

(No Model.)

2 Sheets—Sheet 1.

D. A. QUIGGIN.
INTERNAL FEED WATER HEATER.

No. 536,096.

Patented Mar. 19, 1895.

FIG. I

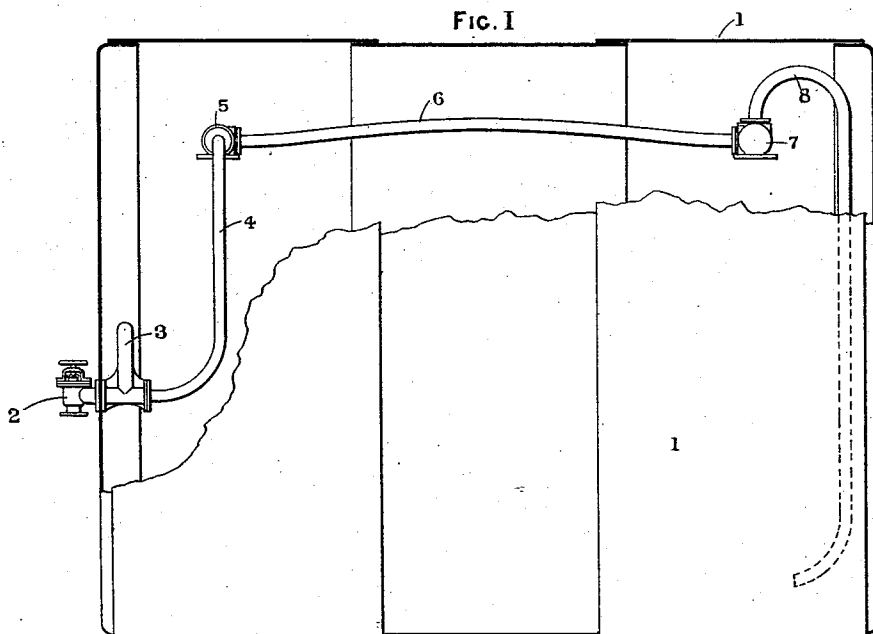
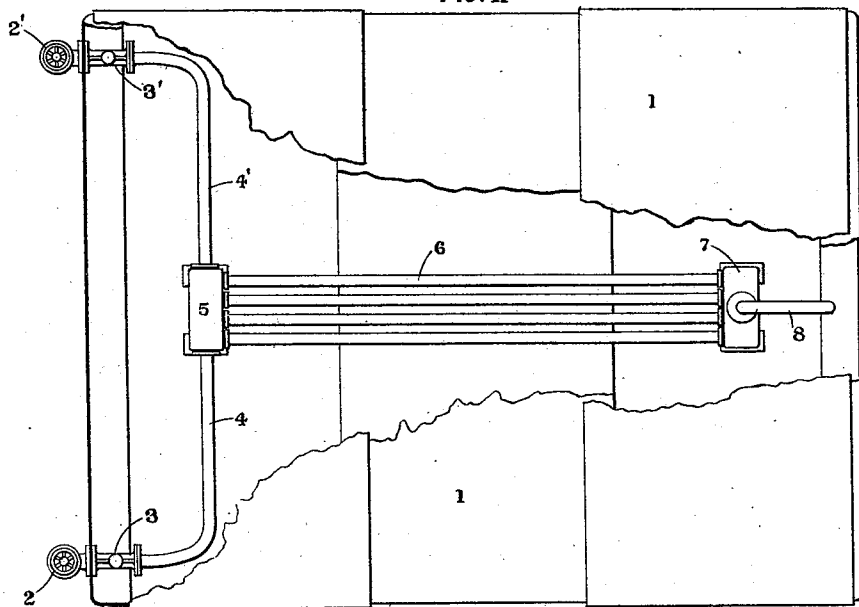


FIG. II



Attest
Walter Madison
J. L. Madison

Inventor
Daniel Arthur Quiggin
by *Ellis Sprar*
Att'y.

(No Model.)

2 Sheets—Sheet 2.

D. A. QUIGGIN.
INTERNAL FEED WATER HEATER.

No. 536,096.

Patented Mar. 19, 1895.

FIG. III

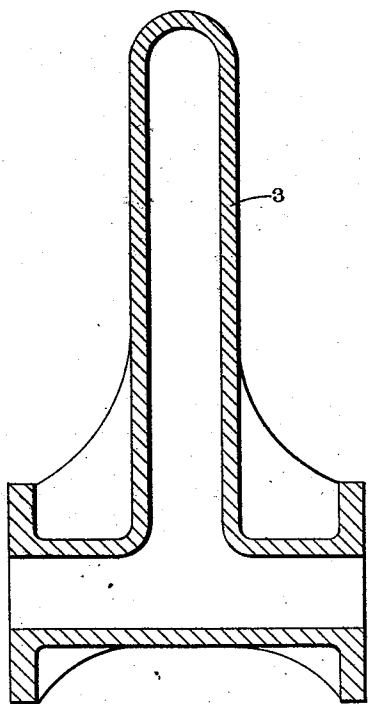


FIG. IV

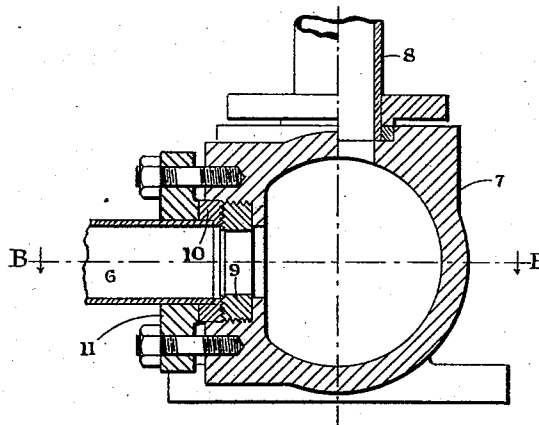
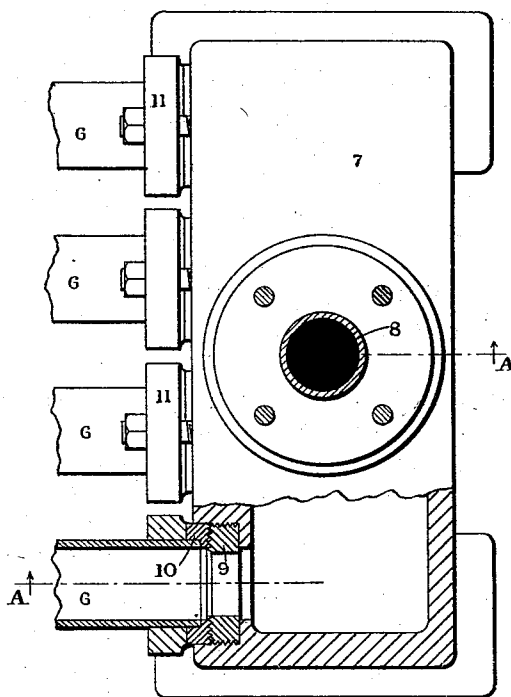


FIG. V



Attest
J. L. Middleton

Inventor
Daniel Arthur Quiggin
by Ellis Spear
A. H. V.

UNITED STATES PATENT OFFICE.

DANIEL ARTHUR QUIGGIN, OF BLUNDELL SANDS, ENGLAND.

INTERNAL FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 536,096, dated March 19, 1895.

Application filed June 7, 1894. Serial No. 513,787. (No model.) Patented in England May 1, 1889, No. 7,251.

To all whom it may concern:

Be it known that I, DANIEL ARTHUR QUIGGIN, a subject of the Queen of Great Britain, residing in Blundell Sands, near Liverpool, in the county of Lancaster, England, have invented certain new and useful Improvements in Internal Feed-Water Heaters for Boilers, (for which, in part, I have obtained a patent in Great Britain, No. 7,251, bearing date May 1, 1889,) of which the following is a specification.

This invention relates to that class of apparatus for heating feed water for steam boilers, in which the feed water, before its final delivery, is caused to traverse heating passages placed in the steam space of the boiler, so that the feed water is raised to or nearly to the temperature of the water in the boiler before mixing therewith. By so heating the feed water, the well known prejudicial effects of cold feed water are obviated and when the heated feed water is delivered at or near the lowest part of an internally fired boiler, where the temperature is usually comparatively low, the displacement of the comparatively low temperature water by the hot feed water will promote circulation.

According to my invention, I provide, within the boiler and at opposite sides thereof, an inlet box and an outlet box, which boxes are connected by a series of tubes forming heat transmitting passages which traverse the steam space of the boiler. The feed water is led through an inlet pipe into the inlet box, through the connecting tubes into the outlet box and is then delivered through an outlet pipe into the lower portion of the boiler.

I have found that in apparatus as described so far, there is a peculiarly destructive action, due apparently to a water-hammer effect caused by the influx of the comparatively cold feed water, the effect being sufficient to deform or burst the pipes even when unusually massive, and to render it very difficult if not impossible to maintain the staunchness of the joints. I have further found that this difficulty may be overcome by fitting an air vessel within the boiler, through which the feed water passes on its way to the feed heater, the said air vessel being placed by preference close to the feed check valve where the feed

water enters the boiler, as I find this to be the most effective position.

In the accompanying drawings, Figure I shows in elevation the general arrangement of the apparatus, the boiler being partially broken away to show the arrangement more clearly. Fig. II is a plan of the same. Figs. III, IV and V are detail views, and will be more fully referred to hereinafter.

Throughout the drawings, similar parts are indicated by the same reference figures, and in the case of sections, the direction in which they are viewed is indicated by the small arrows placed adjacent to the letters denoting the plane of section.

1 is the boiler, of which only sufficient is shown to make clear the relation of the feed water heater and air vessel thereto. The main feed enters by the check valve 2 and passes through the air vessel 3, placed as close as possible to the check valve, being preferably secured by the same bolts as the latter. This air vessel is shown in section to larger scale in Fig. III. From the air vessel, the feed water passes through the inlet pipe 4 to the inlet box 5 and thence through the heat transmitting passages 6 to the outlet box 7, being heated by the heat transmitted from the steam, and finally passes to the lower part of the boiler through the outlet pipe 8, which is taken from the top of the box as shown to prevent the apparatus from being emptied when the feed is cut off. The additional check valve 2', air vessel 3', and inlet pipe 4', shown in Fig. II, are for the auxiliary feed.

The outlet box 7 is shown to larger scale in Figs. IV and V, Fig. IV being a sectional elevation on the line A. A. of Fig. V, and Fig. V being a plan, partly in section on the line B. B. of Fig. IV. These views show the method of attaching the tubes to the outlet box, and the details shown are also applicable generally to the inlet box 5.

9 is a washer screwed tightly into the box, the hole in the washer being preferably made square to facilitate screwing it in.

10 is a washer secured to the end of the heat transmitting passage 6, and adapted to make joint with the face of the washer 9, the abutting surfaces being concentrically cor-

rugated in accordance with the method described in my prior Letters Patent No. 434,804, August 19, 1890. The necessary pressure to make the joint is applied by the elongated loose flanges 11 and the studs shown.

5 The tubes 6 are bowed slightly to give them longitudinal elasticity, to facilitate the screwing up of the joints.

10 The apparatus usually rests upon or is slung from the boiler stays.

Having now fully described my invention, I declare that what I claim, and desire to secure by Letters Patent, is—

15 1. In combination a steam boiler, a feed water heater placed within the boiler, and an air chamber within the boiler connected to the supply pipe and forming an air cushion substantially as described.

20 2. In combination, a steam boiler, a feed water heater placed within the boiler and con-

sisting of an inlet pipe, inlet and outlet boxes connected by a series of heating passages, and an outlet pipe and an air chamber connected with the inlet pipe and forming a cushion, substantially as described. 25

3. In combination, a steam boiler, an inlet pipe extending within said boiler, boxes 5 and 7 connected by heating pipes, one of said boxes being connected with the inlet pipe, and an outlet pipe leading from the other box to 30 the bottom of the boiler, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

DANIEL ARTHUR QUIGGIN.

Witnesses:

J. E. LLOYD BARNES,
JOHN N. DOWNWARD.