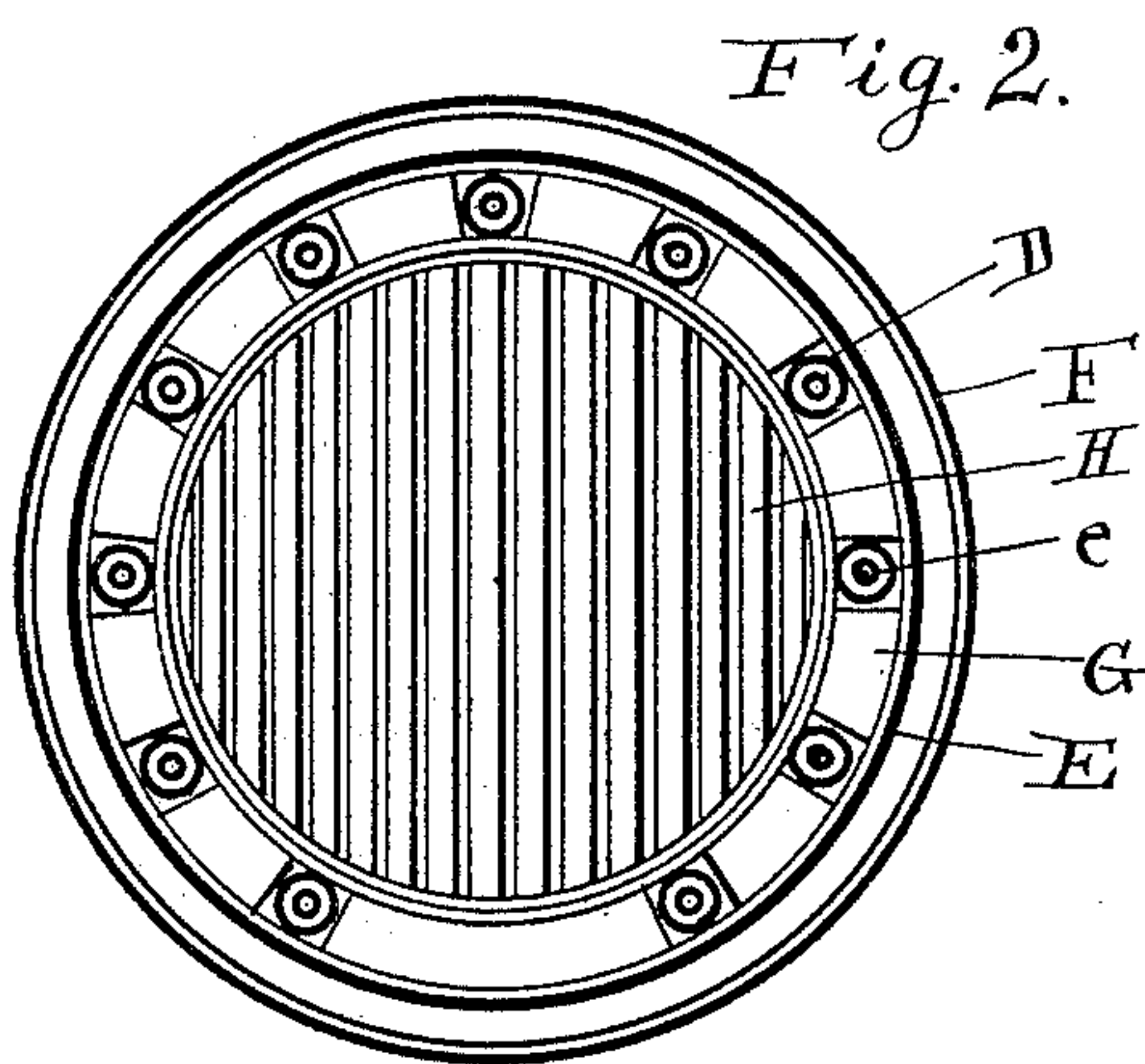
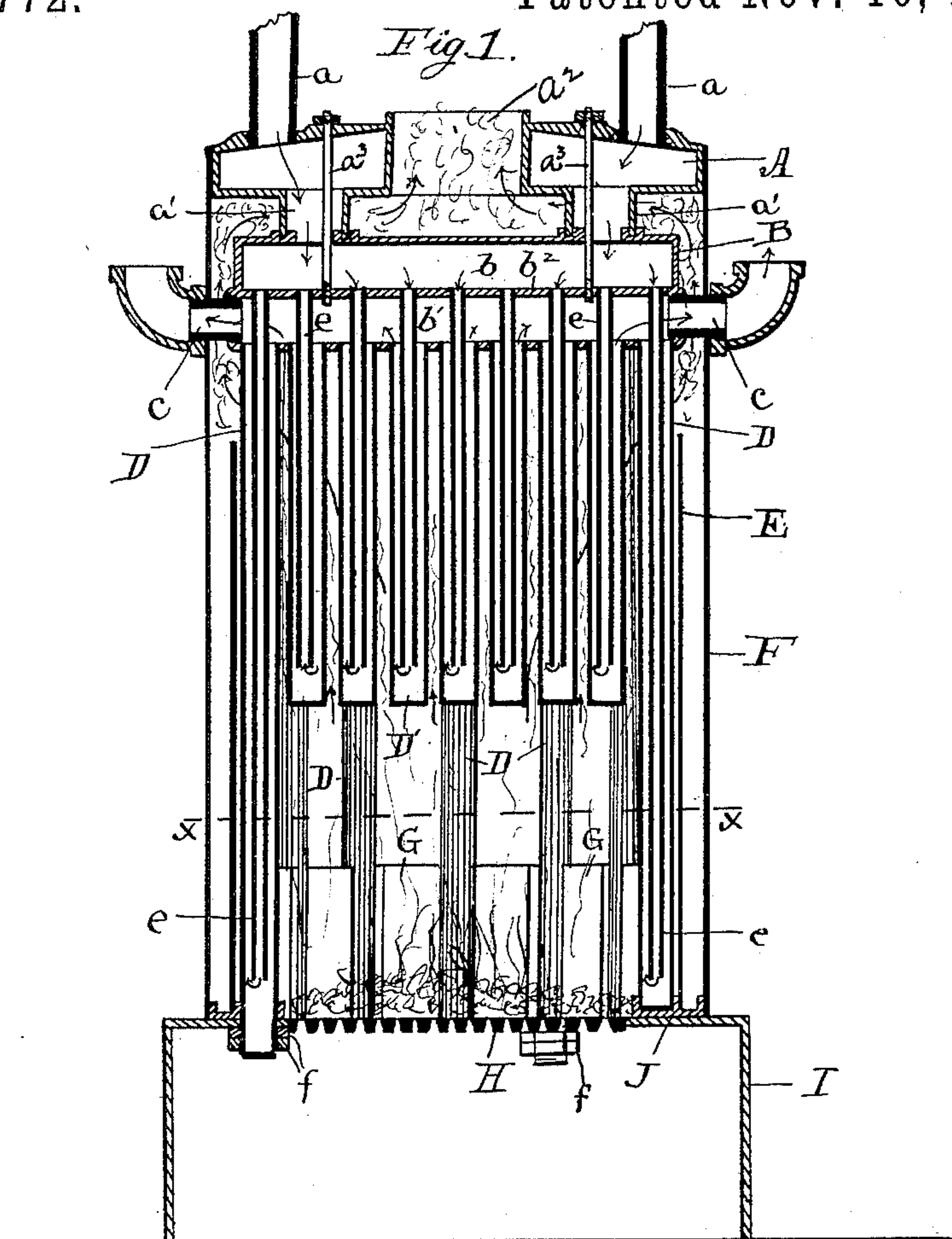


(No Model.)

C. R. NELSON.
HOT WATER HEATER.

No. 462,772.

Patented Nov. 10, 1891.



Witnesses:
H. S. Sanford.
L. P. Crabtree.

Inventor:
Charles R. Nelson
by S. M. Bates
Attorney

UNITED STATES PATENT OFFICE.

CHARLES R. NELSON, OF PORTLAND, MAINE.

HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 462,772, dated November 10, 1891.

Application filed March 6, 1891. Serial No. 383,965. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. NELSON, a citizen of the United States, residing at Portland, in the county of Cumberland and State of Maine, have invented certain new and useful Improvements in Hot-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 heaters for hot-water-heating systems; and the object of the invention is to devise a heater which can be constructed at comparatively small expense with the greatest possible amount of heating-surface for the size of heater and in which the quickest possible circulation will be given to the water.

A further object of my invention is to so construct the heater that wrought pipe may be largely used in its construction. In my new heater I make use of double tubes arranged vertically, a small one inside of a large one, the cold water going down through the small central tube and up through the space between the inner and outer tubes. The main body of these tubes overhang the furnace; but an outer line of them are made longer than the others, so that they extend down to the base to form the walls of the furnace. I provide for the fire passing among them by surrounding their lower ends by a casing, which leaves an annular opening near the top, through which the products of combustion go. The tubes are fixed in a lower chamber having a central horizontal diaphragm, which divides it into two parts. The upper part of this chamber connects with an upper chamber, which is made annular with a smoke-flue in the center, and into this chamber comes the return water, which then comes in contact with the gases of combustion at the point where they leave the boiler.

My invention consists of the various combinations of parts specified in the claims.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a central vertical section, and Fig. 2 is a horizontal section at xx of Fig. 1.

In describing the construction of the heater which I here show I will commence at the top and go downward.

A is an annular upper chamber or dome, the center a^2 of which forms the smoke-flue, by which the products of combustion finally escape from the heater. Below the upper chamber is a lower chamber B, connected with the chamber A by short pipes a' . In the present case the pipes a' are cast in one piece with the chamber A, the lower end of the pipes forming a cup-joint with the chamber B, the two chambers being held together by means of bolts a^3 , passing through the pipes a' . The return-pipes a enter the chamber A. The lower chamber B is of somewhat smaller diameter than the chamber A, as I have here shown it, and it is divided into two parts by a horizontal diaphragm b^2 . I have lettered the upper space of the chamber b and the lower b' . In the lower wall of the chamber B are fixed large tubes D' , which occupy a central position and extend but a portion of the way down to the base, and longer pipes D, extending to the base, which form a line around the outside to inclose the furnace or fire-box. The lower ends of the tubes D and D' are closed, and inside these tubes are small tubes e , which are open at the lower end and are fixed in the diaphragm b^2 . The circulation thus goes down through the small pipes and up through the large ones. The flow or discharge-pipes c lead from the space b' .

I is the base on which the lower ends of the long pipes D rest, and which supports the heater. It is provided with a grate H of any suitable construction. A ring J surrounds the grate, and this ring is provided with three upward-projecting flanges, forming an inner and outer channel. The ends of most of the tubes D rest in the inner channel; but several of them extend entirely through openings in the ring and the base, and are secured beneath the base by lock-nuts $f f$, as shown in Fig. 1. The long tubes D are separated by spaces, into which are inserted fire-bricks G.

Around the outside of the line of tubes E is a casing or jacket E' , which rests on the ring J and extends up around the lower portion of the tubes D' , leaving an annular space between its upper edge and the chamber B for the escape of the products of combustion. It will be seen that the fire must with this arrangement pass up among the tubes until near the under side of the lower chamber, and

then out at the sides. The products of combustion are made to pass up around the outside of the chamber B, thence under the chamber A and out through its central opening.

5 To accomplish this I provide an outer casing, which extends from the base to the upper chamber, it being there secured to the edge of the upper chamber. This forms an annular space around the inner casing and around the
10 lower chamber, through which the products of combustion pass from the annular opening above the inner casing E to the space between the upper and lower chambers, and thence out of the central smoke-flue. An inspection of the drawings shows the way the
15 circulation takes place, this being indicated by arrows in the usual way. As already pointed out, the return water comes in at the upper chamber, through which the smoke passes
20 out. This is an important point in all economical heaters to have the cold water come in at the point where the coolest gases leave. In this way heat is extracted from the products of combustion up to the last instant that
25 they remain in the heater. The return water passes downward into the top of the lower chamber, and thence into and down through the small tubes and up through the large ones, where it comes into direct contact with surface heated by the fire. Leaving the large
30 tubes, it enters the lower chamber, and thence it passes off through the flow or discharge pipes c.

The furnace can be economically built, and
35 it combines the greatest efficiency with the greatest simplicity, and in it I am enabled to use wrought-iron pipes, which are far more efficient than cast-iron. The vertically-disposed pipes are capable of producing the
40 quickest circulation of any arrangement, and they are easily kept clean, because soot will not cling to them.

I claim—

45 1. In a hot-water heater, a chamber divided into two parts by a horizontal diaphragm, large vertical tubes fixed in the lower wall of said chamber, said tubes having their lower

ends closed, small tubes fixed in said diaphragm and extending down inside of said large tubes, said tubes having their lower ends
50 open, inlet or return pipes opening into the upper part of said chamber, outlet-pipes opening from the lower portion of said chamber, a furnace below said tubes, and a casing inclosing said furnace and the lower portions of
55 said tubes and forming an annular discharge for the products of combustion between the upper end of said casing and the lower wall of said chamber, substantially as shown.

2. In a hot-water heater, a chamber divided
60 into two parts by a horizontal diaphragm, large vertical tubes fixed in the lower wall of said chamber, small tubes fixed in the said diaphragm and extending down inside said large tubes, a portion of said tubes forming
65 an outer line of tubes extending downward below those within to form a furnace or fire-box, and a base for supporting said tubes, substantially as shown.

3. In a hot-water heater, the combination of
70 a lower chamber divided into two parts by a horizontal partition, large tubes fixed in the lower wall of said lower chamber, small tubes fixed in said diaphragm and extending down into said large pipes, an annular upper chamber,
75 of larger diameter than said lower chamber, having a central opening forming a smoke-flue, said upper chamber being connected with the lower chamber by pipes, a furnace underneath said tubes, an inner casing surrounding
80 said furnace and the lower portion of said tubes and having an annular space below said lower chamber, an outer casing forming an annular space around said inner casing and
85 having its upper edge connecting with the outer edge of said upper chamber, and discharge and return pipes connecting with said chambers, substantially as shown.

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

CHARLES R. NELSON.

Witnesses:

S. W. BATES,

L. P. CRABTREE.