No. 676,340. Patented June 11, 1901.

S. E. PORTER.

SECTIONAL WATER HEATER AND BOILER.

(Application filed Mar. 19, 1900.)

(No Model.)

Fig. 2.

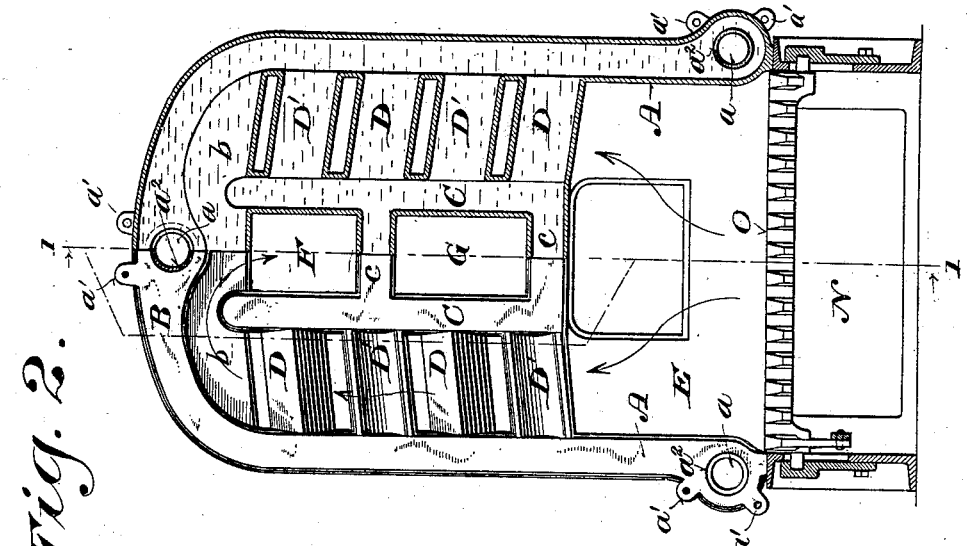
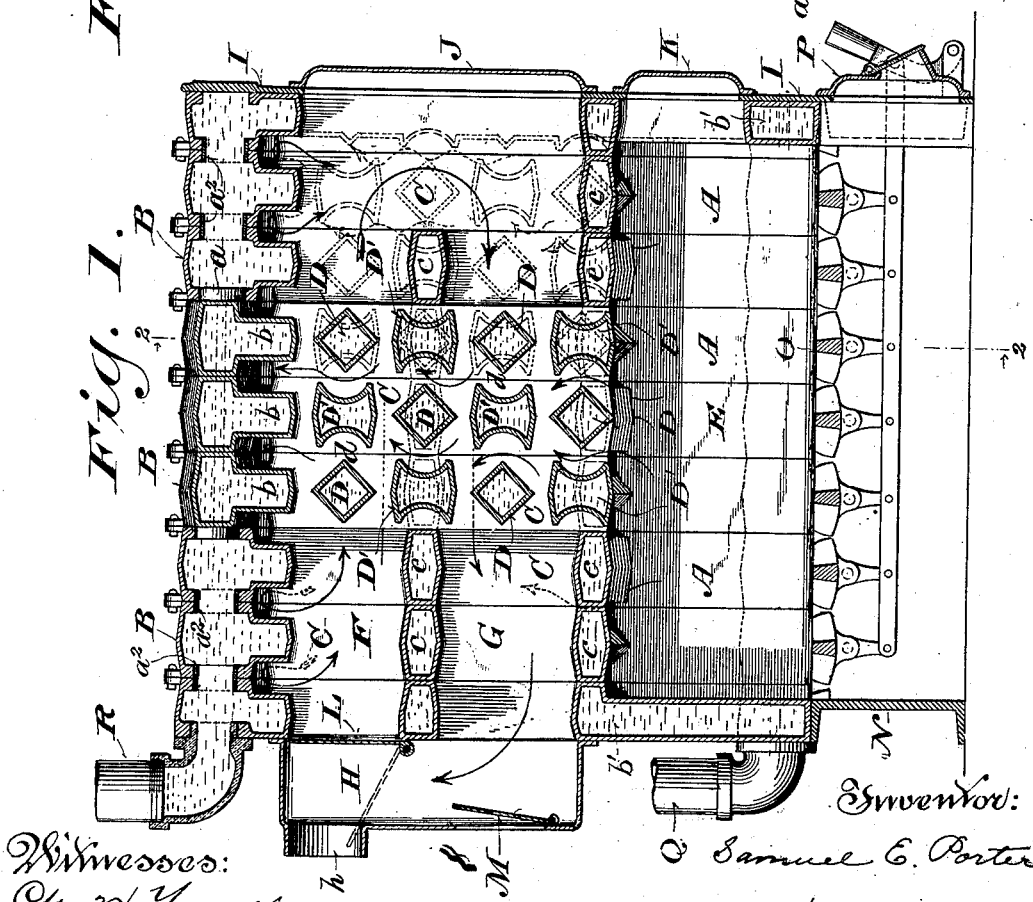


Fig. 1.



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UNITED STATES PATENT OFFICE.

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SECTIONAL WATER-HEATER AND BOILER.

SPECIFICATION forming part of Letters Patent No. 676,340, dated June 11, 1901.

Application filed March 19, 1900. Serial No. 9,302. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL E. PORTER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Sectional Water-Heaters and Boilers, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to sectional boilers and water-heaters of the kind shown in United States Letters Patent No. 638,202, dated November 28, 1899.

The object of the present invention is to afford easy access between the cross-tubes in such a heater for the purpose of cleaning out the side flues and removing the dust and soot which has been found to lodge and collect more or less upon said tubes.

It consists in a certain novel construction and arrangement of parts hereinafter particularly described, and pointed out in the claims.

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

Figure 1 is a vertical longitudinal section of the heater, taken in a broken plane indicated by the line 1 1 on Fig. 2, cutting the three middle sections through the cross-tubes at one side of the center and the remaining sections centrally through the main flues; and Fig. 2 is a vertical cross-section of the heater, taken in a broken plane indicated by the line 2 2, Fig. 1, passing between two adjoining sections to the left of the line 1 1 and cutting one of the sections centrally to the right of the line 1 1.

My improved boiler or heater is composed of a number of hollow cast-iron sections joined together face to face. Each of the intermediate sections consists of two upright side columns or water-legs A A, which are connected at their upper ends by a hollow arch B, two intermediate upright 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 of the heater. The outer columns A are extended at their lower ends below the intermediate columns C and the lower tubes D 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, which run lengthwise through the upper part of the heater, 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 Fig. 1, their faces will form closed joints. The cross-tubes D of each section are preferably made prismatic or diamond shape or with sides projecting beyond their tops and bottoms and alternate with the tubes D′, which have longitudinally concaved or recessed sides. The tubes D on one side of each section preferably alternate with tubes D′ on the other side of the same section, so that a single pattern may be used for all of the intermediate sections, and by reversing every other one in assembling them the tubes D of each section will be directly opposite the tubes D′ of the adjoining sections, the lateral angles or projecting sides of the one being presented toward the recessed sides of the other, so as to form zigzag passages *d d*, leading upwardly from the fire-box E through the spaces between the webs *b* into the upper flue F. The openings between the tubes D D′ in the several sections are arranged opposite or horizontally in line with each other, as shown in Fig. 1, so that a brush may be passed through them from one end of the heater to the other and dust and soot lodging and collecting upon said tubes may be readily removed therefrom. The tubes D D′ are preferably inclined downwardly toward their outer ends, so as to accelerate the circulation of the 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.

The front and back sections have hollow webs *b′ b′*, extending from top to bottom, with plain outer walls and inner walls having cross projections on each side corresponding with the adjacent halves of alternate cross-tubes D and D′ of the adjoining sections.

The heater may be made with a single main flue extending lengthwise through it by omit-

ting the upper cross connections *c* between the intermediate columns C C when an indirect draft is not desired; but when it is made with two flues, as shown in the drawings, the upper cross connection *c* is omitted from the front section and one or more of the intermediate sections next to it to afford free communication between the flues F and G at the front of the heater. At their rear ends the flues F and G open into a smoke-box H, attached to the back section and provided at or near its upper end with a flanged opening *h* for the attachment of the smoke-pipe. The upper flue opening into said smoke-box is provided with a damper L, by means of which direct communication may be established between the upper flue F and the smoke-pipe or indirect communication by way of the lower flue G. The smoke-box H is also provided with a check-damper M.

I is a door plate or frame attached to the front section and provided with doors J and K, opening, respectively, into the front ends of the flues F and G, the spaces between the cross-tubes D and D′, and the fire-box E. Preferably separate clean-out door-openings and doors J are provided for the flues F and G and for the flue-openings between the tubes D and D′ on each side of the heater.

N is a rectangular cast-iron base upon which the sections of the heater are mounted. It forms the ash-pit and is provided at the top with a grate O of the usual or any suitable construction for heaters of this class. The door-plate I may be extended at the bottom over the base and provided with an ash-pit door P.

The water-spaces, in the several sections of which the heater is composed, communicate with each other through openings *a a* in the adjoining faces of said sections at or near the lower ends of the columns A and at or near the middle of the arches B B, and the sections are preferably secured to each other by means of short bolts passing through ears *a′*, cast on the sections, as shown in Fig. 2. To allow for unequal expansion and contraction, to maintain tight joints, and prevent leakage, the openings *a a* may be provided with plain slip-nipples a^2, fitted in said openings.

Q designates the return or water inlet or supply pipe, which may be connected with the opening *a* in the lower end of the water leg or column A at either end and on either side of the heater. If desired, a number of return or supply pipes may be used.

R designates an outlet or service pipe, which may be connected, as shown, with the opening *a* in the arch B at either end of the heater, or one or more such pipes may be connected with any of the sections through the tops of the arches of intermediate sections or the outer sides of the arches of the front and back sections.

By the construction and arrangement of the flue-spaces and water-passages of the sections, as hereinbefore described, 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 *d* between the columns A and C and the cross-tubes D D′ on each side of the heater into the flue F.

It will be obvious that heaters of different sizes and capacities may be built up of like sections on the plan herein described by assembling more or less sections, as required, and providing bases of different lengths.

The draft or course of the products of combustion from the fire-box E to the smoke-pipe is indicated by arrows on the drawings.

Various changes in minor details of construction may be made without materially affecting the principle and mode of operation of the heater and without departing from the spirit and intended scope of my invention.

I claim—

1. A water-heater or boiler comprising hollow sections having upright side columns and intermediate columns connected with each other at their upper ends and cross-tubes connecting the intermediate with the side columns, alternate tubes of each section having projecting and recessed sides, the spaces between the tubes of adjoining sections being in line with each other and the adjoining sections being arranged with the tubes having projecting sides opposite those having recessed sides and forming zigzag passages leading upwardly from the fire-box, substantially as and for the purposes set forth.

2. A water-heater or boiler comprising a number of hollow sections having upright side columns and intermediate columns connected with each other at their upper ends and cross-tubes connecting the intermediate with the side columns which extend below the intermediate columns and form the sides of the fire-box, the sections having registering openings which form a flue extending lengthwise through the upper part of the heater, alternate tubes of each section having projecting and recessed sides, and the tubes having projecting sides in one section being opposite those having recessed sides in the adjoining section and forming zigzag passages which lead upwardly from the fire-box into the longitudinal flue in the upper part of the heater, substantially as and for the purposes set forth.

3. A water-heater or boiler composed of hollow sections having registering openings which form a flue running lengthwise through the upper part of the heater, the middle sections having side columns and intermediate columns connected with each other at their upper ends and cross-tubes connecting the intermediate with the side columns which extend below the intermediate columns and form sides of the fire-box, the openings between tubes of adjoining sections being in line with each other and opposite tubes of adjoining sections having recessed and projecting sides which form zigzag passages lead-

ing from the fire-box into the flue in the upper part of the heater, substantially as and for the purposes set forth.

4. A water-heater or boiler composed of hollow sections having registering openings which form flues running horizontally through the upper part of the heater and communicating with each other at one end thereof, the middle sections having side columns and intermediate columns connected with each other at their upper ends and cross-tubes connecting the intermediate with the side columns, the openings between tubes of adjoining sections being opposite each other, and the opposite tubes having extended and recessed sides and forming zigzag passages which lead upwardly from the fire-box into one of the flues in the upper part of the heater, substantially as and for the purposes set forth.

5. A water-heater or boiler composed of hollow sections having registering openings which form a flue running horizontally through the upper part of the heater, side columns and intermediate columns connected at their upper ends and alternate diamond-shaped and concaved cross-tubes connecting the intermediate and side columns, the openings between the tubes of adjoining sections being arranged opposite each other and the diamond-shaped tubes in one section being opposite the concaved tubes in the adjoining section and forming zigzag passages which lead upwardly from the fire-box into the flue in the upper part of the heater, substantially as and for the purposes set forth.

6. A water-heater or boiler composed of hollow sections having openings which form flues running horizontally through the upper part of the heater and communicating with each other at one end and with a smoke-box at the other, a damper in the opening between one of said flues and said smoke-box which is provided with a check-damper and with a smoke-pipe connection, the middle sections having upright side columns and intermediate columns connected at their upper ends and cross-tubes connecting said intermediate columns with the side columns and forming zigzag passages leading upwardly from the fire-box into one of said flues, the openings between the tubes of adjoining sections being horizontally opposite and in line with each other, substantially as and for the purposes set forth.

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

SAMUEL E. PORTER.

Witnesses:
CHAS. L. GOSS,
M. L. EMERY.