

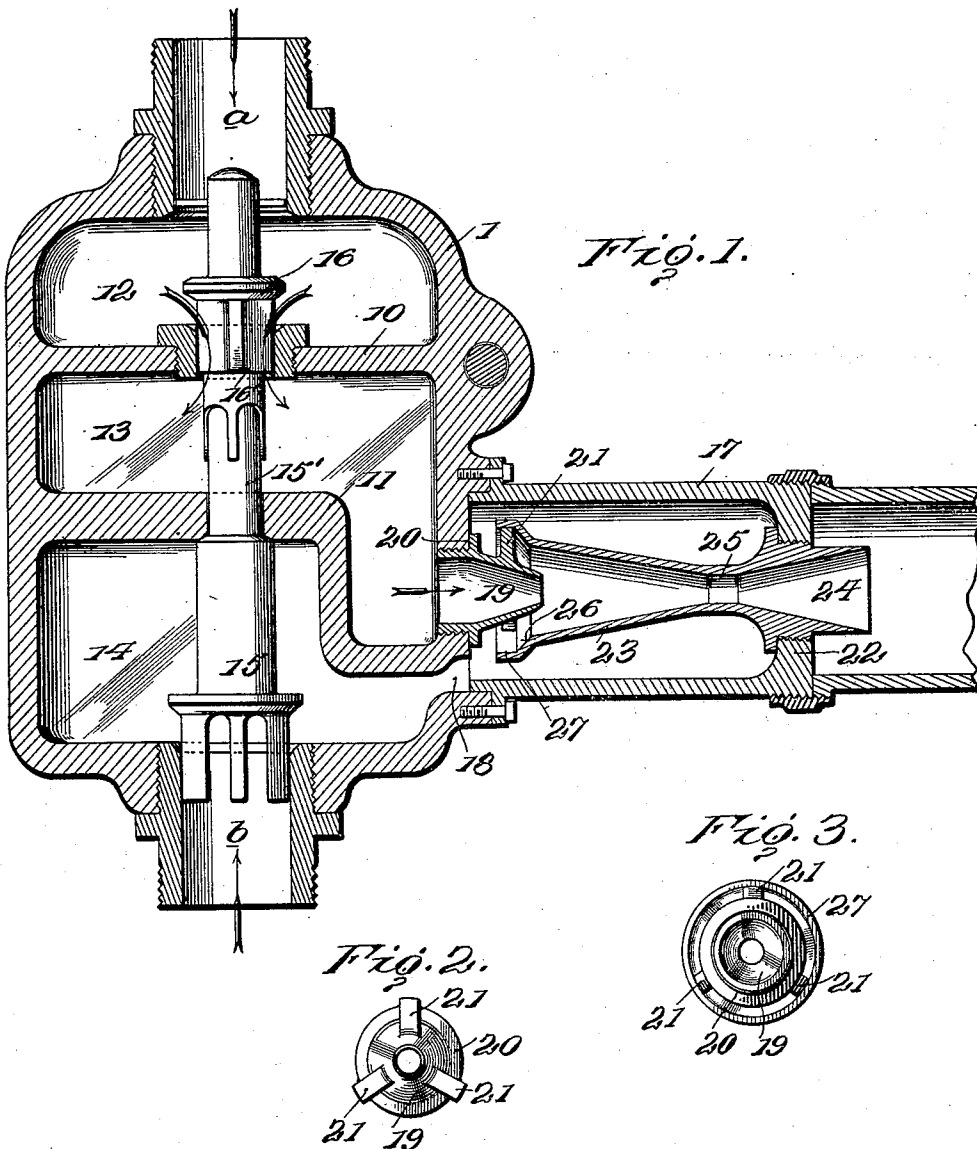
J. S. SWEENEY & W. W. GRINDLE.

FEED WATER HEATER.

APPLICATION FILED JULY 13, 1910.

988,225.

Patented Mar. 28, 1911.



Witnesses:-

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UNITED STATES PATENT OFFICE.

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

FEED-WATER HEATER.

988,225.

Specification of Letters Patent.

Patented Mar. 28, 1911.

Application filed July 13, 1910. Serial No. 571,821.

To all whom it may concern:

Be it known that we, JARED S. SWEENEY and WILLIAM W. GRINDLE, citizens of the United States, residing at Decatur, Macon county, Illinois, have invented certain new and useful Improvements in Feed-Water Heaters; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in feed water heaters for steam boilers, and the like; and the objects and nature of our invention will be readily understood by those skilled in the art in the light of the following description of the accompanying drawings illustrating what we now consider to be our preferred embodiment from among other formations and arrangements within the spirit and scope of our invention.

The invention consists in certain novel features of construction and in combinations and arrangements of parts as more fully and particularly pointed out and specified hereinafter.

Referring to the accompanying drawings, Figure 1, is a vertical longitudinal section through a structure embodying our invention. Fig. 2, is a detail front end view of the steam nozzle. Fig. 3, is a detail rear end view of the steam nozzle and injector combining cone.

In the drawings, 1, is a shell or box internally divided by transverse partitions 10 and 11 into steam chambers 12 and 13, and water chamber 14.

a, is the steam inlet into steam chamber 12, adapted to be connected with the steam dome of the boiler.

b, is the water inlet into the water chamber 14 adapted to be connected with any suitable feed water pump, such as an injector, for forcing the feed water into chamber 14, at a pressure greater than that of the steam entering through steam inlet *a*. A suitable check valve such as 15, is provided to close the water inlet *b*, when the pressure of the water entering said inlet drops below normal. When the feed water entering the inlet *b*, is at or above normal pressure it lifts said check valve. A steam inlet port opens through a partition 10, for the passage of steam from chamber 12, to chamber 13, and a check valve 16, is provided for closing said port against passage of steam from cham-

ber 12, when the flow of feed water through port *b*, stops and the check valve 15 drops. The check valve 15 lifts the check valve 16 and holds the same open through the medium of stems 15' and 16', all as described and shown in our application for patent filed June 28, 1909, Serial No. 504,903, and this present invention relates to certain improvements in the structure of said application.

17, is the feed water or "branch" pipe or connection from the shell 1, to the boiler feed water inlet controlled by the ordinary boiler check valve. This pipe 17, is suitably coupled to the shell 1, and the shell is formed with a water discharge opening or passage 18, from the water chamber 14 into the lower portion of the pipe 17.

19, is the steam discharge nozzle secured in and extending through a wall of the shell 1, and opening into steam chamber 13, and projecting forwardly and centrally into the pipe 17, above the water discharge 18 thereinto. This steam nozzle is formed with an exterior shoulder 20, abutting against the outer surface of the shell wall for holding the nozzle rigidly in position. The nozzle, within the pipe 17, tapers and reduces forwardly and is formed intermediate the length of said tapered portions, with several spaced radiating exterior lugs 21.

The tubular longitudinally elongated member of an injector is centrally and longitudinally arranged within the pipe 17, removably screwing in a central opening in a partition 22, in said pipe, and this tubular member is composed of a forwardly reducing combining cone 23, a forwardly flaring or enlarging delivery cone 24, and an intermediate contracted passage 25, from the delivery end of the combining cone to the receiving end of the delivery cone. The rear or receiving end of the combining cone is open to freely receive the water from the space in the pipe 17, around said cone, and also to longitudinally and centrally receive the projecting contracted or tapered end of the steam nozzle. This rear end of said cone is enlarged or flared rearwardly to form the outwardly inclined annular beveled surface 26 terminating in the enlarged rear cylindrical end or portion 27, receiving the lug 21, of the steam nozzle which at their outer ends abut against the inner surface of the cylindrical end 27, and thereby properly space and center the cone with respect to the nozzle and form water inlet openings ex-

teriorly of the nozzle and between the lugs 21, and into the cone.

In operation, a high speed jet of steam is discharged from nozzle 19, forwardly into 5 and longitudinally of the combining cone, and the water under pressure enters the combining cone around the nozzle and between the lugs 21, and is deflected by the beveled surface 26 inwardly and forwardly 10 toward the conical exterior surface of the nozzle and is thereby in a measure broken up and finely divided to a condition under which the water will be quickly and highly heated by contact with the high speed steam 15 jet. The impetus imparted to the column of water in the pipe 17 by the steam jet, and by the direction of the water in entering the combining cone, is sufficient to open the boiler check and permit entrance of the 20 highly heated feed water to the boiler. The water is heated to a high degree by commingling with the steam jet in the combining cone, and while in this highly heated condition, is forced into the boiler, thereby 25 reducing to the minimum liability of damage to the boiler through unequal expansion and contraction due to introduction of comparatively cool feed water.

In the event that passage of feed water 30 into the boiler is suddenly checked, the back pressure in the branch pipe 17, and through steam nozzle 19, will cause the check valve, 16, to suddenly flip up against the lower edge of the nipple forming steam 35 inlet port *a*, and thereby close said port against back flow toward the steam dome. When the obstruction is cleared so that feed water can again flow into the boiler, the pressure of the feed water entering port *b*, 40 acting on the solid column of water in the branch pipe will be sufficient to again start the flow of water toward the boiler in connection with the impetus of the steam jet which will start up the instant the back 45 pressure falls sufficiently to permit the steam pressure in port *a*, aided by gravity, to force the valve 16, down and open.

The particular improvements of the pres-

ent invention are involved in the formation of the rear end of the combining cone in 50 connection with the steam nozzle to provide enlarged water inlet openings for the purpose, among others, of preventing clogging of the water inlet openings to the cone by incrustation or deposit of lime or chemical 55 salts where certain kinds of water are employed.

It is evident that various changes, variations and modifications might be resorted to in the forms, constructions and arrangements of the parts described without departing from the spirit and scope of our invention, and hence we do not wish to limit ourselves to the exact disclosure hereof.

What we claim is:—

In a feed water heater, in combination, means having steam and water passages, a pipe in communication with said water passage, a tubular injector member in said pipe forming a combining cone, said member forming a water chamber in said pipe and around said cone, said cone at its rear opening into said chamber and formed with a rearwardly flaring deflecting surface terminating rearwardly in an enlarged rear end, 75 and a steam nozzle in communication with said steam passage and projecting forwardly through the open end of said cone to a point beyond said deflecting surface and provided with exterior spaced centering lugs fitted 80 within said rear end, said nozzle exteriorly tapering forwardly within said cone and reduced with respect thereto to form a free water passage around the same and within the cone, whereby said deflecting surface 85 directs the water inwardly and forwardly against the forwardly and inwardly tapering surface of said nozzle, for the purposes substantially as described.

In testimony whereof we affix our signatures, in presence of two witnesses.

JARED S. SWEENEY.

WILLIAM W. GRINDLE.

Witnesses:

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