W. T. STRAIN & W. H. LOCKE.

INJECTOR.

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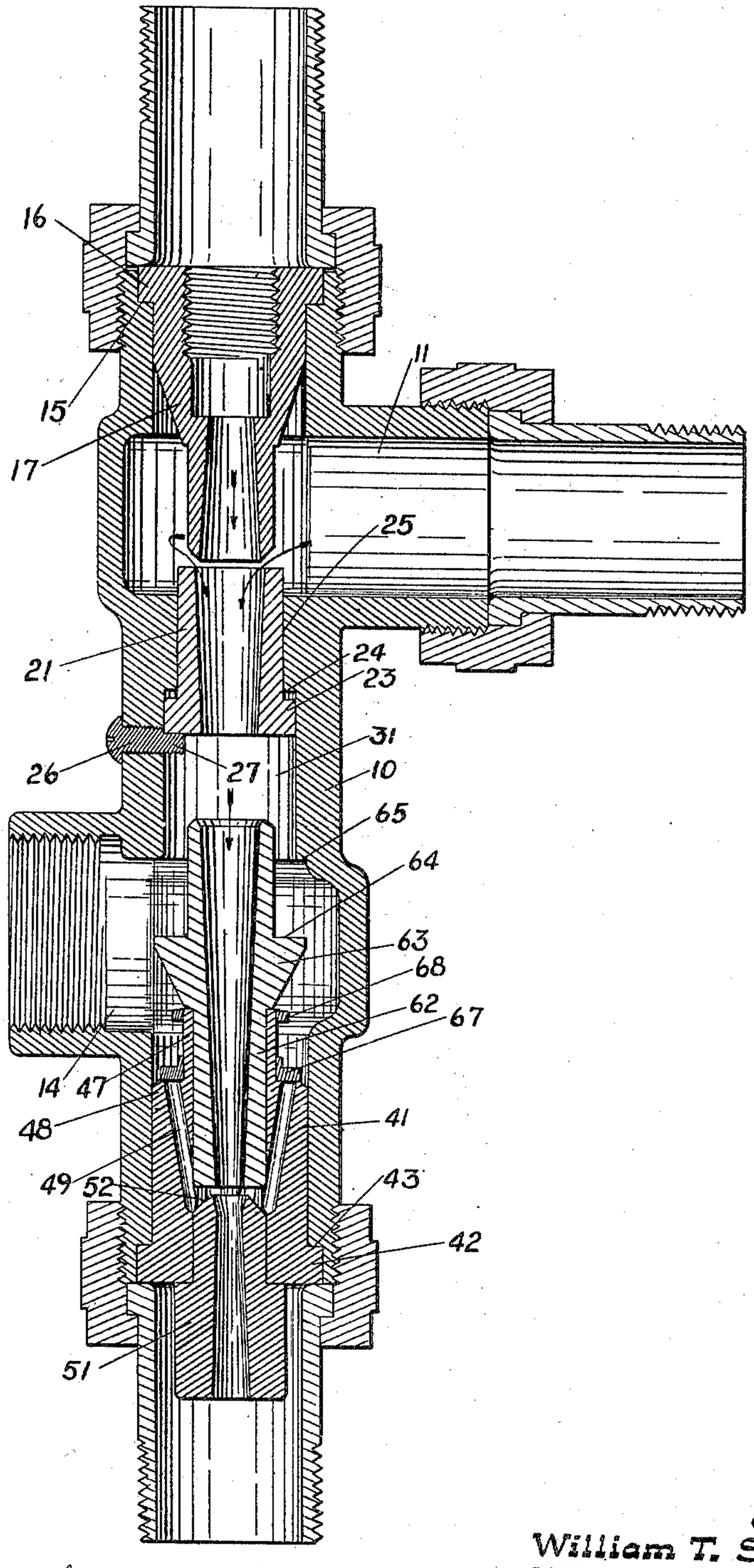
950,774. Patented Mar. 1, 1910.



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INJECTOR.

950,774. Specification of Letters Patent. Patented Mar. 1, 1910.

Application filed February 13, 1909. Serial No. 477,625.

To all whom it may concern:

Be it known that we, WILLIAM T. STRAIN and WILLIAM H. LOCKE, citizens of the United States, residing at Robinson, in the county of Crawford and State of Illinois, have invented certain new and useful Improvements in Injectors, of which the following is a specification.

The object of our invention is to produce an injector of such character that it will be self-starting whether hot or cold and will not drive back upon the water supply.

A further object of our invention is to so form and arrange the several parts that they may be readily machined and caused to coöperate accurately without the necessity of great accuracy of machine work.

The accompanying drawing which is an axial section, illustrates an embodiment of our invention.

In the drawings, 10 indicates the main body of the injector having a water inlet passage 11, a steam-nozzle receiving end, a discharge nozzle receiving end, and an overflow passage 14, the steam nozzle receiving end and the discharge nozzle receiving end being in alinement while the water inlet passage leads into the main body near the steam nozzle receiving end, and the overflow passage leads from the main body between the water inlet and the discharge end.

Formed at the outer end of the steam end is a shoulder 15 adapted to receive the flange 16 of a steam nozzle 17, the inner end of which projects into the main body 10, extending substantially across the water inlet 11. Nozzle 17 is provided with a central bore, the inner end of which is inwardly tapered so that its inner discharge end is larger than its outer receiving end. Arranged within body 10, in alinement with nozzle 17, is a lifting tube 21 which is freely axially movable for a limited distance, within the main body. The upper, or receiving, end of the lifting tube 21 lies closely adjacent the discharge end of nozzle 17 and said lifting tube is provided with a central bore the upper, or receiving, end of which is larger in diameter than the diameter of the adjacent end of bore of the steam nozzle, while the lower, or discharge, end of said bore is smaller than its receiving end. At its lower end tube 21 is provided with a valve shoulder 23 adapted to coöperate with the seat 24 surrounding the bore 25 within which tube 21 is axially movable, and shoulder 23 and seat 24 are so proportioned relative to the length of tube 21 that, when said shoulder 23 is seated upon seat 24, the upper, or receiving, end of the tube 21 will lie as close as desired to the discharge end of nozzle 17, the distance of separation being just sufficient to permit the desired flow of water from passage 11 into tube 21. In order to prevent tube 21 from dropping too far away from shoulder 24 we provide a screw 26, the inner end 27 of which is slightly eccentric and lies in the path of movement of tube 21, the arrangement being such that, by a quarter turn of screw 26, tube 21 may be adjusted slightly toward and from nozzle 17.

Leading from the lower end of tube 21 to the overflow of passage 14 is a passage 31, which is formed within the main body 10. Mounted in body 10 is an outflow nozzle structure comprising the following parts. Fitting loosely within the body 10 is a sleeve 41 having a flange 42 at its lower end, said flange seating upon a shoulder 43. The sleeve 41 is reduced at 47 so as to form an intermediate shoulder 48. Extending downward into the body of sleeve 41 from shoulder 48 are relief passages 49 which, at their lower ends, communicate with the interior of sleeve 41 at an intermediate point. Driven into the lower end of sleeve 41 is a delivery tube 51 the upper end of which is confined immediately at the lower ends of passages 49. A combining tube 62 has its lower end loosely fitted in the upper end of sleeve 41. Combining tube 62 is provided with an intermediate flange 63 the lower end of which is adapted to normally rest upon the upper end of sleeve 41 and in that position hold the lower end of the valve sleeve a short distance above the upper conified end of plug 51. The upper end of flange 63 is formed into a valve shoulder 64 adapted, when the valve sleeve is raised, to seat upon a seat 65 formed at the lower end of passage 31, between said passage and the outflow passage 14. The upper end of the combining tube 62 projects upwardly into the lower end of passage 31. Loosely sleeved upon the upper end 47 of sleeve 41 is a valve ring 67 which normally lies upon shoulder 48 so as to close the upper ends of passages 49. Upward movement of the valve ring 67 is limited by means of a collar 68 secured to the upper end of the portion 47 of sleeve 41.

It is to be understood that structurally, tube 51 is substantially integral with sleeve 41 and might actually be made integral, although, for convenience in manufacture, it is cheaper to make the tube 51 separate from the sleeve and drive it to position.

Steam is admitted through a nozzle 17 and is discharged therefrom thus creating a vacuum in passage 11 and drawing water therethrough and discharging the same into passage 31 from which passage it flows in part into passage 61 and thence outward and upward through passages 49 so as to raise valve ring 67 and flow outwardly from the lifting. Thereupon flow tube 21 will move up toward nozzle 17, so as to decrease the space through which water will be inspirated, this movement continuing until flange 23 seats firmly upon seat 24 thus preventing any air from passing upwardly from the overflow opening 14 into the seats immediately surrounding the steam nozzle, which probably would otherwise happen because tube 21 cannot readily be made to fit bore 25 in such way as to be both air tight and axially movable. At the same time the combining tube 62 will be moved upwardly, by reason of the accumulation of pressure at the lower end thereof, until valve shoulder 64 seats upon the seat 65, thus cutting off any possibility of air entering the stream of water which is being delivered from the flow tube 21 into the combining tube 62. As soon as this movement takes place the water is driven forcibly through plug 51 thus tending to produce a down flow through passages 49 so that said passages are immediately emptied of water and would permit air to be drawn in from the overflow passage, thus interfering with the proper operation of the device if it were not for valve ring 67, which, of its own weight immediately drops down so as to seat upon shoulder 48, and close the upper ends of vent passages 49 against any inflow of air.

The several parts, with the exception of the valve seats and valve flanges which seat thereon, need not be machined with any great degree of accuracy. It will be noticed that all of the parts may be readily extracted and replaced so that the apparatus may be readily repaired as well as cheaply constructed.

We claim as our invention:

1. In an injector, the combination, of a main body having, a main passage therethrough, a water inlet leading into one side of the main passage, a valve seat formed in the main passage beyond the water inlet and toward the discharge end, a lifting tube reciprocally mounted in the main passage beyond the water inlet and having a valve flange adapted to seat upon said valve seat, a steam nozzle mounted in the initial end of the main passage adjacent the receiving end of the lifting tube, an overflow passage leading from the main passage beyond the valve seat, a second valve seat formed in the main passage between the first valve seat and the overflow passage, in the direction of flow, a discharge nozzle arranged in the main passage beyond the overflow passage and provided with a reduced outlet, a valve tube mounted in the inner end of said discharge nozzle and axially movable therein, a valve flange carried by said valve tube and adapted to seat upon the second valve seat, a vent passage leading from the interior of the discharge nozzle at the inner end of the valve tube and emerging at a point adjacent the overflow passage, and a valve coöperating with said vent passage to prevent flow from the overflow toward the interior of the discharge nozzle, all combined and arranged substantially as and for the purpose set forth.

2. In an injector, the combination with the main body, of a steam nozzle, a lifting tube arranged in alinement with the steam nozzle and movable toward and from the same, coöperating valve members carried by the main body and lifting tube in position to seat together upon movement of the lifting tube toward the steam nozzle, and a combining and delivery structure comprising the delivery tube, a combining tube arranged in alinement therewith and movable toward and from the delivery tube, vent passages leading from a point between the combining and delivery tubes toward an overflow, and a valve movable toward and from the outlet ends of said vent passages, as set forth.

In witness whereof, we have hereunto set our hands and seals at Robinson, Illinois, this 5th day of February, A. D. one thousand nine hundred and nine.

WILLIAM T. STRAIN. [L. S.]
WILLIAM H. LOCKE. [L. S.]

Witnesses:
H. C. Bell,
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