(No Model.) 3 Sheets—Sheet 1.

C. A. SULLIVAN & T. J. BEST.

HOT WATER CIRCULATING BOILER.

No. 542,292. Patented July 9, 1895.

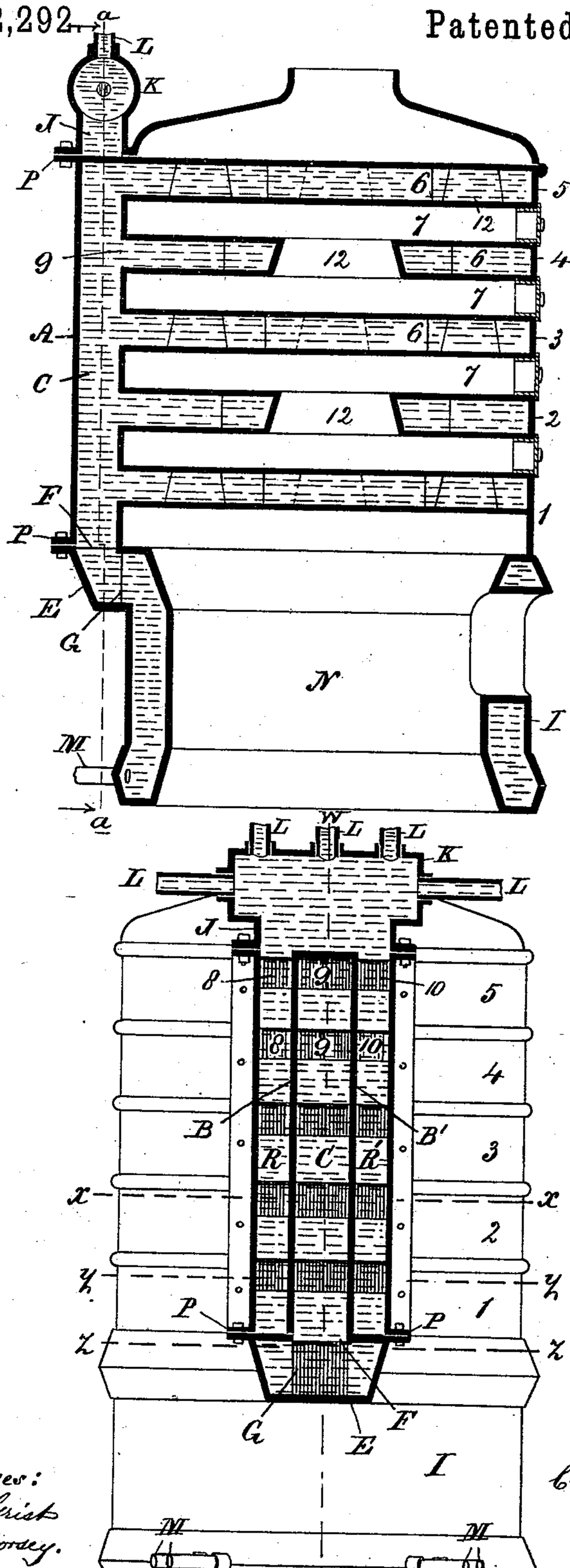

Fig. 1.

Fig. 2.

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(No Model.)

3 Sheets—Sheet 2.

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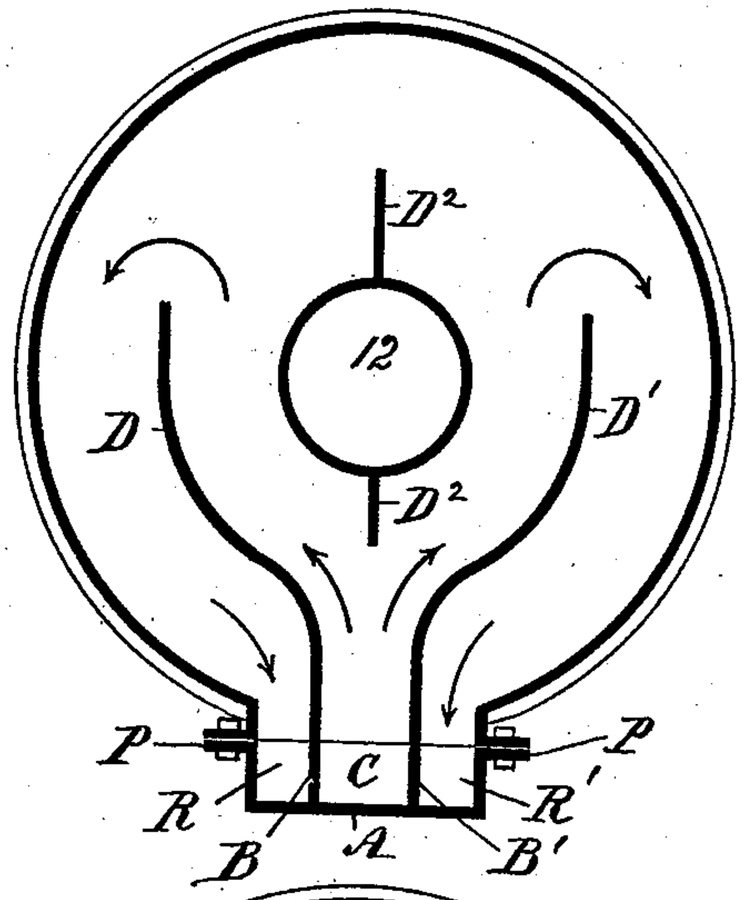

Fig. 3.

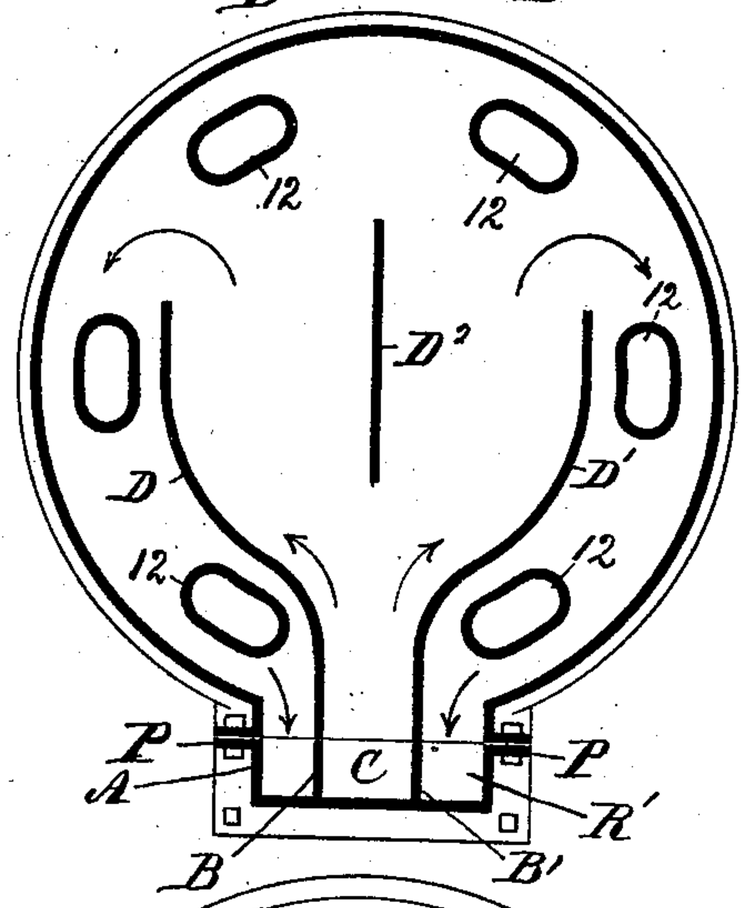

Fig. 4.

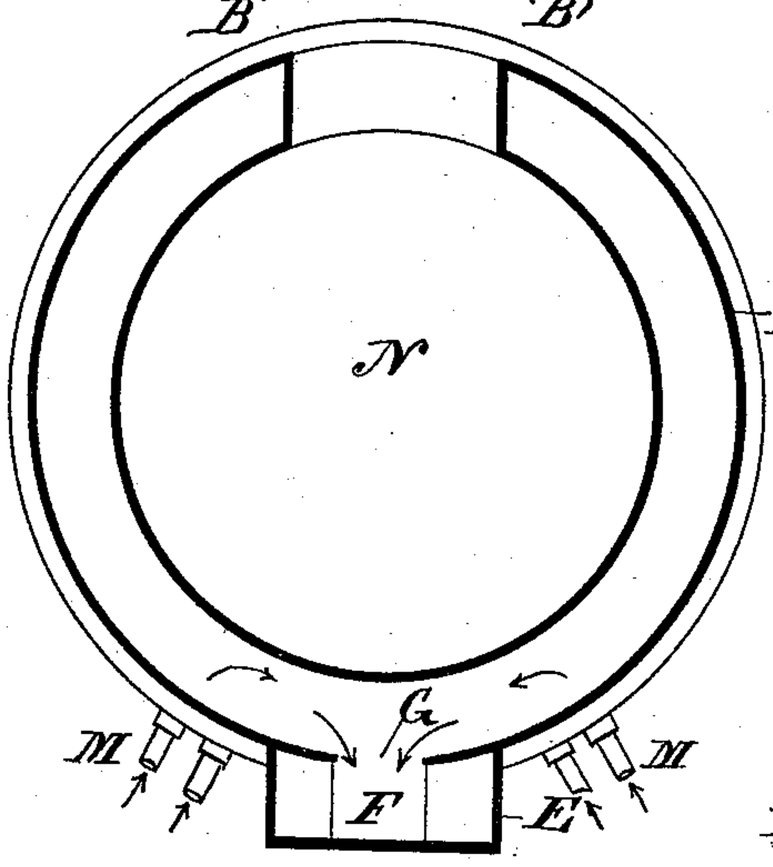

Fig. 5.

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(No Model.)

3 Sheets—Sheet 3.

C. A. SULLIVAN & T. J. BEST.

HOT WATER CIRCULATING BOILER.

No. 542,292. Patented July 9, 1895.

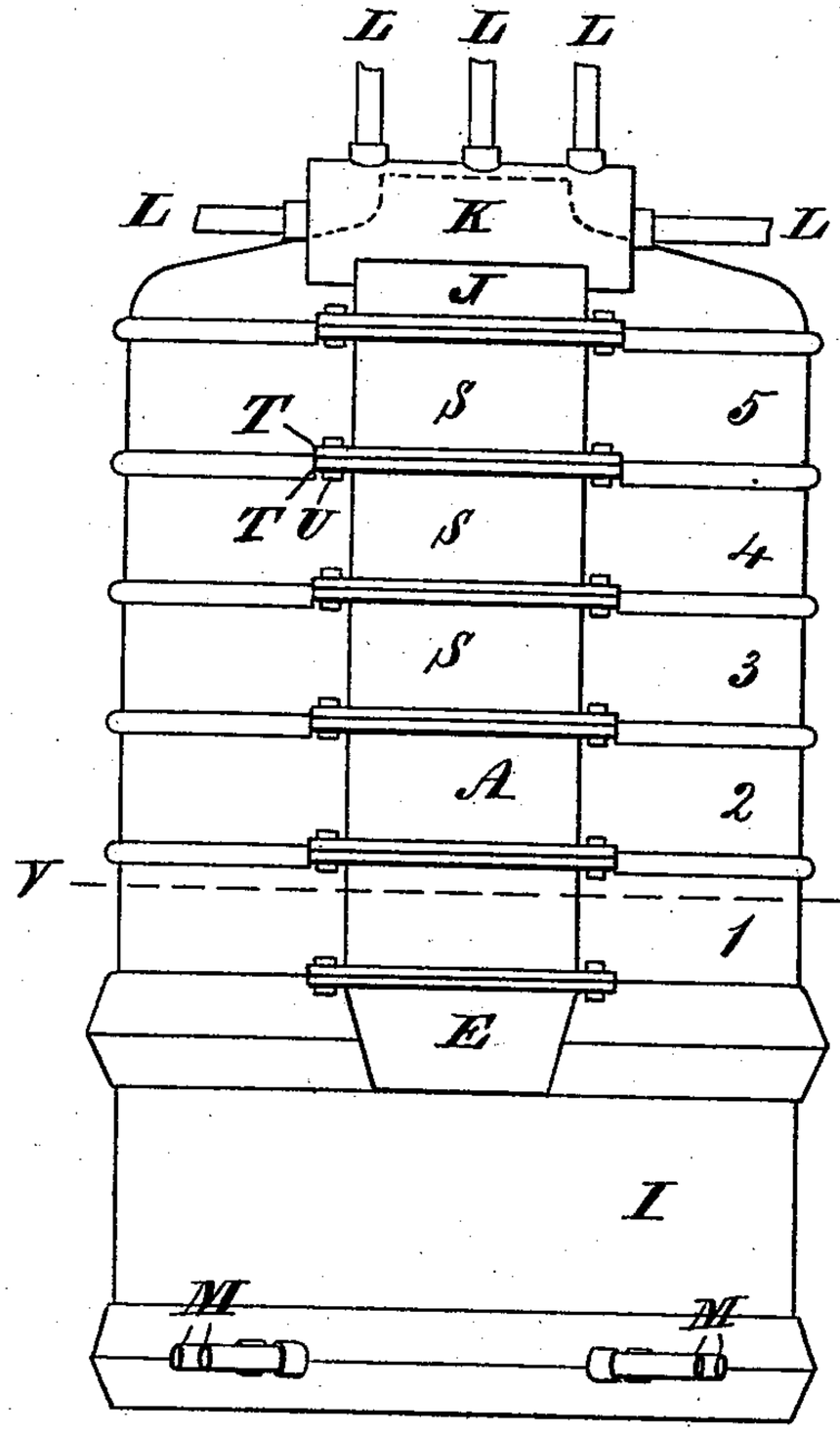

Fig. 6.

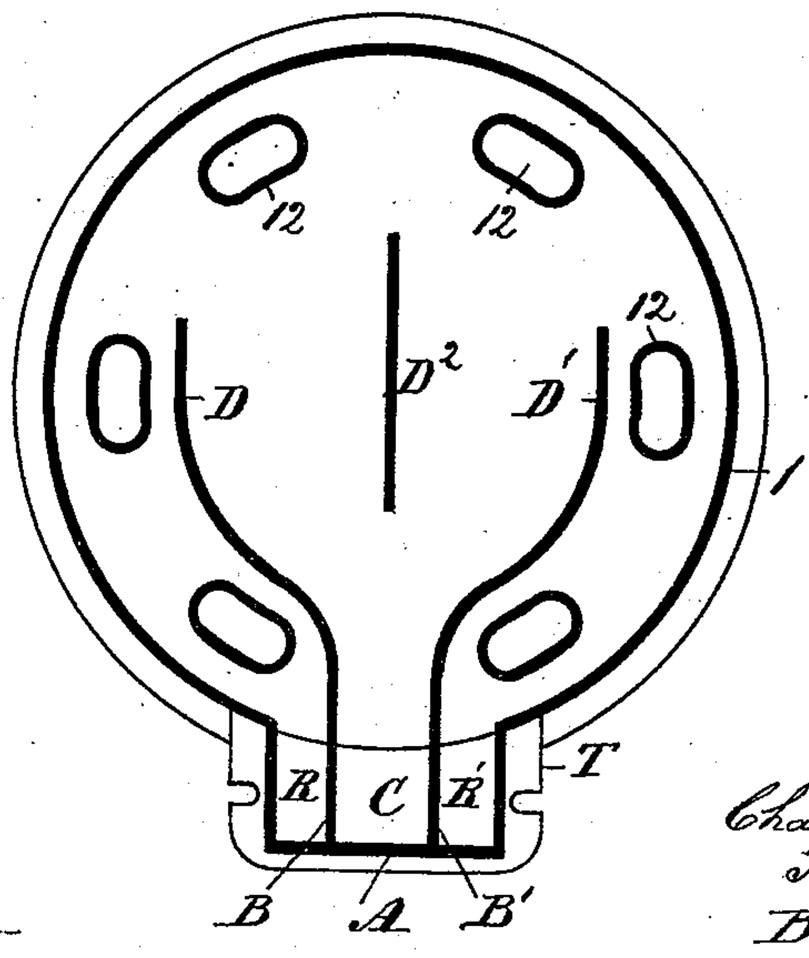

Fig. 7.

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UNITED STATES PATENT OFFICE.

CHARLES ALEXANDER SULLIVAN AND THOMAS JOSEPH BEST, OF MONTREAL, CANADA.

HOT-WATER-CIRCULATING BOILER.

SPECIFICATION forming part of Letters Patent No. 542,292, dated July 9, 1895.

Application filed February 27, 1893. Serial No. 463,811. (No model.) Patented in Canada June 21, 1892, No. 39,168.

To all whom it may concern:

Be it known that we, CHARLES ALEXANDER SULLIVAN and THOMAS JOSEPH BEST, of the city of Montreal, in the Province of Quebec, Dominion of Canada, have invented certain new and useful Improvements in Hot-Water-Circulating Boilers, (for which our assignees, Warden King and James Cochrane King, obtained Patent No. 39,168 of the Dominion of Canada on the 21st of June, 1892;) and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical section of our improved boiler and furnace on line *w w*, Fig. 2. Fig. 2 is an elevation of said boiler from the rear, the water-stack section on line *a a* to show the interior. Fig. 3 is a section on line X X, Fig. 2. Fig. 4 is a section on line Y Y, Fig. 2. Fig. 5 is a section on line Z Z, Fig. 2. Fig. 6 is an elevation of our improved boiler from the rear, showing the boiler-sections and water column or stack cast integrally in sections and bolted together. Fig. 7 is a section on line V V, Fig. 6.

Our invention relates to a combined furnace and circulating hot-water boiler, the boiler constructed of horizontal sections supported by the furnace-section and laid one section upon another, each section of the boiler having a water and smoke space, the smoke-spaces connected by flues passing through the water-spaces and the water-spaces connected by a water-stack or water-column at the back or rear of the boiler; and the object of our invention is to so construct the water stack and sections relatively to each other that the lowermost portion of the water or the body thereof carried by the fire-pot section and which is first heated, together with the body of water in the first section above the fire-pot, through its close proximity to the fire, shall have a free and unobstructed escape and rise or flow to the distributing-pipes without being called upon to force its way through the superimposed body or bodies of cold water contained in the other sections above the first section, this being particularly required of the lowermost body as it allows of a circulation of heat at a mild temperature and with a small fire, while the bodies of water in the other sections are also rendered free and independent in a similar sense and for like reasons, with the addition that the circulation of the heated quantities thereof is enhanced or facliitated.

The invention consists, first, in placing the fire-pot section in direct communication with a central vertical water space or column continuous and uninterrupted throughout its length, but closed at the top and forming with two side columns the water-stack, the side columns, however, being closed or cut off from communication with the fire-pot section, and, secondly, in the combination with the sections above the fire-pot section and the rear water-stack, as above described, of vertical diaphragms serving to separate the heated water in such sections into two bodies and hold them practically apart until they are approaching the central vertical column of the water-back, thus extending the same principle of allowing each heated portion of the water to flow upward unobstructed without resistance from a cold or cooler portion of water above or adjacent to it.

1, 2, 3, 4, and 5 are the horizontal sections of the boiler, the water-space 6 in each section shown as filled with water by horizontal dotted lines in Fig. 1, and the smoke-spaces 7 empty and connected by flues 12 through the water-space. Each section has a row of ports 8 9 10, and the rows are in vertical alignment.

A is a vertical water-stack divided longitudinally by partitions B B′, thus forming three vertical columns or water-spaces, a central one C and two side ones R R′, which are uninterrupted and continuous throughout their length, except as hereinafter explained. One, R, of the side columns connects all the ports 8 of the several sections in a vertical alignment, the middle column C connects all the ports 9, and the other side column R′ the series of ports 10.

The central column is open at its bottom end to communicate through an opening *g* in the fire-pot section with the water-space thereof, but is closed at its top end so as to compel the water to fill the sections.

The two side columns are closed at their

lower ends so as to prevent communication with the water-spaces of the fire-pot section, but are open at their top ends to communicate with the water-chamber J of a header K.

The water-space in each boiler-section is subdivided by two diaphragms D D′ to direct the flow of water from the ports 9 of the middle column C, so as to circulate in the spaces 6 and return to the side columns R R′, such circulation being shown by arrows in Figs. 3 and 4.

The outer or exposed ends of the diaphragms D D′ within the water-space of the boiler-sections coincide with the partitions B B′ of the water-stack, thereby dividing the inflow through the ports 9 into two streams or currents which outflow through the ports 8 10 into the water spaces or columns R R′, respectively.

D^2 are vertical transverse diaphragms through the center of the water-spaces in the boiler-sections intermediately of the diaphragms D D′ and extend past the alignment of the terminations of such diaphragms, and longitudinally are in alignment with the middle of the inlets C to uniformly divide the inflow. This arrangement of the diaphragms in combination with the unobstructed water-column serves to separate a body of water—say in section 1—into two smaller bodies and allow one body, which may become heated sooner than the other, to rise directly through the water-column without being retarded by the other body, which may not be heated as soon, or by having to follow the usual zigzag circuit of other heaters, with the result that the body first heated is not impeded in its upward course by the cooler body, but is provided as it were with an independent open channel immediately after being heated, through which it may flow upward without obstruction, which combined action with its result has not hitherto been attained in any hot-water heating apparatus.

It might also be pointed out that the three-way water-stack having the three uninterrupted water-columns renders the circulation much freer than with three-way interrupted columns heretofore used.

The water-stack A is preferably constructed independently of the boiler-sections and provided with a flange P to bolt the stack to the boiler-sections, as now shown in Figs. 3 and 4; but if desired the water-stack may be formed by sections 8, each section cast integrally with the boiler-section, as shown in Figs. 5 and 7, said sections 3, provided with a flange T, having holes for bolting the sections together by bolts C.

The fire-pot section 1, surrounding the combustion-chamber N, has a double wall and intervening water-space and a projecting water chamber or passage E, provided with a central opening F, which coincides with the middle column C of the water-stack, and said chamber F is provided with an opening G, connecting the water-stack with the water-space around the fire-chamber. The top plate of the water-chamber E closes the bottom of the side columns R R′, whereby the water connection is cut off and connection made only with the middle column C.

The top of the water-column R R′, connects with a water-chamber J, in a header K, secured to the top section of the boiler, and said chamber J has two ports in the bottom which coincide with the water-columns R R′, and the bottom plate of said chamber between said ports covers the top of the water-column C to cut off direct circulation from the column C into chamber J, thereby causing circulation in the water-stack and in the boiler-sections, as described.

L are the distributing-pipes connecting with the header, and M the return-pipes connecting with the fire-water space around the fire-pot.

What we claim is as follows:

1. A hot water heater comprising a fire pot section with water space, superimposed water heating sections, and a water stack, the latter formed with a central water space or column and two side spaces or columns continuous and uninterrupted throughout their length the central column being in direct communication at its lower end with the water space of said fire pot section, but closed at its upper end, and the said side columns closed at their lower ends or cut off from communication with the fire pot section but open at their upper ends to communicate with the distributing header, and the said superimposed heating sections containing vertical diaphragms and communicating with said water stack, for the purpose set forth.

2. A hot water heater comprising a fire pot section with water space, superimposed water heating sections, and a water stack, the latter divided by vertical partitions into a central water space or column and two side spaces or columns continuous and uninterrupted throughout their length, the central column being in direct communication at its lower end with the water space of said fire pot section but closed at its upper end, and the said side columns closed at their lower ends or cut off from communication with the fire pot section but open at their upper ends to communicate with the distributing header, and the said superimposed heating sections communicating with said water stack and containing vertical diaphragms extending from the vertical partitions of the water stack inward concentrically to a point slightly beyond the lateral axis of the section, for the purpose set forth.

3. A hot water heater comprising a fire pot section with water space, superimposed water heating sections, and a water stack, the latter divided by vertical partitions into a central water space or column, and two side spaces or columns continuous and uninterrupted

throughout their length, the central column being in direct communication at its lower end with the water space of said fire pot section but closed at its upper end, and the said side columns closed at their lower ends or cut off from communication with the fire pot section but open at their upper ends to communicate with the distributing header, and the said superimposed heating sections communicating with said water stack and containing vertical diaphragms extending from the vertical partitions of the water stack inward concentrically to a point slightly beyond the lateral axis of the section, and vertical diaphragms situated centrally of such sections and dividing the space between said concencentric diaphragms.

4. In a hot water heater having a fire pot section, superimposed heating sections and a water stack having vertical partitions, said superimposed heating sections communicating with said water stack and containing vertical diaphragms extending from the vertical partitions of the water stack inward concentrically to a point where they terminate freely slightly beyond the lateral axis of the section, and vertical diaphragm situated centrally of the section in line with the longitudinal axis of same dividing the free open space between said concentric diaphragms and extending an equal distance on each side of the lateral axis of the section substantially as shown and described.

5. A hot water circulating boiler having a water stack A, divided into three uninterrupted vertical columns or spaces R, C, R′ by vertical partitions B, B′ said spaces connected by ports 8, 9, 10, with water spaces 6. in the boiler sections, said sections provided with diaphragms D, D′ in said water spaces extending from the vertical partitions of the water stack inward concentrically to a point slightly beyond the lateral axis of the section, said columns R R′ closed at the bottom and open at the top to the outlet, and the column C, closed at the top and open at the bottom to the inlet, as and for the purpose set forth.

6. A hot water circulation boiler superposed on a fire chamber and connecting with a water space around said chamber, said boiler composed of sections laid one upon another, each section having a water space 6, and a smoke space 7, the smoke spaces connected by flues 12, through the water space, said boiler sections having at the rear a row of three ports 8, 9, 10, leading from a water stack, containing vertical partitions, to the water space and subdivided internally by diaphragms D, D′ extending from the vertical partitions of the water-stack inward concentrically to a point slightly beyond the lateral axis of the section, the middle ports 9 being in vertical alignment and connected by an uninterrupted water space or column C, in the water stack, which is closed at the top, the bottom thereof connecting with the water space around the fire chamber; and the vertical side ports 8, and 10, respectively connecting with the uninterrupted water spaces R, R′ in the water stack, being closed at the bottom and open at the top, as set forth.

7. A hot water circulating heater having at the rear uninterrupted water columns R, C, R′, formed in the water stack by vertical partitions B B′, connecting through ports 8, 9, 10 with superposed boiler sections, said sections having diaphragms D, D′ extending from the vertical partitions of the water stack inward concentrically to a point slightly beyond the lateral axis of the section in the water spaces thereof and intervening the smoke spaces; flues 12, connecting the smoke spaces through the water spaces, and vertical diaphragms D^2, intervening the diaphragms D, D′, to divide the inflow as set forth.

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