

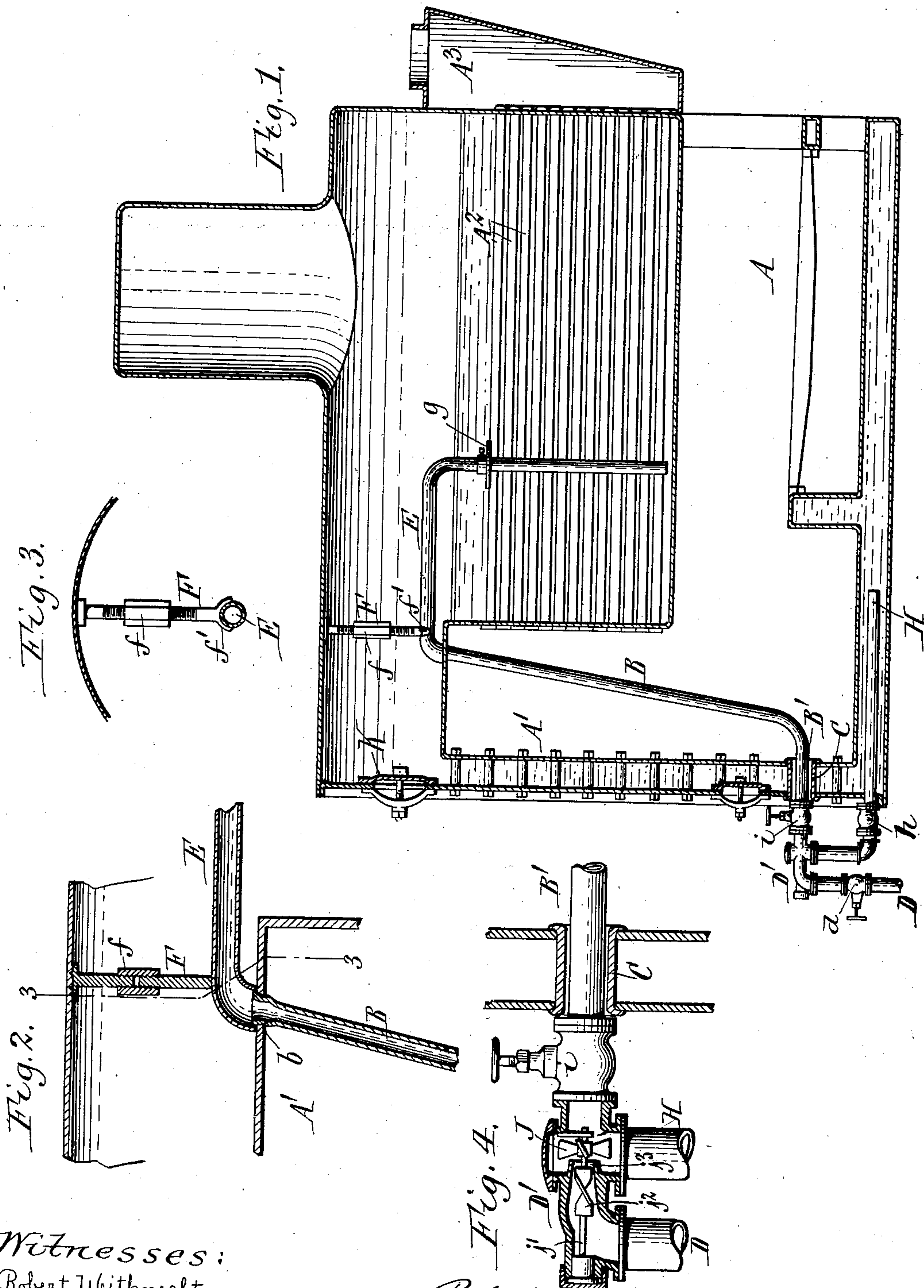
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PATENTED NOV. 17, 1903.

R. B. HODGE.
FEED WATER HEATER AND CIRCULATOR.

APPLICATION FILED DEC. 6, 1902.

NO MODEL.



Witnesses:
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UNITED STATES PATENT OFFICE.

ROBERT B. HODGE, OF BUFFALO, NEW YORK.

FEED-WATER HEATER AND CIRCULATOR.

SPECIFICATION forming part of Letters Patent No. 744,341, dated November 17, 1903.

Application filed December 6, 1902. Serial No. 134,068. (No model.)

To all whom it may concern:

Be it known that I, ROBERT B. HODGE, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Feed-Water Heaters and Circulators, of which the following is a specification.

This invention relates to feed-water heaters for steam-boilers in which the incoming water is passed through a highly-heated circulating-pipe arranged in the combustion-chamber of the boiler.

One of the objects of my invention is to so construct and support this heating and circulating pipe that the same is free to expand and contract without straining the joints and the boiler-sheets, thereby guarding against leakage of water into the combustion-chamber and averting the danger of scalding the firemen.

A further object is to so arrange the heating and circulating pipes that they do not obstruct the fire-box and the front portion of the combustion-chamber and reduce the efficiency of the boiler-furnace.

In the accompanying drawings, Figure 1 is a sectional elevation of a marine boiler provided with my improved appliance. Fig. 2 is a fragmentary longitudinal section of the upper portion of the boiler, on an enlarged scale, showing the joint between the heating-pipe and the upper circulating-pipe. Fig. 3 is a transverse section in line 3-3, Fig. 2. Fig. 4 is an enlarged longitudinal section of the fitting containing the injector.

Similar letters of reference indicate corresponding parts throughout the several views.

A indicates the usual fire-box of the boiler-furnace, A' the combustion-chamber, and A² the flues extending forwardly from the latter to the smoke-box A³.

B indicates a water heating and circulating pipe arranged in the combustion-chamber and extending from the lower to the upper portion thereof. This pipe is provided at its lower end with a horizontal branch or continuation B', which extends loosely through an opening or thimble C, preferably located in the rear wall of the combustion-chamber, as shown, although the same may extend through one of the side walls of the chamber, if desired. The rear end of the extension B' is connected

with a feed-water-supply pipe D by an intermediate chamber or fitting D'. This pipe has a hand-valve *d* for shutting off the supply of water to the boiler. The upper end of the heating-pipe B extends through the upper portion or crown-sheet of the combustion-chamber and is tightly secured in the same by expanding its upper end, as shown at *b*, or by any other suitable means. The upper end of the heating-pipe connects with a circulating-pipe E, arranged in the upper portion of the boiler and preferably extending forwardly and thence downwardly between the flues A² nearly to the bottom of the portion of the boiler containing the flues. To facilitate repairs and renewals, the upper rear end of this circulating-pipe is bent downwardly and removably fitted over the expanded upper end of the heating-pipe B, the bent end of said pipe being firmly clamped against the crown-sheet of the combustion-chamber by any suitable means. The preferred device for this purpose consists of an upright post or strut F, bearing at opposite ends against the circulating-pipe and the interior of the boiler-shell and composed of sections connected by a turnbuckle *f*, the lower section of the post terminating in a saddle *f'*, which straddles the circulating-pipe opposite its junction with the heating-pipe B, as shown in Figs. 1 and 3. The vertical portion of the circulating-pipe E is suitably supported in the boiler—for instance, by a collar *g*, secured to the pipe and resting upon the boiler-flues, as shown.

The heating-pipe B is preferably seamless and continuous from its upper end to the rear end of its horizontal extension B', so that the pipe is free from joints throughout its length.

In the lower portion of the boiler below the furnace a horizontal circulating-pipe H is arranged, which opens into the boiler and extends through the rear head of the same. This pipe is connected with the fitting D' between the supply-pipe D and the extension B' and is provided with a suitable check-valve *h*, constructed to prevent the incoming feed-water from passing directly into the boiler through the lower circulating-pipe H. A hand-valve *i* is preferably arranged between the extension B' and the fitting D' to permit the heating-pipe B to be shut off from the

feed-pipe D and the lower circulating-pipe H for making repairs.

In order to prevent chilling of the boiler and the consequent racking and straining of the same, the incoming cold water should be thoroughly commingled with the hot water returning from the lower to the upper portions of the boiler through the lower circulating-pipe H. For this purpose a rotary mixer J is arranged in the fitting D' at its junction with said lower circulating-pipe, as shown in Fig. 4. In the construction shown in the drawings this mixer consists of a wheel having oblique blades trending in the proper direction to propel the water forwardly and upwardly through the upper circulating-pipe B. The mixing-wheel is mounted on a horizontal shaft j^1 , journaled axially in the fitting D' and preferably driven by a turbine or screw-like water-wheel j^2 , mounted on the shaft and rotated by the current or pressure of the incoming water. If desired, this turbine may be omitted and the mixing-wheel driven directly by the action of the current upon its oblique blades; but the turbine is preferably employed. In order to stimulate the circulation through the boiler, an injector-nozzle j^3 is preferably arranged in the fitting D' opposite the mouth of the lower circulating-pipe H and in rear of the mixing-wheel, and the turbine j^2 is located in this nozzle, as shown. By the use of this mixer a practically uniform temperature of the water is maintained in all portions of the boiler, guarding against excessive straining of the same.

To feed water into the boiler, the hand-valves d i are opened. The incoming water enters the extension B' and ascends through the heating and circulating pipe B, whence it passes through the upper circulating-pipe E into the boiler. As the heating-pipe extends through the combustion-chamber it becomes intensely heated and imparts a comparatively high temperature to the incoming feed-water as the same ascends through it. When the valve d is closed, the water circulates from the lower portion of the boiler upwardly through the lower circulating-pipe H, the heating-pipe B B', and upper circulating-pipe E, back into the boiler.

As the main or upright portion of the heating-pipe is tightly secured to the crown-sheet of the combustion-chamber and loosely arranged in the thimble C in the rear head of the boiler it tends to lengthen in a downward direction in expanding. The thimble C is sufficiently larger in diameter than the horizontal extension of the heating-pipe to permit the same to play laterally in the thimble as the pipe expands and contracts. By this construction the boiler-sheets are not liable to be buckled by the expansion of the heating-pipe, and the joints of the latter are relieved from strain, preventing leakage of water into the combustion-chamber and guarding against injury to the fireman by scalding. This danger is further lessened by

making the heating-pipe and its extension continuous and seamless from end to end.

The upper circulating-pipe H and its clamping-post F are introduced into the boiler through a manhole having a cover K. Upon removing this cover said circulating-pipe may be detached from the upper end of the heating-pipe B and removed for repairing or renewing the same when necessary.

I claim as my invention—

1. The combination of a boiler having a combustion-chamber provided in its rear wall with an opening, a substantially upright water-heating pipe arranged in the combustion-chamber and extending through the top thereof into the water-space of the boiler, said pipe being tightly secured to the top of said chamber and provided at its lower end with a horizontal extension passing loosely through the opening in the rear wall of the chamber and capable of moving vertically therein as said upright pipe expands and contracts lengthwise, and a water-supply pipe connected with said extension, substantially as set forth.

2. The combination of a boiler and its combustion-chamber, a heating-pipe arranged in the combustion-chamber and having its upper end expanded into an opening in the top of said chamber, a circulating-pipe opening at one end into the upper portion of the boiler and having its opposite end detachably fitted to the expanded end of said heating-pipe, and a clamping-post bearing at one end against said circulating-pipe, and at its opposite end against the boiler-shell, substantially as set forth.

3. The combination of a boiler having a circulating-pipe, a feed-water-supply pipe connected with said circulating-pipe, and a mixing-wheel arranged at the junction of said supply and circulating pipes and having oblique blades, substantially as set forth.

4. The combination of a boiler having a circulating-pipe, a feed-water-supply pipe connected with said circulating-pipe, a mixing-wheel arranged at the junction of said supply and circulating pipes, and a turbine or water wheel arranged in said supply-pipe and connected with said mixing-wheel, whereby the turbine is driven by the water flowing through said pipe, substantially as set forth.

5. The combination of a boiler having a circulating-pipe, a feed-water-supply pipe connected with said circulating-pipe, a mixing-wheel arranged at the junction of said supply and circulating pipes, an injector-nozzle located in said supply-pipe in rear of said mixing-wheel, and a turbine for driving said mixing-wheel located in said nozzle, substantially as set forth.

Witness my hand this 20th day of November, 1902.

ROBERT B. HODGE.

Witnesses:

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EMMA M. GRAHAM.