(No Model.) 2 Sheets—Sheet 1.

C. B. RICE.

WATER HEATER.

No. 420,019. Patented Jan. 21, 1890.

Fig. 1.

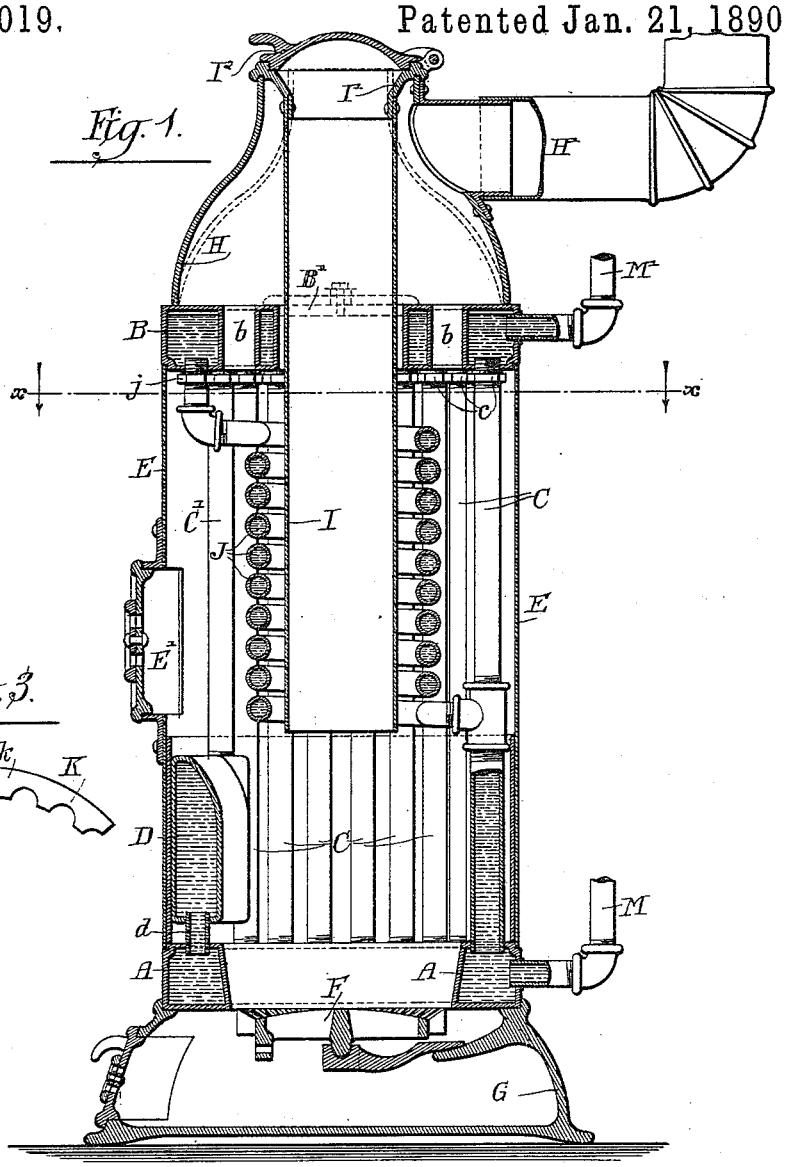


Fig. 3.

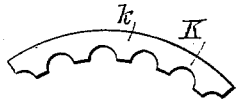
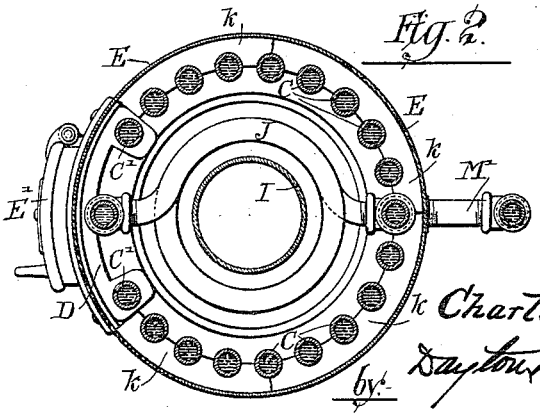


Fig. 2.



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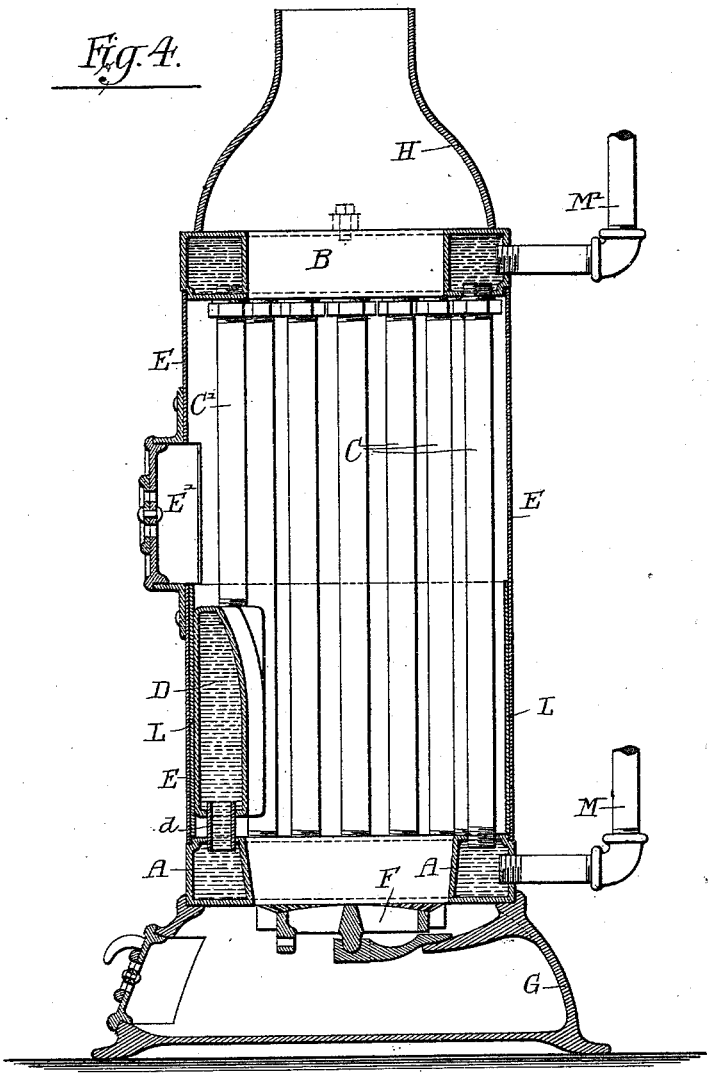
(No Model.) 2 Sheets—Sheet 2.

C. B. RICE.

WATER HEATER.

No. 420,019. Patented Jan. 21, 1890.

Fig. 4.



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Wm. T. Fleming.

Inventor:
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Attorneys

UNITED STATES PATENT OFFICE.

CHARLES B. RICE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE RICE & WHITACRE MANUFACTURING COMPANY, OF SAME PLACE.

WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 420,019, dated January 21, 1890.

Application filed August 9, 1888. Serial No. 282,325. (No model.)

To all whom it may concern:

Be it known that I, CHARLES B. RICE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Water-Heaters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to an improved water-heater of that class shown in a prior patent, No. 351,070, granted to me October 19, 1886, and embracing upper and lower water heads or receptacles and a plurality of annularly-arranged water-pipes connecting the top and bottom heads and forming the side walls of the fire-pot of the apparatus.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

In the accompanying drawings, illustrating my invention, Figure 1 is a central vertical section of a water-heating apparatus embodying my invention. Fig. 2 is a sectional plan view thereof, taken upon line *x x* of Fig. 1. Fig. 3 is a detail plan view of a lining-piece shown in Figs. 1 and 2. Fig. 4 is a central vertical section of an apparatus differing somewhat from that shown in Figs. 1 and 2.

As illustrated in said drawings, A is a hollow ring-shaped casting located at the base of the heater; B, a similar casting located at the top of the same, and C C C are vertical water-tubes connected at their opposite ends with the castings A and B.

D is a water-front consisting of a hollow casting which occupies a space above the bottom casting A, and is connected with the said casting by means of a nipple *d* and with the upper casting B by means of two pipes C′ C′.

E is a sheet-metal cylinder or jacket surrounding the water-tubes and filling the space between the bottom and top castings A and B. Said jacket is provided with a fuel-door E′, which is located opposite the space between the pipes C′ C′, which latter are placed at a distance apart somewhat greater than the width of the door. The space inclosed by the lower parts of the tubes, the water-front D, and the lower casting A forms the fire-pot of the apparatus, a suitable fuel-grate F being placed at the level of the bottom of the casting A, as clearly shown in the drawings.

G is a cast base, which is fitted at its upper edge to the casting A and forms the ash-box of the heater.

H is a dome resting at its edges on the casting B. Said dome receives the smoke passing through or past the casting B and communicates with an exit pipe or flue H′.

I indicates a coal-magazine having the form of a metal cylinder attached at its upper end to the dome H, and extending downwardly through the casting B and terminating at a point near the fuel-door. The said cylinder is herein shown as riveted to an annular conical casting I′, which is fitted to the margins of a central hole in the top of the dome H.

I² is a cover hinged to the casting I′ for closing the top of the magazine.

In cases where the coal-magazine is absent the dome H may be shaped as shown in dotted lines in Fig. 1 and the smoke-pipe H′ connected with the top of the dome. The upper hollow casting B is shown in said Figs. 1 and 2 as provided with integral smoke pipes or flues *b b*, which afford passages for the upward passage of smoke and products of combustion through said casting and add to the heating-surface of said casting. When the coal-magazine is absent, the central opening of said annular casting B will preferably be covered with a plate, (shown in dotted lines at B′, Fig. 1,) by which the smoke and products of combustion will be forced to pass through the flues *b b*, so that the heating-surfaces afforded by said flues will be fully utilized.

For the purpose of increasing the heating capacity of the heater I place in the space inclosed by the water-tubes C C and C′ C′ above the fire-pot a spiral coil J of pipe, which is connected at its upper end with the casting B and at its lower end with one of the pipes C. The upper end of said coil is herein shown as

attached to the upper casting B at the space afforded between the pipes C′ C′ above the fuel-door. At its lower end the said coil is desirably connected with one of the rear water-tubes at a point somewhat above the level of the fire.

The several joints between the tubes C C′ and J and the hollow casting B are herein shown as formed by screw-threading the ends of the tubes and the holes in the castings and providing the tubes with screw-collars *c* and *j*, which are tightened against the casting after the pipes are in place, packing-washers being placed between said collars and the surfaces of the castings. To enable the tubes to be inserted in both upper and lower castings the screw-threads at the upper end of each tube are cut of sufficient length to enable the tube to be screwed into the top casting farther than necessary for making the joint and then backed out of that casting and into the lower one. Tight joints are formed at the lower ends of the tubes by screwing the latter inwardly the full length of the threaded part or until a tight joint is formed in the usual manner.

In similar apparatus as heretofore constructed—as, for instance, in the construction shown in my said prior patent—a space or opening is left between the pipes and the external cylinder or jacket, in which ashes are liable to accumulate and remain. The presence of ashes about and between the water-tubes is objectionable, for the reason that the ashes retard or prevent the transmission of heat to the rear surfaces of the water-tubes. In order to prevent the entrance of ashes through the spaces between the tubes, I employ a filling K, occupying the spaces between the tubes and the outer cylinder or jacket. Such filling may be made of cast metal, fire-brick, asbestus, cement, or other refractory material. The filling is desirably fitted to the rear surfaces of the tubes and extends between the same to the points at which they come nearest together, thereby preventing entrance of ashes between the tubes, while at the same time exposing as much of the pipes as is practicable to the direct action of the fire. In the particular construction illustrated the filling K is made of cast metal or fire-brick in several pieces or sections *k k*, one of which is shown separately in Fig. 3. The filling may, however, be constructed or inserted in any way found convenient or desirable.

In Fig. 4 I have shown another form of water-heater having some of the main features of my invention. In this instance the bottom casting A, pipes C C and C′ C′, water-front D, jacket E, grate F, base G, and dome H are made in the same manner as before described. An upper ring-shaped hollow casting B′ is employed in this instance, which is without flues, and any coal-magazine and water-coil are absent. As illustrated in said Fig. 4, furthermore, the filling K is absent, a cylinder L, of sheet metal, being placed around the tubes C C inside of the jacket to prevent immediate contact of hot coals and ashes with the latter.

M M′ indicate in both forms of the apparatus water-pipes communicating with the interior of the heater, such pipes serving to afford a supply of water to the heater and to carry the heated water to the point where it is used. When the heater is used for house-warming, the said pipes M M′ will form the terminals of the water-circulating system of the building. Such pipes M M′ may also be connected with a water-tank, the water in which is to be heated by being circulated through the heater.

It will of course be understood that the apparatus herein shown is more specifically intended for heating water and not for the generation of steam, the said apparatus being without any steam-dome or other space or chamber to contain steam, and being therefore much more compact and simple in form than boilers employed for generating steam—such, for instance, as are shown in Figs. 1 and 4 of said prior Patent No. 351,070.

The object of employing the water-front D, arranged in the manner described, is to utilize the space below the fuel-door as heating-surface, it being entirely obvious that unless the said water-front were employed the space necessarily left between the vertical tubes for the door would be vacant and a part of the heat produced by the fuel would be wasted. Such water-front also serves as a shield to protect the sheet-metal jacket from the direct action of the fire.

I claim as my invention—

1. A water-heating apparatus comprising a hollow ring-shaped bottom casting, a hollow ring-shaped top casting, a series of vertical tubes connecting said castings, a water-front located above the lower casting and connected therewith and with the top casting, a casing or jacket surrounding the tubes, fitted at its upper and lower edges to said upper and lower castings, and provided with a door located above said water-front, a base sustaining the lower hollow casting, a grate sustained upon said base and closing the interior space of the said lower casting, a smoke-dome resting in its margins upon the top of the upper hollow casting, and a smoke-pipe connected with said dome, substantially as described.

2. A water-heating apparatus comprising a hollow ring-shaped bottom casting, a hollow ring-shaped top casting, a series of vertical tubes connecting said castings, a casing or jacket surrounding the tubes and fitted at its upper and lower edges to said upper and lower castings, a hollow base sustaining the lower hollow casting, a grate sustained upon said base and filling the interior space of the said hollow lower casting, a smoke-dome resting at its margins upon the top of the upper casting, and a smoke-pipe connected within said dome, the said upper hollow casting being provided with a plurality of vertical flues

cast integral therewith, substantially as described.

3. A water-heating apparatus comprising a hollow ring-shaped bottom casting, a hollow ring-shaped top casting, a series of vertical tubes connecting said castings, a casing or jacket surrounding the tubes and fitting at its upper and lower edges to the said top and bottom castings, a hollow base sustaining the lower casting, a grate sustained upon said base, a smoke-dome resting upon the top casting, a smoke-pipe connected with said dome, a plurality of integral vertical flues in said ring-shaped top casting, and a cylindric fuel-magazine attached to the upper part of the smoke-dome and passing through the said ring-shaped top casting, substantially as described.

4. A water-heating apparatus comprising a hollow ring-shaped bottom casting, a hollow ring-shaped top casting, a series of vertical tubes connecting said castings, a casing or jacket surrounding the tubes and fitted at its upper and lower edges to said upper and lower castings, a hollow base sustaining the lower casting, a grate sustained upon said base and filling the interior space of the said lower casting, a dome resting at its margins upon the upper hollow casting, a smoke-pipe connected with said dome, and a vertically-arranged coil attached to one of said vertical pipes at its lower end and connecting at its upper end with the upper hollow casting, substantially as described.

5. A water-heating apparatus comprising a hollow ring-shaped bottom casting, a hollow ring-shaped top casting, a series of vertical tubes connecting said castings, a water-front located over said lower casting and connected therewith and with the top casting, a casing or jacket surrounding the tubes and fitted at its upper and lower edges to said upper and lower castings, a hollow base sustaining the lower casting, a grate sustained upon said base and filling the interior space of the said lower casting, a dome resting at its margins upon the upper hollow casting, a smoke-pipe connected with said dome, and a vertically-arranged coil attached to one of the said vertical pipes at its lower end and connecting at its upper end with the upper hollow casting within the space over said water-front, substantially as described.

6. A water-heating apparatus comprising a hollow ring-shaped bottom casting, a hollow ring-shaped top casting, a series of vertical tubes connecting said castings, a water-front connected with said castings, a casing or jacket surrounding the tubes and fitted at its upper and lower edges to said upper and lower castings, a hollow base sustaining the lower castings, a grate sustained upon said base, a dome resting over said upper casting, and a filling inserted between the lower parts of said tubes and the said jacket, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

CHARLES B. RICE.

Witnesses:
C. CLARENCE POOLE,
TAYLOR E. BROWN.