

No. 688,412.

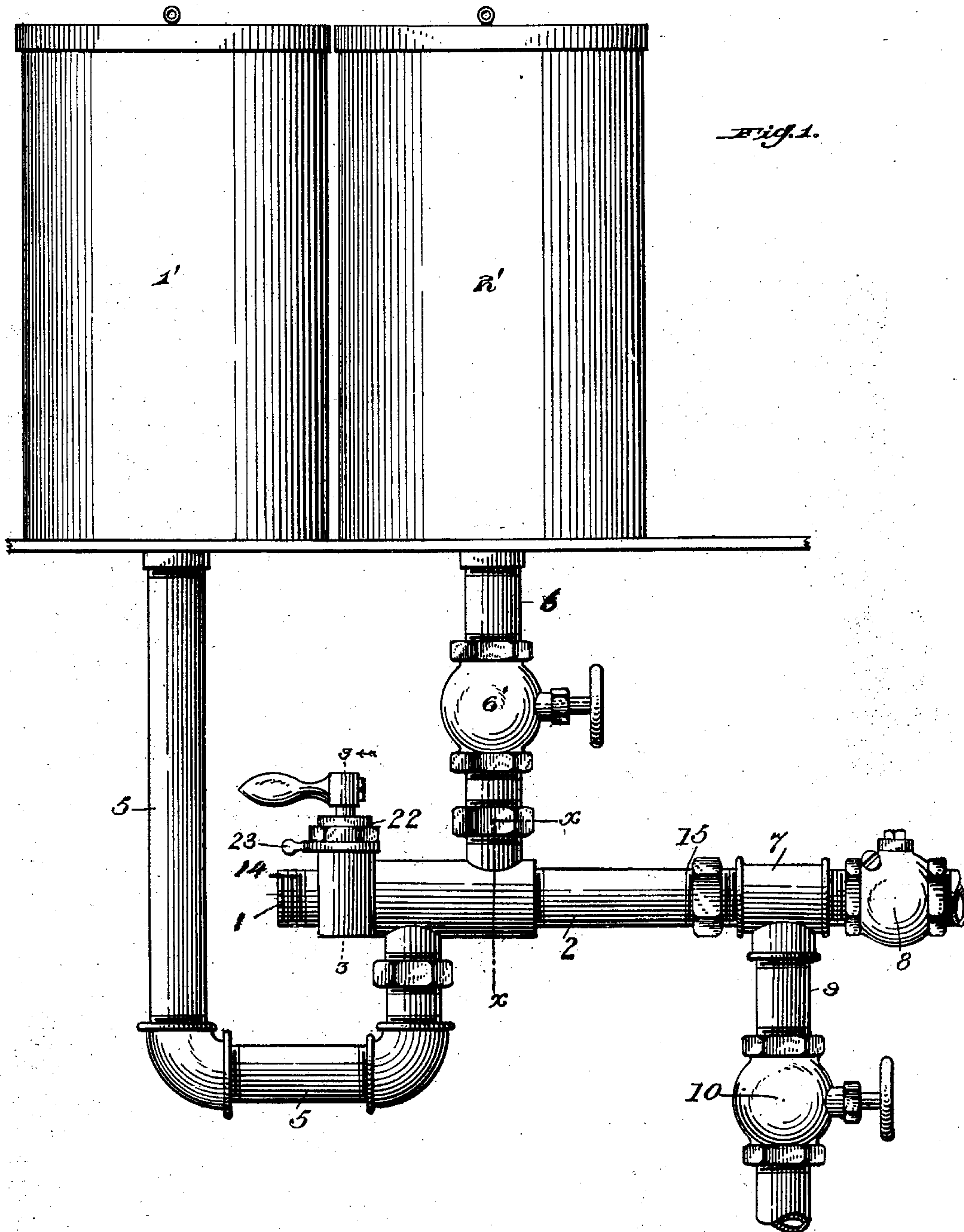
Patented Dec. 10, 1901.

W. HAGUE.
INJECTOR.

(Application filed Jan. 26, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
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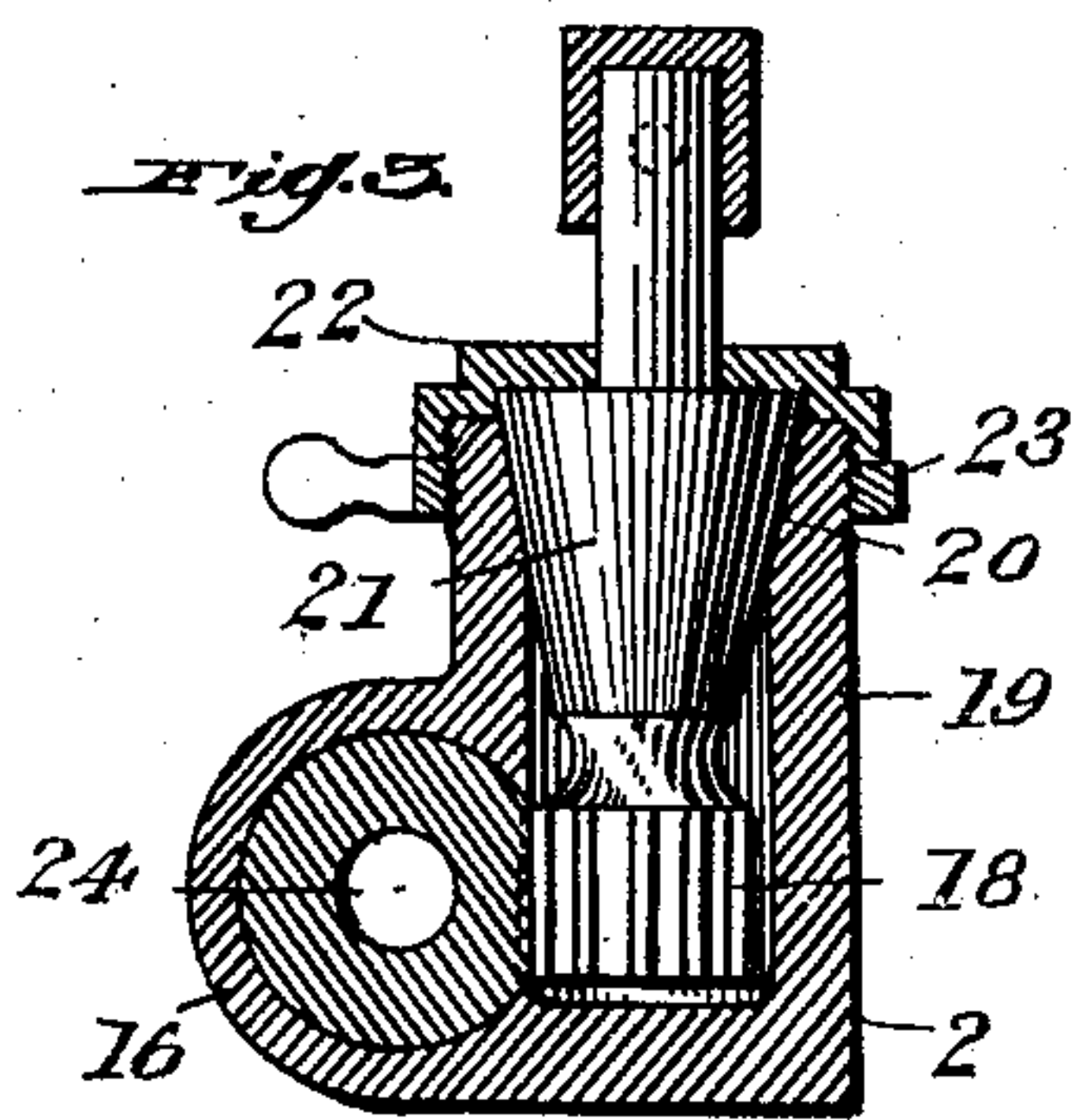
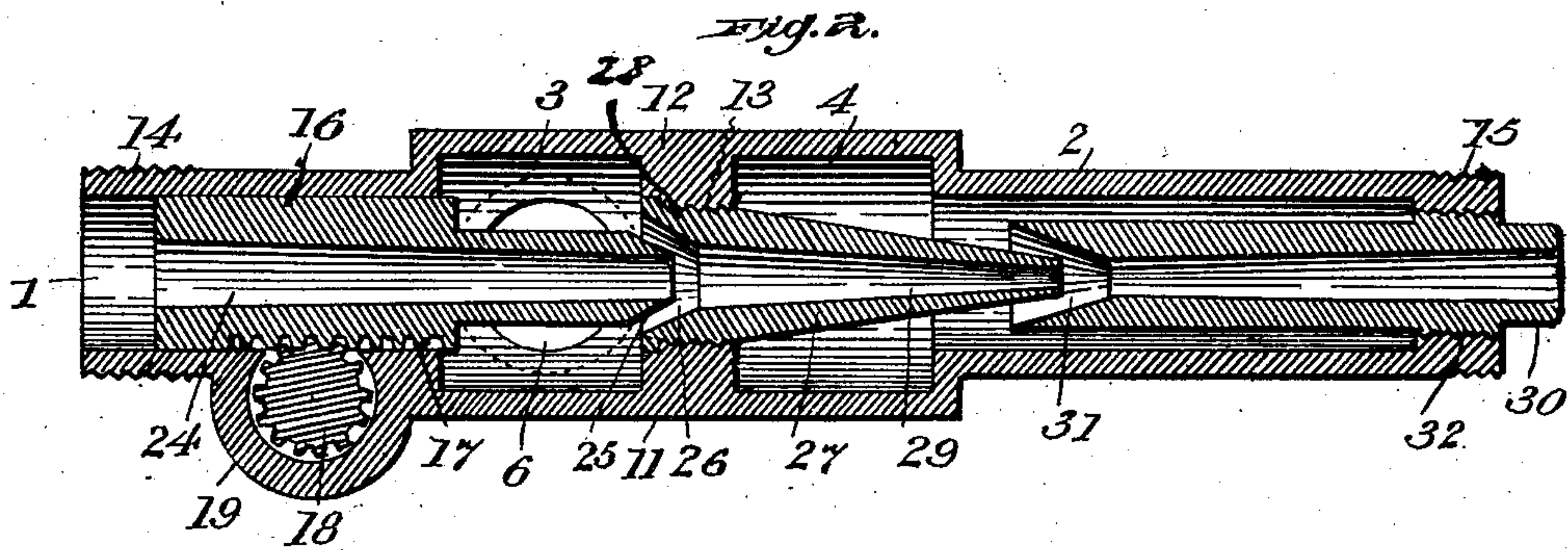


Fig. 4.

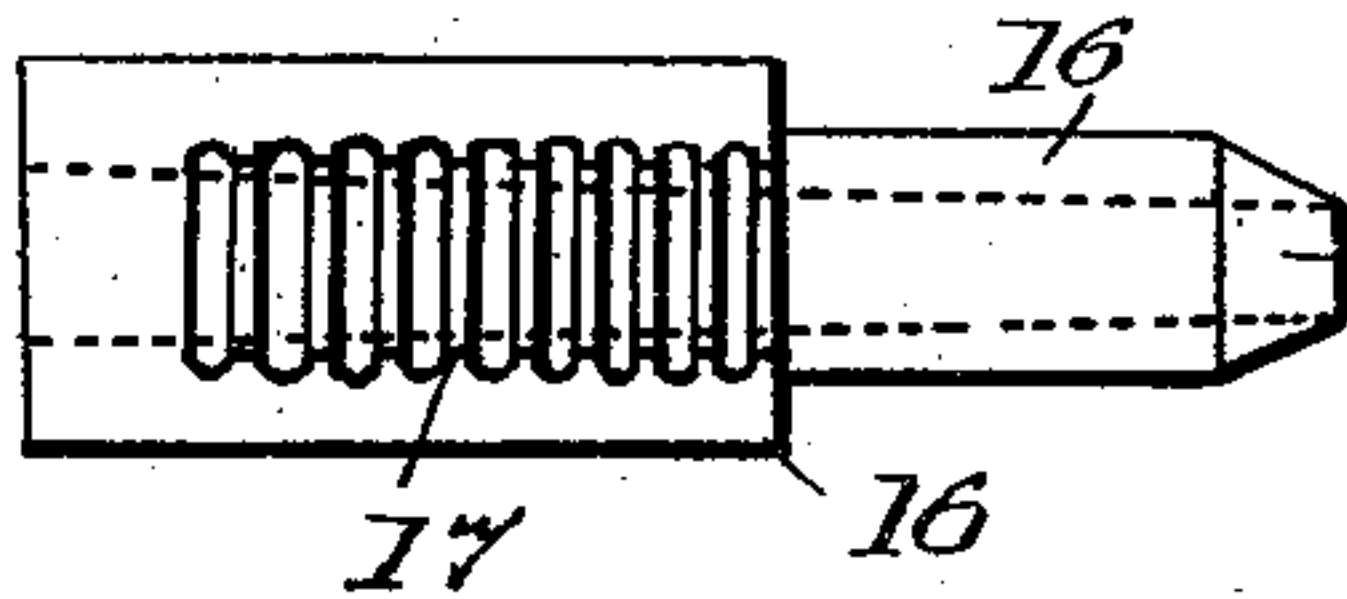


Fig. 5.

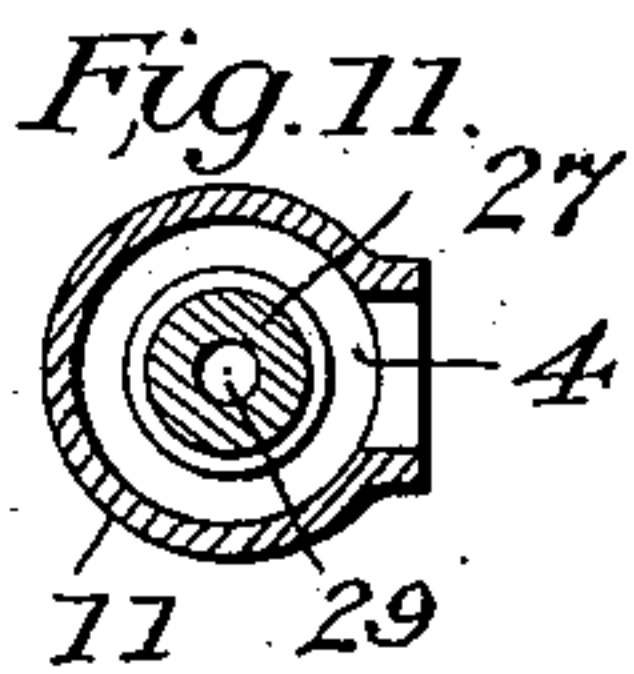
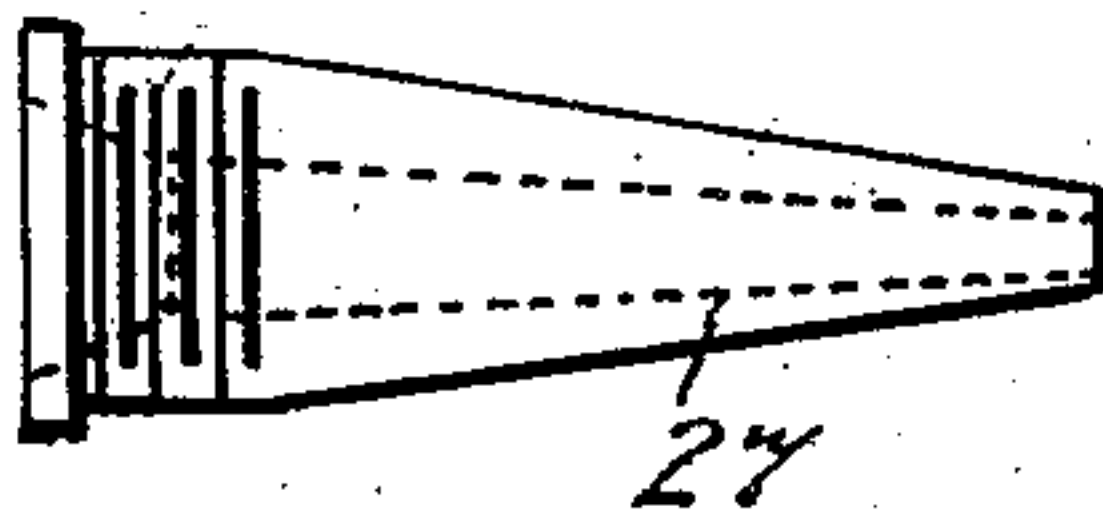


Fig. 8.



Fig. 6.

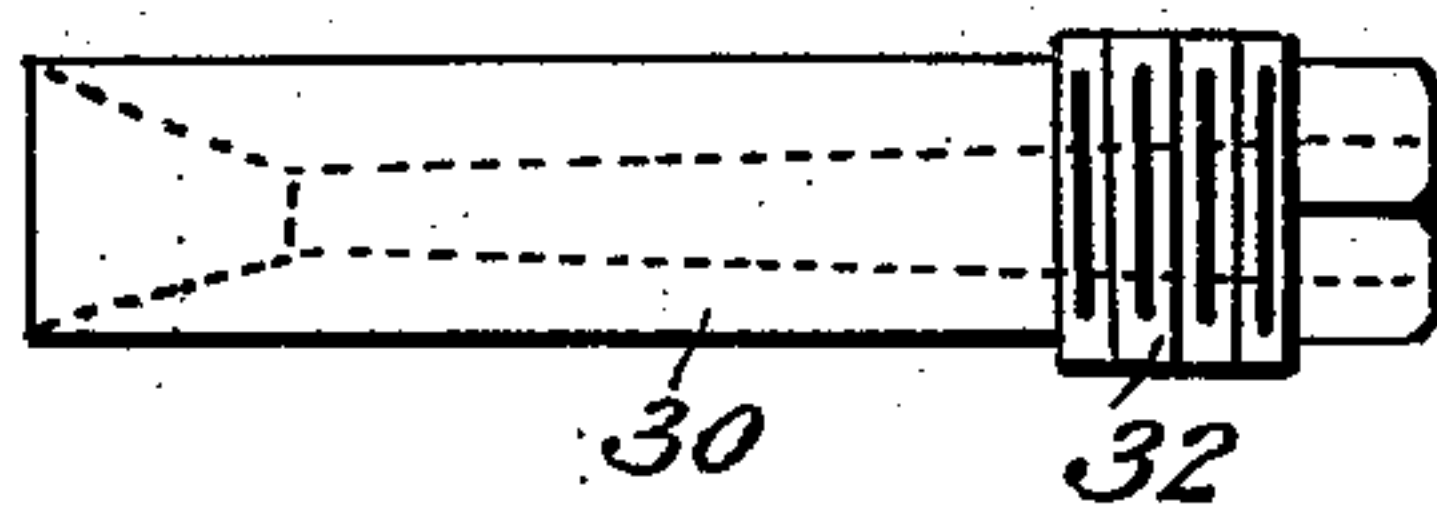


Fig. 9.

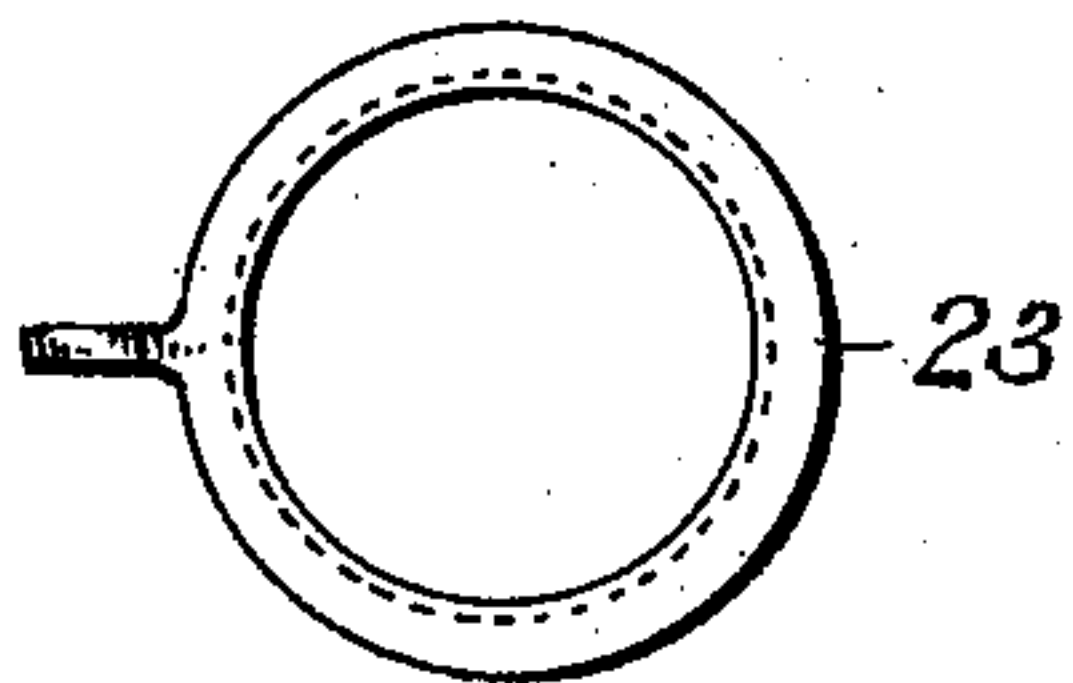
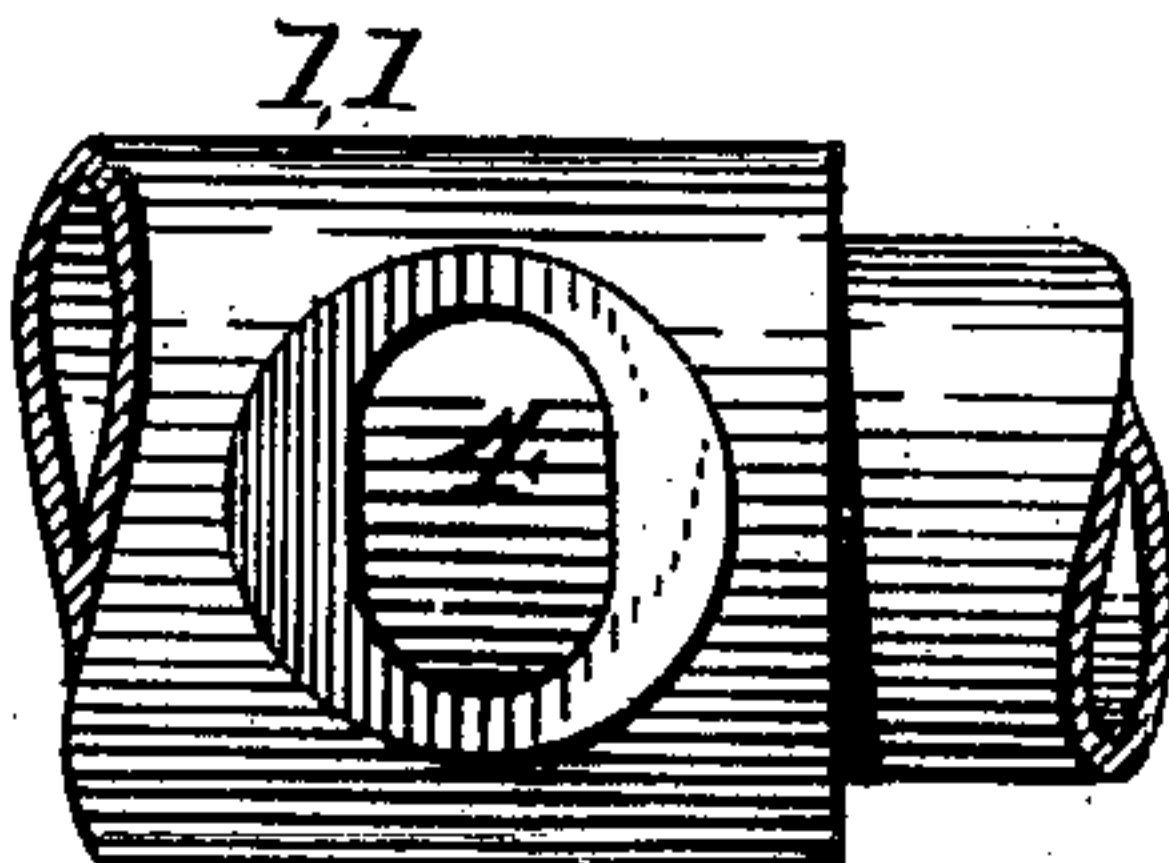


Fig. 7.



Fig. 10.



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UNITED STATES PATENT OFFICE.

WALTER HAGUE, OF ALLEGHENY, PENNSYLVANIA, ASSIGNOR OF THREE-FOURTHS TO WESLEY S. GUFFEY, OF PITTSBURG, PENNSYLVANIA, AND PAUL HARBULA, OF ALLEGHENY, PENNSYLVANIA.

INJECTOR.

SPECIFICATION forming part of Letters Patent No. 688,412, dated December 10, 1901.

Application filed January 26, 1901. Serial No. 44,818. (No model.)

To all whom it may concern:

Be it known that I, WALTER HAGUE, a citizen of the United States of America, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Injectors; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to certain new and useful improvements in injectors, and has for one of its objects to provide a steam-jet tube which may be either fixed or movable, with a long projecting discharging end for projecting into the water-space in the first vacuum-chamber for the purpose of obtaining an increased steam-condensing surface, thereby producing a much better vacuum, and thus using the steam more expansively by flowing into a more perfect vacuum, thus giving the steam an increased velocity and striking force by which sixty-five per cent. additional water is driven through the same diameter combining-tube.

The invention further aims to provide a second water-inlet which may be located either on the top, bottom, or sides of the enlarged portion of the injector-casing for the purpose of admitting additional water into said second vacuum-chamber and discharge-tube, which water is admitted in such a position as will cause it to strike the combining-tube, thus preventing the said water from striking the primary water-jet at right angles and deflecting it from its course. The second supply-water is about thirty-five per cent. of the total amount put into the boiler, more or less, according to pressure of water in the second supply-pipe. There is also provided a discharge-tube having an enlarged internal diameter for the purpose of reducing the friction of said water entering therein.

The invention has for another of its objects to take water in through the second water-supply pipe as hot as water can be made when supplied under pressure; also, to utilize whatever pressure there may be in the second water-supply pipe and to lift water

where there is no pressure in said second supply-pipe; also, to use the injector as an ejector; and, further, to make it a never-failing starter at the first attempt and a never-breaking jet when started as long as there are supplied steam through the steam-jet tube and cold water through the first supply-pipe. All of the above-mentioned objects are accomplished by this injector in actual use.

With the above and other objects in view the invention consists of the novel combination and arrangement of parts to be hereinafter more fully described, and specifically pointed out in the claims.

In describing the invention in detail reference is made to the accompanying drawings, forming a part of this specification, and wherein like numerals of reference indicate corresponding parts throughout the several views, in which—

Figure 1 is a side elevation of my improved injector, showing the same in an operative position as it appears in actual use. Fig. 2 is a longitudinal sectional view of the injector. Fig. 3 is an end sectional view taken on the line 3 3 of Fig. 1. Fig. 4 is a longitudinal view of the steam-jet tube. Fig. 5 is a similar view of the cone-shaped combining-tube. Fig. 6 is a like view of the discharge-tube. Fig. 7 is an end view thereof. Fig. 8 is an end view of the pinion. Fig. 9 is a top plan view of the collar-locking ring. Fig. 10 shows the oblong water-inlet in the top of the injector, which communicates with the second vacuum-chamber. Fig. 11 is an end sectional view through the injector at the second vacuum-chamber and water-intake on line X X of Fig. 1.

In the drawings the reference-numeral 1 indicates the steam-inlet to the injector 2.

3, Fig. 2, indicates the first vacuum-chamber.

4 indicates the second vacuum-chamber.

5, Fig. 1, represents the first water-supply pipe, connecting the tank 1' with the injector.

6 indicates the second water-supply pipe, connecting the tank 2' with injector, said pipe having a valve 6' thereon.

The numeral 7 indicates a T-shaped pipe

between and communicating with the injector and check-valve 8. The reference-numeral 9 indicates a waste-pipe communicating with the said T-shaped pipe 7, the said waste-pipe 5 9 being provided with a waste-controlling valve 10. The injector proper is formed of a cylindrical outer casing having an enlarged central portion 11, said enlarged portion carrying a central partition 12, (see Fig. 2,) having 10 formed therein a screw-threaded opening 13.

14 indicates a screw-threaded end of the injector-casing at the steam-inlet 1 for the purpose of coupling to a suitable supply-pipe.

15 indicates the opposite end of the injector coupled to the said T-shaped pipe 7.

16 represents the steam-jet tube, arranged in the injector-casing at the intake end, said jet-tube being provided with teeth 17, which 20 are adapted to engage with the toothed pinion 18. This pinion is suitably secured in a casing 19, which is formed upon the injector-casing. Said pinion-casing is provided with a cone-shaped opening 20 (see Fig. 3) to receive 25 a cone-shaped pinion-stem 21, which is held in position by means of the collar 22 and the screw-threaded ring or jam-nut 23. The said steam-jet tube 16 (see Fig. 2) is provided with a converging interior opening 24 and an external tapering end 25, the latter being adapted 30 to operate and project into the converging receiving end 26 of the combining-tube 27. The combining-tube is rigidly secured by means of screw-threads 28, which are formed 35 within the partition-wall 12 of the central casing, said combining-tube have a cone-shaped interior opening 29.

30 represents the discharge-tube, which is likewise provided with a converging receiving 40 end 31, into which the discharging end of the combining-tube extends. This discharge-tube is provided with exterior screw-threads 32, by which it is secured in the end of the injector-casing 15.

45 In operation when starting, the steam from the steam-jet tube, on its way through the combining-tube, discharge-tube, and waste-pipe into the atmosphere, drives the air from the first and second vacuum-chambers by 50 friction therewith in passing through the smallest parts of the combining and discharge tubes, thus producing a vacuum in both the tubes and vacuum-chambers. Then the cold water in the first water-supply pipe 55 is driven by the atmospheric pressure into the combining-tube, where the steam and water come in contact with each other, the steam being thereby rapidly condensed, thus producing a vacuum into which the incoming 60 steam in the steam-jet tube expands up to its highest limit and flows with a proportionately-greater velocity than it would flow into the atmosphere with the same amount of pressure, and when the steam is 65 thus transformed into water while moving at

such a high velocity the said water thus obtains an increased velocity, and consequently an increased striking force, and by its kinetic energy acts upon and mingles with the water 70 from the first supply-pipe and drives it through the combining-tube, forming a water-jet as it escapes into and through the second vacuum-chamber. When water is admitted 75 through the second supply-pipe into the second vacuum-chamber, it strikes the combining-tube and passes all around it and moves along the second vacuum-chamber toward and into the discharge-tube, where it comes in contact with the water-jet and is moving in nearly the same direction. The 80 said water-jet by its kinetic energy acts upon and mingles with the water from the second water-supply pipe and drives it through the discharge-tube and check-valve when the waste-valve is closed. 85

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

1. An injector of the class described, comprising in combination a casing having a vacuum and water chamber formed near the intake end thereof, a steam-jet tube at said intake end, a second vacuum and water-intake chamber in said casing adjacent to and separated from said first chamber, a combining-tube 95 extending from said first chamber into said second chamber to the receiving end of the discharge-tube, said discharge-tube having its smallest internal diameter about twenty-one one-thousandths of an inch greater 100 in diameter than the smallest internal diameter of the combining-tube.

2. An injector of the class described, comprising in combination an injector-casing having a vacuum and water-intake chamber 105 formed at the intake end thereof with a steam-jet tube having a long projecting end extending therein, a second vacuum and water-intake chamber formed in said casing adjacent to and separated from said first chamber, a 110 combining-tube extending from said first chamber into said second chamber to the receiving end of the discharge-tube, said steam-jet tube being of such length as to give an increased steam-condensing surface up to such 115 limits at which the casings surrounding the discharge end of the steam-jet tube is raised to a temperature of about 100° Fahrenheit, said discharge-tube having its smallest internal diameter about twenty-one one-thousandths of 120 an inch greater in diameter than the smallest internal diameter of the combining-tube.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

WALTER HAGUE.

Witnesses:

JOHN GROETZINGER,
H. E. BECKER.