No. 881,124. PATENTED MAR. 10. 1908.

L. E. HOGUE.

INJECTOR.

APPLICATION FILED DEC. 11, 1906.

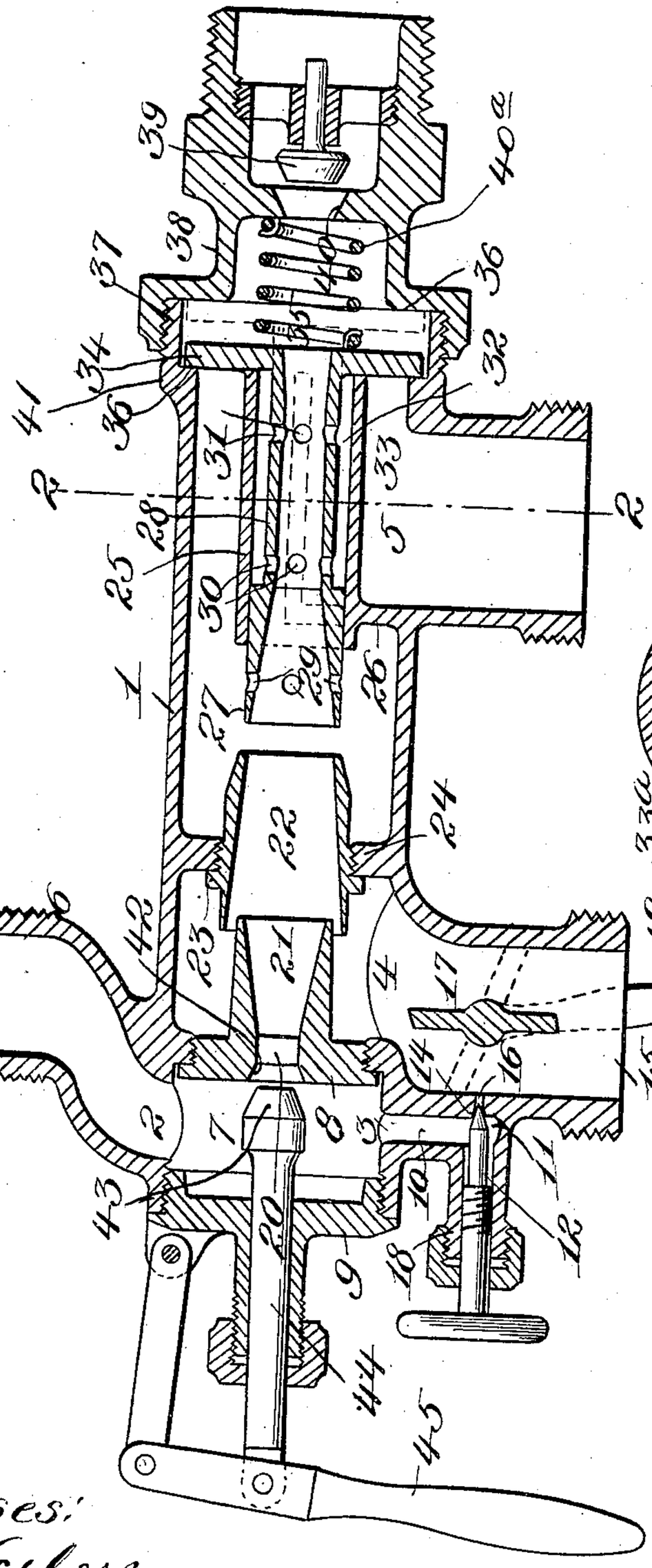


Fig. 1.

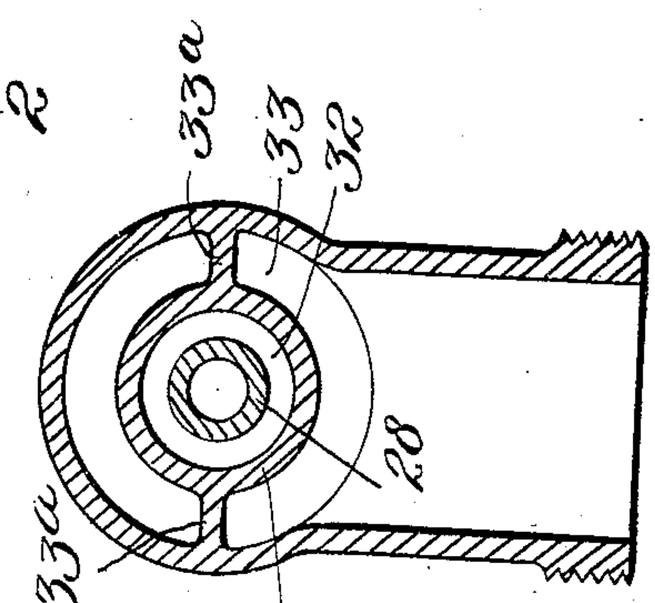


Fig. 2.

Witnesses:
C. D. Kesler
H. B. Keelers

Inventor
Lauren E. Hogue
By
James L. Norris,
Atty.

# UNITED STATES PATENT OFFICE.

LOVREN E. HOGUE, OF GREENVILLE, PENNSYLVANIA.

## INJECTOR.

No. 881,124. Specification of Letters Patent. Patented March 10, 1908.

Application filed December 11, 1906. Serial No. 347,345.

*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 Steam-Injectors, of which the following is a specification.

This invention relates to steam injectors, and the object thereof is to provide in a manner as hereinafter set forth an automatic re-starting, lifting and forcing injector which may be worked under the maximum range of steam pressure, and furthermore enabling the automatic draining of the injector.

A further object of the invention is to provide a steam injector in a manner as hereinafter set forth, with means to retain the water above a freezing temperature without heating the body portion of the injector or injuring in any way the regulating supply valve in the suction pipe, such valve opening and closing communication between the water supply and the injector.

The invention further aims to provide the injector with an automatically-operable overflow valve for retaining the overflow in the body of the injector during the operation thereof and automatically shiftable from closure position when the injector is not operated thereby allowing of the overflow to be drained from the body of the injector.

The invention further aims to provide an injector in a manner as hereinafter set forth which will permit of access to its interior so that the parts can be readily cleaned when occasion so requires.

Further objects of the invention are to provide an injector in a manner as hereinafter set forth which shall be simple in its construction, strong, durable, efficient in its use, readily set up and comparatively inexpensive to manufacture.

With the foregoing and other objects in view, the invention consists of the novel construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings wherein is shown the preferred embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In describing the invention in detail reference is had to the accompanying drawings wherein like reference characters denote corresponding parts throughout the several views, and in which—

Figure 1 is a longitudinal sectional view of an injector in accordance with this invention, and, Fig. 2 is a section on line 2—2 of Fig. 1.

Referring to the drawings by reference characters, 1 denotes the body portion of the injector which is cylindrical and is formed with the openings 2, 3, 4 and 5. The opening 2 communicates with a branch 6 which is connected with the steam space of the boiler, and furthermore with a valve chamber 7 formed by a head 8 secured within the body portion 1 and a cap 9 at one end of said body portion 1. The opening 3 communicates with the chamber 7 and a conduit 10 opening into a valve chamber 11 in which operates a needle valve 12 adapted to be held against a seat 14 formed in the outer face of the suction pipe 15, the latter communicating with a water supply. An inlet port 16 for the entrance of steam to the suction pipe is formed in the wall of the pipe and the said port 16 is arranged below a regulating valve 17 positioned within the suction pipe 15 and said valve is of what is termed the "butterfly" class. A housing for the stem of the needle valve is indicated by the reference character 18 and which projects from the suction pipe 15. A handle for operating the butterfly valve is indicated by the reference character 19. The opening 4 establishes communication between the suction pipe 15 and the interior of the body portion 1. The opening 5 establishes communication between the body portion 1 and the pipe 20 so that the injector can be drained when water is not being forced to the boiler.

The arranging of the port 16 below the butterfly valve 17 allows of a supply of steam into the suction pipe so that the water will be kept above the freezing temperature, and, owing to the arrangement of the port 16 below the valve 17 when the valve is closed no admission of steam will be had to the interior of the body portion 1, and, consequently, the body of the injector is kept entirely free from steam when the injector is not running and as the butterfly valve can be closed down solidly against the inner face of the suction pipe 15 there is no danger of the incoming steam injuring the valve in any manner. Owing to the employment of the butterfly valve the incoming supply of water can be regulated.

The head 8 is provided with a centrally-arranged opening 20 which communicates with the main delivery jet tube 21, the latter projecting from one face of the head 8 and extending into the lifting tube 22 which is of much greater diameter than the delivery jet tube 21. The inner face of the delivery jet tube 21 is formed in a tapering manner, and the same is true of the inner face of the lifting tube 22, but the taper of the tube 21 extends in an opposite direction with respect to the direction in which the taper of the tube 22 extends. The tube 22 is secured within the body portion 1 by the boss 23 engaging a fixed support 24. Mounted within the body portion 1 forwardly of the tube 22 is a sleeve 25 which is formed integral with a support 26 the tube 25 being arranged opposite the opening 5 and within the sleeve 25 is slidably mounted the combined forcing tube and nozzle element which comprises an end portion 27, constituting the forcing tube and which at one end terminates in a nozzle 28. The end portion 27 is of a greater diameter than the nozzle 28 and is adapted to engage the inner face of the sleeve 25 when the said element is shifted in either direction. The end portion 27 is arranged in alinement with the tube 22, but there is an intervening space between the same, and said end portion 27 is provided with a series of openings 29 and furthermore has its inner face formed in a tapering manner, the taper extending in the same direction as the direction in which the taper of the tube 22 extends.

The nozzle 28 in close proximity of the joint thereof with the end portion 27 is formed with a plurality of openings 30 and near its forward end is also provided with a series of openings 31, the openings 30 and 31 establishing communication between the interior of the nozzle and the overflow space 32 formed between the sleeve 25 and the nozzle 28. An overflow space 33 is formed in the body portion 1 between the sleeve 25 and the said body portion and the said overflow space 33 is divided by the partitions $33^a$ interposed between the body portion 1 and the sleeve 25. The end of the nozzle 28 carries a valve 34 for closing the spaces 32 and 33. The forward end of the body portion 1, the sleeve 25 and partitions $33^a$ constitutes a seat for said valve and when the said valve is shifted off its seat communication is established between the overflow spaces 32 and 33 and the overflow chamber 35 and between said chamber 35 and the pipe 20. The valve 34, when the injector is not operating, is adapted to be shifted by a pulling spring $40^a$ having one end fixed to the valve 34 and at its other end to one wall of the chamber 35. The valve 34 is shifted against an abutment 36 formed by the flanged collar 37 carried on the inner end of a tube 38 which is adapted to communicate with the water space of the boiler (not shown) when the check valve 39 arranged within the tube 38 is moved off its seat 40. The collar 37 is secured to an annular offset 41 formed integral with the periphery of the body portion 1 at the lower end thereof.

Arranged within the valve chamber 7 and normally engaging with a seat 42 formed on one face of the head 8 is a steam inlet valve 43 having a stem 44 which projects through the cap 9 and is connected to a shifting lever 45. When the lever 45 is operated in one direction the valve 43 is moved off its seat and steam from the boiler is then supplied to the body portion of the injector.

The operation of the injector is as follows: It will be assumed that the valve 34 is in the position shown in dotted lines in Fig. 1 which would cause the combined forcing tube and nozzle to also be in the position shown in dotted lines in Fig. 1, thereby leaving a considerable space between the end portion 27 and the tube 22. The butterfly valve is then opened in the suction pipe 15 and steam is admitted by moving the valve 43 off its seat, steam entering the jet tube 21, passing through the delivery tube 22, then through the space between the tube 22, and the end portion 27 which constitutes the forcing tube. Steam also passes around into the overflow spaces 33, through the end portion 27 and out through the openings 29 and 30 into the overflow space 32; thence into the overflow chamber 35, and from there into the discharge pipe 20. As soon as the water arrives the condensation of steam forces the water through the tube 27 and nozzle 28 into the overflow chamber 35 and against the forward face of the valve 34, and consequently forces the valve 34 against its seat, as well as removing the check valve 39 from its seat. The valve 34 will be retained against its seat during the passage of the water to the water space of the boiler. When the valve 34 assumes a position just set forth the injector is forcing water into the boiler, as the hot and cold overflow is closed to the chamber 35 and to the atmosphere. When the valve 43 is shifted to its seat to cut off the supply of steam, the valve 39 closes, and consequently pressure is relieved from the forward side of the valve 34. The latter, then owing to the pressure of the overflow on the other side thereof, is shifted from its seat and communication will be established between the overflow spaces 32, 33, chamber 35, and pipe 20 so that the injector can be drained.

When the valve 34 is held against its seat during the operation of the injector, the pressure upon the forward side thereof is such that it will overcome the pressure that can be brought to bear on the inside of the tubes; so under such circumstances, it will make the lifting and forcing tubes the same as if they were solid tubes from the head 8

to the end of the nozzle. It will furthermore be evident that the condensation of the steam in the forcing tube and the moving of the valve 34 up against its seat, starts the quick motion of the water through the tube requiring, practically, no water overflow. As the overflow chamber 35 is empty and as the valve 34 is moved against its seat, instantly when the water reaches the overflow chamber, it is evident that no water is discharged from the injector at the beginning of the operation of supplying water to the boiler; so consequently what is termed "slabbering" in the art, is prevented.

What I claim is—

1. An injector embodying a plurality of overflow spaces, and a combined forcing and nozzle element carrying a valve for automatically closing said spaces by pressure thereby preventing an overflow during the operation of the injector.

2. An injector communicating with a water and steam supply, means for regulating the water supply, and means for supplying steam to maintain the water above the freezing temperature, said regulating means preventing such supply of steam from entering the body portion of the injector.

3. An injector embodying a lifting tube, a forcing tube carrying a valve and spaced from said lifting tube, and means for automatically increasing the space between the lifting tube and the forcing tube when the injector is in inoperative position to form a large passage to facilitate the operation of the valve carried by the forcing tube when initially supplying pressure to operate the injector.

4. An injector comprising a plurality of overflow spaces adapted to communicate with the atmosphere when the injector is not lifting, and means operated by pressure for automatically closing said spaces when communication is established between the injector and boiler thereby preventing any overflow from the injector during the lifting action of the injector.

5. An injector comprising a plurality of overflow spaces adapted to communicate with the atmosphere when the injector is not lifting, means operated by pressure for automatically closing said spaces when communication is established between the injector during the lifting action of the injector and boiler thereby preventing any overflow from the injector, and an overflow chamber communicating with the atmosphere and with said overflow spaces, said means when the injector is closed to the boiler adapted to automatically establish communication between the said spaces and said chamber.

6. An injector comprising a body portion provided with a plurality of overflow spaces adapted to communicate with the atmosphere, a lifting tube, a shiftable forcing tube carrying a nozzle, said forcing tube and nozzle provided with openings communicating with said overflow spaces, and means connected to the nozzle and automatically operated by pressure when the injector is in communication with the boiler for closing the said spaces to prevent overflow of the injector.

7. An injector comprising a body portion communicating with a steam supply, a water supply and the atmosphere, means for regulating the water supply, means for shutting off the steam supply, a delivery jet tube, a lifting tube in alinement with said jet tube, a slidable forcing tube carrying a nozzle in alinement with the lifting tube, a check valve adapted to establish communication with a boiler, and means carried by the nozzle and operated by pressure for closing said spaces thereby cutting off communication between the body portion and the atmosphere, said means automatically movable when the pressure is relieved therefrom to open communication between the body portion and the atmosphere.

8. An injector comprising a body portion and having overflow spaces communicating with a steam and water supply, means for regulating the supply of water, means for supplying steam for retaining the water above the freezing temperature, said regulating means preventing the entrance of such steam into the body of the injector, a lifting tube within the body portion, means for supplying a jet of steam through said lifting tube, a check valve for establishing communication between the injector and a boiler and adapted to be moved from its seat when the jet of steam is supplied, and a combined forcing and nozzle element slidably mounted within the body portion and carrying a valve adapted to automatically seat itself by pressure when the check valve is opened thereby closing said overflow spaces and prevent overflow during the operation of the injector.

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

LOVREN E. HOGUE.

Witnesses:

ISAAC HAVEN POLLARD,

WILLIAM LOOSER.