J. S. SWEENY & W. W. GRINDLE.

FEED WATER HEATER.

APPLICATION FILED FEB. 13, 1909.

929,050. **Patented July 27, 1909.**

2 SHEETS—SHEET 1.

Fig. 1.

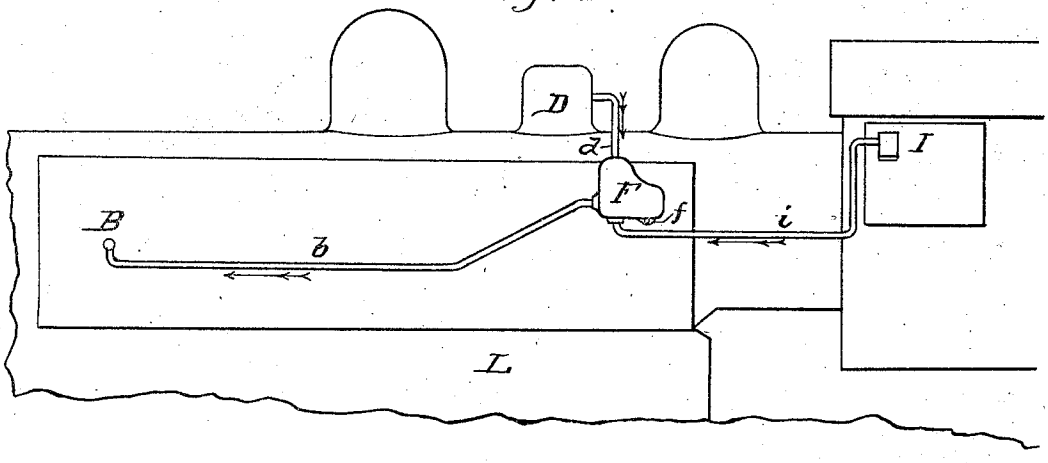
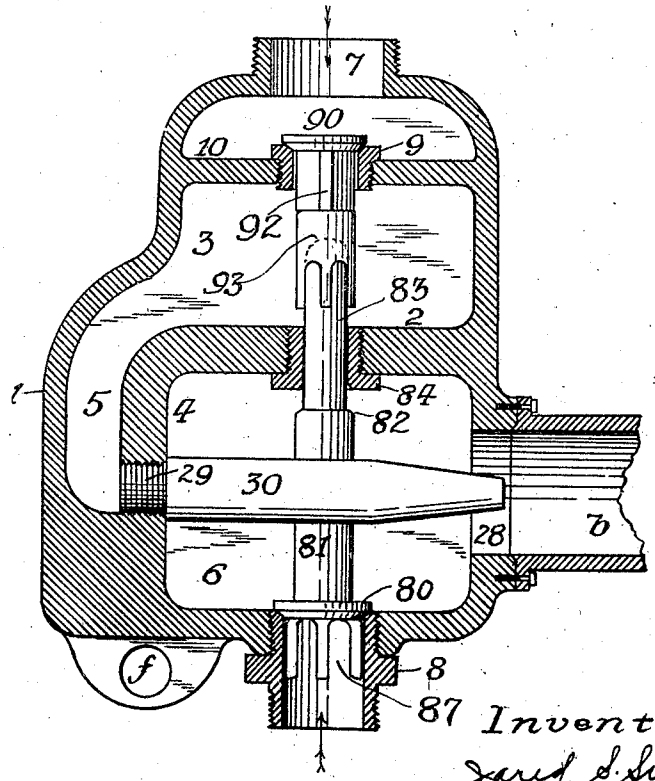


Fig. 2.



Witnesses.
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2 SHEETS—SHEET 2.

Fig. 3.

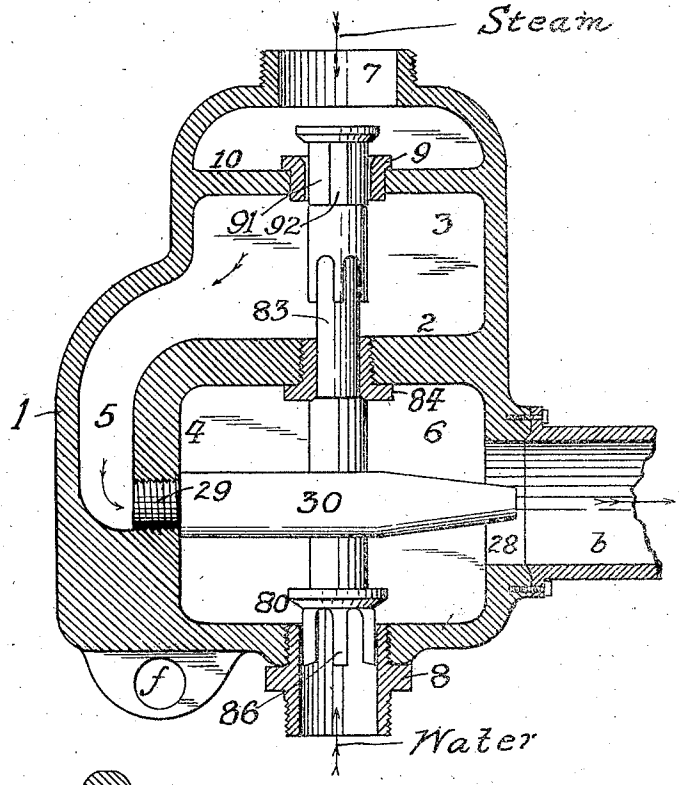


Fig. 4.

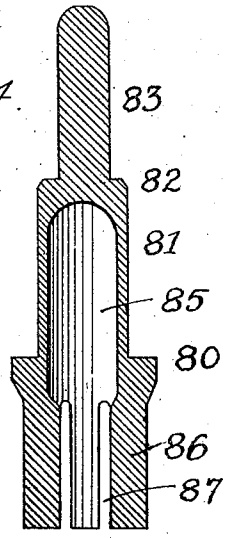
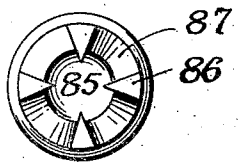


Fig. 5.



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UNITED STATES PATENT OFFICE.

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

FEED-WATER HEATER.

No. 929,050. Specification of Letters Patent. Patented July 27, 1909.

Application filed February 13, 1909. Serial No. 477,803.

To all whom it may concern:

Be it known that we, JARED S. SWEENY and WILLIAM W. GRINDLE, 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 in a feed water heater constructed as an improvement on and simplification of our previous invention for which an application for patent is pending bearing Serial Number 467278 and filed Dec. 12, 1908.

The preferred construction of the present idea is set forth in the following specification and shown in the accompanying drawings, wherein—

Figure 1 is a side elevation of a portion of a locomotive boiler, showing this invention attached thereto and properly connected. Figs. 2 and 3 are central vertical sections with the valves closed in the former and open in the latter. Fig. 4 is a central vertical section and Fig. 5 a lower end view of the water valve.

Referring to the drawings, the letter L designates a locomotive having a steam dome D, I is the injector, B is the boiler check, and F is the feed water heater here shown as attached to the locomotive at *f*. The water flows from the injector through the pipe *i* to the feed water heater F, whereas the steam flows from the dome D through the pipe *d* to said heater, and the superheated water flows from the latter through the pipe *b* and into the boiler at the point B.

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. This object is 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 steam chamber 3 at the top and a water chamber 6 at the bottom, and an upright partition 4 producing a steam passage 5 communicating with said chamber 3. Across the upper portion of the steam chamber 3 is a second partition 10 into a hole in which is screwed a nipple 9 forming the steam valve seat, the entire nipple being smaller than the inlet 7 with which the steam pipe *d* communicates. Into a hole in the bottom of the shell is screwed a nipple 8 constituting the water valve seat, and the water inlet pipe *i* connects with this nipple. The water outlet pipe *b* communicates in any suitable way with a water outlet hole 28 formed in the side of the shell and opening into the water chamber 6, and this hole is of such size that a nozzle 30 can be bodily removed therethrough or inserted therein so that its threaded end 29 engages a hole in the upright partition 4 and puts it in communication with the steam passage 5.

The water valve 80 is adapted to close upon the seat in the nipple 8, its stem 81 rising through the chamber 6 and being preferably shouldered as at 82 to prevent its rising too high, and above the shoulder the stem is reduced as at 83 and extends through packing such as a wear nipple 84 screwed into the partition 2 either from above or from below as shown and of such a size that it can be removed through the hole for either nipple 8 or 9. By preference the stem 81 is formed with an air chamber 85 which extends downwardly through the head 80 and communicates with the axial space between wings 86 beneath said head and opens radially outward through slots 87 between said wings. The latter are made triangular in cross section as best seen in Fig. 5.

The steam valve 90 is adapted to close downwardly upon the seat in the nipple 9. Beneath its head it has wings 92 with grooves 91 between them, and beneath this part of the valve its stem has a socket 93 which fits removably over the reduced upper end 83 of the stem of the water valve—thus permitting the steam valve to be lifted upwardly out of place at will.

The parts being constructed as above described and properly assembled, the operation of this device is as follows: Water being admitted from the injector I through the pipe *i* raises the water valve 80 from the position shown in Fig. 2, and its stem 81 raises the steam valve 90 so that both valves are

opened as shown in Fig. 3. Steam passing from the dome D through the pipe *d* enters the inlet 7, passes through the grooves 91 in the steam valve 90 and into the steam chamber 3, whence it flows through passage 5 and out through the nozzle 30 in a jet into and along the pipe *b*—thereby heating the water within the chamber 6 through radiation by the inclosed nozzle and heating the water within the pipe *b* through the injection of live steam into it. Should steam escape from the chamber 3 through the nipple 84 into the chamber 6, it will have no unfavorable effect as it will only mingle with the water passing out through pipe *b* and will do no harm. When the admission of water through pipe *i* is cut off, steam pressure on the inlet side of the steam valve 90 will cause both valves to close so that the parts resume the position shown in Fig. 2.

A striking feature of improvement in the present construction—aside from its simplification over our former device—consists in the employment of a water valve of peculiar shape so as to prevent it from chattering. As best seen in Figs. 4 and 5, the stem of this valve contains an air chamber 85 wherein under normal conditions is trapped a certain amount of air. When water is admitted through the pipe *i*, it flows up through the nipple 8 into the space between the wings 86 and raises the valve by first compressing the air within this chamber 82. As the valve 80 rises, the slots 87 are exposed and the water flows through them into the chamber 6, the air within the chamber 85 being gradually carried out with the inflowing water so that water hammer is prevented, and said chamber finally fills with water. When the inlet *i* is again closed, the parts resume their former position quickly under steam pressure upon the head of the steam valve 90, both valves seating at practically the same moment although finding their seats any-way by reason of the looseness of the socket 93 upon the reduced portion 83 of the stem. Furthermore, the various nipples may be adjusted from time to time so that the seating of the valves will be caused to take place as nearly simultaneously as possible.

What is claimed as new is:

1. In a feed water heater, the combination with a shell having a cross partition producing steam and water chambers and an upright partition producing a steam passage leading from its chamber to one side of the water chamber, a water outlet from the opposite side thereof, and an injector nozzle leading from said passage completely across the water chamber and directed into the outlet; of a nipple removably inserted in the bottom of the water chamber and forming a water valve seat, a second partition across the steam chamber having a hole smaller than the steam inlet, a nipple removably inserted in said hole and forming a steam valve seat, valves on the seats both closing downwardly, and a stem leading from the water valve through a hole in the main partition to the steam valve.

2. In a feed water heater, the combination with a shell having a cross partition producing superimposed steam and water chambers and an upright partition producing a steam passage leading from its chamber to one side of the water chamber, a water outlet from the opposite side thereof, and an injector nozzle leading from said passage completely across the water chamber and directed into the outlet; of a nipple removably inserted in the bottom of the water chamber and forming a water valve seat, a second partition across the steam chamber having a hole smaller than the steam inlet, a nipple removably inserted in said hole directly above the other nipple and forming a steam valve seat, valves on the seats both closing downwardly, and a stem leading from the water valve through a hole in the main partition directly in line with the axes of said nipples to the steam valve.

3. In a feed water heater, the combination with a shell having a cross partition producing superimposed steam and water chambers and an upright partition producing a steam passage leading from its chamber to one side of the water chamber, a water outlet from the opposite side thereof, and an injector nozzle leading from said passage completely across the water chamber and directed into the outlet; of a nipple removably inserted in the bottom of the water chamber and forming a water valve seat, a second partition across the steam chamber having a hole smaller than the steam inlet, a nipple removably inserted in said hole directly above the other nipple and forming a steam valve seat, valves on the seats both closing downwardly, a hole in the main partition directly in line with the axes of said nipples, a wear nipple removably inserted in said hole and smaller than either of the others, and a stem leading from the water valve through said wear nipple to the steam valve.

4. In a feed water heater, the combination with a shell having a cross partition producing steam and water chambers and an upright partition producing a steam passage leading from its chamber to one side of the water chamber, a water outlet from the opposite side thereof, and an injector nozzle leading from said passage completely across the water chamber and directed into the outlet; of a nipple removably inserted in the bottom of the water chamber and forming a water valve seat, a second partition across the steam chamber having a hole smaller than the steam inlet, a nipple removably inserted in said hole and forming a steam

valve seat, valves on the seats both closing downwardly, a stem integral with the main valve and passing through a hole in the main partition, and a stem on the steam valve fitting removably over the water-valve-stem so that both valves will be opened by the admissions of water.

5. In a feed water heater, the combination with a shell having steam and water chambers, an inlet to each surrounded by a valve seat, an outlet from the water chamber, and a nozzle leading from the steam chamber completely across the water chamber and directed into the water outlet; of a check valve for the water inlet comprising a stem having an air chamber, a surrounding head, and wings of triangular cross section projecting at the inlet side of the head and having slots between them, and a steam valve on its seat adapted to be opened by the stem of the water valve when the latter rises from its seat.

6. In a feed water heater, the combination with a shell having steam and water chambers, an inlet to each surrounded by a valve seat, an outlet from the water chamber, and a nozzle leading from the steam chamber completely across the water chamber and directed into the water outlet; of a check valve for the water inlet comprising a stem having an air chamber, a surrounding head, and wings at the inlet side of the head and having slots between them, the stem having a reduced inner end projecting into the steam chamber, and a steam valve having a head fitting its seat and a socket in its stem fitting removably over the reduced end of the water-valve stem.

In testimony whereof we sign our names in the presence of two subscribing witnesses, this the 10th day of February, 1909.

JARED S. SWEENY.
WILLIAM W. GRINDLE.

Witnesses:
JOS. W. PIERSON,
ROSA VOELCKER.