No. 719,749. PATENTED FEB. 3, 1903.

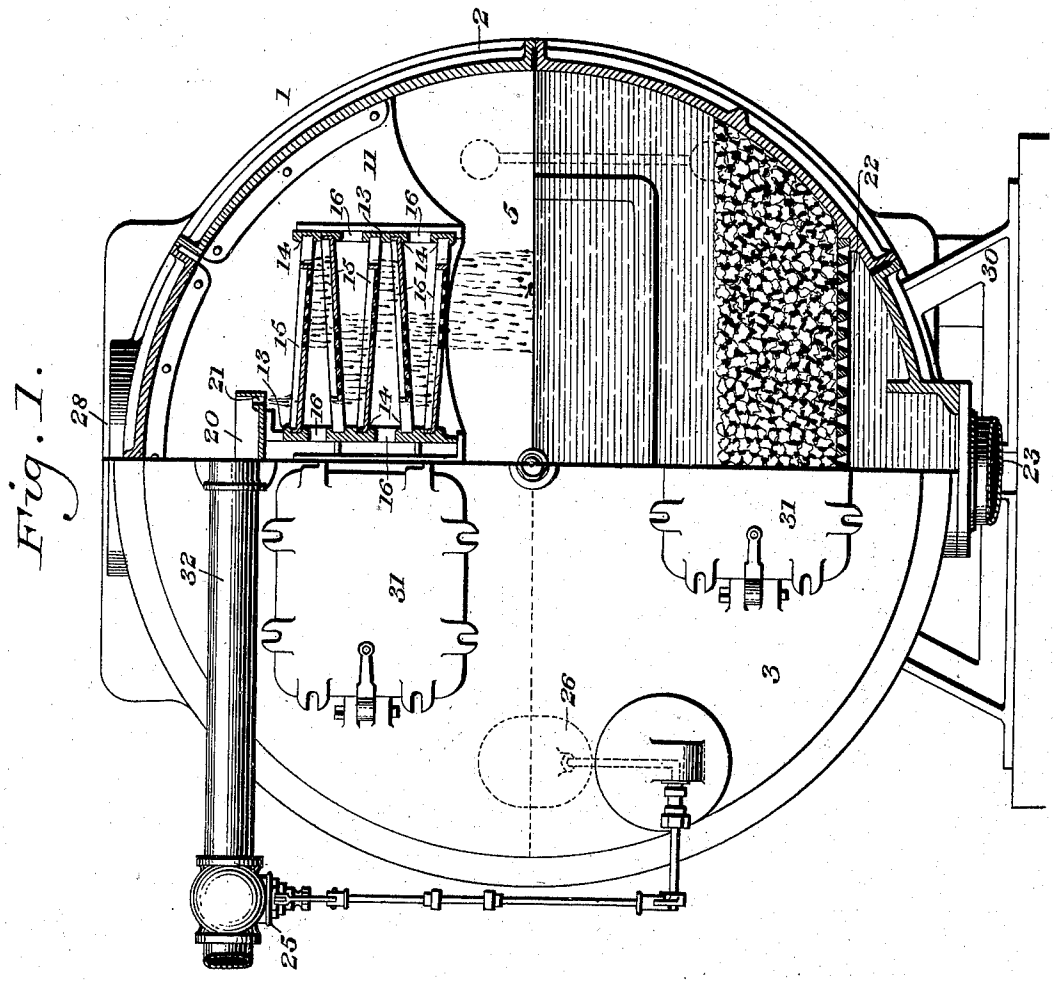
D. COCHRANE.

DEVICE FOR HEATING AND PURIFYING WATER.

APPLICATION FILED JUNE 5, 1900. RENEWED DEC. 27, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 5.

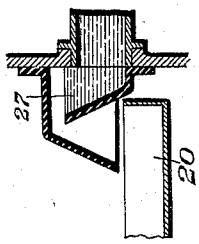


Fig. 2.

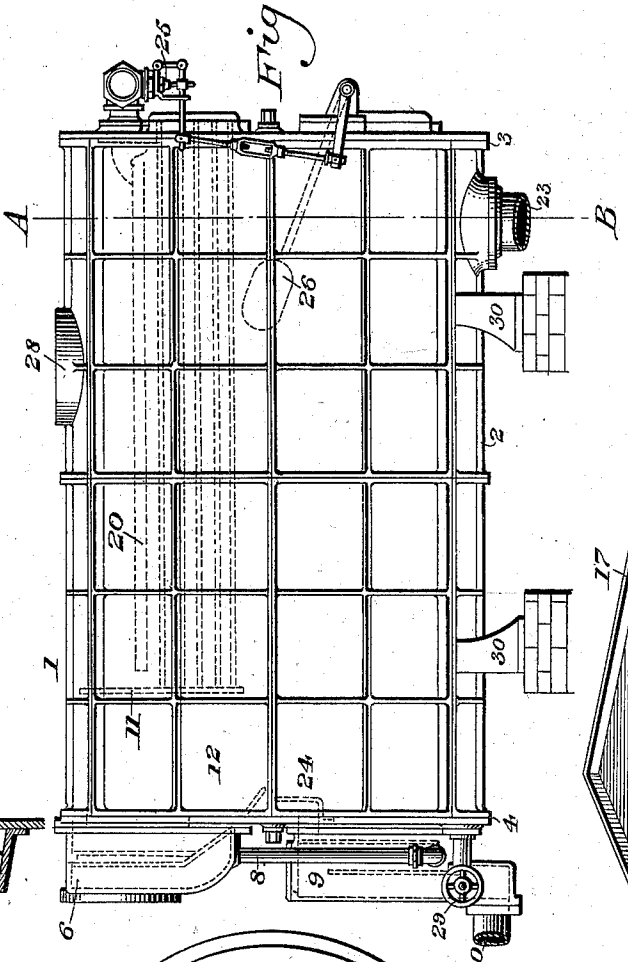


Fig. 6.

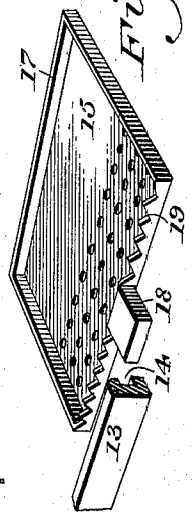


Fig. 4.

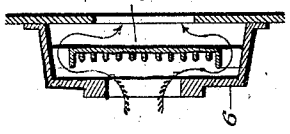
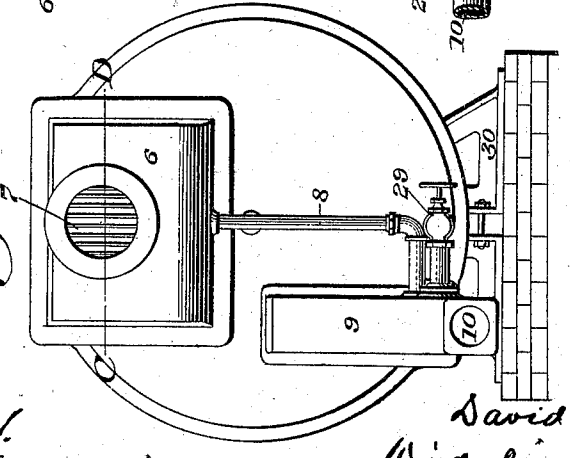


Fig. 3.



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UNITED STATES PATENT OFFICE.

DAVID COCHRANE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO ' FIRM OF HARRISON SAFETY BOILER WORKS, OF PHILADELPHIA, PE SYLVANIA.

DEVICE FOR HEATING AND PURIFYING WATER.

SPECIFICATION forming part of Letters Patent No. 719,749, dated February 3, 1903.

Application filed June 5, 1900. Renewed December 27, 1902. Serial No. 136,803. (No model.)

To all whom it may concern:

Be it known that I, DAVID COCHRANE, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Devices for Heating and Purifying Water, which improvement is fully set forth in the following specification and accompanying drawings.

My invention relates to improvements in feed-water heaters and purifiers; and it consists in providing means for so introducing water and steam thereinto that the former will absorb all the heat it can carry, but rendering it impossible should the supply of steam be excessive to pick up the water and carry it along with it.

It further consists of novel details of construction, all as will be hereinafter fully described, and particularly pointed out in the claims.

Figure 1 represents a partial end elevation and partial sectional view on line A B, Fig. 2, of a feed-water heater and purifier embodying my invention. Fig. 2 represents a side elevation thereof, showing a portion of the interior construction in dotted lines. Fig. 3 represents an end elevation at which exhaust-steam enters. Fig. 4 represents a section on line C D, Fig. 3. Fig. 5 represents a sectional view of a portion of the distributing-trough and of the water seal at the discharge end of the pipe for feeding water to said distributing-trough. Fig. 6 represents a perspective view of a tray employed.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates a feed-water heater and purifier formed of a shell 2, made either in section or in one piece, as most convenient, and preferably of cast-iron and having heads 3 and 4, forming the chamber 5, in which the water is heated and purified, provision being made on said heads for attaching different parts, as will be hereinafter described.

Secured to the head 4 is an oil-separator 6 of any suitable construction. In the present instance I have shown one similar to that for which Letters Patent have been grante me on February 4, 1890, No. 420,718, in w a baffle-plate 7 stops all oil and water, v allowing the steam to enter the heater purified condition through an opening ir head 4.

8 designates a drain-pipe adapted to c the oil and water stopped by the baffle-p 7 from the separator to a water seal 9, w is U-shaped and forms a free passage fo surplus or waste from the separator or he while preventing the escape of steam, a 10 serving as an outlet to any desired p

11 designates a baffle-plate extending ac the upper portion of the heater and forr a chamber in which are supported the t 15 and an expansion-chamber 12 betwee head 4 and said plate 11, thereby lesse the pulsation of the exhaust-steam befo passes under the plate 11 to the space w the heating is accomplished.

13 designates guide-plates extending len wise of the heater from the baffle-plate 1 the head 3, leaving passages around the sa said guide-plates having grooves 14 for porting the trays 15, arranged one above other in such a manner that the adja trays slant in opposite directions, whe the lower portion of one tray discharges the higher portion of the next, said gu plates being provided with openings 16 tween each pair of trays for permitting condensation that takes place as the w passes from tray to tray to draw more st from the supply, the said trays being for of a plate narrower than the space betw the guide-plates and having a rim 17 a lug 18, which rests in one of the groove the guide-plates, the rim on the edge wl the lug is situated being saw-toothed, a 19, and a portion of the bottom of the t being perforated in order to break up the ter in its flow to more readily absorb heat, space between the lower edge of each and the guide-plates permitting a free sage of the water should the perforation with deposit.

20 designates a water-distributing tro extending from the head 3 to the baffle p

11, bolted to said guides and provided with slots 21, through which the water drops on top trays.

22 designates a false bottom, made in sections, resting on sides of shell 2 and is provided with perforations, excepting over the outlet 23 of the heater, where it is solid, said bottom being adapted to support any suitable filtering material, such as crushed coke, &c.

Secured to the head 4 is a skimming-trough 24, which is in communication with the water seal 9 and prevents the heater from being flooded, as the water has a free flow to waste when it rises to the edge of the skimmer.

25 designates a balanced regulating-valve operated by a float 26, which rises and falls with the water in the heater and by suitable connections opens and closes the valve 25, which controls the cold-water supply to the heater, conducted through the pipe 32 from any suitable source of supply.

27 designates a water seal covering opening where cold water enters heater for keeping the pipe between the regulating-valve and the heater filled, and thus preventing steam from entering and causing a cracking noise, said seal 27 discharging into the trough 20.

28 is an outlet for surplus steam, and 29 is a blow-off connecting bottom of the heater with the water and thence to waste for emptying the heater.

30 designates chairs for supporting the heater, and 31 designates doors suitably supported which can be opened for clearing or refilling the heater and withdrawing trays.

The operation is as follows: The exhaust-steam in the separator is freed from any entrained oil or water, passes around baffle 7 through the opening in the head 4 into the expansion-chamber 12. Thence it passes under the baffle 11 and fills the space where the trays 15 are suspended and passes up between the shell and the outside guides and between the two middle guides, (only one set of trays and guides being seen,) the surplus steam leaving the heater at the outlet 28, near the water-inlet end. The quantity of cold water necessary to meet the demand of hot water is passed into the heater through the pipe 32 and controlled by the regulating-valve 25, which is operated by the float 26. The water passes through the water seal 27 into the distributing-trough 20 and drops through the slots 21 upon the upper trays 15, flows across the same and drops to the next tray below, and so on until it reaches the bottom ones, where it passes into the lower portion of the heater. From the time the water reaches the top tray 15 until it leaves the bottom ones it is continually broken up into fine particles by the perforations and saw-toothed edges, thus enabling it to absorb from the steam which is drawn through the openings 16 in the guide-plates by the condensation that is going on all the heat that it is capable of carrying and at the same time liberating the gases and air that can be driven off at the temperature, and thus bringing into suspension in the water any impurities that may have been solved by the liberated gases, it being noted that the steam will be drawn through the openings from the chamber to the spaces between the trays to heat the water, and the balance of the steam will pass upward between the guides or the shell and the outside guides to the outlet 28, thus preventing the steam from picking up the water and carrying it along. When the water drops into the lower part of the heater, it sinks slowly through the filtering material and perforated bottom 22 into the chamber beneath and is drawn off through the opening 23 as desired, it being seen that while the water is passing through the lower part of the heater impurities and suspension in the water are deposited by filtration or by settling in the lower chamber, there being no currents to disturb the sediment except the slight current caused by the water leaving the heater. Floating impurities in the water may be drawn off by admitting more water than is taken from the heater, thus raising the water-level until it overflows into the skimmer 24 and thence through the water seal 9 to the waste-pipe 10. By opening the blow-off 29 occasionally most of the sediment that may settle in the lower chamber can be blown out into the waste-pipe. The float 26 rises and falls with the water-level in the heater, and thus controls the supply of water conducted to the trough 20. The trays 15 may be formed in a single piece from the baffle-plate 11 to the head 3, but it is preferable to make the same in sections for ease of removing. Attention is also called to the fact that said trays run lengthwise of the heater and the flow of water is across, which insures that the water will be properly heated.

While I have shown a preferable form of constructing a feed-water heater and purifier, I do not desire to be limited in every instance to the exact construction I have herein shown and described, but desire to make such changes as may come within the scope of my invention.

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

1. In a feed-water heater and purifier, a casing, a chamber therein, a series of trays entirely inclosed in said chamber, means whereby water passes from one to the other, means for causing the steam to pass from under to above the trays in opposite direction to the water, and means whereby the steam will be drawn into the chamber in between the trays by condensation.

2. In a feed-water heater and purifier, a casing, a chamber therein, a series of trays in said chamber, adjacent trays slanting in opposite directions, means for causing the steam to pass from under to above the trays in opposite direction to the water, and open-

ings between said trays on alternate sides, whereby steam is drawn from the chamber between adjacent trays by condensation.

3. In a feed-water heater and purifier, a casing, a chamber therein, a series of trays in said chamber, passages on both sides of said trays for causing the steam to pass from under to above the trays in opposite direction to the water, and an opening between each adjacent tray on alternate sides forming communications between the passages and the spaces between said trays.

4. In a feed-water heater and purifier, a casing, a chamber therein, a series of trays in said chamber, and openings in the walls of said chamber between adjacent trays on one side forming communications between the interior of casing and the space between the trays, the opposite side between each adjacent tray being closed.

5. In a feed-water heater and purifier, means for introducing steam thereinto, a baffle-plate extending across the upper portion of the interior of the heater, guide-plates having openings therein, one or more series of trays supported on said guide-plates, means for introducing water to the upper tray of each series, and means for permitting the water to fall from one tray to the next, said openings in said guide-plates being so arranged as to permit the steam to be drawn in between the adjacent trays.

6. In a feed-water heater and purifier, means for conducting steam thereinto, guide-plates suitably supported in said heater, trays carried by said guide-plates, so arranged as to conduct water from one to the other, openings in said guide-plates between adjacent trays, whereby steam is drawn therethrough by condensation during the passage of the water.

7. In a feed-water heater and purifier, a distributing-trough for water, a series of trays so arranged that the upper one receives the water from said trough and conducts the said water to the next adjacent tray and so on, guide-plates supporting said trays, openings in said guide-plates so arranged that steam can be drawn between adjacent trays, means for conducting steam into said heater and purifier, and means for filtering the water after being heated.

8. In a feed-water heater and purifier, a casing, a steam-chamber formed in the upper part of the same, and a series of trays suspended in said chamber and so arranged that the water passes from one tray to the other while absorbing the heat of the steam, the steam passing from under to above the trays in an opposite direction to the water.

9. In a feed-water heater, a casing, a baffle-plate in the upper part of the casing forming a steam-chamber in the same, and a series of water-trays suspended in said steam-chamber, the steam passing from under to above the trays in an opposite direction to the water.

10. In a feed-water heater, a casing, a baffle-plate in the upper portion of the casing, dividing the same into a steam and tray chamber, and a series of water-trays suspended in said chamber.

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