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1,928,085

BOILER FEED WATER HEATER

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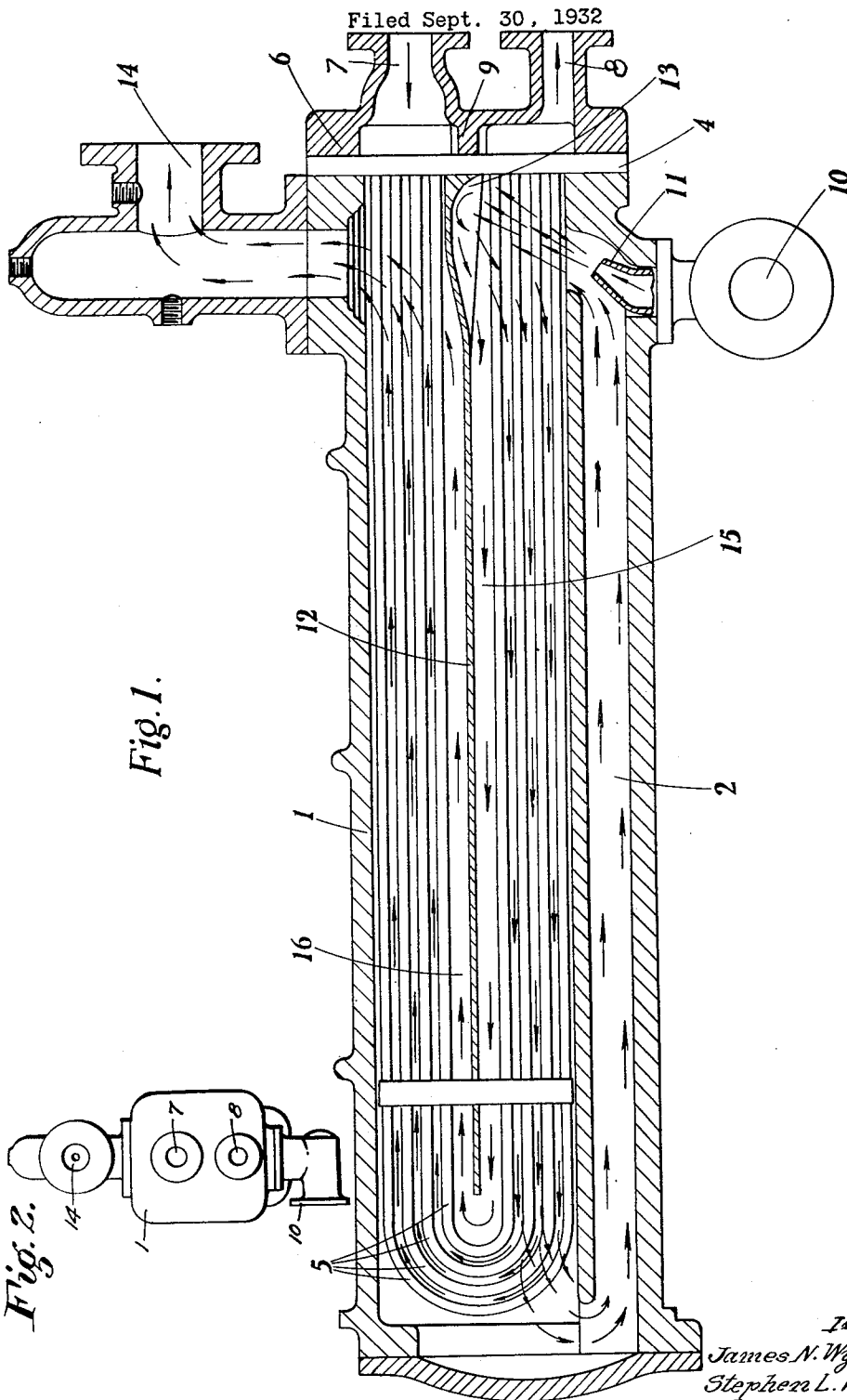


Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE

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BOILER FEEDWATER HEATER

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4 Claims. (Cl. 257-239)

This invention relates to boiler feedwater heaters and is a development of the invention set forth in our patent specification No. 1,749,654. That specification describes and claims the combination of a casing forming a main conduit for the passage of the feedwater to the boiler, means for heating the feedwater in the casing, at least one auxiliary conduit in circuit with the casing, and means whereby the feedwater admitted to the casing is utilized to set up a return flow through the auxiliary conduit.

According to the present invention the feedwater inlet is located directly in the auxiliary conduit for inducing a circulation therethrough and along the lower part of the main conduit or heating chamber within the casing. The feedwater inlet in the auxiliary conduit includes, or may include, a nozzle for directing the entering water.

Deflecting means for preventing the direct passage of lesser heated water to the feedwater outlet may be provided.

Live steam nozzles may also be fitted substantially midway in the auxiliary conduit for the purpose of heating the water in a boiler or boilers prior to the firing thereof.

A feedwater heater embodying the features of the invention positively assures circulation of the lesser heated water through the conduit and prevents cold water from entering the feed outlet connection.

One embodiment of the improved feedwater heater according to the present invention is illustrated, by way of example, on the accompanying drawing wherein Fig. 1 is a sectional elevation and Fig. 2 is an end elevation.

The heater comprises a horizontally arranged casing 1 consisting of a tubular metal casting with the auxiliary conduit 2 formed in the wall thereof. One end of this casing is closed by a cover plate 3 and the other end by a plate 4 into which return bend steam tubes 5 are expanded or otherwise secured, a steam distributing chest 6 being fitted over this tube plate 5 and having a steam inlet port 7 and a steam outlet port 8, the ports being separated by a partition 9.

Opening into the conduit 2 towards the tube plate end thereof is a feedwater inlet 10 which includes a nozzle 11 by which the entering water is turned substantially into the line of the conduit. A deflector plate 12 is secured to the tube plate 5 and lies in a horizontal position between the inlet and outlet limbs of the steam tubes 5, this plate being slightly concave downwards at 13 opposite the nozzle 11 to provide a partly stream-

lined path for the water leaving the conduit 2 and passing along the lower part 15 of the heating chamber 1. The feedwater outlet 14 extends from the upper part 16 of the heating chamber substantially opposite the inlet.

In the operation of the heater, which is arranged on the delivery side of the feedwater pump, feedwater is injected through the inlet nozzle 11 into the conduit 2. This water is turned upwards into the heating chamber or main conduit 1 and deflected by the concavity 13 in the deflector 12 along the lower part 15 of the chamber about the lower limbs of the steam tubes 5. At the same time water in the conduit 2 is entrained by the action of the nozzle and draws with it water from the closed end of the heating chamber 1, so that a circulation of the lesser heated water is set up around the lower part of the chamber and the conduit 2. As some of the water becomes hotter, instead of being drawn down into the conduit 2 when it reaches the closed end of the heating chamber, it rises above the deflector plate 12 and flows along the top part 16 of the heating chamber about the upper limbs of the steam tubes 5, and thus to the outlet 14. The steam is introduced to the upper limbs of the steam tubes and leaves by the lower limbs, so that the water flows both through the part 15 and the part 16 of the heating chamber 1 counter to the heating steam (as shown by the arrows).

With this arrangement all the steam and water connections are located at one end of the heater, so that it may be arranged in spaces where there is no access from the rear and sides. This may be a great convenience in the design of power plants. Further, it is a matter of no difficulty to fit a by-pass for the feedwater, and this may be of a simple one-spindle type.

It will be apparent that the tube plate 4 together with the tubes 5 and the deflector 12 can be removed as a unit, whenever required, after first disconnecting the steam chest 6.

Steam nozzles (not shown) may be placed in the conduit 2, preferably at or near the middle thereof, and connected to a source of live steam supply, such as the auxiliary live steam range of a steamship. The feed heater may thus be used as a hydrokinetic, and cold water in a boiler or a set of boilers heated up prior to firing so that steam can be raised quickly without risk of damage to the boilers.

Obviously, the feedwater heater may be varied without departing from the scope of the invention. The form and mounting of the deflector

plate may be modified, or the plate dispensed with altogether and its purpose fulfilled, for example, by the shaping of the entry from the conduit to the heating chamber, or by suitably dishing the tube plate.

Further, it is merely to be preferred that the feedwater inlet, the feedwater outlet and the steam connections should be grouped adjacent the same end of the heater, and other arrangements may be adopted according to the exigencies of space and accessibility.

We claim:—

1. A boiler feedwater heater comprising a casing forming a main conduit for the passage of the feedwater to the boiler, return-bend steam heating tubes extending into the main conduit, a deflector extending between the limbs of the tubes and dividing the main conduit into intercommunicating parts, an auxiliary conduit in circuit with one of said parts, and inlet means for the feedwater located directly in the auxiliary conduit whereby the feedwater admitted induces a circulation through said circuit, the deflector plate being curved adjacent the feedwater inlet to provide a partly stream-lined path for the water leaving the auxiliary conduit.

2. A boiler feedwater heater comprising a casing forming a main conduit for the passage of the feedwater to the boiler, return-bend steam heating tubes extending into the main conduit, a deflector extending between the limbs of the tubes and dividing the main conduit into intercommunicating parts, an auxiliary conduit in circuit with one of said parts and an inlet nozzle for the feed-

water located directly in the auxiliary conduit to cause the entering feedwater to induce a circulation through said circuit, the deflector plate being curved adjacent the feedwater inlet to provide a partly stream-lined path for the water leaving the auxiliary conduit.

3. A boiler feedwater heater comprising a tubular casing with an auxiliary conduit in the wall thereof, a feedwater inlet located in the conduit with a nozzle for entraining water and directing it into the casing, a feedwater outlet from the casing, return-bend steam tubes projecting into the casing from a tube-plate, a deflector projecting from the tube-plate between the limbs of the tubes and having a concave portion opposite the feedwater inlet, and a steam chest fitted over the tube-plate and having an inlet and an outlet disposed for passing the steam through the tubes counter to the flow of the feedwater through the casing.

4. A boiler feedwater heater comprising a casing forming a main conduit for the passage of the feedwater to the boiler, return-bend steam heating tubes extending into the main conduit, a deflector extending between the limbs of the tubes and dividing the main conduit into intercommunicating parts, an auxiliary conduit in circuit with one of said parts, and an inlet nozzle for the feedwater located in the auxiliary conduit at one end thereof to direct the entering feedwater directly into the main conduit and induce a circulation through said circuit.

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