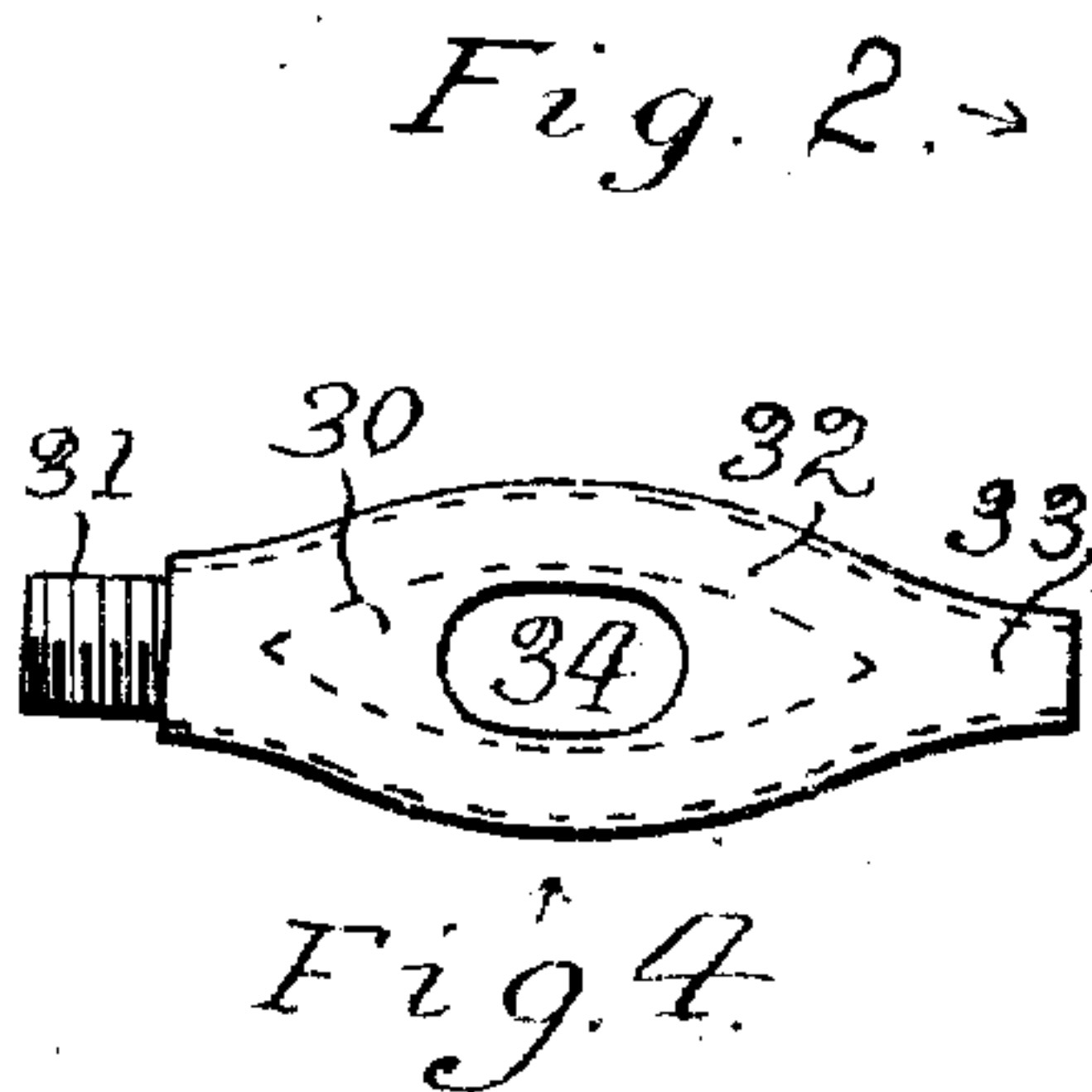
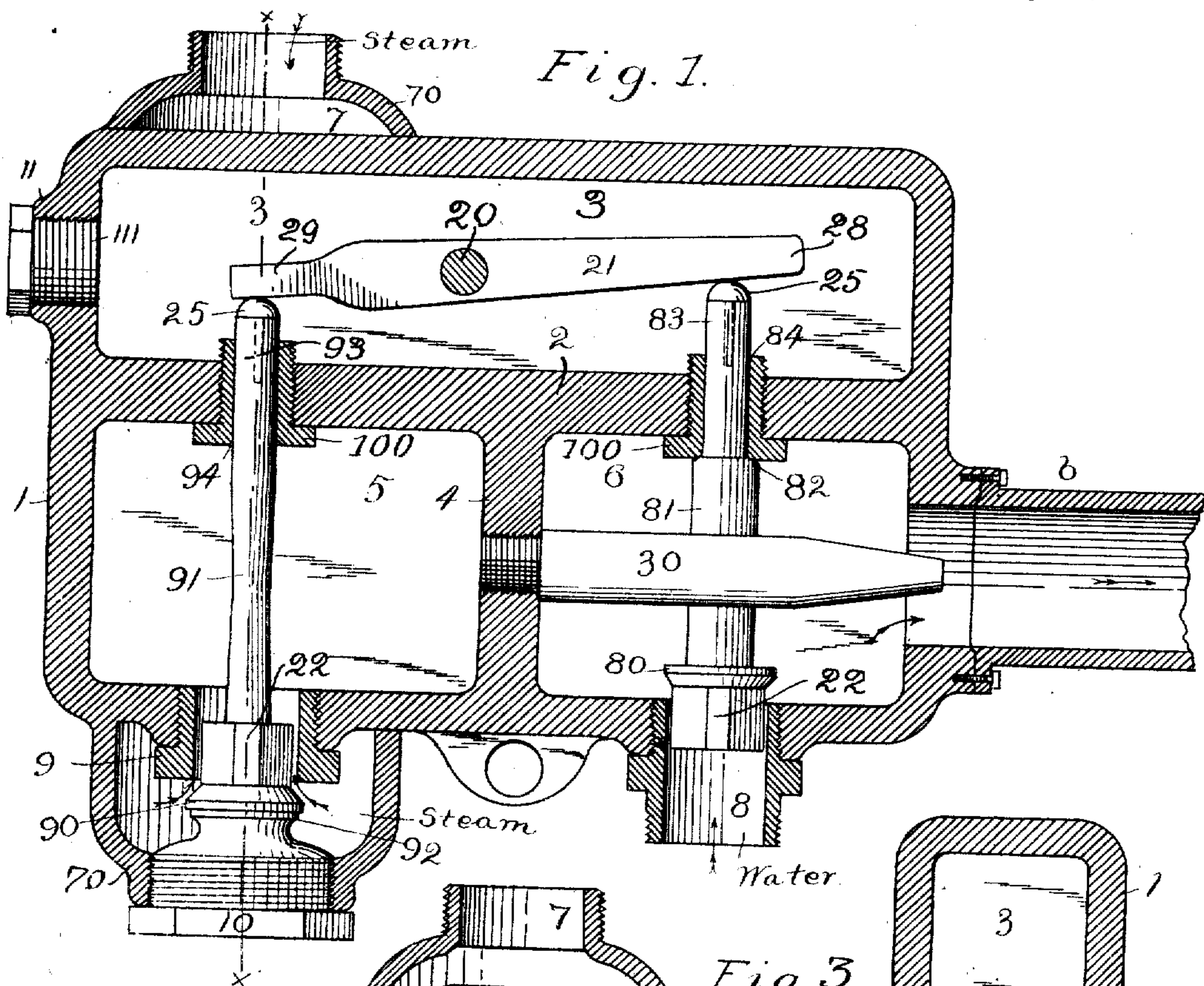


W. W. GRINDLE & J. S. SWEENEY.  
 FEED WATER HEATER.  
 APPLICATION FILED DEC. 12, 1908.

928,962.

Patented July 27, 1909.



Witnesses.

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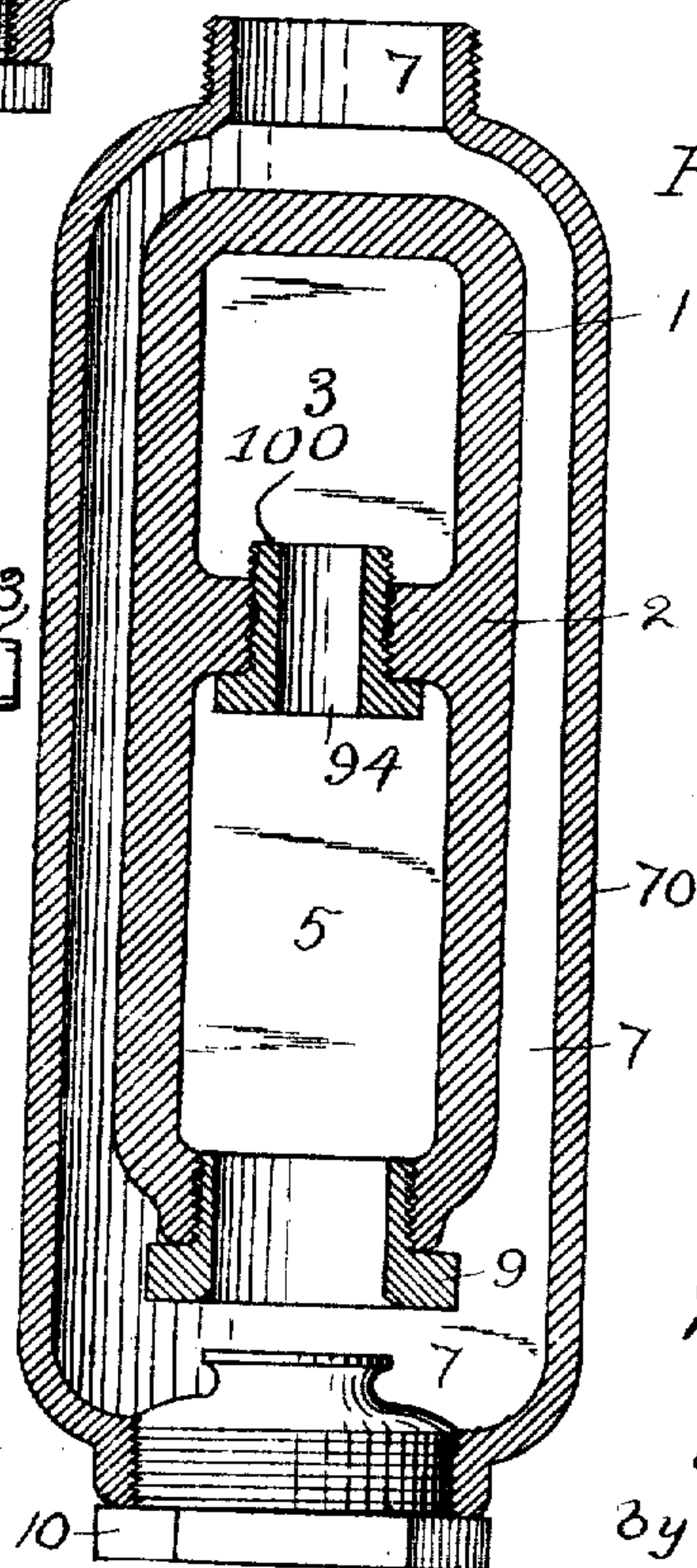
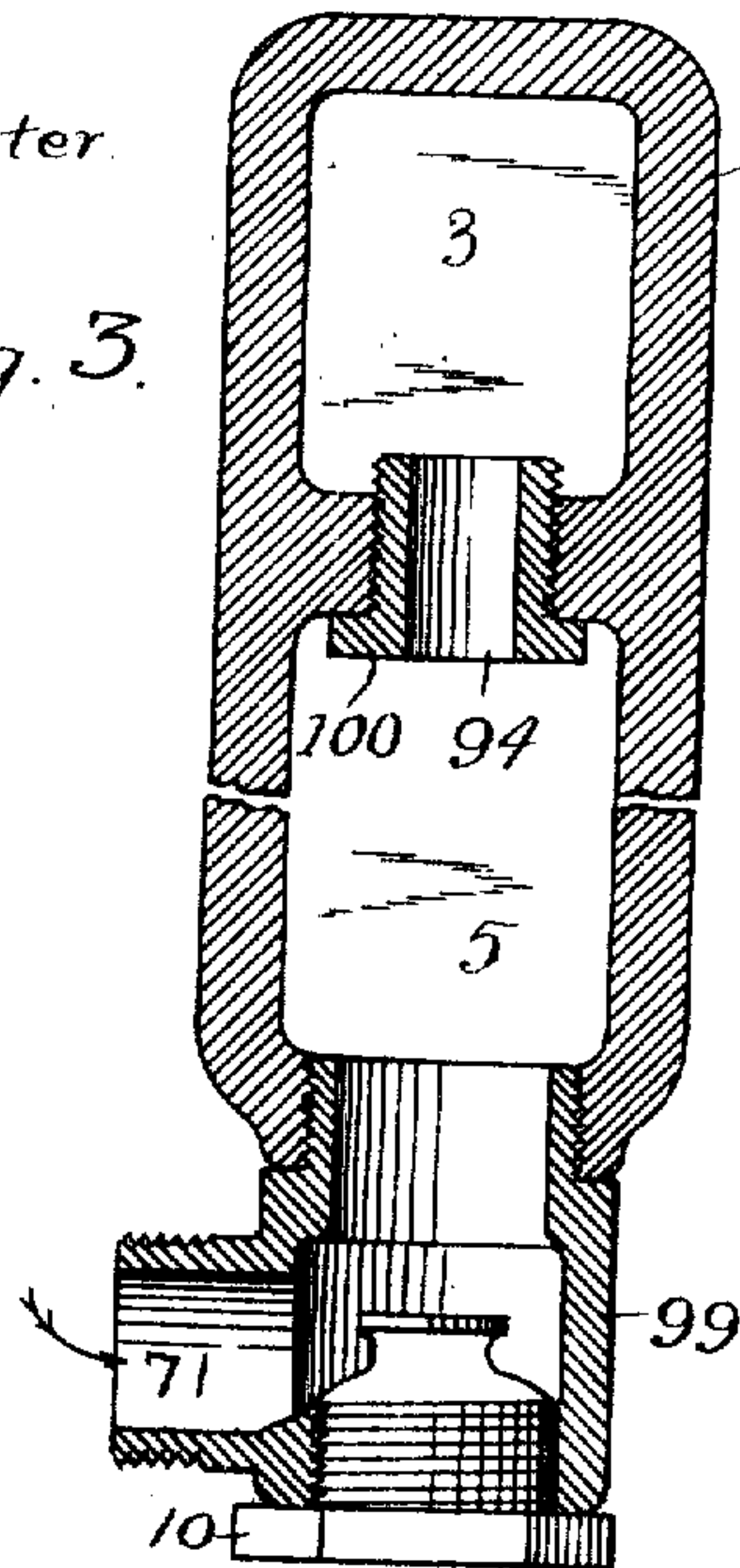


Fig. 3.



Inventors.

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# UNITED STATES PATENT OFFICE.

WILLIAM W. GRINDLE AND JARED S. SWEENEY, OF DECATUR, ILLINOIS.

## FEED-WATER HEATER.

No. 928,962.

Specification of Letters Patent.

Patented July 27, 1909.

Application filed December 12, 1908. Serial No. 467,278.

*To all whom it may concern:*

Be it known that we, WILLIAM W. GRINDLE and JARED S. SWEENEY, citizens of the United States, and residents of Decatur, in the county of Macon and State of Illinois, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

This invention relates to steam boilers, and more especially to the heating of feed water therefor; and the object of the same is to produce an improved steam injected feed water heater which will increase the temperature of the water leaving the injector before it enters the boiler, yet without robbing the latter of any of its steam.

To this end the invention consists of a feed water heater whose preferred construction is described below and illustrated in the accompanying drawing wherein—

Figure 1 is a central vertical section through this device, and Fig. 2 a cross section on the line  $x-x$  of Fig. 1. Fig. 3 is a section also on the line  $x-x$  showing a modification in which the jacket is omitted. Fig. 4 is a detail of the nozzle in plan view.

The object of the present invention is to utilize the heat of the steam from the dome to superheat the water before it enters the boiler so that it will not chill the water already in the same and may be more quickly converted into steam therein than if it were injected cold.

Another object is to so construct the feed water heater that the water therein will not freeze in the injection pipe if left standing for some time and the parts become cold.

These objects are accomplished by constructing the invention as follows:

The shell or casing 1 is preferably a casting of brass provided with a horizontal partition 2 producing a lever chamber 3 at the top, and an upright partition 4 from the horizontal partition to the bottom of the shell producing a steam chamber 5 at the inlet end and a water chamber 6 at the outlet end of the shell. Around the inlet end of the shell 1 is an upright jacket 70 producing an inlet steam passage 7 beyond the outer and inner faces of the shell 1 at that end whereby the material of the entire shell is kept warm and the contents prevented from freezing. By preference the injector delivery pipe connects with a nipple 8 in the bottom of the water chamber 6, and the inner end of the nipple forms a valve seat. The steam pipe

is connected with the top of the steam passage 7 whence the steam leads around shell 1 to a nipple 9 in the bottom of the steam chamber 5 and also forming a valve seat. Below this nipple the jacket 70 may have an opening closed by a removable plug 10 to permit insertion and removal of parts and cleaning out. One end of the chamber 3 preferably has an opening 11 for the insertion and removal of the lever described below, and this opening is to be closed by a plug 111.

The water valve 80 is adapted to close upon the seat in the nipple 8, its stem 81 rises through the chamber 6 and is preferably shouldered as at 82 to prevent this valve from rising too high, and above the shoulder the stem is reduced as at 83 and extends through a hole 84 in a wear bushing 100 screwed into the partition 2. The steam valve 90 is adapted to close against the seat in the nipple 9, its stem 91 rises through the chamber 5 but needs no shoulder as this valve closes upwardly, and its upper end 93 passes through a hole 94 in a wear bushing 100 also screwed into the partition 2. The upper extremity 92 of plug 10 serves as a stop to limit the opening movement of this valve. Mounted on a pivot 20 across the chamber 3 is a rocking lever 21 whose long arm 28 stands over the valve stem 81 and short arm 29 stands over the valve stem 91. Both valves may be provided with wings 22 which guide them in their movements within their nipples, and both stems may be provided with removable wear pins 25 in their upper ends which may be replaced by others when they become worn.

In Fig. 4 is shown a nozzle 30 whose inlet end 31 is threaded so that it may screw into an opening in the partition 4 with its body extending horizontally across the water chamber 6, and said body has a hole 34 through it for the passage of the valve stem 81. Around this hole the passageway through the nozzle is split or divided as shown at 32, and its tip 33 is directed into the pipe  $b$ .

The parts being constructed as above described and properly assembled, the operation of this device is as follows: Water being admitted under low pressure from the injector delivery pipe raises the water valve 80, and its stem 81 by means of the unbalanced lever 21 depresses the stem 91 and opens the steam valve 90 against the steam pressure as



shown in Fig. 1. Steam passing in through the passageway 7, then enters the chamber 5 and flows out through the nozzle 30 into and along pipe *b*—thereby heating the water within the chamber 6 through the heat of its inclosed nozzle and heating the water within the pipe *b* through the injection of live steam into it. Should steam from the chamber 5 escape into the chamber 3 through the hole 94 it will have no unfavorable effect on the operation of the lever, and should it escape from this chamber through the hole 84 into the water chamber 6 it will only mingle with the water passing out through pipe *b* and will do no harm. The water in the chamber 6 will not be under pressure sufficient to overcome the pressure of the steam within parts of the shell. When the injector is closed and the pressure of the water reduced, the water valve will be closed automatically by the pressure on the inlet side of the steam valve which closes the latter, and that motion through the lever 21 closes the water valve.

It is obvious that the details of construction may be changed considerably without departing from the spirit of our invention.

We prefer to locate the nozzle 30 in the same plane as the stem 81, which necessitates the use of the hole 34; but if they are not in the same plane or either is deflected from it, we need not have the hole nor the branch passageway.

If a simpler and less expensive type of device were desired, the steam might be admitted directly through the steam passage 71 adjacent that closed by the plug 10, as seen in Fig. 3, in which event the jacket 70 surrounding that end of the shell could be entirely omitted, but as above stated we prefer its use because it prevents freezing by keeping the shell warm for a longer time.

What is claimed as new:

1. In a feed water heater, the combination with the shell having a lever chamber, a water chamber and a steam chamber, the water inlet leading into its chamber, the water outlet leading therefrom, and a water inlet valve opening inwardly: of the steam inlet leading into its chamber, an injector nozzle leading from this chamber through the water chamber and directed into the water outlet, a steam inlet valve closing inwardly, the stems of said valves leading across their respective chambers and into the lever chamber, wear pins on said stems, and a lever piv-

oted within the lever chamber with its arms contacting with said pins.

2. In a feed water heater, the combination with the shell having a lever chamber, a water chamber and a steam chamber, the water inlet leading into its chamber, the water outlet leading therefrom, and a water inlet valve opening inwardly: of the steam inlet leading into its chamber, an injector nozzle leading from this chamber through the water chamber and directed into the water outlet, a steam inlet valve closing inwardly, the stems of said valves leading across their respective chambers and into the lever chamber, a rocking lever pivoted within the latter and engaging the extremities of said stems, and stops for limiting the opening movement of the valves.

3. In a feed water heater, the combination with the shell having a water chamber and a steam chamber, water and steam inlet valve seats in the walls of their respective chambers, valves thereon having stems, and a rocking lever pivoted to the shell with its arms engaged by said stems: of a water inlet leading to and a water outlet leading from its chamber, a nozzle leading from the steam chamber and directed into the water outlet, a jacket cast around the shell and providing a steam passage communicating with the steam inlet valve, and a steam inlet pipe leading to said passage.

4. In a feed water heater, the combination with the shell having a lever chamber, a water chamber and a steam chamber, water and steam inlet valve seats at the bottom of their respective chambers, valves thereon having stems extending into the lever chamber, and a rocking lever pivoted therein with its arms engaged by said stems: of a water inlet leading to and a water outlet leading from its chamber, a nozzle leading from the steam chamber through the water chamber and directed into the water outlet, a jacket cast around the shell and providing a steam passage communicating at the bottom with the steam inlet valve, and a steam inlet pipe leading to the top of said passage.

In testimony whereof we sign our names in the presence of two subscribing witnesses, this the 7th day of December, 1908.

WILLIAM W. GRINDLE.  
JARED S. SWEENEY.

Witnesses:

E. S. McDONALD,  
ROSA VOELCKER.