

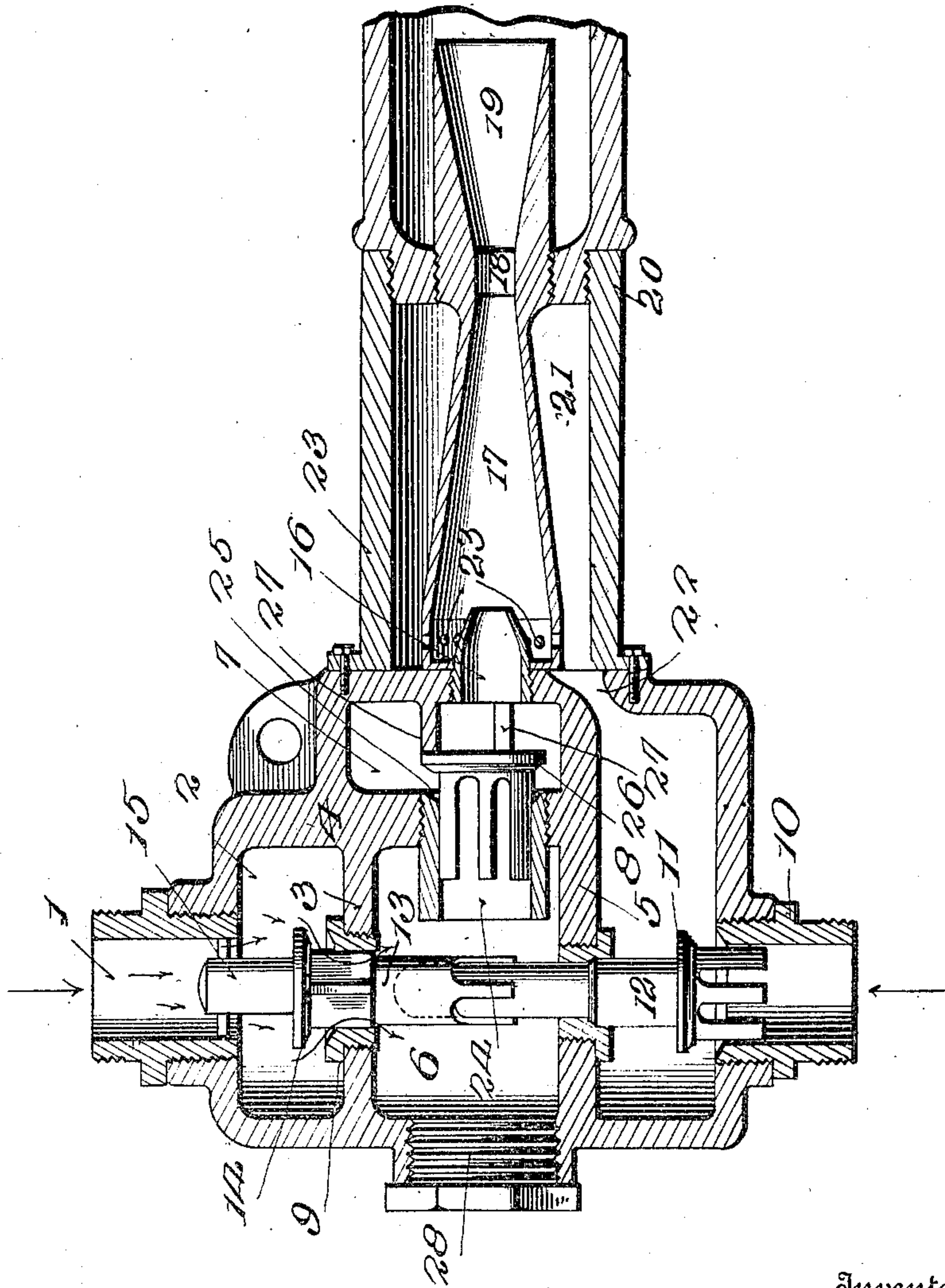
J. S. SWEENEY & W. W. GRINDLE.

FEED WATER HEATER.

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Witnesses

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UNITED STATES PATENT OFFICE.

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FEED-WATER HEATER.

960,209.

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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, or steam boilers; and the objects and nature of the invention will be readily understood by those skilled in the art in the light of the following explanation of the accompanying drawings illustrating a preferred embodiment of the invention.

The invention consists in certain novel features in construction and in arrangements or combinations of parts as more fully and particularly set forth hereinafter.

The accompanying drawings show the feed water heater of our invention in vertical section.

The heater comprises a casing having a steam inlet duct or port 1, provided with a nipple for connection with the steam dome of a boiler. The port or nipple 1, opens into a steam or valve chamber 2, within the casing and formed by a horizontal partition 3 and a vertical partition 4, and said partitions 3 and 4, in connection with the horizontal partition 5, further divide the interior of the casing into steam chambers 6, and 7, and water chamber 8. The partition 3, is formed with a steam port containing nipple or bushing 9, at its end forming a valve seat. An inlet port into chamber 8, is provided for the entrance of the feed water from any suitable injector or other pump. This port contains nipple 10, at its upper or inner end forming a valve seat and at its outer end formed for coupling to the water pipe from the feed water injector or the like.

11, is a vertically movable check valve in chamber 8, and adapted to seat on the nipple 10, and having guide wings depending thereinto. This valve is provided with vertical stem 12, extending upwardly through a guide opening in partition 5, and into longitudinal sliding or telescopic connection with the depending stem 13, of the steam check valve 14, arranged in chamber 2, and

adapted to seat on the upper end of nipple or bushing 9. The steam valve can be provided with a vertical guide stem 15, extending into nipple 1, and guided by projections therein.

An outwardly projecting tapering steam nozzle 16, forms the steam outlet from the steam chamber 7, to the exterior of the casing, and this nozzle projects a distance longitudinally into the large end of the combining cone 17, of an injector comprising said combining cone, a cylindrical passage 18, and a delivery cone 19, secured longitudinally in water pipe 20, extending from the heater casing to the boiler and opening into the boiler at the boiler check valve.

A chamber or space 21 is formed in the water pipe surrounding the combining cone 17, and a water discharge port 22, opens into this space from the water chamber 8, of the casing.

The large end of the combining cone is formed with a surrounding series of radial water inlet perforations 23, through which the water enters the combining cone under pressure and in the form of radial jets striking the tapered end of nozzle 16, and being thereby reduced to spray and directed outwardly in the combining cone 17, and where in the water is highly heated by the steam jet discharged from nozzle 16. The steam enters chamber 7, and the steam nozzle 16, from chamber 6, through a bushing or nipple 24, inserted in a port through said wall 4, with its outer end shaped to form valve seat 25, and this bushing is arranged in alinement with the steam nozzle 16.

An emergency check valve 26, is arranged in chamber 7, between said bushing and the inner end of said nozzle 16, and arranged to close inwardly against valve seat 25, to prevent back flow of water from chamber 7, into steam chamber 6. This check valve can be provided with the usual guide wings extending into bushing 24, and spaced stop posts or lugs 27, project from the wall of the casing, to limit the outward or opening movement of said valve to its normal open position spaced from both bushing 25, and nozzle 16, so that the steam can freely pass around the valve and to the nozzle.

The wall of the casing opposite the nozzle 16, can be formed with an opening for the insertion of the bushing 24 and valve 26, and this opening is normally tightly closed by plug 28.

In the drawings the various valves are all shown open as when the feed water heater is in normal operation. When the water pump or injector is not operating, the water valve 11, and steam valve 14, are closed by gravity on their respective seats.

In operation, water is forced in through nipple 10, at a pressure greater than the pressure of the steam entering nipple 1, and the valves 11 and 14, are thereby opened, and the steam pressure under normal working conditions keeps valve 26, open. The high speed of the steam jet discharged through nozzle 16, into the injector imparts such momentum to the solid column of water in feed water pipe 20, as to overcome the boiler pressure and open the boiler check valve, and the water is heated to a high degree by the action of the steam thereon in the combining cone of the injector, all as described in our co-pending application S. No. 504,903, filed June 28, 1909, wherein the construction and operation of the water and steam inlet valves and of the injector are described in detail and wherein an application of the feed water heater to a boiler is illustrated. The present invention relates to certain improvements in the structure of said co-pending application, and involving the provision of an emergency valve between the steam nozzle 16, and the steam chamber 6, to prevent back flow of water into said chamber and therefrom to the boiler dome.

If for any reason the boiler check should fail to open or the pipe 20, should otherwise become clogged, the water will back up in the injector and through nozzle 16, with great rapidity and at high pressure, and the speed of the back flow through nozzle 16, will flip the valve 26, suddenly to its seat closing the nipple 24, and preventing passage of the water to the steam chamber and therefrom to the boiler dome. When the boiler check is again restored to normal operation and the flow of water through the injector toward the boiler is again restored, the pressure will be reduced at the outer face of the emergency check valve so that the steam pressure restores said valve to its normal open position and the steam jet from nozzle 16, is again set up.

Certain advantages are attained by locating the emergency check valve adjacent to the steam outlet or nozzle from the heater casing or between said nozzle and the main steam chamber of the casing.

The invention is not limited to employment in connection with locomotive boilers, as it can be employed for feeding water to stationary boilers, and a pump can be used for forcing the feed water under the necessary high pressure to the heater, as well as an injector. Also the heater can be arranged above or below the boiler water line.

We do not wish to limit our invention to the employment of the steam valve 14, nor to the particular arrangement or construction of steam and water inlet valves disclosed, nor to the particular arrangement of chambers and partitions within the heater casing.

What we claim is:—

1. A feed water heater comprising a casing having steam and water chambers, a water heating discharge connection therefrom having a receiving inlet from the water chamber, a steam nozzle discharging thereinto from the steam chamber, and an emergency check valve arranged between the nozzle and steam chamber, substantially as described.

2. A feed water heater comprising a casing, a water pipe connection therefrom, said casing having a water passage to said connection, a steam nozzle from the casing discharging into said connection, said casing having a steam passage therethrough to said nozzle and separate from said water passage, and an emergency check valve arranged in the casing adjacent to the inner end of said nozzle to close said steam passage against back flow of water from said nozzle.

3. A feed water heater comprising a casing having a steam chamber, a steam inlet thereto and a steam outlet therefrom, a steam discharge nozzle from said outlet, an injector in coöperative relation with respect to said nozzle and having a water supply passage, and an emergency check valve arranged between said steam chamber and said nozzle to close said outlet against backflow of water into said chamber.

4. A feed water heater comprising a water heating and forcing injector, and means having a water supply passage thereto and a separate steam passage thereto embodying a steam chamber and an outlet to said injector, and an emergency check valve arranged between said chamber and said outlet and normally held open by the passage of steam to the injector and adapted to close said passage against back flow of water into said chamber from the injector.

5. A feed water heater comprising a casing, a water heating and forcing injector leading therefrom, said casing having a water passage to said injector, and also having a steam passage to the injector, said steam passage embodying a steam chamber having a steam inlet and a separate steam outlet communicating with the injector nozzle, and an emergency check valve arranged between said steam outlet and said nozzle and normally held open toward said nozzle by the passage of steam thereto, and adapted to close said outlet against back flow of water from the injector.

6. A feed water heater comprising a cas-

ing having a steam chamber having a steam supply inlet, a steam discharge nozzle from said casing, a vertical wall of said chamber having a steam outlet therefrom to said nozzle and in alinement therewith, and an emergency check valve opening toward said nozzle and adapted to close said outlet.

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

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