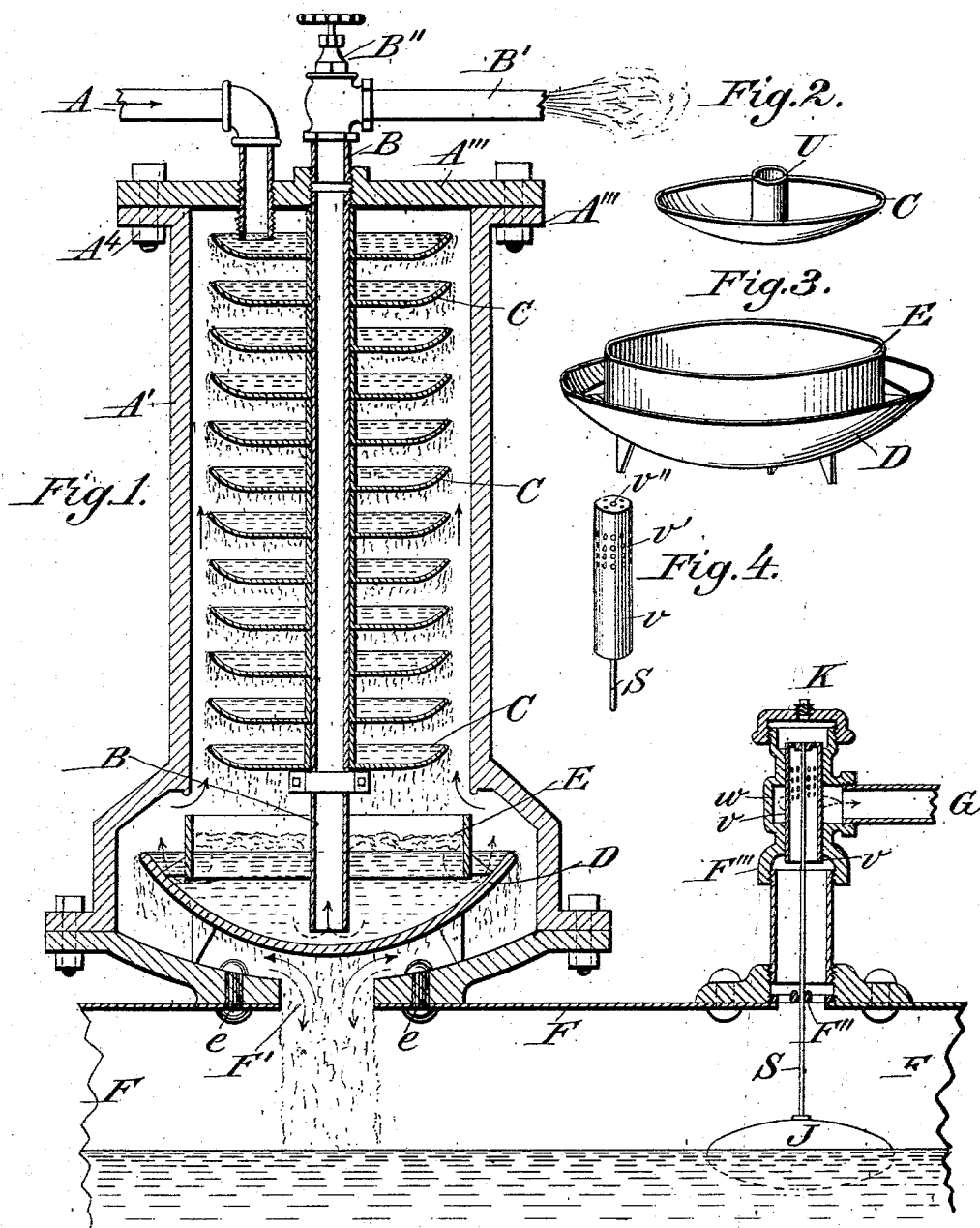


(No Model.)

A. C. & W. B. BRANCHER.
FEED WATER HEATER AND PURIFIER.

No. 533,523.

Patented Feb. 5, 1895.



Attest:

J. H. Schott
Charles C. Weaver

Inventors:

Arthur C. Brancher
William B. Brancher
By W. A. Ruff
attorney

UNITED STATES PATENT OFFICE.

ARTHUR C. BRANCHER AND WILLIAM B. BRANCHER, OF DANVILLE,
ILLINOIS.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 533,523, dated February 5, 1895.

Application filed October 24, 1893. Serial No. 489,060. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR C. BRANCHER and WILLIAM B. BRANCHER, of Danville, in the county of Vermilion and State of Illinois, have invented certain new and useful Improvements in a Combined Feed - Water Heater and Purifier; 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 has for its object to provide a combined feed water heater and purifier for steam boilers, as hereinafter set forth and claimed.

Referring to the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is a view in vertical section of a feed water heater, purifier and regulator, a portion of a boiler in longitudinal section to which the feed water heater is attached and a pump regulator valve in vertical section attached to the boiler, all constructed and arranged in accordance with this invention. Fig. 2 is a detail view of one of the distributing pans of the feed water heater. Fig. 3 is a detail view of the settling basin and collecting ring of the feed water heater, and Fig. 4 is a detail view of the valve of the pump regulator.

A' indicates the shell or casing of the feed water heater and purifier provided with the feed pipe A, projecting into the upper end of the chamber of the feed water heater and below the surface of the water in the upper pan C. Projecting through the top and down centrally to the lower end of the chamber of the feed water heater is a blow-off or discharge pipe B, provided with a valve or cock B'', which may be opened for the purpose of blowing off the sediment and scum from the settling basin D, while the boiler is under full pressure. The lower end of the blow-off pipe B, terminates just above the bottom of a settling basin D mounted on the bottom of the chamber of the feed water heater mounted on the settling basin D, so as to project above and below the plane of the top of the basin D, and to leave a space below for the flow of water, is a collecting ring E, the function of which with the

basin D will be hereinafter particularly described.

Upon the blow-off pipe B are mounted a number of distributing pans C, constructed with a central sleeve C', by means of which the pans C are slid upon the pipe B, and are spaced from each other the bottom of each pan resting on the top of the sleeve C' of the pan beneath. The lowest pan C rests upon a ring or sleeve d, bolted or clamped to the pipe B, and located a little above the settling basin D.

The top A'' of the feed water heater is removably secured to the flanges A''' of the sides by bolts and nuts A'. By means of this construction the pans C may be removed from the feed water heater and cleaned of scale or other impurities.

The feed water heater A' is secured by bolts, rivets or cap screws e to a boiler F and the chamber of the feed water heater opens into the boiler F, by means of the opening or passage-way F', beneath the settling basin D. Riveted to the boiler F over an opening F'' is a tube F''' and valve chamber W connected by steam pipe G to a boiler feed pump or injector and provided with a hollow cylindrical regulating valve V, having perforations V' in its side and perforations V'' in its top by means of which the passage of steam is permitted through perforations V' to the pipe G when the valve V descends in chamber W to bring the holes V' opposite the opening at the end of pipe G and the passage of steam is permitted through the holes V'' to the space above, thus making the valve perfectly balanced and free to act in response to the slightest force. The valve V' is connected by a valve stem S to a float J in the boiler F, by means of which the valve is opened and steam is allowed to pass to the pump or injector as the water lowers, while it is closed as the water rises and the steam is shut off, thus increasing or decreasing the amount of feed water in proportion to the demand. This keeps the water at a regular height and increases the efficiency of the boiler.

L indicates the water line in the boiler in which the float J rests.

The operation of the invention is as follows:

lows: When the float J upon the water line L descends as the water lowers, steam is admitted to the pump or injector through the pump-regulating valve V and steam pipe G, starting the pump or injector which supplies water through the pipe A. The feed water entering the chamber of the feed water heater A' from the feed pipe A, flows downward over the distributing pans C, and the impurities are deposited on the pans C or settle or float in the settling basin D, while the purified overflowing water enters the boiler F through the opening F'. The floating impurities are held in the settling basin D by the collecting ring E. During the passage of the feed water over the pans C, live steam, under full boiler pressure, comes in direct contact with the feed water, thus heating the water and precipitating the impurities. The floating impurities and settlings in the settling basin D are blown off and removed by opening the valve B' in the blow-off pipe of the steam upward through blow-off pipe B.

The advantages of our invention are as follows: The full boiler pressure having free access to the interior of the feed water heater, will cause the water to be heated to the temperature due to that pressure. The steam that is in contact with the feed water quickly gives up its heat to the feed water and condenses, tending to reduce the pressure in the boiler. This reduction of pressure is immediately met and counteracted by the more rapid evaporation of the water in the boiler, all of which is maintained at the exact temperature due to the pressure in the boiler. This rapid evaporation of water requires great quantities of heat, which is taken at the most available point, that is, the point of highest temperature, the heating surface of the boiler. This reduces the temperature of the heating surface of the boiler to that of the water in contact with it and as the water continues to boil as long as steam is condensed in the heating of the feed water, or used for running the engine, or for any other purpose that tends to reduce the pressure in the boiler, the plates or tubes are maintained at a uniform and much lower temperature than if water below the boiling point were in contact with them, as is the case when water is fed into the water space of the boiler.

We have discovered that water will not absorb heat as rapidly from the heating surface of the boiler before it begins to boil as it will afterward and this is especially so if the boiling is forced by a reduction of pressure by condensation or otherwise. Hence more heat will be taken from the fire and transmitted to the water when acting on a reducing pressure than when acting on an increasing pressure, if the water in contact with the heating surface is at the temperature of boiling under pressure.

The pans are, broadly considered, distributing plates that subject the water in a thinned, or distributed, condition to the action of the steam, and while they are preferably concaved in their upper surfaces,—or pan-shaped,—such conformation is not entirely essential to their operation.

The immediate connection of the heater with the boiler, in addition to simplifying and cheapening the device, enables the heater to be easily and safely applied to the boilers of traction engines and the like.

Having described our invention, we claim—

1. In a feed-water heater, the combination of a shell having a water inlet and a steam inlet, a settling basin in the lower end of the shell, and a blow-off pipe extending through the shell and terminating in the settling basin, substantially as set forth.

2. In a feed-water heater, the combination of a shell having a water inlet and a steam inlet, a settling basin in the lower end of the shell, a scum-collecting ring in the settling basin, projecting above and below the plane of the top of the basin and leaving a space between the bottom of the basin and the lower edge of the ring, and a blow-off pipe extending through the shell and the ring and terminating in the settling basin, substantially as set forth.

3. In a feed-water heater, the combination of a shell having a water inlet in its upper end and a steam inlet in its lower end, a settling basin in the lower end of the shell, a blow-off pipe extending vertically through the shell and terminating in the settling basin, and a set of distributing plates mounted on the blow-off pipe, substantially as set forth.

4. In a feed-water heater, the combination of a shell having a water inlet in its upper end and a steam inlet in its lower end, a settling basin in the lower end of the shell, a scum-collecting ring in the basin, a blow-off pipe extending vertically through the shell and the ring and terminating in the basin, and a set of distributing plates mounted on the blow-off pipe, substantially as set forth.

5. The combination, with a steam boiler, of a feed-water heating compartment seated on the boiler and having a single opening communicating with the steam space of the boiler and serving as a passage way for the steam from the boiler to the feed water compartment and for the water from the feed water compartment to the boiler, substantially as set forth.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

ARTHUR C. BRANCHIER.
WILLIAM B. BRANCHIER.

Witnesses:

GUS GOLDSMITH,
GEORGE W. WHYTE.

It is hereby certified that the names of the patentees in Letters Patent No. 533,523, granted February 5, 1895, for an improvement in "Feed-Water Heaters and Purifiers," were erroneously written and printed "Arthur C. Brancher and William B. Brancher," whereas said names should have been written and printed *Arthur C. Braucher and William B. Braucher*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 19th day of February, A. D. 1895.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.