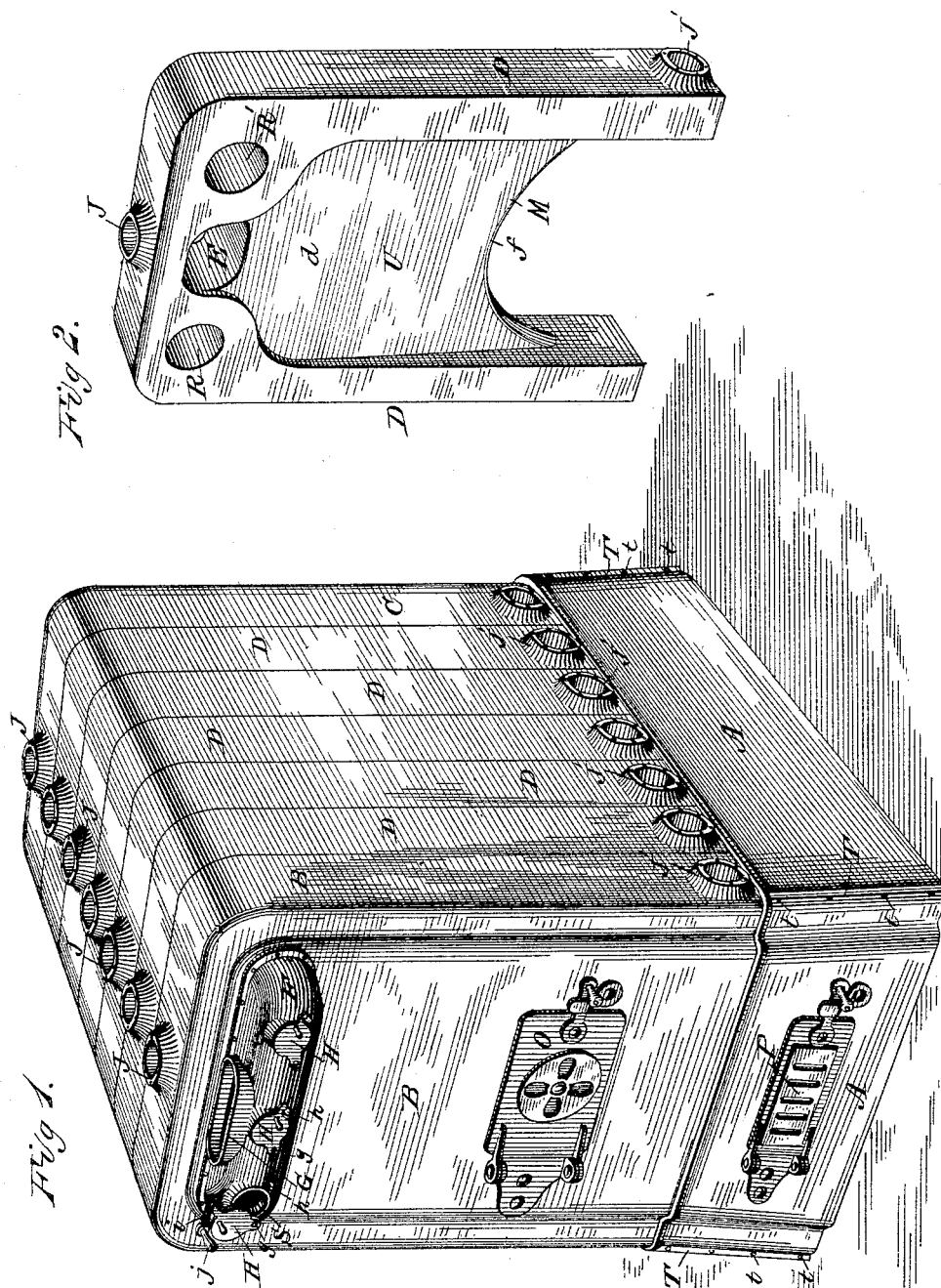


D. E. HOWATT.
SECTIONAL WATER HEATER.

No. 459,096.

Patented Sept. 8, 1891.



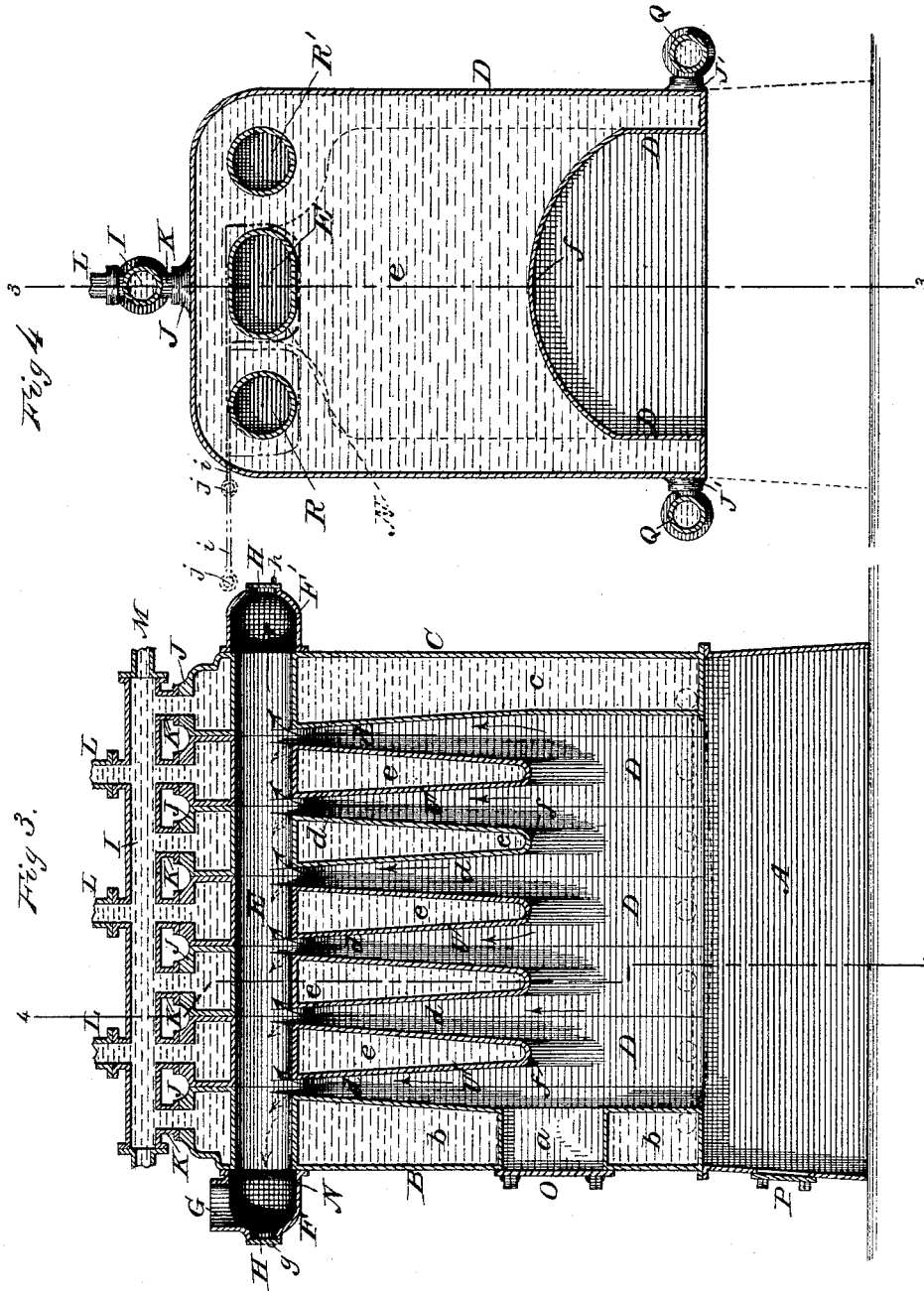
WITNESSES
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WITNESSES
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(No Model.)

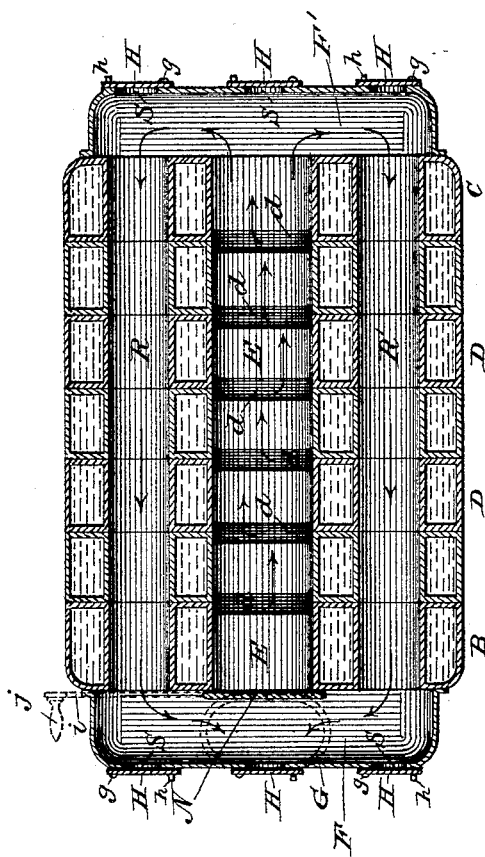
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Fig 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

DAVID E. HOWATT, OF HYDE PARK, NEW YORK.

SECTIONAL WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 459,096, dated September 8, 1891.

Application filed April 29, 1891. Serial No. 390,998. (No model.)

To all whom it may concern:

Be it known that I, DAVID E. HOWATT, a citizen of the United States, residing at Hyde Park, in the county of Dutchess and State of New York, have invented certain new and useful Improvements in Sectional 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 sectional water-heaters in which the sections, when placed together side by side, as shown in the drawings, constitute a complete heater without other joints than those formed by the union of the sections themselves, this union of the sections being in the fire-sections and not in the water-cells.

The water-heater, as hereinafter described, is an improvement upon the sectional heater shown in Letters Patent of the United States, No. 431,355, granted to me July 1, 1890; and the objects of my improvements upon my former heater are, first, to provide a gradually-contracting fire and heat space between the water-spaces to prevent a too rapid escape of the heated gases; second, to provide a corresponding enlargement of the water-space of each section from bottom to top to permit the freer movement of the water as it naturally expands with the increasing heat, and, third, to provide, by the addition of a flue on either side of the center flue and by the use of a movable cover at one end of the center flue, the means of changing the heater at once from an indirect draft to a direct draft, and vice versa. I attain these objects by the device illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of my heater, showing it in position for use, except that the ordinary outside manifold pipe connections are omitted for the sake of simplicity. Fig. 2 is a perspective view of a single section of my water-heater, showing the three smoke-flues and the gradual tapering of the water-cell and the fire-space. Fig. 3 is a vertical section cut through the center of heater from front to back on line 3 3 of Fig. 4, showing the relative positions of the various portions

of the heater, including the upper manifold pipe connections with the outlet-pipe. Fig. 4 is a vertical cross-section cut on line 4 4 of Fig. 3, showing the relation of water-space to fire-box and smoke-flues; and Fig. 5 is a horizontal section of the heater cut through the smoke-flues and smoke-bonnets to better show the movement of the heated gases when indirect draft is used.

Similar letters refer to similar parts throughout the views.

A represents the base of the heater, and may be of any desired size and shape. In the drawings it is shown as about fourteen inches high and made in four parts, which terminate at the corners in the flanges T, bolted together at *t t*. It is preferably made about two inches wider at the bottom than at the top, and is provided with the ordinary door P.

Upon the base are placed the end sections B and C and the intermediate sections of the heater D D. These intermediate sections D D are of like construction, as shown in Fig. 2, and are cast in a single piece with a core which has its only openings J at the top to make the manifold connections at K with the outlet-pipe I and at either side at the bottom J' for connections with the return and inlet pipes, which are of the usual construction and not shown in the drawings, except in section, Fig. 4. The sections D are also cast with the flues E R R' near the top, these flues being entirely surrounded by water-spaces, as is shown in Fig. 4. The deep water-cell M is cast tapering from its narrowest point at the fire-box arch *f*, becoming larger toward the top, thus narrowing the fire-space *d* as it nears the entrance to the center flue E, so that a too rapid escape of the heated gases from the water-spaces surfaces is avoided. That escape of the heated air is still further delayed by my device for creating an indirect draft, which consists of the smoke-bonnets F F' and the sliding cover N for closing the end of the center flue nearest the chimney-flue G, thus forcing the heated gases to pass, as is shown in Fig. 5, through E into the smoke-bonnet F' and back through both side flues R R' to smoke-bonnet F, and then out of G to the chimney.

The retention of the heated air and its passage along the upper water-surfaces tends to

greater economy of fuel when it is desired to run the heater steadily after the heat in the fire-box is once raised to the desired point. On the other hand, if a quick direct draft is required in starting up the fire this result may be quickly obtained by drawing aside from its position opposite the center flue E the sliding cover or damper N, which is conveniently operated by the handle *j* and the connecting-rod *i*.

The advantages are very apparent of thus being able by the movement of a single damper and without the use of a jacket or any outer casing to change the action of my heater from the quick direct draft desirable in starting a fire to the slower indirect draft which maintains even heat and economizes fuel.

In order to provide a means of rapidly cleaning the flues E R R', I construct openings S in the smoke-bonnets opposite the respective flues and close them by doors H, pivoted at *g* and retained in place by engaging with a keeper *h*. During the cleaning of the flues the doors may be thrown upward and back and a direct entrance to each flue obtained at both ends of the heater. The smoke-bonnets are alike in construction, except that F' has no collar for a chimney, only one such connection—that in G—being necessary. The passage of the heated gases through the smoke-flues and smoke-bonnets into the chimney by indirect draft through the side flues R R' is shown by the direction of the arrows in Fig. 5 and by the heavy arrows in Fig. 3. The dotted arrows in Fig. 3 represent the movement directly to the chimney of the heated gases when the indirect damper N is removed to the end of center flue E.

The end sections B C differ somewhat in construction from the intermediate sections to adapt them for the smoke-bonnets F F', and also in the front section for the ordinary door O. The number of sections may be varied according to the work required, and in case of a boiler with a large number of sections it might be convenient to have a fire-door also in the rear section C. Any ordinary grate may be used at the bottom of the fire-box, corresponding in size to the required number of sections in the heater. The lower arches *f* of the water-cells M may be at any convenient height above the grate; but in practice I have found that they may be carried about an inch below the upper part of the fire-door. The fire-door should be high enough to permit a good depth of live coals upon the grate below the door-opening.

If it be desired to increase the heating-surfaces of the water-cells still further than is shown in the drawings, the cells M may be constructed with vertical flutings or shallow corrugations running upward from *f* and gradually decreasing in size until they disappear at a point about where the letter *d* is placed in Fig. 2; but this is a mere mechani-

cal change which I do not claim, and have not thought it necessary to represent in the drawings. So, also, the boiler may be set in a brick casing; but it is one of the advantages of this sectional boiler and of the one described in United States Patent No. 431,355 that this outer casing is not necessary if the section-joints, which are all fire-box joints, are packed with asbestos or similar packing.

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

1. A water-heater composed of sections containing continuous water-spaces depressed in the center to form, when the sections are placed adjacent to one another, heat-flues opening at the top into a central smoke-flue, these depressions of the sections being greatest at the bottom and decreasing toward the top to somewhat contract the flue-openings at their entrance to the central smoke-flue, as and for the purpose specified.

2. A sectional water-heater in which each section consists of a continuous water-space surrounding fire-box and smoke-flue openings, depressed in the center over the fire-box to form heat-flues, as described, and increasing in width from the bottom of the water-cell to the central horizontal smoke-flue for the purpose of facilitating a free upward movement of the heated water, substantially as set forth.

3. A water-heater composed of two outer and one or more inner sections constructed with continuous jointless water-spaces which increase in width from the arch of the fire-box to the central smoke-flue for the purpose of contracting the heat-flues and enlarging the water-cells from the bottom upward, all the sections being united by outside manifold pipe connections and placed above an ash-pit and grate, substantially as described.

4. In a water-heater, a smoke-flue connected by direct draft with the heat-flues above the fire-box and with the chimney, in combination with one or more parallel smoke-flues connected by outside smoke-bonnets, and a movable damper adapted to close the chimney end of the main flue for the purpose of forcing the heated gases through the supplementary flues, substantially as described.

5. A water-heater consisting of two outer and one or more inner sections having continuous water-spaces alternating with heat-flues, constructed as described, in combination with cross-flues, only one of which is connected by direct draft with the heat-flues over the fire-box, outside smoke-bonnets for uniting the cross-flues, and a movable cover or damper for closing the chimney end of the main flue, as and for the purpose specified.

6. A sectional water-heater consisting of the sections B C D, united by outside manifold pipe connections and having inside continuous water-spaces surrounding fire-box and smoke-flues, the sections being depressed

in the center, as described, to form the heat-flues *d*, the main cross-flue E, into which the heat-flues lead by direct draft, the supplementary flues R R', the smoke-bonnets F' F',
5 covering the ends of the cross-flues, one of them F being adapted to receive a smoke-pipe at flange G, and a movable damper N, operated to close the chimney end of flue E when it is desired to force the heated gases

through flues R R', all substantially as and 10 for the purposes described.

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

DAVID E. HOWATT.

Witnesses:

IRVING ELTING,
SILAS WODELL.