(No Model.) 2 Sheets—Sheet 1.

C. MITCHELL.

WATER HEATER.

No. 456,582. Patented July 28, 1891.

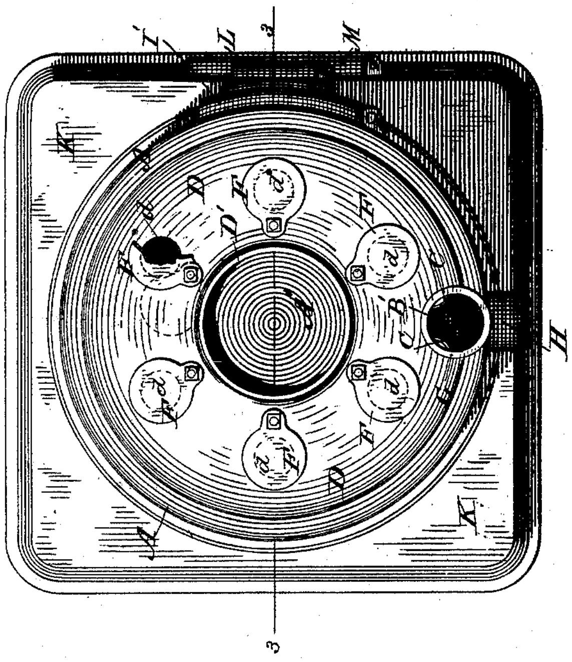

Fig 2.

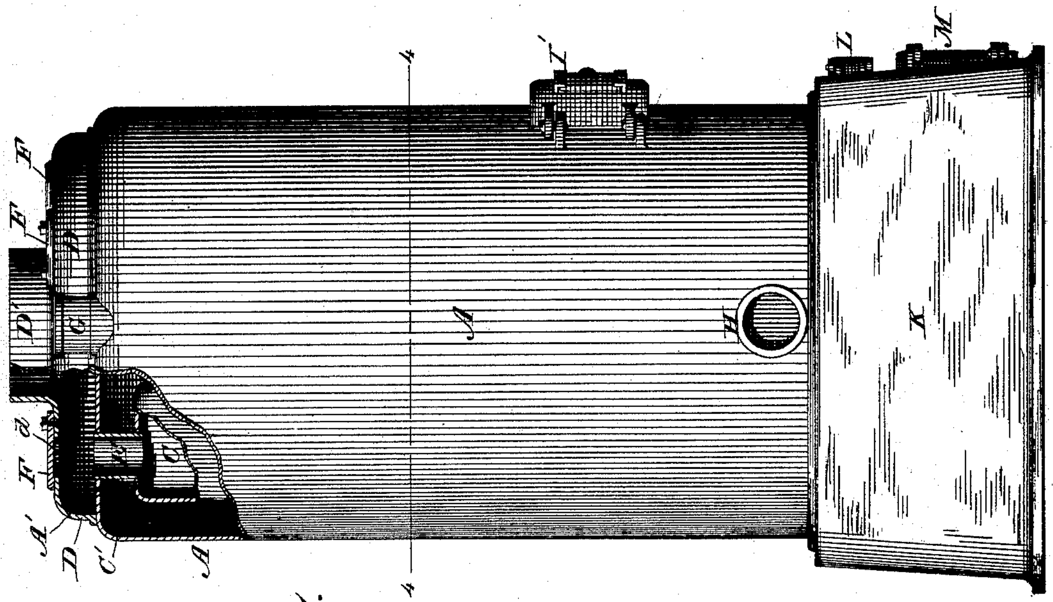

Fig 1.

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2 Sheets—Sheet 2.

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Fig 4.

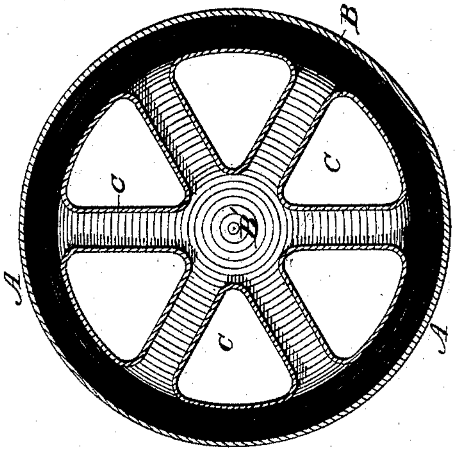
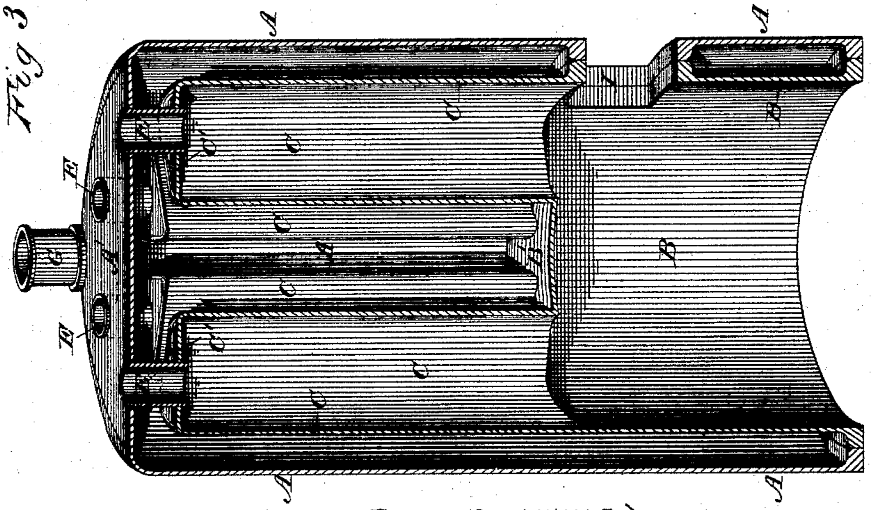


Fig 3.



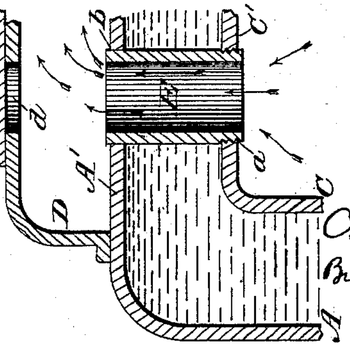


Fig 5.

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UNITED STATES PATENT OFFICE.

CHARLES MITCHELL, OF POUGHKEEPSIE, NEW YORK.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 456,582, dated July 28, 1891.

Application filed September 29, 1890. Serial No. 366,463. (No model.)

To all whom it may concern:

Be it known that I, CHARLES MITCHELL, a citizen of the United States, residing at Poughkeepsie, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Water-Heaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in water-heaters in which a series of vertical heat-flues lead from fire-box to smoke-flue and divide the boiler into vertical water-spaces; and the objects of my improvements are, first, to construct a heater which shall not only permit an uninterrupted vertical flow or water, but also a cross or diagonal flow from side to side, thus greatly facilitating the freedom of general circulation and the consequent rapidity of heating, which is so desirable; second, to afford as large an area of direct heating-surface as is consistent with producing the best heating results from a given grate-surface; third, to utilize the greatest possible amount of heat by contracting the flues at the top in order to prevent its too rapid escape to the chimney; fourth, to construct a heater which has as few joints as possible, the joints being located in parts of the heater least liable to leakage by expansion and contraction, and fifth, to provide for convenient cleaning of the flues without interrupting the work of the heater. I attain these objects by the device illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of my heater, with a part of the upper portion broken away to better show the relation of its several parts. Fig. 2 is a top plan view of the heater, showing movable covers to be used for cleaning flues. Fig. 3 is a vertical section of the heater without the smoke-bonnet, cut through the center at line 3 3 of Fig. 2, and showing the interior construction and the relation of the various parts. Fig. 4 is a cross-section of the heater, cut on line 4 4 of Fig. 1, and showing the relation of water-cells to fire-spaces or heating-surfaces; and Fig. 5 is a detached vertical section of one side of the upper portion of the heater, including the smoke-bonnet, and showing the position of the water and the movement of the heated gases, and also the manner of constructing the small tubular draft-flues.

Similar letters refer to similar parts throughout the several views.

In the drawings, A represents the outer shell of the heater, and A′ the upper surface of the same.

B represents the lower portion of the inner shell, and B′ the closed portion or crown-sheet of the same above the fire-box.

C represents that portion of the inner shell which forms the vertical heat-flues, and C′ the closed portion or secondary crown-sheet, as it were, of the flues, to check the too rapid escape of the heat to the chimney.

D represents a smoke-bonnet with a central outlet or flue to the chimney, represented by D′, and with openings *d* for the purpose hereinafter specified.

E represents the small pipe-outlet leading from the heat-flues C into the smoke-bonnet D through A′.

F represents the movable covers on the top of the smoke-bonnet and directly over the pipes E to facilitate the cleaning of the heat-flues.

G represents the water-outlet pipe, which may be placed on both sides of the outer shell instead of on only one side, as shown in Fig. 2. Indeed, any number of outflow-pipes may be used, to form convenient connection with the house-pipes.

H represents the inlet-pipes at the bottom of the outer shell of the heater.

I represents the fire-door opening, and I′ the door itself.

K represents the base, and L and M the base-doors, of any desired style or size.

It will readily be seen that the form of boiler which is shown in the drawings permits the flow of water to take place diagonally as well as vertically, as is possible with a tubular boiler, and yet by the means of large heat-flues with small outlet-pipes, as shown, the heated gases are prevented from escaping before they have imparted their heat by direct radiation to the water surrounding the flues, an advantage not obtained in the ordinary tubular boiler. The number of heat-flues or their shape is a matter of choice, not affecting the merits of my invention. The outlet or draft flues E should be simply large enough to create draft sufficient for proper combustion, and for practical use the heat-flues C may be about twelve times the area of the draft flues E, though this proportion may be somewhat varied to suit different conditions, the gist of my invention being to provide large heat-flues having small short draft-flues leading to the chimney, whereby the heated gases are made to do more effective work before escaping. This form of boiler permits a very even distribution of the water along the heating-surfaces and leaves the largest body of water in the center of the boiler directly over the hottest portion of the fire, which tends to better equalize the circulation of the heated water than if the greater flue-space was in the center and the larger water-spaces were near the circumference of the boiler. It is evident, also, that as large an area of direct heating-surface as is desirable in proportion to the grate-surface may be obtained in this heater.

Other features of my invention deserve special mention because of the advantages arising therefrom.

As is apparent from Fig. 3, it is possible to cast my heater in two castings consisting of A A′ and B B′ C C′, which decreases the number of necessary joints. The heater is thus more economical in construction and less liable to leakage and consequent need of repairs. The location of the main joint just above the base of the heater makes it subject to less expansion and contraction than if higher up and nearer the greater heat. The only other joints are some distance above the fire-box, where the small draft-flues E connect the heat-flues C with the smoke-bonnet D. For this connection I drill down from the top through the outer shell and the top of the vertical heat-flues, and screw short tubes into C′ and expand them tight in the outer shell A′. These tubes E are made, preferably, of copper, brass, or any sufficiently ductile metal to permit considerable uneven expansion without their breaking or loosening. Another advantage of this method of constructing the draft-flues E is, that they may be tightened or replaced without taking the boiler apart.

Directly above the draft-flues and in the top of the smoke-bonnet are drilled the openings *d*, corresponding to E in size and adapted to be shut by the pivoted smoke-tight covers F. Through these openings all dirt collecting in the flues can readily be brushed down upon the fire and the heater quickly and thoroughly cleaned.

The smoke-bonnet D is constructed so as to permit the water-outflow pipe G to project from the top of the outer shell A for connection with the house-pipes. The pipes G might be carried more from the side of the outer shell and entirely away from the smoke-bonnet; but the upright position promotes a freer circulation of the water.

My method of constructing a water-heater renders it possible to make it either round or square in shape. For smaller boilers the round form is generally preferable, but for larger heaters it is more convenient to provide a square grate.

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

1. A water-heater having an outer shell and an inner shell constructed to form a fire-box, and a crown-sheet above the fire-box, the crown-sheet having vertical heat-flues leading out of it, separated by diametrical water-spaces and connected at the top with smaller draft-flues for the purpose of preventing too rapid an escape of the heated gases, substantially as described.

2. A water-heater consisting of an outer shell A A′, an inner shell B, constituting a fire-box, a crown-sheet B′, the vertical heat-flues C, leading from the crown-sheet, separated by diametrical water-spaces and terminating in C′ near the top of the boiler, and the draft-flues E, connecting with a smoke-bonnet D and having only about one-twelfth the area of the flues C, whereby the heat is prevented from escaping too rapidly from the larger flues, as and for the purpose specified.

3. In a water-heater, the combination of a base or ash section K, containing a grate, the outer shell A, the inner shell B B′ C C′, constructed with vertical heat-flues separated by diametrical water-spaces, as described, and the small draft-flues E, leading from the larger heat-flues, as and for the purpose specified.

4. In a water-heater, the combination of a base K, the inclosing shell A, having inlet and outlet pipes H G, the inner shell B B′ C C′, preferably cast in one piece and constructed with vertical heat-flues, as described, the small draft-flues E, and the smoke-bonnet D, having the outlet D′, the openings *d*, and the covers F, all substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES MITCHELL.

Witnesses:
EDWARD S. ATWATER,
IRVING ELTING.