(Model.)

F. W. KREMER.

INJECTOR.

No. 335,227. Patented Feb. 2 ,1886.

Fig. 1.

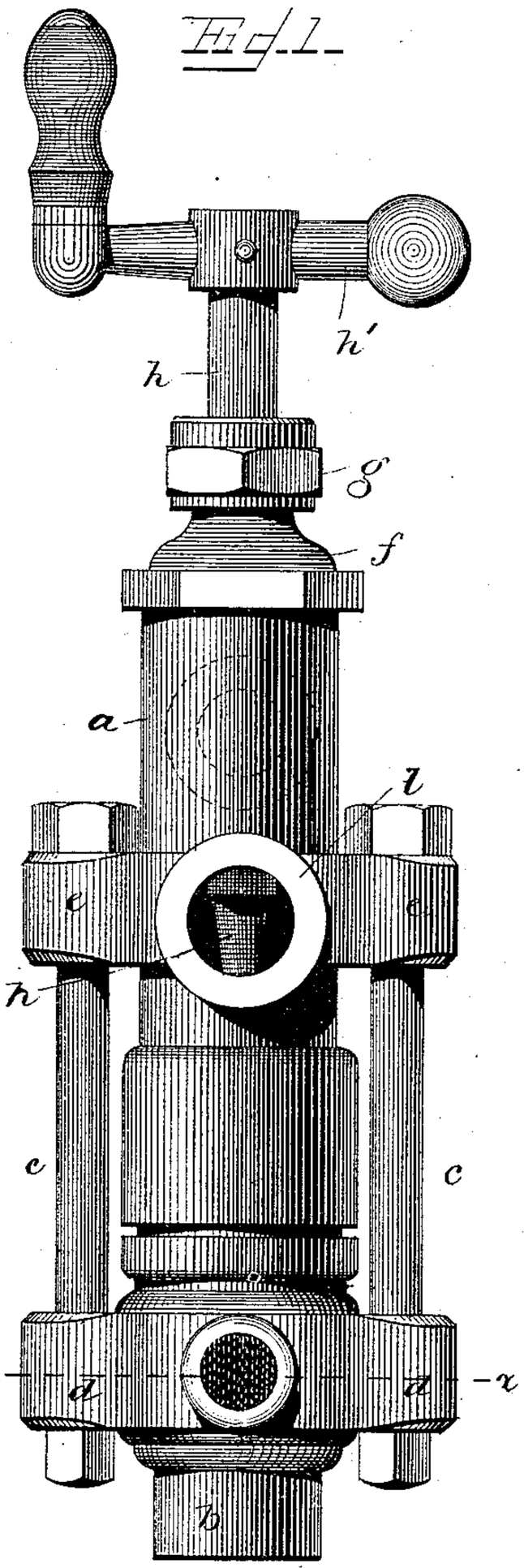


Fig. 2.

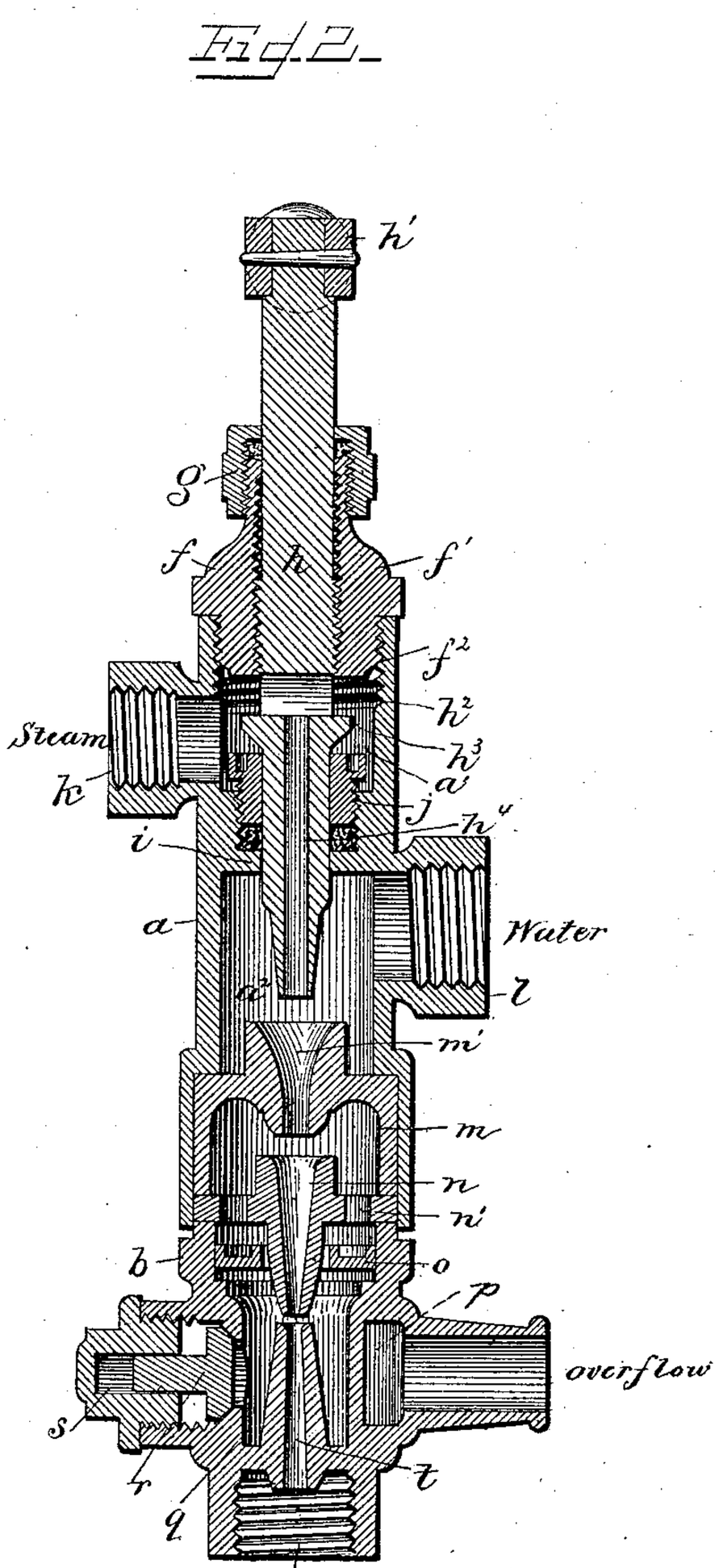
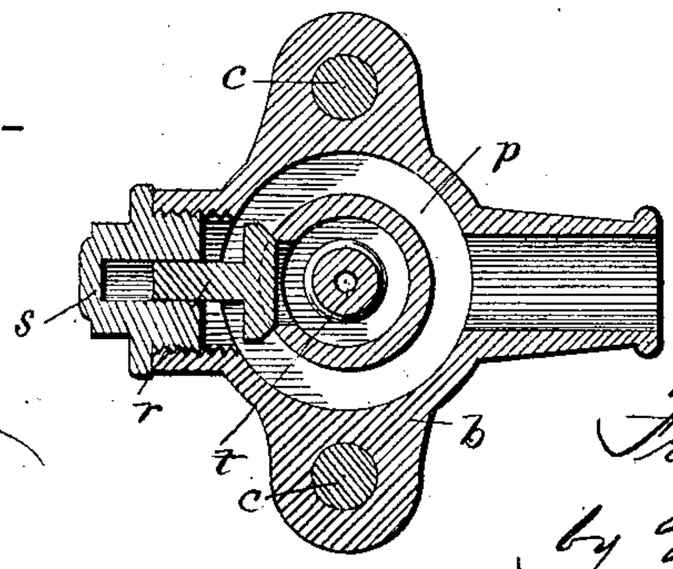


Fig. 3.



WITNESSES

F. L. Ourand

E. A. Finckel.

INVENTOR

Franklin W. Kremer

by Wm. N. Greene

his Attorney.

UNITED STATES PATENT OFFICE.

FRANKLIN W. KREMER, OF WADSWORTH, OHIO.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 335,227, dated February 2, 1886.

Application filed June 11, 1885. Serial No. 168,369. (Model.)

To all whom it may concern:

Be it known that I, FRANKLIN W. KREMER, a citizen of the United States, residing at Wadsworth, in the county of Medina and State of Ohio, have invented a certain new and useful Improvement in Triple-Tube Automatic Injectors, of which the following is a full, clear, and exact description.

This invention relates to that class of devices for supplying steam-boilers with water represented in my United States Letters Patent Nos. 282,092, 299,229, and 299,230; and one special object, among others, of the invention is to provide an injector of such character as that should the water be withdrawn from the suction-pipe momentarily, or the jet be broken, as by an abrupt jar, which is liable in such instruments when used on traction or railway locomotive engines where the water-supply is taken from tanks, and when the water is returned to the suction-pipe, the water will be again taken up by the instrument and the jet re-established automatically. The means employed for accomplishing this object constitute the present invention, as I will now proceed to particularly point out and claim.

In the accompanying drawings, in the several figures of which like parts are similarly designated, Figure 1 is a front elevation of my improved injector; Fig. 2, a central vertical section of the same in a plane at right angles to Fig. 1; and Fig. 3 is a horizontal cross-section in the plane of line *x x*, Fig. 1.

I prefer to unite the several sections or tubes *a b* of my injector by rods or bolts and nuts *c c*, engaging ears or lugs *d d* and *e e* on the end sections or tubes and unthreaded joints, as in my Patent No. 282,092, referred to. A bonnet, *f*, is screw-tapped into the head of the upper section, *a*, and is provided with a suitably-packed steam-tight gland, *g*. The bonnet *f* is screw-threaded internally at *f'* for any suitable distance to receive the screw-threaded spindle *h*, which is provided with a suitable lever or hand-wheel, *h'*, for operating it. This spindle has a transverse opening or port, h^2, a collar, h^3, below it, which seats against the bottom f^2 of the bonnet within the steam-chamber *a'* of the upper section, *a*, and a longitudinal passage, h^4, leading from the opening or port h^2 to the point of the spindle, and opening into the suction-chamber a^2, which in this example of my invention is integral with the tube *a*. The steam and suction chambers are separated by a diaphragm, *i*, which is provided with an opening for the passage of the spindle, and this opening is rendered steam-tight by a packed gland, *j*, screw-tapped in from the steam-chamber.

k is the steam-inlet, and *l* the water inlet or suction. In this example of my invention the lower end of suction *a* is chambered to receive the lifting-tube *m*, which has the jet-passage *m'* aligned with the spindle *h*. Beneath the lifting-tube and held in place by it upon or in the upper end of the boiler-section *b* is the combining-tube *n*, having the ported base *n'*, and a check-valve, *o*, beneath the same, substantially as in my Patent No. 299,229.

p is the ordinary annular overflow-chamber, in the passage leading from which into the exhaust or delivery chamber *q* is arranged the check-valve *r*, held in place by the screw-cap *s*.

t is the delivery-tube.

The operation is as follows: When the spindle is run out till its collar h^3 is seated against the bonnet-bottom f^2, steam will be cut off and the instrument be inactive; but when the parts are in the position shown in Fig. 2, steam enters through the inlet *k* and port h^2 and passage h^4, making impact in lifting-tube *m*, and passes through ported base *n'* out into the chamber *q*, and escapes past valve *r* out at the overflow, whereby a "vacuum," so-called, is produced in the suction-chamber a^2, and water is drawn in and forced by the steam through the lifting-tube *m*. As soon as the water becomes accelerated, there will be a partial vacuum produced between the tubes *m'* and *n*, which will cause the check-valve *o* to rise and close the ports in the base *n'* of the combining-tube. When the water is sufficiently accelerated to overcome the resistance of the boiler-pressure, it is driven across the space between the combining tube and delivery-tube, producing a vacuum in chamber *q*, which causes the check-valve *r* to close the overflow and admit the water to the boiler. In case a portion of the water should continue to discharge at the overflow, which is liable to occur when there is a low pressure of steam, the spindle should be adjusted in the direction of the lifting-tube, to thereby cut off a por-

tion of the water at that point, when the discharge at the overflow will cease. In high pressure where the steam is in excess of the water-supply, steam will escape at the overflow, in which event the steam-spindle should be withdrawn from the lifting-tube until the discharge ceases at the overflow. Thus it will be seen that in the construction of this machine the spindle performs a double function—viz., it is adjustable to varying steam-pressure, and also for shutting off and controlling the quantity of steam to be admitted to the instrument, thus dispensing with a globe-valve in steam-pipe.

In my machine there is practically but one chamber, and when the machine is in operation it is impossible to have an unequal vacuum between the tubes m' n and n t, and should there be an excess of water at m' n, which is liable to occur with varying steam-pressure or varying lift, a vacuum is produced at n t, causing the check-valve o to open the ports in the ported base n', and the surplus water from this point will be carried to the boiler. Thus in this construction it will be seen that an equal vacuum or pressure will be maintained on either side of the combining-tube, and consequently there can be no loss of water, as has heretofore occurred.

It will be understood that in my machine the steam-jet of spindle h performs both the functions of lifting and forcing, and through the employment of the tube m', combining-tube n and its ported base, check-valve o, exhaust and delivery tube t is had a perfectly automatic machine, and which I am pleased to call a "triple-tube automatic injector."

My construction possesses, among others, the following advantages: The working parts are all accessible without disturbing pipe-connections. By one manipulation the adjustment for varying pressure and for the admission of steam is had; the machine starts up again automatically upon the return of the water after being temporarily withdrawn; the ready substitution or renewal of parts, and the provision against impairment of operation by having only one manually-movable part.

What I claim is—

1. In an injector having steam and water inlets and an outlet, the tubular screw-spindle h, provided with a steam-inlet port, h^2, and a collar, h^3, on the same, and a threaded bonnet, f, in which said spindle is moved longitudinally to open and wholly close the inlet, combined with the suction-chamber separated from the steam-inlet by the diaphragm i, and the packing-gland j, surrounding said spindle and bearing upon the diaphragm, substantially as shown and described.

2. The combining-tube provided with a valvular base interposed between the suction and exhaust chambers, a superposed lifting-tube, a longitudinally-adjustable steam-inlet spindle provided with a steam-inlet port, and a collar on said spindle co-operating with the bonnet, in which said spindle is adjustable to open and close said port by the longitudinal movement of said spindle in said bonnet, combined to control the flow of water commensurately with the steam-pressure, substantially as described.

3. In an injector, the combination, with the steam and water inlets, the suction-chamber, and the outlet, of the screw-threaded steam-spindle h, having a longitudinal steam-passage, h^4, an inlet-port, h^2, and a collar, h^3, arranged below said port, the screw-threaded bonnet f, in which the said spindle is adjustable, and against the bottom of which it is seated to wholly shut off the supply of steam, and a hand-wheel to operate said spindle, substantially as described.

4. The tube m, forming a chamber above the combining-tube, combined with such combining-tube, parts therein, a check-valve co-operating automatically with said ports, a delivery-chamber having an automatically-operated check-valve in its overflow, and a steam-induction spindle provided with a valvular port and operable by longitudinal adjustment to automatically start and maintain the flow of water, and to re-establish it after accidental cessation, substantially as described.

In testimony whereof I have hereunto set my hand this 9th day of June, A. D. 1885.

FRANKLIN W. KREMER.

Witnesses:

E. J. YOUNG,

H. B. CLARK.