W. H. LOCKE.

INJECTOR.

APPLICATION FILED OCT. 31, 1911.

1,032,222. **Patented July 9, 1912.**

Fig. 1.

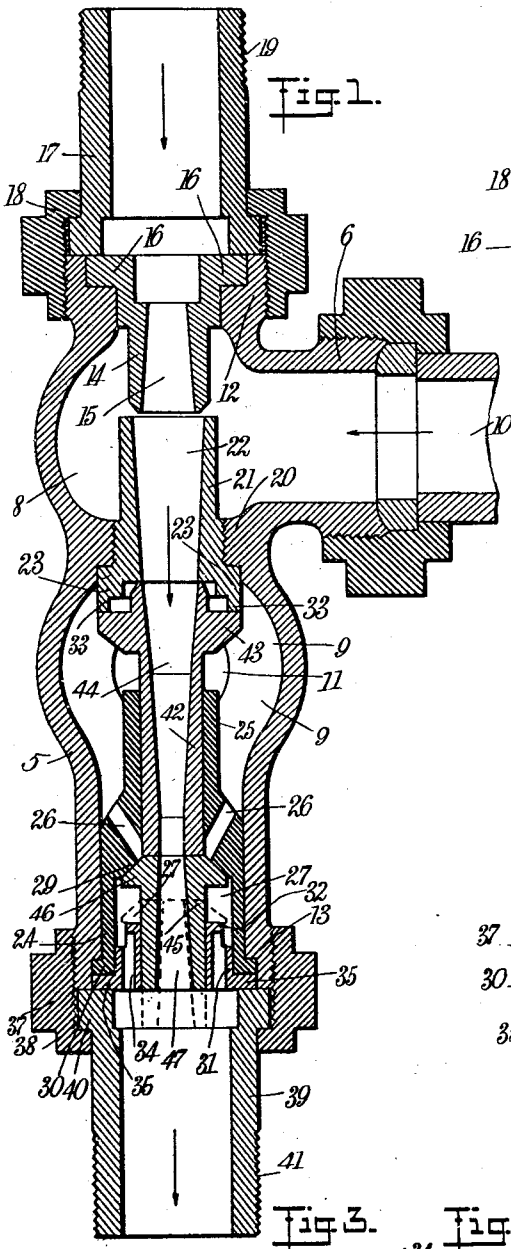


Fig. 2.

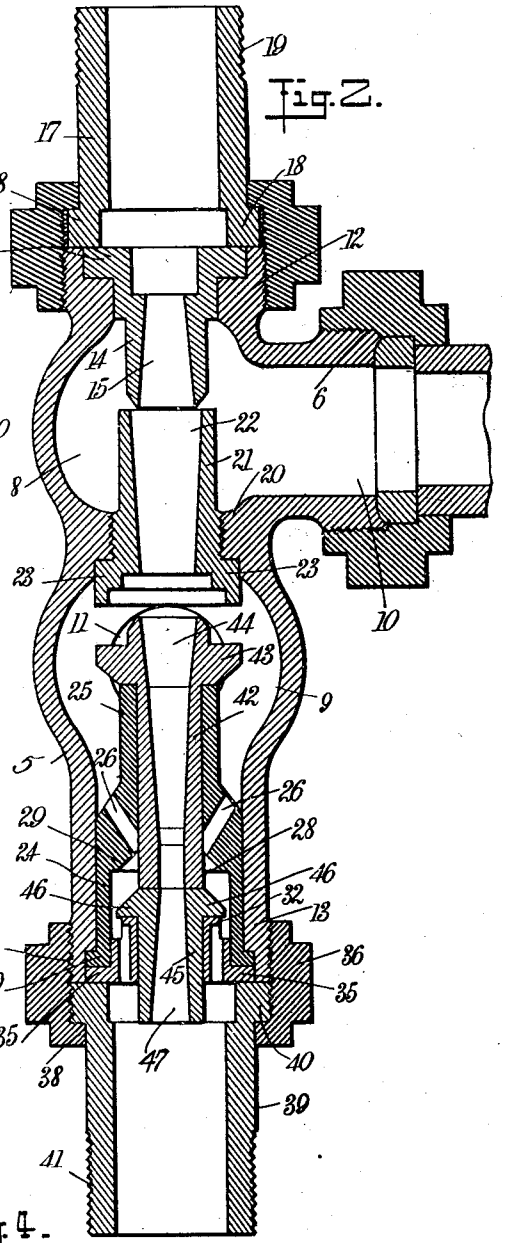


Fig. 3.

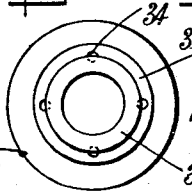
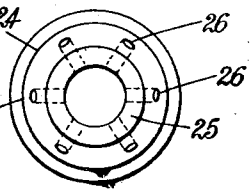


Fig. 4.



WITNESSES

E. C. Hazard

L. J. Gallagher.

INVENTOR

William H. Locke

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM HALE LOCKE, OF HUNTINGTON, WEST VIRGINIA, ASSIGNOR TO LOCKE MFG. CO., OF HUNTINGTON, WEST VIRGINIA.

INJECTOR.

1,032,222. Specification of Letters Patent. Patented July 9, 1912.

Application filed October 31, 1911. Serial No. 657,823.

To all whom it may concern:

Be it known that I, WILLIAM H. LOCKE, a citizen of the United States, and a resident of Huntington, in the county of Cabell and State of West Virginia, have invented a new and Improved Injector, of which the following is a full, clear, and exact description.

My invention relates to injectors of the general type shown in Patent No. 590,774, dated March 1, 1910, issued to William T. Strain and myself.

The purpose of my improvement is to change the construction and action of various movable parts in order to increase the positiveness of the action of said parts, and to enable the injector to be used under greater extremes of temperature of hot and cold water, as well as to increase the amount of pressure against which the injector will work.

Reference is to be had to the accompanying drawing forming a part of this specification in which like characters of reference indicate corresponding parts in all the views, and in which—

Figure 1 is a substantially central section through my injector complete, showing the various movable parts in the positions they occupy while the device is in action; Fig. 2 is a section similar to Fig. 1, but showing the injector as idle and the movable parts as consequently occupying their respective normal positions; Fig. 3 is a detail showing the bearing sleeve used for supporting and guiding the delivery tube; and Fig. 4 is a detail showing, in plan, the inner casing or frame which is employed for holding and guiding the parts which are movable automatically.

The body portion 5 or outer casing of the injector is conveniently made in a single piece, and is provided with a threaded nipple 6, and with compartments 8, 9; the compartment 8 is disposed adjacent the nipple 6, while the compartment 9 is below it and adjacent the overflow passage 11. The threaded nipple 6 is provided with an inlet passage 10, and the overflow passage 11 extends through a similar nipple. The body portion 5 is provided with threaded ends 12, 13. A steam nozzle is shown at 14 and is provided with a frusto-conical passage 15 and with an annular flange 16, the latter resting upon the end 12. A steam pipe 17 is provided with an annular flange 18 mating the flange 16 and engaging the same. The steam pipe 17 is further provided with a threaded portion 19.

Within the body portion 5 and coaxial therewith is a member 20 which is integral with said body portion. Within this member is mounted a suction tube 21 which is provided with a frusto-conical passage 22 extending entirely through it and coaxial with the body portion 5. The suction tube 21 is provided with an annular flange 23 integral with it and secured rigidly in position relatively to the member 20, there being another annular flange 33 below the first one and of greater interior diameter.

A member 24 having generally a cylindrical form and provided with a reduced portion 25, I designate as an "inner casing." This inner casing is provided with a number of apertures 26 which are inclined outward and disposed equidistant. The inner casing 24 is provided with a centrally disposed passage 27 and the inclined apertures 26 communicate with the passage 27 and also with the compartment 9. The casing 24 is provided with an annular shoulder 29 disposed between the passages 26 and 27. The inner casing 24 is provided with an annular flange 30 integral with it.

A bearing sleeve 31 (see Fig. 3), having generally an annular form, is provided with an annular portion 32 of reduced diameter, and is also provided with an annular flange 35 mating the flange 30. The bearing sleeve 31 is further provided with apertures 34 extending through it and disposed parallel with each other, as will be understood from Fig. 3, these apertures being in communication with the passage 27. A coupling section 36 is provided internally with a threaded portion 37 which engages the end 13. This coupling section 36 is provided with an annular flange 38, and extending through the latter is a pipe section 39 which forms, when the parts are in position, a part of the pipe leading to the boiler. To facilitate making connections, the pipe section 39 is provided adjacent to one of its ends, with a thread 41, and at its opposite end with a flange 40. The coupling section 36 clamps the flanges 30, 35 and 40 together.

A combining tube is shown at 42 and is provided with an enlarged annular portion 43 integral with it. The combining tube is

further provided with a passage 44 having a substantially frusto-conical form.

A delivery tube is shown at 45 and is provided with an end portion 46 of enlarged diameter, this end portion being beveled and adapted to fit steam-tight against the adjacent annular shoulder 29. The delivery tube 45 is further provided with a passage 47 of frusto-conical form, the portion of smallest diameter being disposed adjacent to the portion of smallest diameter of the combining tube 42. The combining tube 42 and the delivery tube 45 are normally loose, but are adapted to move each in the general direction of its axis which coincides with the general direction of the body portion. The section 17 is connected with the steam supply, the nipple 6 with the water supply, the outlet 11 with the overflow pipe, and the pipe section 39 is brought into communication with the boiler, as above explained. Adjacent to the annular portion 43 of the combining tube 42 is the annular flange 33 which forms a seat to be engaged by the annular portion 43 of the combining tube. When the device is inactive, as indicated in Fig. 2, the combining tube 42 and the delivery tube 45 occupy their respective lowermost positions.

The operation of my device is as follows: The parts being connected and arranged as above described, steam is admitted through the nozzle 14. This steam being discharged violently through the passage 44 of the combining tube creates a partial vacuum within the compartment 8, and this causes water to flow in through the passage 10 and to mix with the steam, thereby effecting condensation of the latter. The mixture of steam and water is now forced through the passage 22 and in through the passage 44 of the combining tube, a portion, however, passing under the flange 33 and making its escape through the outlet 11. This produces an aspirating action and causes the combining tube 42 to move bodily toward the suction tube 21, and in so doing, to lessen the distance between the flange 43 and the adjacent annular flange 33 so that a volume of water mixed with more or less steam passes out in the form of a sheet intermediate the annular portion 43 and the flange. Most of the mixture of water and steam now passes through the passage 44, and from the lower end of this passage a portion of it passes into the passage 47, another portion filling the compartment 27 and being discharged obliquely upward through the inclined apertures 26. The rapid escape of the mixture through the apertures last-mentioned produces a partial vacuum in the passage 28 and the delivery tube is, by virtue of this partial vacuum, raised bodily upward in the general direction of its axis. The end portion 46 of the delivery tube now engages the annular shoulder 29, and is pressed tightly against the same. This closes the apertures 26 in the sense that it cuts off communication, through these apertures, between the passages 11 and 27. The upward pressure of the delivery tube 45 also moves the combining tube 42 to its limit; that is, until the flange 43 is forced tightly against the flange 33. The entire mixture of water and steam now passes down through the passages 44 and 47 and the pipe section 39 to the boiler.

I have found that the injector above described is very reliable in its action and that it will operate successfully between wide limits of temperature in the water and with quite a variety of steam pressure. I find, moreover, that the water is injected with considerable force and that the lift of the water entering the nipple 6 may be considerable without interfering with the action.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. An injector comprising an outer casing, a steam nozzle mounted therein, a vacuum tube mounted within said casing and coaxial with said steam nozzle, said vacuum tube being rigid relatively to said casing, a combining tube in alinement with said vacuum tube and movable relatively to said casing, and a delivery tube mounted within said casing and movable relatively thereto and to the combining tube, said delivery tube being in alinement with said combining tube.

2. An injector comprising an outer casing, a steam nozzle and a vacuum tube mounted in the casing and disposed in alinement with each other, an inner casing fitting within the outer casing and having a central passage therethrough, enlarged at one end portion, a combining tube slidably mounted within said inner casing and movable relatively to the same, said combining tube being in alinement with said vacuum tube, and a delivery tube slidably mounted within the enlarged portion of said passage and disposed in alinement with said combining tube, the said delivery tube being movable relative to said combining tube.

3. An injector comprising an outer casing, a steam nozzle mounted therein, a vacuum tube mounted within said outer casing, an inner casing located within said outer casing and having a reduced portion, said inner casing being provided with a passage extending axially through it and also provided with inclined passages extending through the wall thereof and disposed adjacent to said reduced portion, a combining tube slidably mounted within said reduced

portion and free to move relatively to said outer casing, a delivery tube movably mounted within said inner casing and adapted, by moving to its limit in one direction, to close said passages extending through the wall of said inner casing, and a bearing sleeve connected with said inner casing and engaging said delivery tube for the purpose of supporting and guiding the latter.

4. An injector comprising an outer casing provided with two compartments, one of said compartments having a water inlet, and a steam nozzle extending into said compartment, the other compartment having an overflow passage leading therefrom, a vacuum tube mounted in said casing and opening into both of said compartments, an inner casing located within said outer casing and having a reduced portion extending within the last mentioned compartment, the said inner casing having a central passage reduced in diameter in the said reduced portion, and passages extending through the wall of said casing adjacent to said reduced portion and adapted to connect the central passage of said inner casing with the said last mentioned compartment of the outer casing, a combining tube slidably mounted within said reduced portion of the inner casing, and a delivery tube movably mounted within said inner casing and adapted to close the passages extending through the wall of said inner casing.

5. An injector comprising an outer casing having a water inlet and an overflow passage, a steam nozzle and a vacuum tube mounted within said casing, an inner casing located within said outer casing and having one end portion enlarged, said inner casing having a central passage enlarged in the enlarged portion, the inner casing being provided with passages in its wall establishing communication between the enlarged portion of the said central passage and the overflow passage of the outer casing, the inner casing having an annular shoulder adjacent said last mentioned passages, a combining tube slidably mounted within the smaller portion of the inner casing and having a flanged end adapted to engage a flange on the end of the vacuum tube, a bearing sleeve mounted in the enlarged portion of said inner casing and provided with apertures extending through the same and in communication with the enlarged portion of said central passage, and a delivery tube mounted in said bearing sleeve, one end of said delivery tube being adapted to engage the adjacent end of the combining tube, the said delivery tube being enlarged at said end for engaging the said annular shoulder on the inner casing to close the passages extending through the wall of said inner casing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM HALE LOCKE.

Witnesses:
HENRY SIMMS,
GUY C. MACE.