No. 638,202. Patented Nov. 28, 1899.

S. E. PORTER.

SECTIONAL BOILER.

(Application filed Aug. 6, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

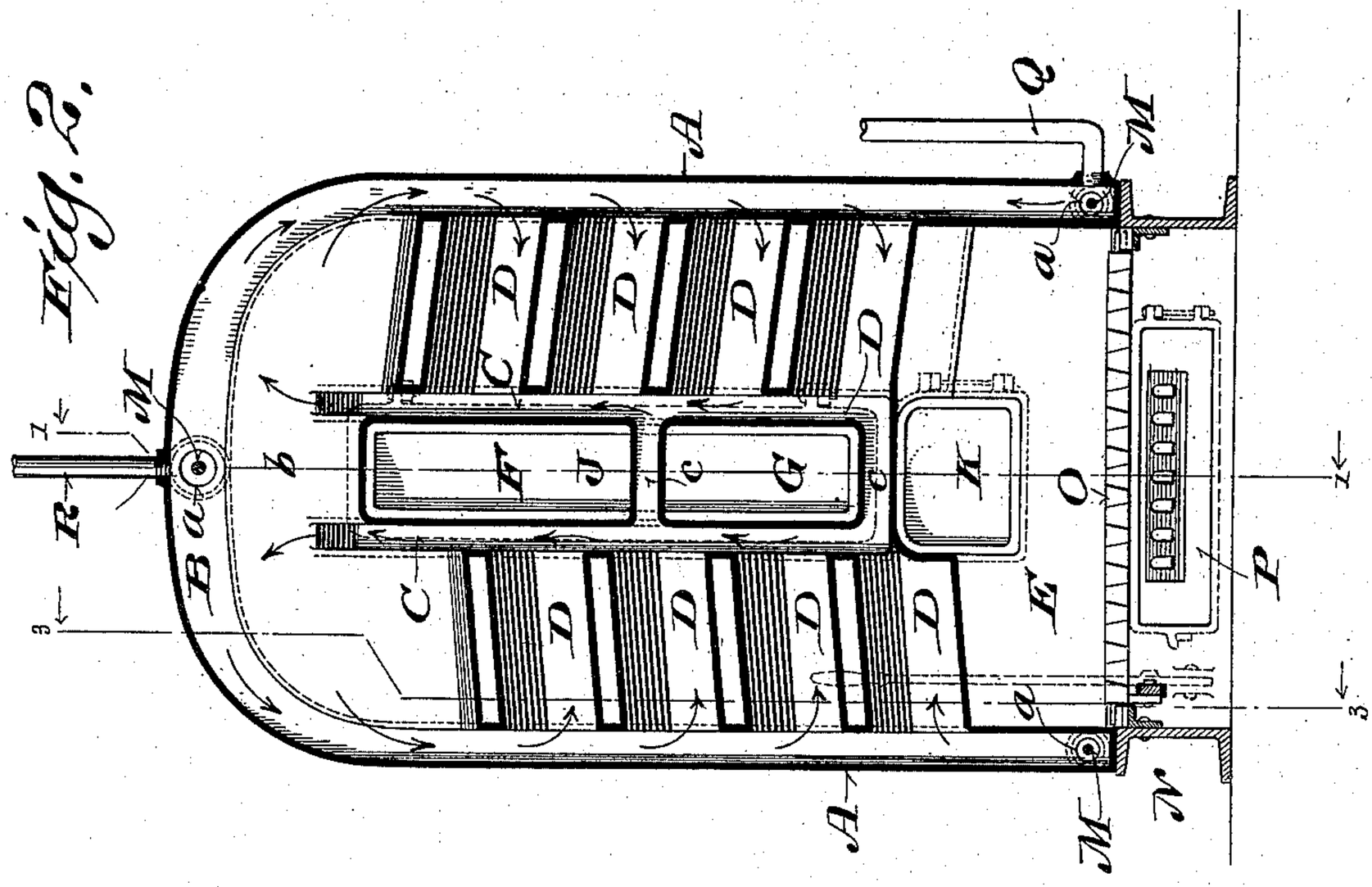

Fig. 1.

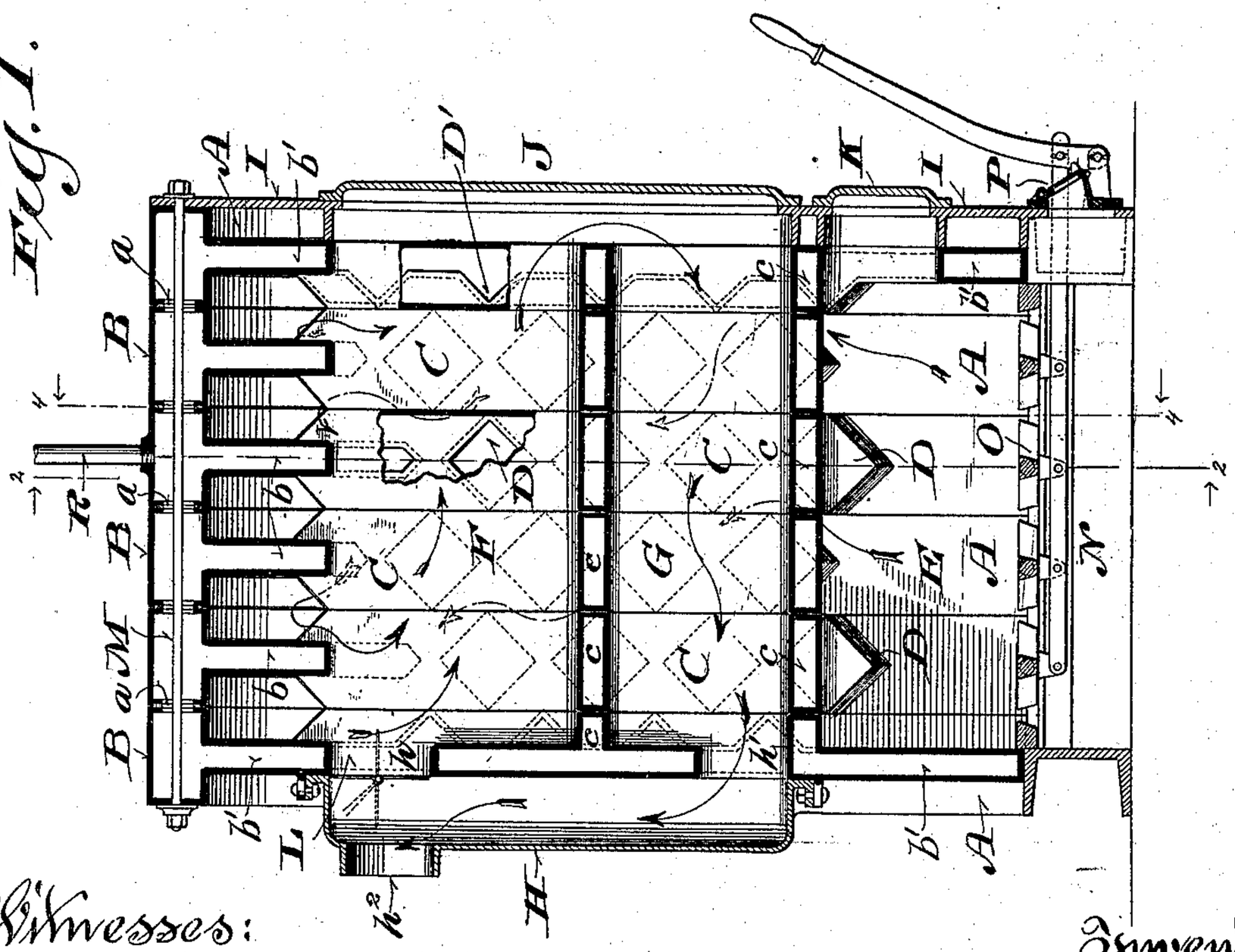

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Fig. 4.

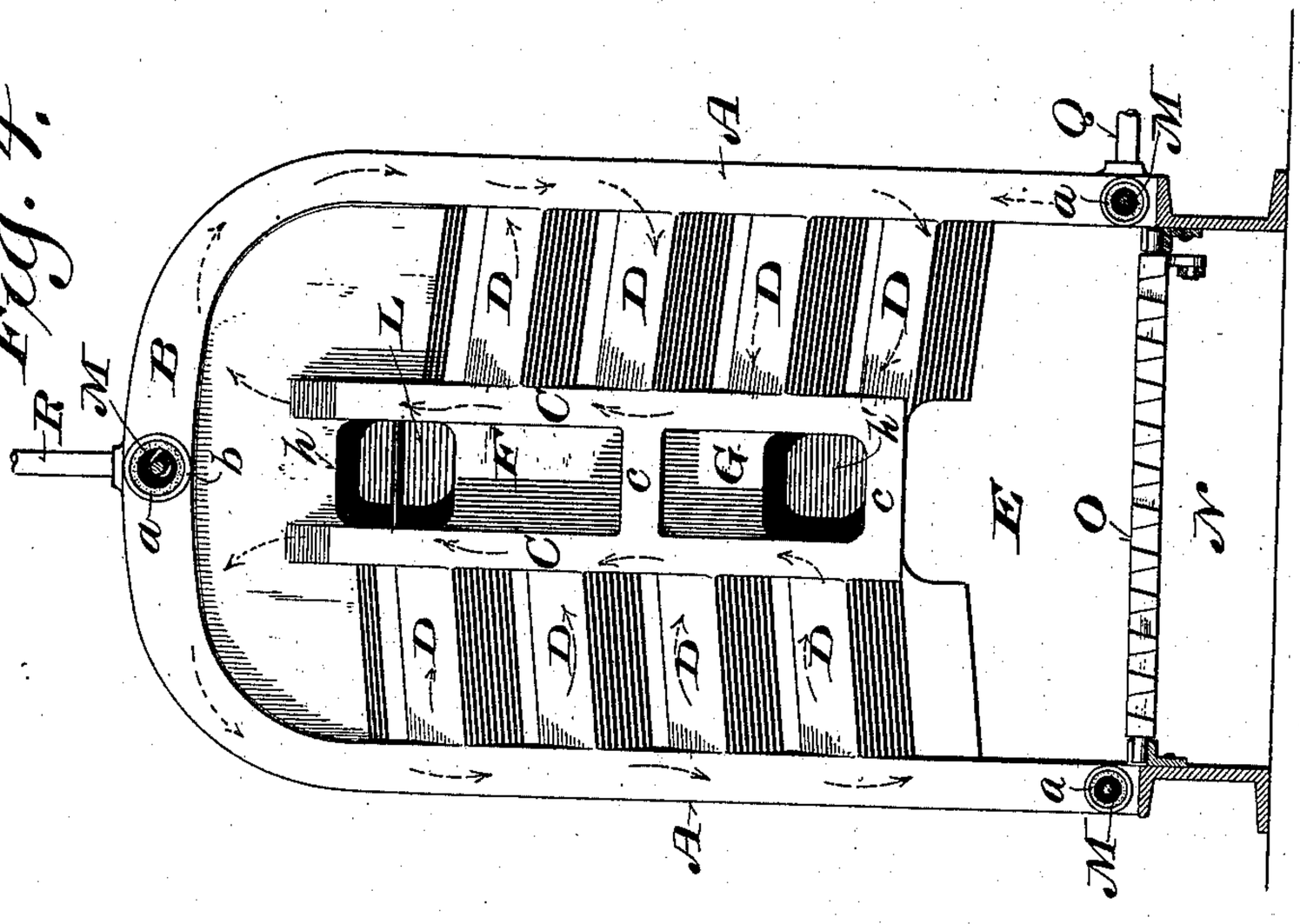
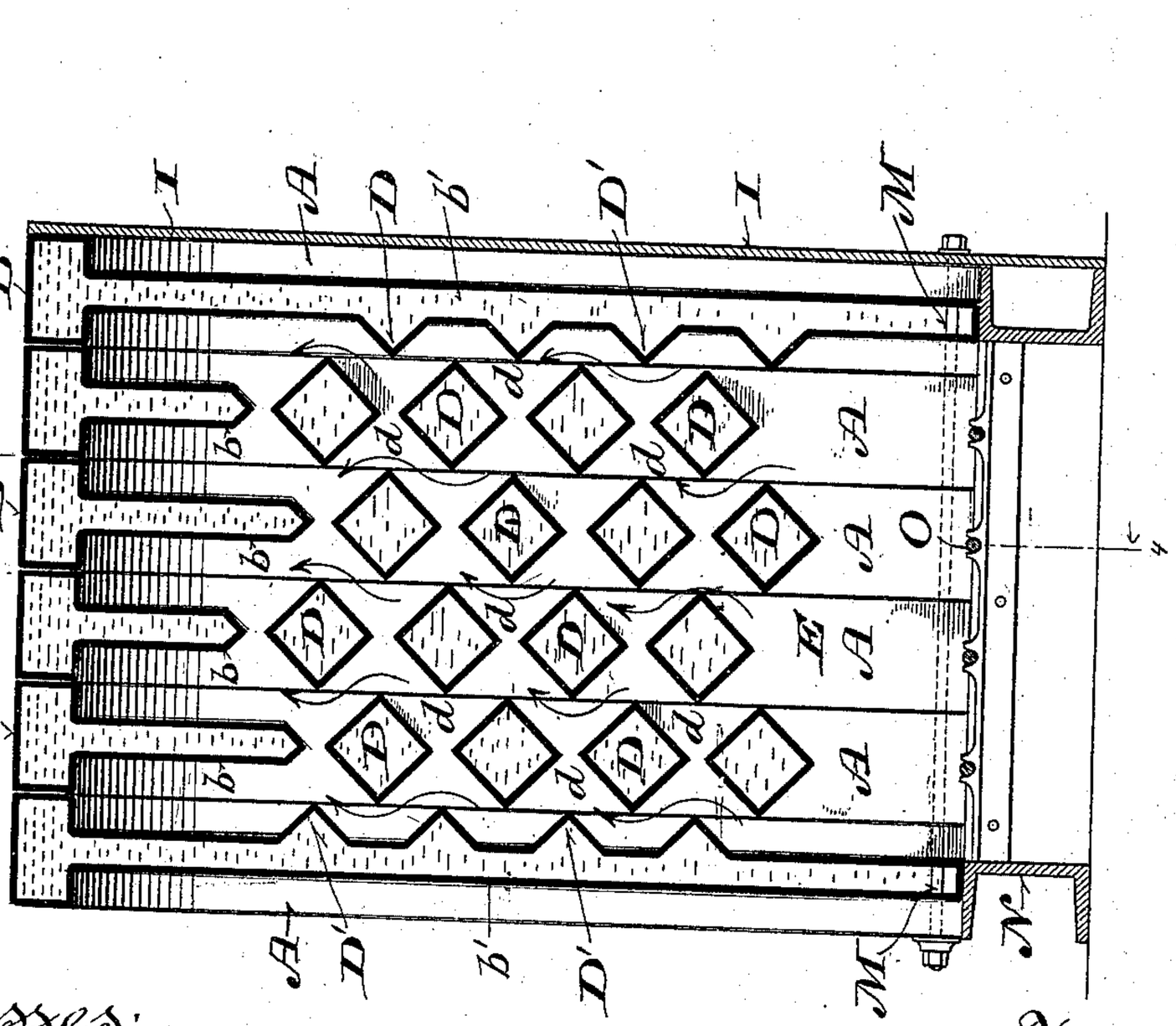


Fig. 3.



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UNITED STATES PATENT OFFICE.

SAMUEL E. PORTER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO THE FULLER-WARREN COMPANY, OF SAME PLACE.

SECTIONAL BOILER.

SPECIFICATION forming part of Letters Patent No. 638,202, dated November 28, 1899.

Application filed August 6, 1897. Serial No. 647,285. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. PORTER, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Sectional Boilers and Water-Heaters; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The main objects of my invention are to increase the area of the water-containing walls exposed to the direct action of the fire in the furnace, to promote circulation of the water, to avoid formation of scale and deposit of sediment on heat-absorbing walls, to facilitate the assemblage of the component sections in a heater of any desired size or capacity, and generally to improve the construction and operation of heaters of this class.

It consists of certain novel features in the construction and arrangement of component parts of the heater, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a vertical longitudinal section on the line 1 1, Fig. 2, of a boiler or heater embodying my improvements. Fig. 2 is a vertical cross-section on the line 2 2, Fig. 1, cutting one of the component sections of the heater centrally. Fig. 3 is a vertical longitudinal section on the line 3 3, Fig. 2; and Fig. 4 is a vertical cross-section in the plane of division between two adjoining sections indicated by the line 4 4, Figs. 1 and 3.

My invention relates to that class of boilers or heaters which are composed of a number of hollow cast-iron sections assembled together face to face.

Referring to the drawings, the intermediate sections each consist of two upright hollow columns or water-legs A A, which are connected at their upper ends by a hollow arch B, forming the top or crown of the heater, two intermediate vertical hollow columns C C, connected at their upper ends by a hollow web *b* with the arch B, and cross-tubes D D, connecting the columns A and C on each side. These tubes D are preferably made of prismatic or parallelepipedal shape and descend toward their outer ends, so as to accelerate the circulation of water from the outer columns A to the inner columns C and to prevent the deposit of sediment and the formation of scale upon the heat-absorbing walls of said tubes. Spaces or openings are or may be left between these cross-tubes. The outer columns A are extended at their lower ends below the intermediate columns C and the lower tubes D and form the sides of the fire-box E. The space between the columns C C, opening through the several intermediate sections, is separated from the fire-box E and divided into two flues F and G by hollow cross connections *c c*. The columns A and C and the arch B of each section are of the same dimension lengthwise of the heater, so that when the several sections are assembled, as shown in Figs. 1 and 3, their faces will form close joints. The cross-tubes D of each section are arranged alternately with the cross-tubes of the adjoining section or sections, so as to form zigzag flues *d*, extending upwardly from the fire-box E into the flue-spaces between the webs *b b*, communicating with the upper or horizontal flue F, which runs lengthwise through the upper part of the heater from end to end, as shown in Fig. 1. The faces of the tubes D are inclined or set obliquely to the vertical faces of the sections, so as not to catch and retain soot and ashes carried upwardly between them by the flame, and thereby interfere with the absorption of heat by the walls of said tubes.

By the above-described construction and arrangement of the sections and flues extended heat-absorbing surfaces are exposed directly to the action of the fire, which is drawn upwardly from the fire-box through the sinuous passages or flues *d* between the columns A and C and the cross-tubes D on each side of the heater into the flue F.

The front and back sections of the heater have hollow webs *b' b'* extending from top to bottom, with flat outer walls and inner walls having annular cross-ribs or half-tubes D' alternating with the cross-tubes D of the ad-

jacent sections. The front section is formed with flue-openings corresponding with the flue-openings F and G in the intermediate sections, and the back section has two openings h h' through its web into the upper and lower parts of the flues F and G. These openings are connected by a smoke box or flue H, attached to the back section, as shown in Fig. 1, and formed or provided at or near its upper end with a smoke-pipe connection or collar h^2.

I is a door plate or frame secured to the front section and provided with door-openings and doors J and K opening, respectively, into the front ends of the flues F and G and the fire-box E. The flues F and G connect with each other at the front end of the heater, as shown in Fig. 1, and the upper flue-opening h in the rear section is provided with a damper L, by means of which direct communication may be established between the upper flue F and the smoke-flue H or indirect communication by way of the lower flue G and the lower flue-opening h'.

The several sections of which the heater is composed connect with each other through openings a a in their adjoining faces at or near the lower ends of the columns A and at the middle of the arches B, and they are secured together by tie bolts or rods M passing through said openings. A rectangular cast-iron base N, flanged at the top and bottom, supports the sections and forms the ash-pit, above which it carries a fire-grate O of the usual or any suitable construction.

The door-plate I may be extended at the bottom over the base and provided with an ash-pit door P.

Q designates an inlet or water-supply connection with the lower end of one of the legs or columns A, and R designates an outlet connection with the arch B or crown of one of the sections. In place of single inlet and outlet or supply and discharge connections manifold connections may be made, as is commonly done with this class of heaters.

It will be observed that the cross-tubes D on one side of each section alternate with those on the other side, so that a single pattern may be used for all the intermediate sections, and by reversing every other one in assembling them the cross-tubes of adjoining sections will alternate with each other.

It is obvious that heaters of different sizes and capacities can be built up of like sections by assembling more or less sections, as required, and providing bases of different lengths.

The course of the draft or fire and heated products of combustion through the several flues is indicated by arrows in Figs. 1 and 3, while the circulation of water through the sections is indicated by arrows in Figs. 2 and 4.

I do not wish to limit myself to the exact details of construction or the identical arrangement of flues shown in the drawings and hereinbefore described, as they may be variously modified without material effect upon the operation of the heater or departure from the spirit and intended scope of my invention. For instance, in place of the flues F and G between the columns C C three flues may be formed in the upper part of the sections and said columns united at the center into one, the zigzag flues d in this case opening at their upper ends directly into the two outer flues, which in turn lead into the middle flue at one end of the heater.

The projecting portions of the columns A and C and arches B on the outer sides of the front or back sections may be cut away in the planes of the outer walls of their webs b', and the door-plate I may be dispensed with, the doors J, K, and P in that case being hinged or attached directly to the web b', and the cross connection c between the flues F and G in one or more of the intermediate sections next behind the front section being omitted to afford ample communication between the front ends of said flues.

I claim—

1. A boiler or water-heater comprising a number of sections, each consisting of a number of upright columns and cross-tubes connecting the intermediate with the outer columns, and having openings which, when the sections are assembled, form horizontal flues running lengthwise through the heater and communicating with each other at one end thereof, the cross-tubes of adjoining sections alternating with each other and forming flues leading upwardly from the fire-box directly into the flue-space communicating with one of said horizontal flues in the upper part of the heater, substantially as and for the purposes set forth.

2. A boiler or water-heater composed of a number of sections, each intermediate section consisting of upright columns and of parallelepipedal cross-tubes which connect the intermediate with the outer columns and are inclined downwardly toward their outer ends, and having openings which, when the sections are assembled, form horizontal flues running lengthwise of the heater, the cross-tubes of adjoining sections forming zigzag flues leading upwardly from the fire-box into the flue-space communicating with one of said horizontal flues in the upper part of the heater, substantially as and for the purposes set forth.

3. A boiler or water-heater composed of front and back sections and a number of intermediate hollow sections, each of which consists of two upright side legs or columns, two intermediate upright columns, cross-tubes connecting the intermediate with the side columns, and cross connections separating the space between the two intermediate columns from the fire-box and dividing said space into two horizontal flues, the cross-tubes of adjoining sections forming flues leading upwardly into the upper horizontal flue which connects

with the lower flue at one end of the heater, substantially as and for the purposes set forth.

4. A boiler or water-heater composed of hollow sections, the intermediate sections of which each consist of upright columns, cross-tubes connecting the intermediate columns with the side columns which are connected by an arch at their upper ends, cross connections separating the space between the intermediate columns from the fire-box and dividing said space into upper and lower horizontal flues which communicate with each other at one end, and a hollow web connecting said arch and columns above the cross-tubes which form ascending flues leading from the fire-box into one of said horizontal flues, substantially as and for the purposes set forth.

5. A boiler or water-heater composed of hollow cast-iron sections, forming when assembled, horizontal flues which run lengthwise through the heater and communicate with each other at one end thereof and each comprising side and intermediate columns connected at their upper ends by an arch, and cross-tubes connecting the intermediate with the side columns, the cross-tubes on one side alternating with those on the other side of each section, and the cross-tubes of adjoining sections alternating with each other and forming flues leading upwardly from the fire-box into a flue running lengthwise through the upper part of the heater, substantially as and for the purposes set forth.

6. A boiler or water-heater composed of hollow sections, comprising upright columns connected at their upper ends by an arch and cross-tubes connecting the intermediate with the outer columns which extend below the lower tubes and form the sides of the fire-box, said sections having openings which form horizontal flues running lengthwise through the heater and communicating with each other at one end thereof, and the cross-tubes of adjoining sections alternating with each other and forming zigzag flues, each of which leads upwardly from the fire-box into one of said horizontal flues in the upper part of the heater, substantially as and for the purposes set forth.

7. A boiler or water-heater composed of hollow sections consisting of upright side columns connected at their upper ends by arches, intermediate upright columns connected at their upper ends with said arches and terminating at their lower ends above the lower ends of the side columns which form the sides of a fire-box, and cross-tubes connecting the intermediate with the side columns and forming flues each leading upwardly into a flue running lengthwise through the upper part of the heater, said sections communicating with each other through openings in the adjoining faces of the side columns at their lower ends and the arches at the top of the heater, substantially as and for the purposes set forth.

8. A sectional boiler or water-heater composed of hollow sections consisting of upright columns connected at their upper ends by arches and webs, and below by cross-tubes, the outer columns extending below the intermediate columns and forming sides of the fire-box, the space between the intermediate columns being separated from the fire-box and divided into longitudinal flues by hollow cross connections, and the cross-tubes of adjoining sections forming flues leading from the fire-box into the upper flue, doors opening into the flue and fire-box space in the front section, a smoke box or flue attached to the back section and connecting the flue-openings therein, and a damper in the upper flue connection of said back section, substantially as and for the purposes set forth.

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

SAMUEL E. PORTER.

Witnesses:
CHAS. L. GOSS,
D. A. KEELEY.