(No Model.) 2 Sheets—Sheet 1.

W. T. SUGG.

APPARATUS FOR HEATING WATER AND OTHER LIQUIDS.

No. 383,921. Patented June 5, 1888.

Fig. 1.

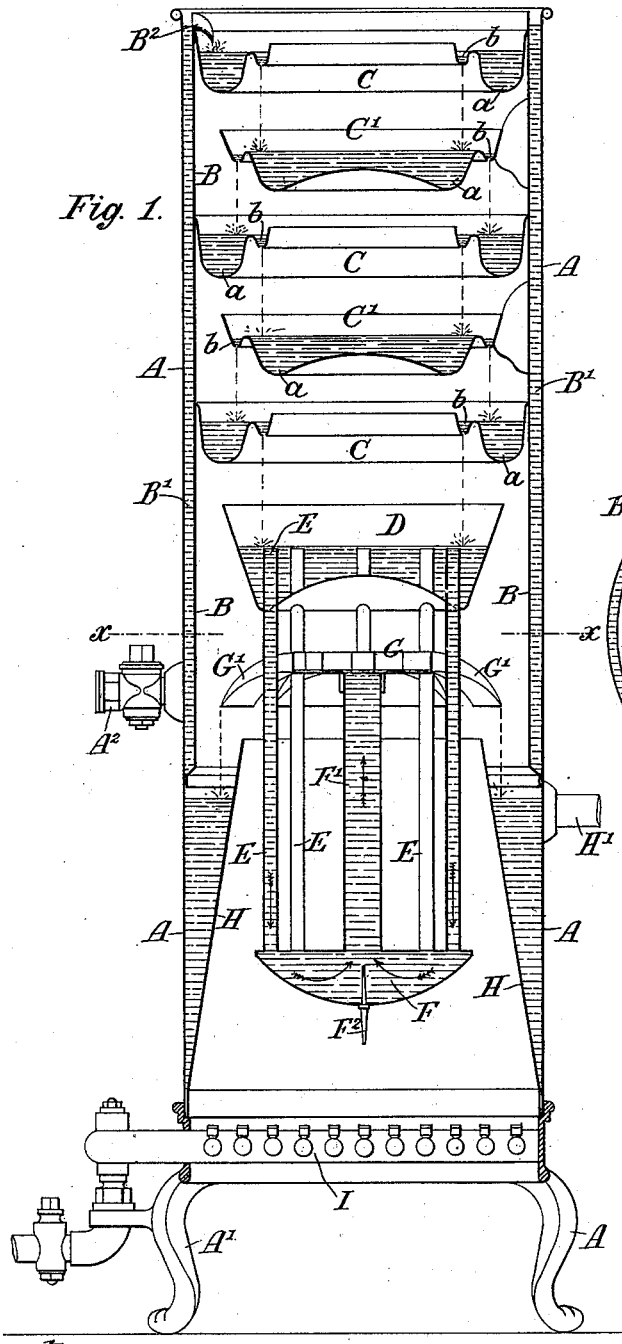
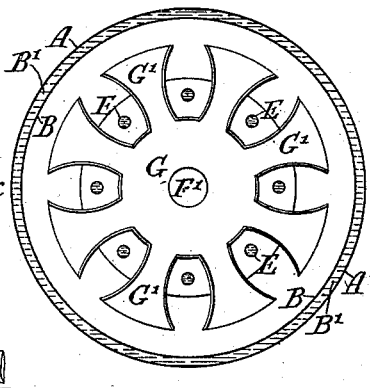


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

W. T. SUGG.

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Fig. 3.

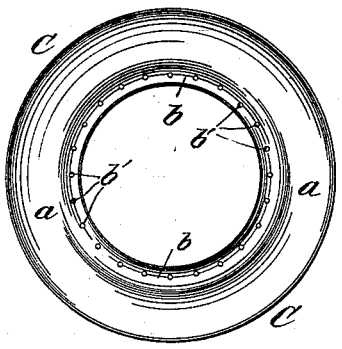
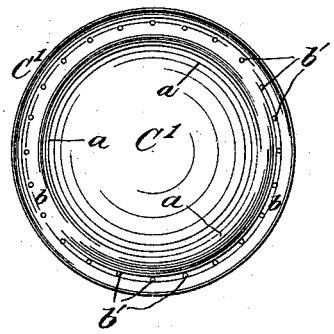


Fig. 4.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR HEATING WATER AND OTHER LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 383,921, dated June 5, 1888.

Application filed February 21, 1887. Serial No. 228,279. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM THOMAS SUGG, of Vincent Street, in the city of Westminster, England, engineer, have invented a new and useful Improvement in Apparatus for Heating Water and other Liquids, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to that class of apparatus in which the water or other liquid is heated as it runs through the apparatus.

One object of the invention is to obtain in such apparatus a most active circulation of the liquid by taking advantage to the fullest extent practicable of the continual rising to the surface of a body of water of those of its particles which have become most highly heated by exposure to the heated bottom or surface of the vessel in which it is contained. This I accomplish by such a construction of the apparatus that during the whole heating operation and in every part of the apparatus the liquid shall always be drawn from the surface or the hottest portion in that particular part of the apparatus.

Another object is to provide for taking the apparatus apart for removal of deposits or otherwise cleaning, or for repair.

My invention, having the above objects in view, consists in the several combinations of parts hereinafter described and claimed.

In the accompanying drawings of the apparatus, Figure 1 represents a central vertical sectional elevation. Fig. 2 represents a horizontal section of the same in the line *x x* of Fig. 1. Figs. 3 and 4 are plans of the two forms of water-trays which are used in the apparatus.

Similar letters of reference indicate corresponding parts in the several figures.

A is an upright cylinder or casing, of copper or other metal, which is provided at the bottom with feet A′.

B is a second cylinder arranged within the cylinder A, and having its bottom secured thereto in a water-tight manner to form therewith a chamber, B′, of annular horizontal section, to the lower part of which cold water is supplied by a pipe, A^2, which is conveniently connected to the cylinder A. At the top of the cylinder B is formed an inwardly-projecting spout or lip, B^2, by which water rising in the chamber B′ overflows into the top tray of a series of alternating trays, C and C′, which are arranged one above another within the cylinder B, to which they are secured in any suitable manner.

The trays C C′ are of different diameter, as shown in Fig. 1, the larger ones, C, fitting closely within the cylinder B, and being annular, or having central openings, and the smaller ones having no central openings, but having annular spaces left between them and the said cylinder. By the alternate arrangement of these trays a circuitous passage is formed for the ascending hot gas from the burner or heating device. The said trays are of the sectional form shown in Fig. 1 of the drawings, or of substantially similar section—that is to say, each contains a comparatively deep reservoir, *a*, and a shallow annular trough, *b*, into which water will overflow from said reservoir, the trough *b* of the trays C being encircled by its reservoir and the trough *b* of those C′ encircling its reservoir. The bottom of the said trough *b* is perforated with a number of fine holes, *b*′, (see Figs. 3 and 4,) from which the water issues and descends in fine streams to the reservoir *a* below and from the trough of the lowest tray C to a pan or circular vessel, D, below, so that the ascending hot gases of combustion become practically absorbed by the water or condensed before they can escape into the apartment, and thus any disagreeable smell due to the combustion of the gas is avoided.

The pan or vessel D, which is of external diameter less than the internal diameter of the cylinder B, has projecting upward through its bottom a series of pipes, E, the lower ends of which connect with the top or crown-sheet of a boiler, F, from the center of which crown-sheet there projects upward an ascension-tube, F′. This boiler F may be of any suitable form, but preferably with an externally-convex bottom, and the tube F′ will always be placed at the highest part thereof. The tube F′ has connected with its upper end a shallow tray or ledge, G, which is provided with a number of spouts, G′, (see Fig. 2) through which the water may overflow from said tray or ledge into an open annular chamber formed between the main cylinder A and an internal conical lining, H, which is secured at its lower end to the said cylinder with a water-tight joint. The boiler F is of such diameter that the gases of combustion from the burner or heating device below may circulate freely between it and the conical lining.

L is a gas-burner, which may be of any suitable construction, arranged at the base of the cylinder A.

Projecting both inwardly and outwardly of the bottom of the boiler F is a double-pointed metal peg, F^2, the object of which is twofold. The outer portion forms a dripping-point for the water of condensation, which is produced by the products of combustion (when the gas is first lighted) coming into contact with the cold surface of the apparatus and the streams of cool water. The water collects on the curved under surface of the boiler and runs down to the point F^2, from which it drips clear of the gas-burners. The inner point serves to break up the opposing currents of hot water in the interior of the boiler and direct them up the tube F'.

The action of the apparatus is as follows: Water flows from the supply A^2 into the chamber B', and from this chamber overflows by the spout B^2 into the top tray C. When the reservoir *a* of this tray is full, the water overflows into the trough *b*, and from this trough runs through the perforations into the tray C'. From this tray it overflows in like manner, and runs into the second tray C, thence into the second C', and finally into the third C. The number of trays may vary according to the size of the apparatus. As the water runs from these trays it takes up the heat of the ascending products of combustion, thereby not only becoming partially heated, but condensing the products, thus preventing the disagreeable smell usually arising from this class of apparatuses caused by the escape of noxious fumes into the room, as before referred to. The water runs from the lowermost tray C into the vessel D, from which it overflows by the pipes E and runs into the boiler proper, F. There the water comes for the first time into contact with a surface directly heated by the flame, and the heated molecules of the water immediately rise up the pipe F' into the tray G and run into the chamber between the casing A and the lining H. The heated molecules in this chamber, which is also in direct contact with the flame, also rise to the top, and, meeting those from the tray G, run off by the discharge-pipe H'.

The temperature of the water discharged will depend upon the speed at which it runs through the apparatus. For example, in a full-size apparatus having its cylinder A forty-two inches high and fourteen inches diameter, one hundred and twenty gallons per hour may be heated to 105° Fahrenheit in fifteen minutes, whereas it will take one hour to heat thirty gallons to boiling-point.

The water and gas supply pipes will be provided with suitable cocks, and, if desired, the water and gas cocks may be connected together, so that they shall always be turned on and off at the same time.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus for heating water or other liquid, a tray containing both a reservoir and a perforated overflow-trough approximately concentric with each other, substantially as herein described.

2. In an apparatus for heating water or other liquid, the combination, with a cylinder or casing and a burner or heating device at the base thereof, of a series of trays arranged one above another and each containing a reservoir and a perforated overflow-trough, the said reservoirs and overflow-troughs being relatively arranged with the reservoirs of one tray directly under the perforated overflow-trough of that above it, substantially as and for the purpose herein set forth.

3. In an apparatus for heating water, the combination, with a cylinder or casing and a burner or heating device at the base thereof, of a series of alternating larger and smaller trays, C and C', the larger tray, C, fitting the cylinder or casing and having a central opening, and the smaller tray, C', having no opening, and each containing a reservoir, *a*, and a perforated overflow-trough, *b*, the trough *b* of each being directly over the reservoir *a* of the one below, substantially as herein described.

4. The combination, with a casing, A, and lining H, forming an open annular water-chamber and a burner or heating device at the bottom thereof, of a boiler, F, arranged above said burner, a tube, F', ascending from said boiler, and a tray or ledge, G, arranged on the top of said pipe and having overflow-spouts situated above said open annular water-chamber, substantially as herein described.

5. The combination, with the open annular water-chamber A H and a burner at or near the bottom thereof, of the boiler F, arranged above the burner, a water pan or vessel, D, above the boiler, communicating overflow-pipes E between the said vessel D and the boiler, an ascending pipe, F, connected with the boiler, and a tray or ledge, G, arranged at the top of said ascending pipe and provided with overflow-troughs over the said water-chamber, substantially as herein set forth.

6. The combination of a casing, A, having within its upper part a reservoir, B', with an overflow, B^2, and having in its lower part a water-chamber, A H, and a burner or heating device at the base of said casing, of the series of trays C C', comprising reservoirs *a a*, and perforated overflow-troughs *b b*, constructed and arranged as described, a pan, D, for receiving water from said trays, a boiler, F, and pipes E, connecting it with said pan, an ascending pipe, F, having its lower end in communication with the boiler, and having at its upper end a tray or ledge, G, with spouts G' arranged over the water-chamber A H, all substantially as herein set forth.

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