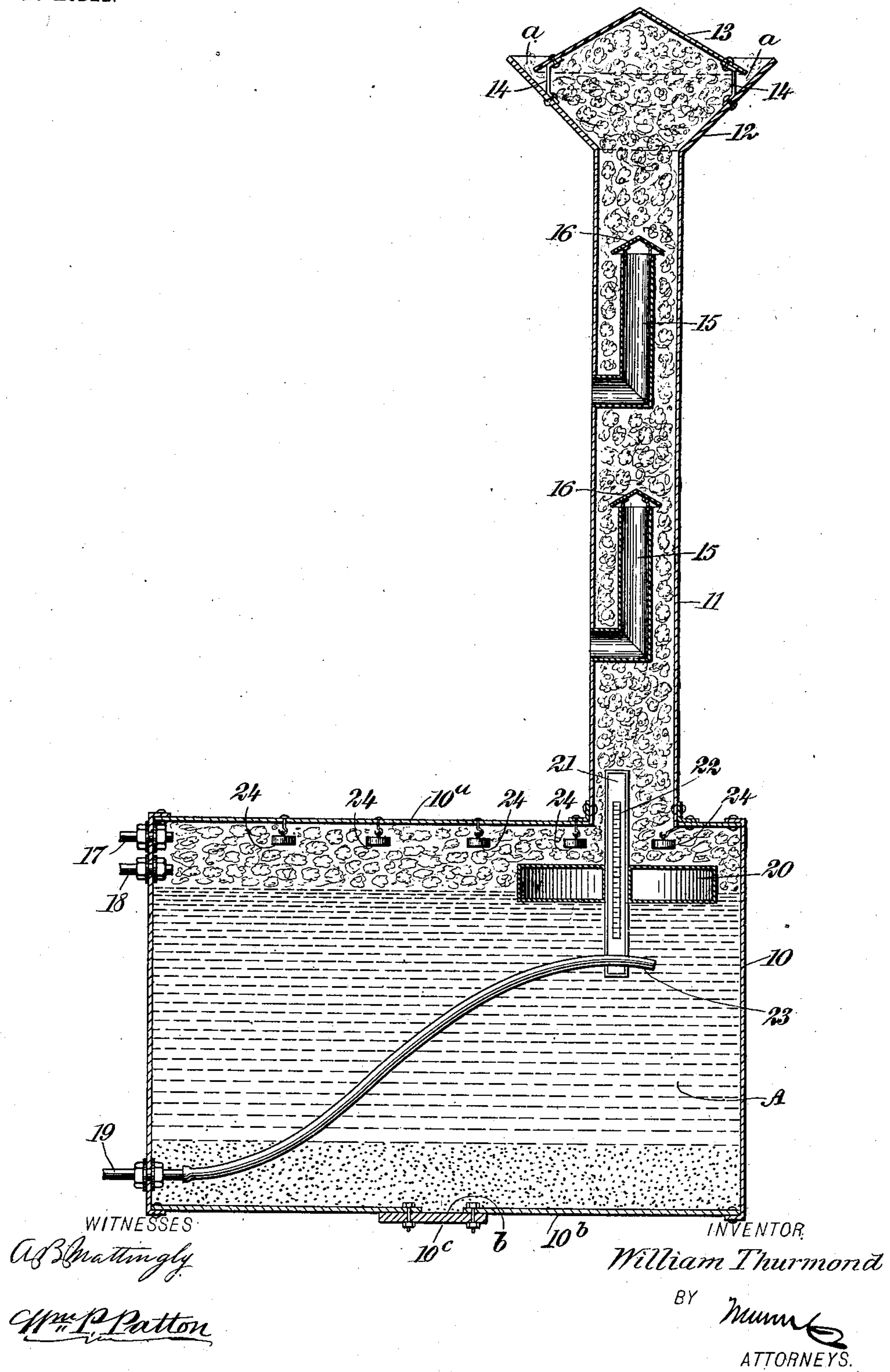


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PATENTED DEC. 22, 1903.

W. THURMOND.  
FEED WATER HEATER.  
APPLICATION FILED FEB. 14, 1903.

NO MODEL.





# UNITED STATES PATENT OFFICE.

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## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 747,509, dated December 22, 1903.

Application filed February 14, 1903. Serial No. 143,297. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM THURMOND, a citizen of the United States, and a resident of Denver, in the county of Denver and State of Colorado, have invented a new and Improved Feed-Water Heater and Purifier, of which the following is a full, clear, and exact description.

This invention relates to a class of feed-water heaters for steam-boilers, in which exhaust-steam from a motor driven by steam from the boiler is employed for heating water previous to its introduction into the boiler.

It is well known that steam which has done duty in an engine when exhausted therefrom carries with it oily matter that is vaporized, this impurity being introduced as a lubricant for working parts in the cylinder and valve-chest of the engine.

The objects of this invention are to provide a novel simple apparatus which will afford effective means for the utilizing of exhaust-steam, to heat the water-supply for a steam-boiler, separate oily matter therefrom, and also purify the feed-water by elimination of acids or alkalies that may pervade the water when it enters the improved heater and purifier.

The invention consists in the novel construction of parts and their combination, as is hereinafter described, and defined in the appended claims.

Reference is to be had to the accompanying drawing and the characters of reference thereon, the single figure representing a sectional side elevation of the improved water heating and purifying apparatus.

A receptacle or tank 10 is provided of suitable capacity and any preferred form. As shown, the tank 10 is quadrangular, having its top and lower walls parallel with each other and separated sufficiently to afford necessary depth to the liquid it contains in service. Upon the top wall 10<sup>a</sup> of the receptacle 10 a condensing-stack 11 is erected over an aperture therein, said stack having suitable height and diameter for efficient service.

On the upper end of the stack 11 a flaring enlargement or wall 12 is formed, surmounted by a coniform hood 13 of less diameter than the flaring top piece of the stack, and the

hood is supported concentrically in said top by a plurality of upright posts 14, erected upon the flaring wall 12, thus affording an annular throat  $\alpha$  between the wall 12 and hood 13.

At suitable intervals the side wall of the stack 11 is intersected by a plurality of cold-air-inlet pipes 15, preferably in the form shown, each consisting of a tubular piece bent at a right angle near its lower end, affording a short horizontal member secured in an orifice formed in the stack-wall, the main portions of the inlet-pipes being upwardly projected centrally within the stack, as represented in the drawing.

On the upper end of each inlet-pipe 15 a hood 16 is preferably mounted and spaced therefrom a proper degree, said hoods serving to diffuse the air inducted within the stack by the pipes 15.

Near the top wall 10<sup>a</sup> of the receptacle 10 one end of an exhaust-steam pipe 17 is secured in a side wall of the receptacle, this pipe (shown broken away) in complete condition being extended to a steam-actuated motor (not shown) to serve as an exhaust-steam conduit from the motor to the receptacle 10.

Below and near the exhaust-steam pipe 17 a water-supply pipe 18 is introduced through the side of the receptacle 10, this pipe being extended to a source of water under pressure sufficient to insure a proper delivery of water into the receptacle 10, and it is to be understood that the water-supply is regulated by means of a valve, (not shown,) so that a proper quantity may be introduced into the receptacle or tank 10 or be prevented from flowing into it if this is desired.

A water-feeding pipe 19, that in complete form extends from a suitable water-supply, communicates with a side wall of the tank 10 near the bottom wall 10<sup>b</sup> thereof.

A float 20, of any preferred material or form, is provided and adapted by its buoyancy to be carried upon the water A, that is fed into the receptacle or tank 10 from the supply-pipe 18, and upon the float 20 a vertically-adjustable bracket-plate 21 is mounted, passing through a vertical guide-tube therein and having a graduated scale 22 thereon.



The scale-plate 22 is held at a desired point of vertical adjustment by its frictional engagement within the guide-tube or by any other suitable means. Upon the lower end 5 of the bracket-plate 21 one end portion of a hose-section 23 is secured, so that the open end of the hose will be projected therefrom for a free flow of water therein.

The hose-section 23 is extended from the 10 bracket-plate 21 to engage with the end of the water-feed pipe 19 within the tank 10, and in effect is a flexible extension of the same.

A suitable number of box-like holders 24 are hung from the inner surface of the top 15 wall 10<sup>a</sup>, thus disposing them at suitable distances apart on said wall within the tank 10. The holders 24 may contain concentrated lye or other chemical adapted to neutralize oily matter or acids that may pervade the water 20 contained within and that enters the tank 10.

In the bottom wall 10<sup>b</sup> of the tank 10 an opening *b* is formed, that is normally sealed by a cover 10<sup>c</sup>, secured in place by bolts or other means, which permit a displacement of 25 the cover for discharge of impurities from the tank when this is necessary.

In service the tank 10 is supplied with water through the pipe 18, being sprayed therefrom into the upper portion of the tank, this 30 spray of water being mingled with the exhaust-steam that enters the tank 10 through the pipe 17 above and near to the water-supply pipe 18.

The intimate contact of the water and exhaust-steam heats the water highly, and a 35 considerable amount of the steam is condensed thereby. The influx of exhaust-steam that exceeds the amount condensed by the water heats the chemical—such, for example, 40 as concentrated lye contained in the boxes 24—and a small amount of such material continuously drips from the boxes that are arranged to permit such a gradual escape of the lye when liquefied by the heat of the steam.

The chemical action of the contents of the 45 boxes 24, that enter the water held in the tank 10, effects a precipitation of the impurities, which by their gravity fall down to the bottom of the tank to be removed when this becomes necessary. The volume of water usually 50 held in the tank 10 maintains the float 20 upon its surface near the top wall 10<sup>a</sup> of the tank, and, as shown, the open end of the hose-section 23 is thus supported on the 55 bracket-plate 21 at a predetermined distance below the level of the water for conveyance of the purified water through the hose-section and feed-pipe 19 to the steam-boiler for its supply.

It is found in practice that the water in 60 the tank becomes heated to such a degree that it is advantageous for its transfer from the tank to the steam-boiler that the inlet end of the hose-section 23 be supported a 65 short distance below the level of the water, and for such a purpose the free end of the hose is supported by the adjustable bracket-

plate 21 on the float 20, the depth of immersion of said end of the hose-section being indicated by the scale 22 on the bracket-plate. 70

It will be seen that the excess of exhaust-steam that enters the tank 10 will be drawn into the base of the stack 11 and pass upward therein, the contact of the steam with 75 the cooling-surfaces of the stack and air inlet pipes 15, along with the air introduced within the stack by said pipes, serving to condense the steam into water that drips from the bonnet 13 and runs down the inner surface of the stack as purified water into 80 the tank 10.

The apparatus as explained is simple, practical, and adapted for continuous operation, and serves effectively as an exhaust-steam 85 condenser, a feed-water heater, and a feed-water purifier.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a water-holding 90 tank, a water-supply pipe, an exhaust-steam pipe, said pipes tapping the tank near each other, and a boiler-feeding water-pipe extending from the tank near its lower wall, of a pliable hose-section forming an inward extension of the feed-water pipe, a float, and a 95 graduated scale-plate slidably held on the float by suitable means, the lower end of said scale-plate supporting the inner end of the pliable hose above the bottom of the tank 100 to receive purified water.

2. The combination with a feed-water-heating tank, of boxes hung from the inner side of the top wall of the tank, to contain purifying material that is heated by steam that 105 enters the tank.

3. The combination with a feed-water-heating tank, means for introducing steam into said tank, and means for introducing water therein adjacent to the steam-inlet, of an upright hollow stack wherein excess of exhaust-steam is condensed, said stack having a flaring 110 top, a hood supported on the stack concentric with the flaring top, and a cold-air-inlet pipe tapping the side of the stack to aid condensation of exhaust-steam passing upward therein. 115

4. The combination with a water-tank, a water-inlet pipe, and an exhaust-steam-inlet pipe near the water-supply pipe, of a hollow 120 stack on the tank having an air-inlet pipe tapping its side and projecting upward therein.

5. The combination with a feed-water-heating tank, a cold-water-inlet pipe, and an exhaust-steam-inlet pipe, of a boiler-feeding water-pipe, tapping a side of the tank near its 125 bottom, a flexible gum-hose connection secured by one end upon the inserted end of the boiler-feed pipe, a graduated scale-plate, adjustable through the float, and connected 130 with the remaining end of the hose-section, to elevate it for the reception of purified feed-water



6. In an apparatus of the character described, the tank, the feed-water pipe extended in pliable form therein from one side of the tank near its bottom, the hermetically-  
5 sealed float, having a guide - tube there-through, a bracket-plate having a graduated scale thereon, passing through and held adjustably by suitable means in the guide-tube, the lower end of the bracket-plate having en-  
10 gagement with the extended end of the feed-

water pipe, to elevate it by means of the float, a distance determined by the adjustment of the bracket-plate on said float.

In testimony whereof I have signed my name to this specification in the presence of 15 two subscribing witnesses.

WILLIAM THURMOND.

Witnesses:

WILSON D. REID,  
ALBERT S. BROOKS.