



# UNITED STATES PATENT OFFICE.

EDWARD C. HOCK, OF PITTSBURG, PENNSYLVANIA.

WATER HEATER OR BOILER.

995,139.

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To all whom it may concern:

Be it known that I, EDWARD C. HOCK, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Water Heaters or Boilers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of a heater or boiler, embodying my invention; Fig. 2 is a section on the line II—II of Fig. 1, and partly broken away; Fig. 2<sup>a</sup> is a section on the line a—a of Fig. 1; Fig. 3 is a section on the line III—III of Fig. 2; Fig. 4 is a section on the line IV—IV of Fig. 2; Fig. 5 is a fragmentary section on the line V—V of Fig. 1; and Fig. 6 is a detail sectional view showing a modification.

My invention has relation to water heaters or boilers of the sectional or unit type, and is designed to provide a boiler or heater of this type, in which the body of water to be heated is broken up into a large number of relatively small bodies; in which there is a maximum direct heating surface; and in which the circulation of the hot gases is so arranged as to insure the utilization of a maximum amount of their contained heat.

The nature of my invention will be best understood by reference to the accompanying drawing, in which I have shown the preferred embodiment thereof and which will now be described, it being premised, however, that various changes may be made in the details of construction and arrangement of the parts by those skilled in the art, without departing from the spirit and scope of my invention as defined in the appended claims.

My improved heater or boiler comprises a back or rear section 2, a front section 3, and a plurality of intermediate sections 4, these sections being of the vertical plane type. Each of the sections is enlarged laterally at its ends, as shown at 5, so as to abut an adjacent section or sections while leaving the intermediate portions of the intermediate sections separated from each other by the fire spaces 6. Each of the intermediate sections has downwardly extending water legs 7, surrounding the fire space 8, said sections being connected at their lower portions by the water passages 9.

The upper wall 10 of the fire space 8 forms

a crown sheet, through which open a plurality of vertical fire tubes or flues 11, which are entirely surrounded by the water spaces 12. The flues 11 open at their upper ends into the horizontal flues or passages 13, one of which is arranged at each side of a central opening or passage 14, and separated therefrom by the water space 15.

16 designates central and lateral openings extending horizontally through each section or unit below the passages 13 and 14 and intermediate the fire tubes or flues 11, each of these openings being also surrounded by the water spaces 12.

17 designates a steam space at the upper end of each section, these spaces being connected and communicating with each other by the tubular nipples 18.

19 designates steam off-take connections.

The intermediate sections are also formed with front and rear enlargements 20, at their upper ends, which abut each other in the manner shown in Figs. 2 and 5, to close off the spaces 6 between adjacent sections at the upper ends thereof, thereby forcing the hot gases rising through these spaces to pass back to the heater, and thence upwardly into the rear end 13<sup>a</sup> of the lateral flues 13, as best shown in Fig. 5. The rear section 2 is also formed with an inward projection or baffle portion 21 (see Fig. 3) which projects into contact with the adjacent intermediate section or unit, and thereby assists in directing the gases into the passages 13.

It will be understood that when the sections are assembled, the openings 13 and 14 form continuous passages or flues extending from the forward chamber 22 to the back section 2, the flue or passage 14 also extending through the back section, as shown at 14<sup>a</sup> in Fig. 2, for connection with the stack flue or chimney.

The products of combustion in the fire spaces 8 in part pass upwardly through the fire tubes 11 and directly into the flues 13, and in part pass upwardly through the spaces 6 intermediate the units or sections and also through the openings 16 and into the flues 13 at the back of the heater. The gases in the flues 13 pass forwardly into the front chamber 22 and into the forward end of the central flue 14, and thence backwardly through said flue to the stack or chimney connection.

It will be seen that my invention in effect provides a combined water and fire tube

boiler, the water being divided into relatively small bodies with heating or firing flues extending at the sides thereof and also upwardly through the same. The enlargements 20 form, in effect, an upper crown sheet which, together with the lower crown sheet 10, not only gives an increased heating surface, but serves to hold the gases within the furnace and distribute them so that the maximum heating efficiency is obtained. The manner in which the gases circulate through the heater is also very effective, since they are not only given upward passes through the spaces between the intermediate sections and through the fire box 11, but are also given back and forth horizontal passes, not only affording a large area of direct heating contact for the water, but also acting to heat the steam contained in the upper steam chamber or space.

In Fig. 6, I have shown a slight modification in which the inner portions 12<sup>a</sup> of the water spaces or legs adjacent to the fire tubes 11 instead of being connected at the bottom, as in the form first described, are closed at the bottom, the passages 16 in this form forming an extension of the fire space or chamber 8.

It will be obvious that my invention provides a boiler or heater which can be very readily manufactured and assembled, each section or unit being capable of being formed as an integral casting, and the sections can be readily set up and connected. Either solid or gaseous fuel may be employed.

I claim:

1. A unit or section for water heaters or boilers having a body portion provided with water spaces with flue openings or passages extending both longitudinally and vertically therethrough, substantially as described.

2. A unit or section for water heaters or boilers having a body portion provided with water spaces with flue openings or passages extending both longitudinally and vertically therethrough, the section having a crown sheet portion at both upper and lower ends of the vertical openings or passages, substantially as described.

3. In a heater or boiler of the type described, a unit or section having a plurality of water chambers arranged side by side, and a plurality of vertically extending fire tubes leading through each of said chambers, substantially as described.

4. A unit or section for sectional water heaters or boilers having side legs connected at their upper ends by a steam space and separated at their lower ends by a fire space,

and an intermediate water-containing portion having a plurality of fire tubes extending vertically therethrough and also a plurality of fire openings or passages extending horizontally therethrough, substantially as described.

5. A section or unit for water heaters or boilers of the type described, having water legs at each side connected at their upper ends by a steam space and separated at their lower ends by a fire space, there being an intermediate water-containing portion between the steam space and the fire space, a plurality of fire tubes extending upwardly from the fire chamber through the water space, a plurality of horizontal fire openings intermediate the vertical fire tubes, lateral openings with which the fire tubes connect at their upper ends, and an intermediate opening between said lateral openings separated therefrom by water spaces, substantially as described.

6. A sectional water heater or boiler, comprising a front section, a rear section and a plurality of intermediate sections, each of the intermediate sections having a plurality of vertical fire tubes extending therethrough, said sections being separated from each other by fire spaces, and the sections being abutted at the upper ends of the fire tubes to close said spaces at the top, and a plurality of horizontal fire flues or passages extending through the intermediate sections and arranged to give back and forth passes of the gases through the body of water contained in the section, substantially as described.

7. A sectional water heater or boiler comprising a plurality of sections or units separated from each other by vertical fire spaces, communicating with a fire chamber at their lower ends and closed at their upper ends, there being horizontal flues with which said spaces connect at the back of the heater, and a plurality of vertical fire tubes in each section also leading upwardly from the fire chamber and into the said flues, substantially as described.

8. In a sectional water heater or boiler, a section having vertical tubular water-containing portions exposed to the hot gases on the exterior, and also having fire tubes extending upwardly therethrough, substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWARD C. HOCK.

Witnesses:

JESSE B. HELLER,  
H. M. CORWIN.