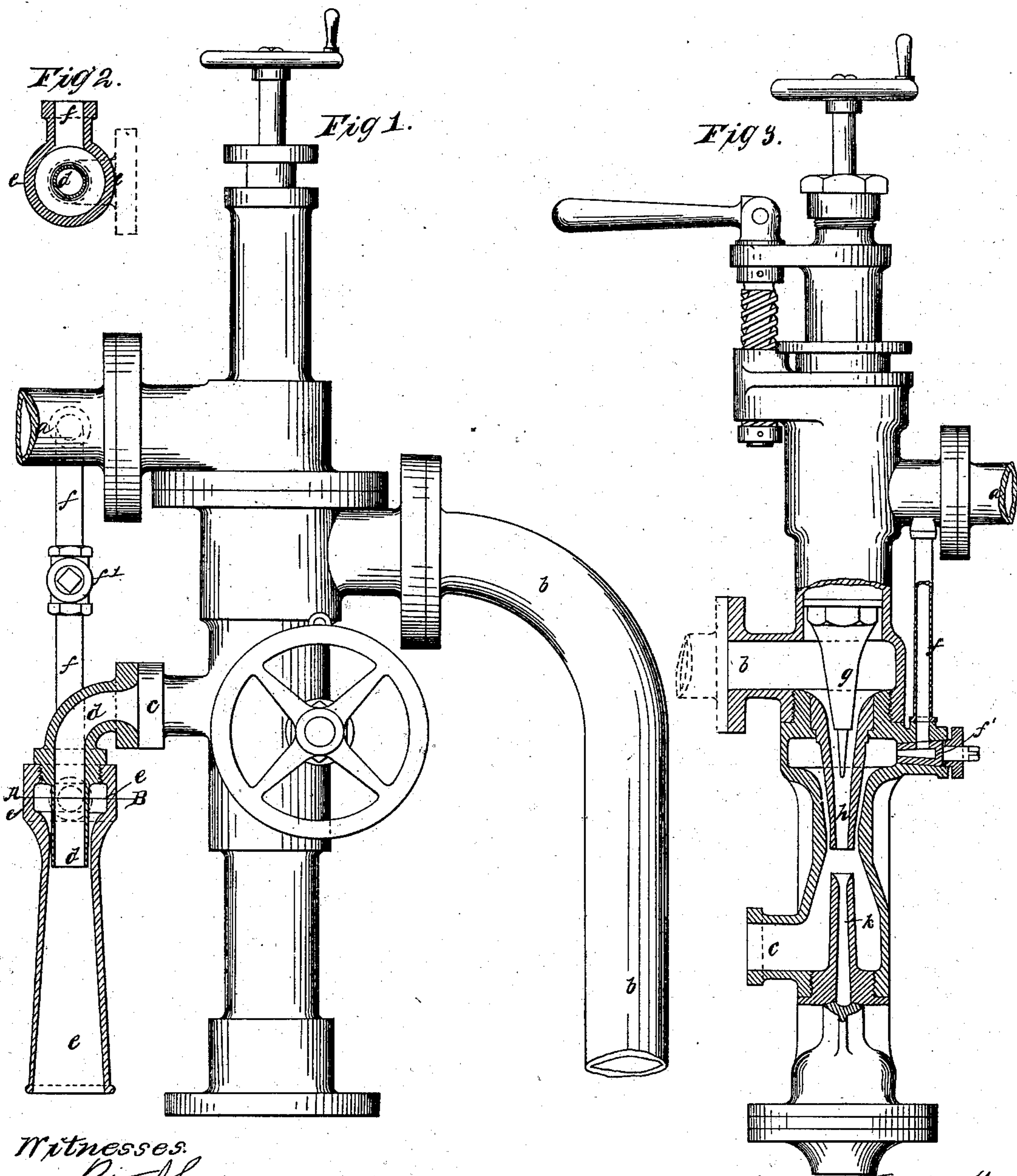


J. GRESHAM.
Injectors for Boilers.

No. 57,057.

Patented Aug. 7, 1866.



Witnesses:
Peter Levey
W Giffard.

Inventor.
James Gresham

UNITED STATES PATENT OFFICE.

JAMES GRESHAM, OF MANCHESTER, GREAT BRITAIN.

IMPROVEMENT IN INJECTORS FOR BOILERS.

Specification forming part of Letters Patent No. 57,057, dated August 7, 1866.

To all whom it may concern:

Be it known that I, JAMES GRESHAM, of the city of Manchester, in the county of Lancaster and Kingdom of Great Britain and Ireland, engineer, have invented new and useful improvements in and applicable to that and similar apparatus for raising and forcing fluids and feeding steam-boilers known as "Giffard's Injector;" and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying sheet of drawings, which forms a part of this specification, and to the letters of reference marked thereon.

It is well known that Giffard's injector cannot be started to work if the feed-water supplied to it has to be lifted by its action from a depth below it much more than five feet perpendicular, but that if once started it will continue in operation and draw its feed-water from perpendicular depths below it approaching that at which ordinary suction-pumps will lift water.

The form of the nozzles and spaces for steam and water in Giffard's injector, though well adapted for lifting and propelling water when brought so as to condense the steam used, is not adapted for forming a vacuum or partial vacuum by discharging air from the supply-pipe.

The nature of my invention consists in adding to or forming in the injector nozzles or spaces so adapted to each other that a steam-jet may be used there especially for lifting and drawing the water through the combining-tube in the injector, so that while the water is passing through this tube another steam-jet may be applied to it and force it into the boiler, and when this has been accomplished the supplementary or lifting jet may be shut off, leaving the instrument at work.

I carry out my invention by taking any ordinary arrangement of apparatus for forming a vacuum or partial vacuum by means of a steam-jet or jets, and connect this with the overflow-orifice of the injector. Consequently when the space for water in the injector is opened there will be a communication between the vacuum apparatus and the water-feed pipe through the injector; or the nozzles of the injector may be constructed so as to be sur-

rounded by a space the outlet from which is through the overflow-orifice.

The manner of carrying out my invention will be more particularly described by reference to the accompanying drawings.

Figure 1 is an outside view of an injector with the vacuum apparatus applied, shown in section; and Fig. 2 is a cross-section of the vacuum apparatus, taken at A B, Fig. 1.

The injector shown is one made according to the invention for which a British patent was granted to John Robinson and myself, dated the 10th day of November, A. D. 1864; but my improved apparatus is equally applicable to any ordinary Giffard injector.

a is the steam-pipe of the injector; *b*, the pipe for feed-water; *c*, the overflow-pipe of the injector.

The vacuum apparatus is formed by a pipe, *d*, joined to the overflow-pipe *c*, and the nozzle of this pipe *d* is surrounded by another pipe, *e*, so as to leave an annular cavity of the form shown. This cavity is supplied with steam from the steam-pipe *a* by a pipe, *f*, provided with a tap, *f'*. When the injector is to be started into operation by means of this apparatus the tap *f'* is opened, and the steam will escape in an annular jet through the funnel *e*, and when water is seen to be discharged from it the injector is started in the usual manner. Then the tap *f'* is shut, and the injector continues at work.

The vacuum apparatus may be modified. For instance, the steam may be made to pass through the center tube, and the annular cavity made to communicate with the overflow-orifice *c*.

Fig. 3 shows a view, partly in section, of an ordinary injector having my improvements applied. *a* is the steam-pipe; *b*, the feed-water pipe; *g*, the ordinary steam or partition cone or nozzle between the steam and water; *h*, the ordinary fixed combining-nozzle; *k*, the ordinary fixed receiving-nozzle, and *c* the overflow-cavity.

My improvements are applied by forming an annular cavity around the ordinary combining-nozzle *h* and receiving-nozzle *k*, as shown, and in making a communication by means of a pipe, *f*, between the steam-pipe *a* and the annular cavity round the combining-

nozzle *h*, the pipe *f* or cavity being provided with a tap, *f'*, as shown.

My improved charging apparatus may be used either with or without a foot-valve at the lower end of the feed-pipe *b*, this valve opening to allow water to ascend, but preventing its descent; but a foot-valve will be found of advantage when the depth from which the water has to be lifted approaches the greatest depth at which the apparatus will perform its office.

I have now particularly described my invention and the modes of carrying it into effect, and wish it to be understood that

I claim—

The arrangement of mechanical devices, as herein set forth, whereby a supplemental steam-jet may be produced for raising water, in combination with the ordinary steam-jet of the Giffard injector for forcing water, in the manner and for the purpose as herein set forth.

JAMES GRESHAM.

Witnesses:

PETER J. LIVSEY,
W. GIFFARD.