

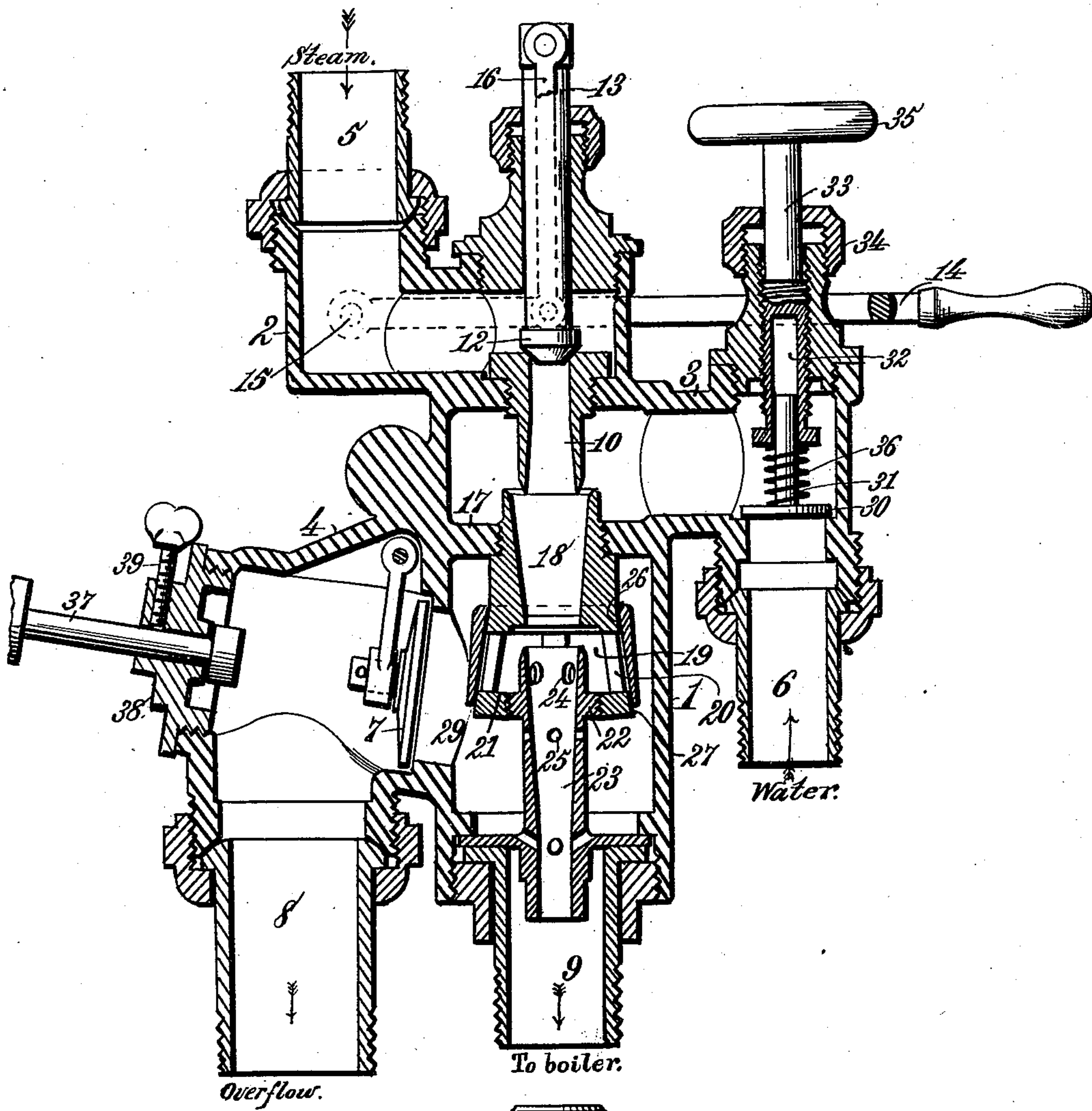
(Model.)

L. E. HOGUE.  
INJECTOR.

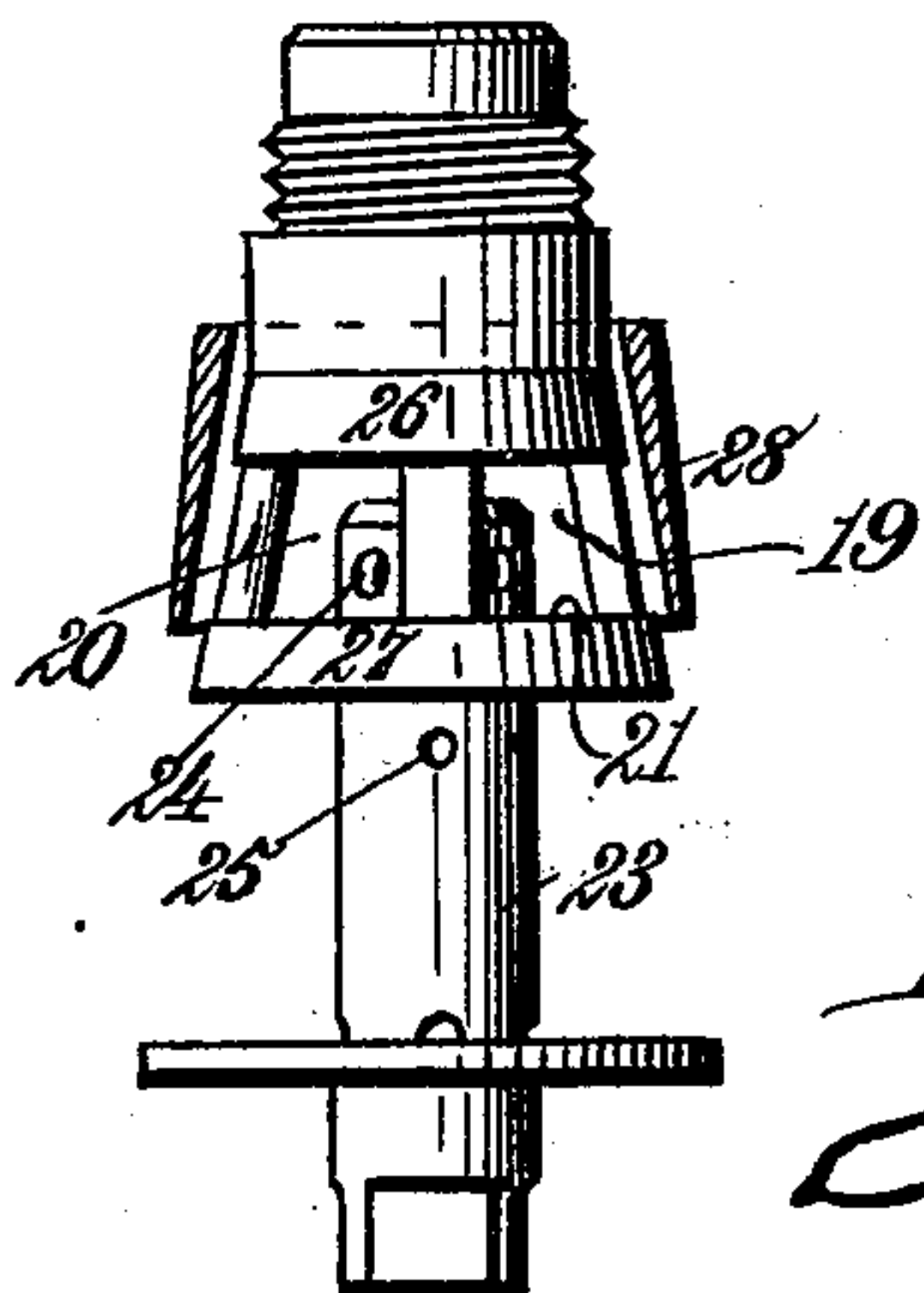
No. 550,558.

Patented Nov. 26, 1895.

*Fig. 1.*



*Fig. 2.*



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 550,558, dated November 26, 1895.

Application filed April 22, 1895. Serial No. 546,733. (Model.)

*To all whom it may concern:*

Be it known that I, LOVREN E. HOGUE, a citizen of the United States, residing at Greenville, in the county of Mercer and State of Pennsylvania, have invented new and useful Improvements in Injectors, of which the following is a specification.

This invention relates to that class of steam-injectors having means for opening the exhaust-ports of the lifting-tube on starting the injector and for closing the same when a vacuum is created around the inner end of the combining-tube for the purpose of preventing overflow of the injector and enabling the latter to start automatically at any suitable pressure. It has heretofore been proposed to open the exhaust-ports of the lifting-tube on starting the injector and to close the same when a vacuum is created around the inner end of the combining-tube through the medium of a conoidal sleeve-valve seating on a separate casing surrounding the combining-tube in such manner that when steam first passes into the lifting-tube the ring or band will be raised and the steam pass out into the overflow-chamber, thus raising the overflow-valve and producing a vacuum, which causes suction, and when the vacuum is created the ring or band closes down over the apertures in the lifting-tube and the overflow is shut off.

The objects of my invention are to improve the prior construction of injectors of the character alluded to; to provide a perfect airtight overflow-chamber at the upper end of the combining-tube for effectually preventing the entrance of air into the combining-tube after the injector starts, and also to exclude hot water from gaining access into the upper end of the combining-tube when the injector is working and water is flowing through to the boiler, and to provide means whereby the overflow-valve of the injector can be rigidly held seated, so that steam can be forced through the injector into the tank and pipes of a locomotive-engine to prevent freezing of the same.

The invention consists in the combination, in an injector, of a combining-tube having its upper end formed with upper and lower perforations and a surrounding chamber constructed with separated upper and lower ground valve-seats, which are inclined or bev-

eled, and a vertically-movable valve-sleeve having its upper and lower end portions formed with internal beveled or inclined ground valve-faces to accurately fit the separated upper and lower ground valve-seats of said surrounding chamber for the purpose of sealing the upper and lower ends of the valve-sleeve air and water tight, and thus effectually prevent the entrance of air and water when a vacuum has been created and the injector is working to force water into a boiler.

The invention also consists in the combination, with the overflow-valve of an engine, of a lengthwise movable spindle adapted to bear against and hold the overflow-valve rigid on its seat and a set-screw for holding the spindle in a fixed position.

Figure 1 is a vertical central sectional view of a steam-injector constructed in accordance with my invention; and Fig. 2 is detail sectional side elevation showing the combining-tube, the lifting-tube, and the vertically-movable valve-sleeve.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The numeral 1 indicates the casing of the injector, which is preferably a casting formed integrally with branches 2, 3, and 4. The branch 2 is provided with a coupling 5 to connect with a steam-supply pipe, and the branch 3 is provided with a coupling 6 to connect with the liquid or water supply, while the branch 4 contains the overflow-valve 7 and is provided with an overflow-outlet 8.

The lower end of the injector-casing is provided with a coupling 9, designed to connect with the boiler which is to be supplied with water when the injector is working.

The upper end of the injector-casing is provided with an inserted steam-jet 10, having a valve-seat in its upper end adapted to be opened and closed by a valve 12, carried by a valve-stem 13. The valve-stem 13 is connected by links 16 with a hand-lever 14, pivoted, as at 15, to the upper end of the injector-casing, so that by operating the hand-lever the valve 12 will be opened or closed to control the flow of steam into the steam-jet 10.

The interior of the injector-casing is constructed with a diaphragm 17, having a screw-



threaded orifice, into which is screwed the upper end of the lifting-tube 18. The bore of the lifting-tube is tapering and its widest upper end receives the lower end of the steam-jet 10. The lower end of the lifting-tube is laterally expanded to provide a chamber 19, having lateral ports 20. The bottom wall 21 of the chamber 19 is constructed with a screw-threaded orifice to receive a screw-threaded portion 22 near the upper end of the combining-tube 23. The screw-threaded portion 22 of the combining-tube is located between two sets of lateral perforations 24 and 25, formed in the upper end portion of the combining-tube, so that the bottom wall 21 of the chamber 19 is located between said sets of perforations 24 and 25.

The lower end portion of the lifting-tube, which forms the chamber 19, is conical or tapering externally, and this external, conical, or tapering portion is formed with upper and lower accurately-ground circular valve-seats 26 and 27, which, as clearly shown in Fig. 2, are of different diameters and are beveled or inclined. The valve-seats are separated from each other and the lateral ports 20 are located between the valve-seats. The ports 20 are adapted to be opened and closed through the medium of a conical or tapering valve-sleeve 28, having its upper and lower end portions accurately ground to provide internal upper and lower inclined valve-faces to fit air-tight against the upper and lower separated valve-seats 26 and 27. The valve-seats 26 and 27 are ground, and likewise the upper and lower ends of the valve-sleeve are ground internally, so that when the valve-sleeve is seated a perfectly air-tight joint is obtained and it is impossible for air or liquid to enter from the overflow-chamber 29 into the chamber 19, which surrounds the upper end of the combining-tube.

The inlet of water into the injector is regulated through the medium of an automatic spring-pressed valve 30, having a cylindrical stem 31, entering and adapted to move vertically in a cylindrical bore 32 in a screw-threaded spindle 33, working in a stuffing-box 34. The upper end of the spindle 33 is provided with a suitable handle 35, preferably in the form of a hand-wheel, and a spring 36, of any suitable construction, is arranged between the valve 30 and the lower end of the spindle 33, so that by adjusting the spindle 33 the tension of the spring can be varied. The valve 30 is adapted to open and close independent of any movement of the spindle 33, and in the practical operation of the injector the spring resists the opening of the valve 30, and thus offers resistance to the inflowing water, so that the passage of water into the injector is graded or graduated. The valve 30 normally stands closed or nearly closed, and the passage of steam through the steam-jet 10 creates a vacuum, whereby the valve 30 is more or less opened to permit water to flow into the injector. The variations in the

steam-pressure will more or less open the valve, and consequently the quantity of water delivered to the injector is increased or diminished according to the conditions required by variations in the pressure of the steam or forcing fluid, all substantially as described in Letters Patent No. 515,683, issued to me February 27, 1894.

In the operation of the injector the steam flowing through the steam-jet 10 and lifting-tube 18 enters the chamber 19, raises the valve-sleeve 28, and flows into the chamber 29, thereby creating a vacuum, which starts the water through the injector, and instantly the valve-sleeve closes and tightly fits the upper and lower circular valve-seats 26 and 27, thereby effectually preventing the entrance of air and hot water from the chamber 29 into the chamber surrounding the upper end of the combining-tube.

The provision of the chamber around the upper end of the combining-tube, with the upper and lower separated valve-seats accurately fitting the upper and lower ends of the valve-sleeve 28, effectually seals the upper end of the combining-tube against the entrance of air and water from the chamber 29 after a vacuum has been created and the injector is working to force water into the boiler. By this means I effectually prevent overflowing of the injector and enable the latter to start automatically at any suitable pressure.

In the use of an injector in connection with a locomotive-engine it is desirable to pass steam through the injector into the tank and pipes of the locomotive to prevent the latter freezing, and to accomplish this the overflow-valve should be held seated. I hold the overflow-valve seated through the medium of an adjustable device, consisting, as here shown, of a spindle 37, working through a cap 38, screwed into or upon the branch 4 of the injector-casing. The cap 38 is provided with a set-screw 39, and the construction is such that the spindle 37 can be thrust inward against the overflow-valve 7 and the set-screw turned to clamp the spindle 37 in a fixed position, thereby rigidly holding the overflow-valve on its seat and enabling steam to be passed through the injector into the tanks and pipes of the locomotive to prevent freezing thereof. This construction makes a frost-cock out of the overflow-valve and is a very desirable feature in an injector for locomotive-engines.

Having thus described my invention, what I claim is—

1. The combination in an injector, of a combining-tube having its upper end formed with upper and lower perforations 24 and 25, and a surrounding chamber constructed with separated, beveled, or inclined upper and lower ground valve seats 26 and 27, and a vertically movable sleeve valve 28 having its upper and lower end portions constructed with internal ground valve faces adapted to fit air and water tight against the said bev-



eled or inclined upper and lower valve seats, for the purpose of sealing the upper and lower ends of the valve sleeve air and water tight when a vacuum has been created and the injector is working to force water into a boiler, substantially as described.

2. The combination in an injector, of a combining-tube having its upper end portion provided with a surrounding chamber constructed with upper and lower beveled or inclined ground valve seats 26 and 27 of different diameter, and lateral perforations 19 between said valve seats, and a vertically movable, conical valve sleeve having its upper and lower end portions constructed with internal valve faces adapted to fit air and water tight against the said upper and lower valve seats, for sealing the upper and lower ends of the valve-sleeve air and water tight when a vacuum has been created and the injector is working to force water into the boiler, substantially as described.

3. The combination with the overflow valve of an engine, of a lengthwise movable spindle adapted to bear against and hold the overflow valve rigid on its seat, and a set screw for holding the spindle in a fixed position, substantially as described.

4. The combination with an injector having a pivoted, swinging overflow valve, of a lengthwise movable smooth spindle adapted to slide lengthwise in a bearing in the injector casing, and a device carried by the injector casing and adapted to bind against the surface of the said smooth spindle for holding the latter in a fixed position, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LOVREN E. HOGUE.

Witnesses:

ALBERT H. NORRIS,  
THOS. A. GREEN.