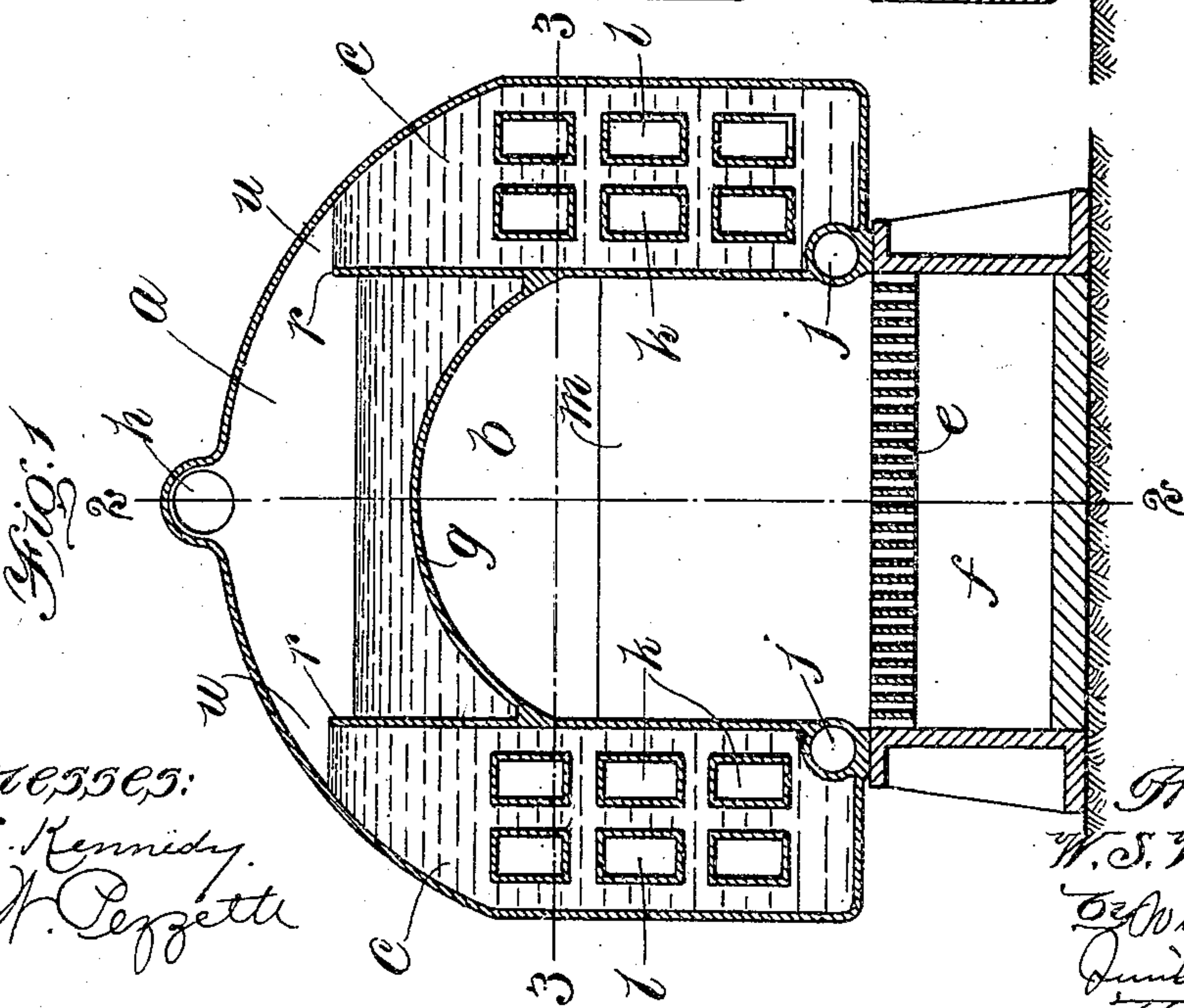
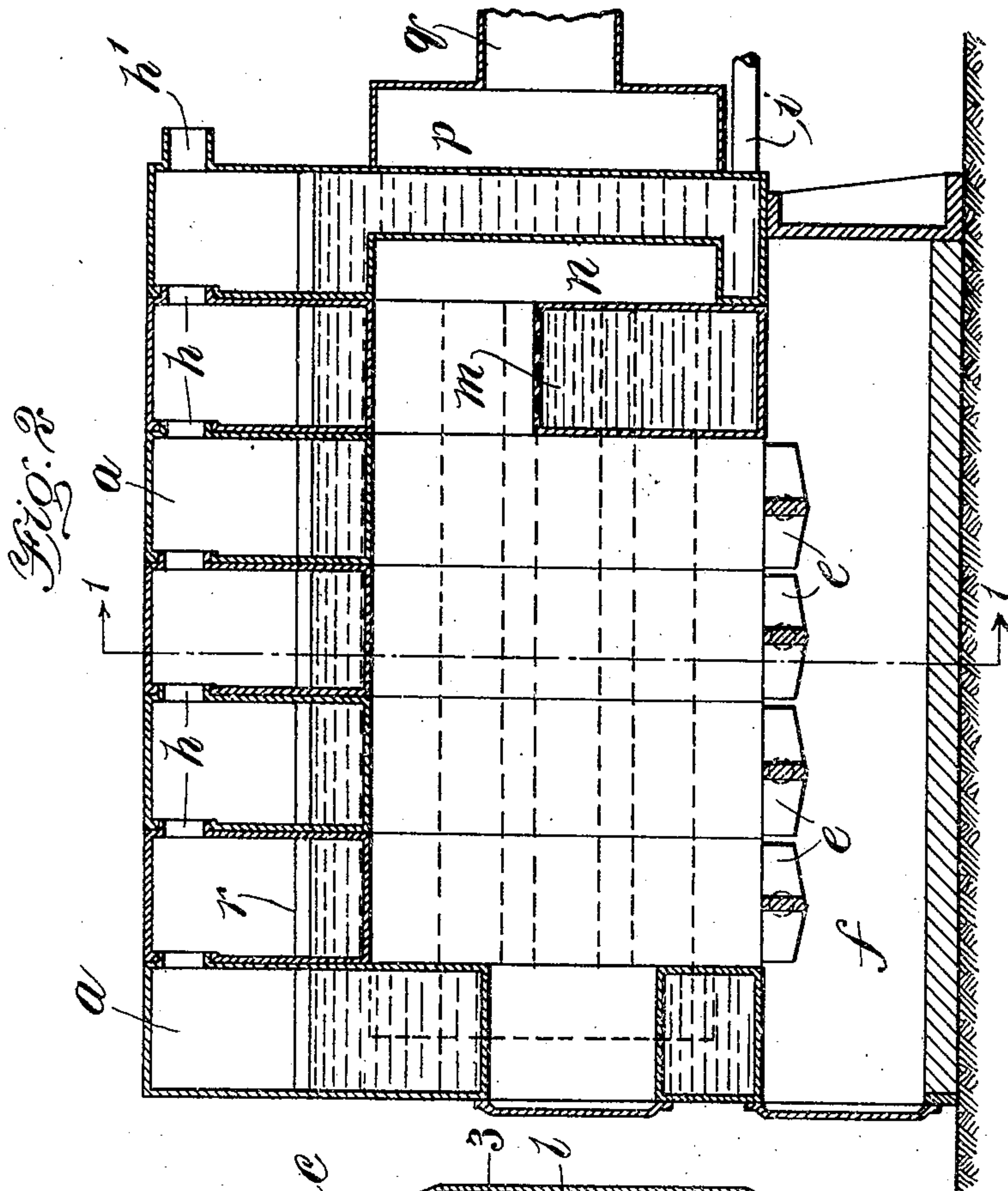


W. S. WASHBURN.
HEATING APPARATUS.

APPLICATION FILED AUG. 23, 1905.

3 SHEETS—SHEET 1.



Witnesses:
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P. H. Pezzetti

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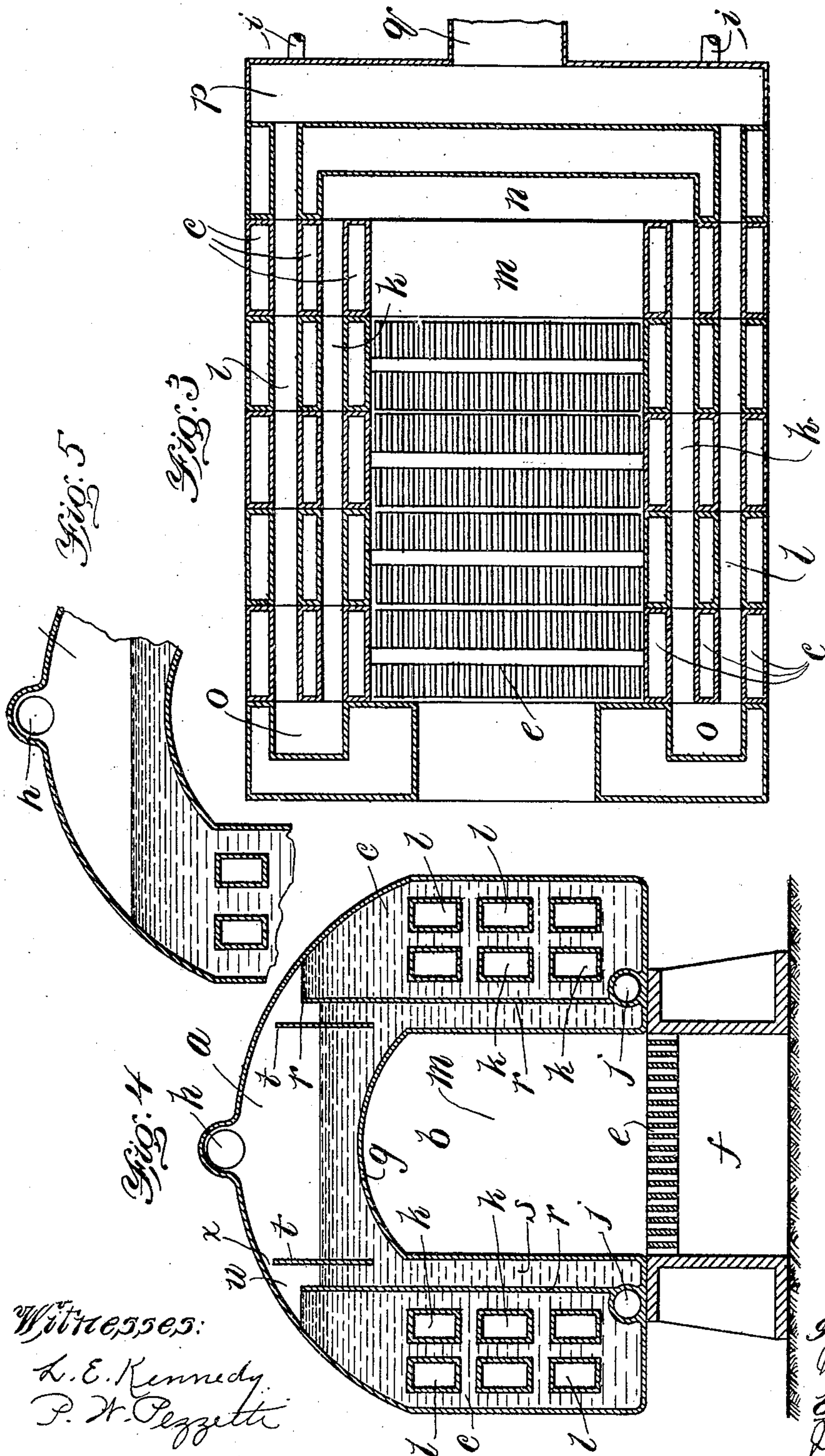
No. 809,154.

PATENTED JAN. 2, 1906.

W. S. WASHBURN.
HEATING APPARATUS.

APPLICATION FILED AUG. 23, 1905.

3 SHEETS—SHEET 2.



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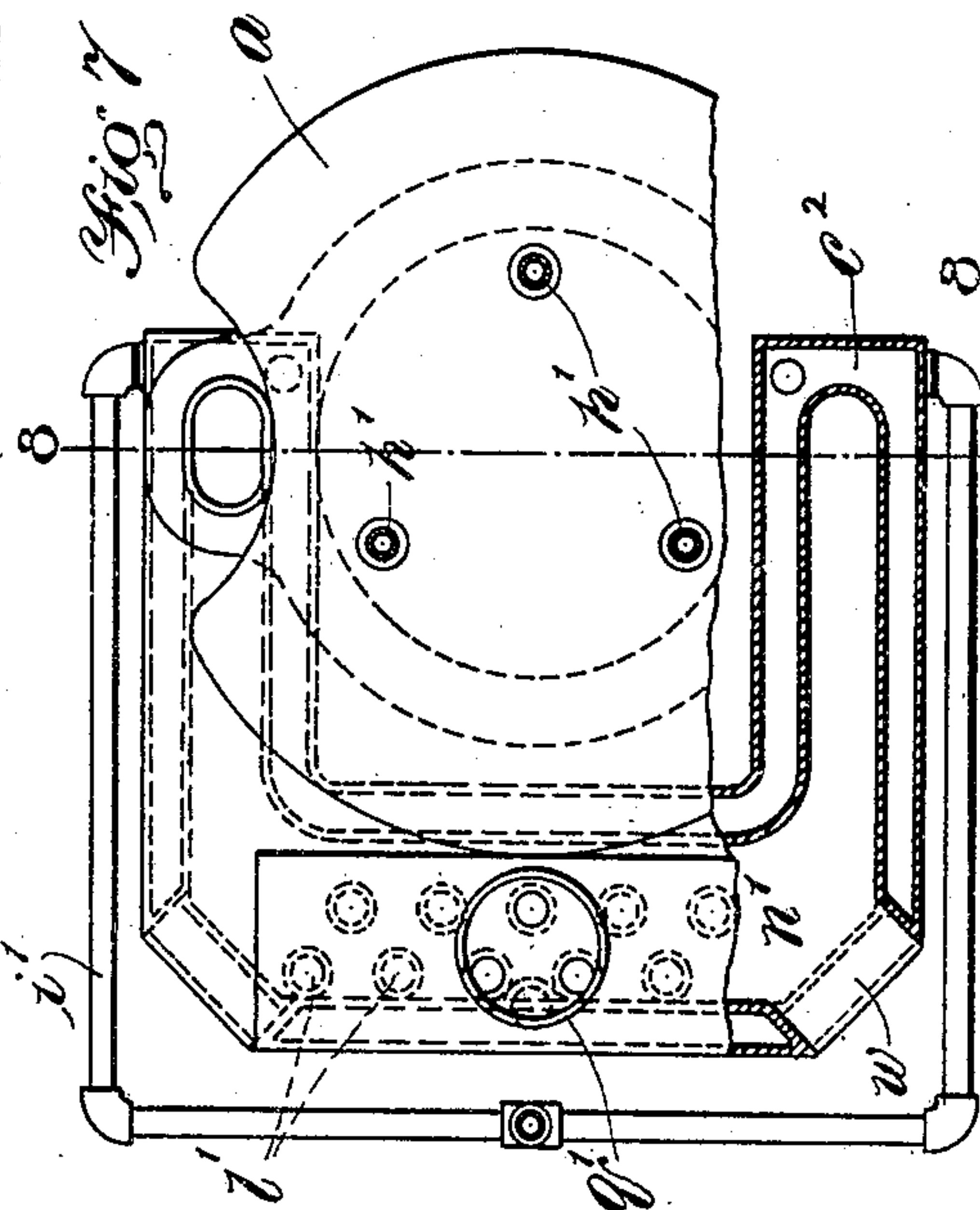
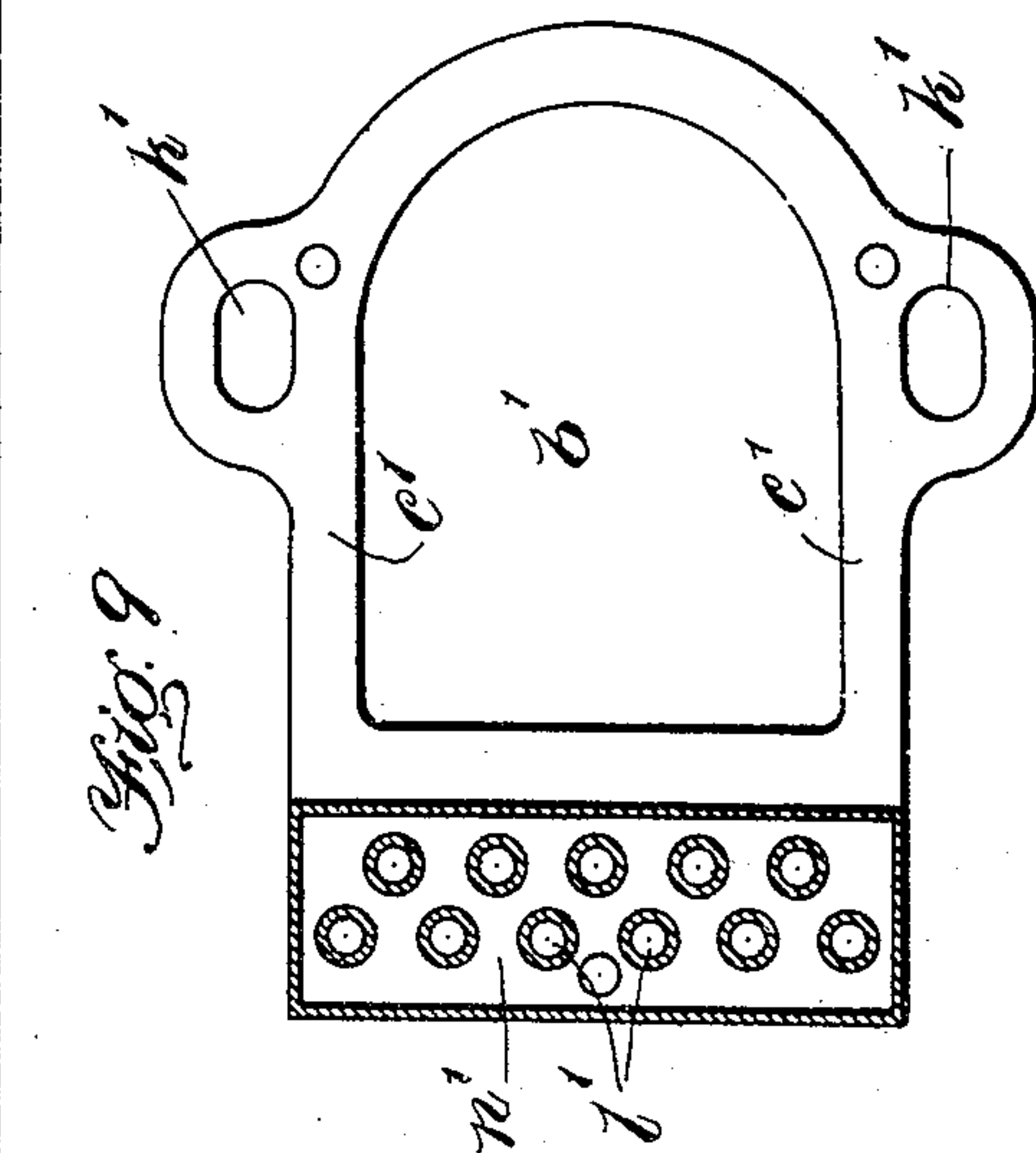
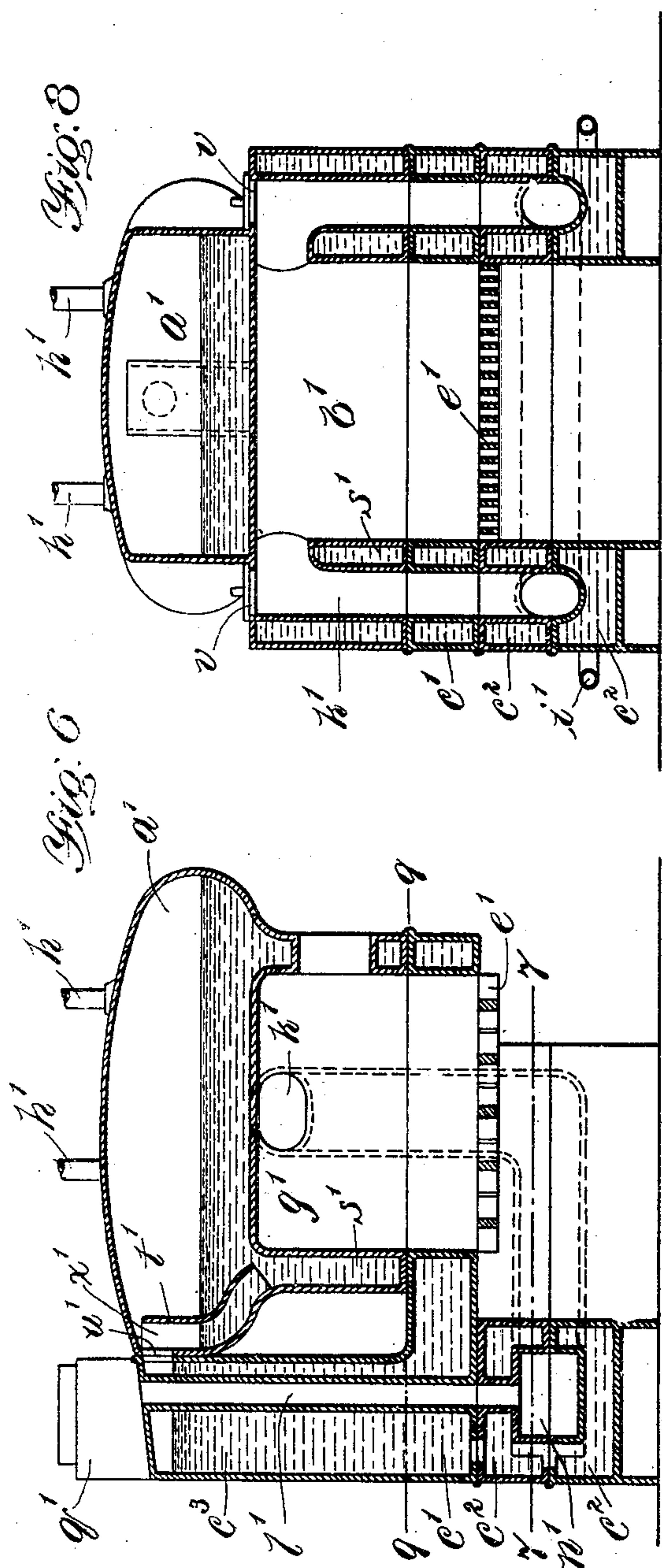
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PATENTED JAN. 2, 1906.

W. S. WASHBURN.
HEATING APPARATUS.

APPLICATION FILED AUG. 23, 1905.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

WILLIAM S. WASHBURN, OF BROCKTON, MASSACHUSETTS.

HEATING APPARATUS.

No. 809,154.

Specification of Letters Patent.

Patented Jan. 2, 1906.

Application filed August 23, 1905. Serial No. 275,397.

To all whom it may concern:

Be it known that I, WILLIAM S. WASHBURN, of Brockton, in the county of Plymouth and State of Massachusetts, have invented certain new and useful Improvements in Heating Apparatus, of which the following is a specification.

This invention relates to heating appliances, and particularly to that class used to generate steam or to heat water for supplying heating systems and radiators of buildings, and is of the same general character as the heating apparatus shown and described in the patent granted to me July 25, 1905, No. 795,464.

The apparatus of the present invention is similar to the one in the patent referred to in that it has a main heating-chamber, in which steam may be generated or water raised to the required temperature for a hot-water heating system, the greater portion of such main heating portion being directly above the fire-box, and therefore in close proximity to the source of greatest heat, and also has a preliminary heating portion or chamber which receives the cooler water returning from the system and discharges the return-water into the main heating-chamber.

In cases where the cellar of a building, or that portion where the heater is located, is not at a great depth below the floor where the heating radiators or pipes are supported it has been found difficult to arrange the return-pipes for heaters of the usual type so that the lowermost radiators may be properly drained; and it is the object of this invention to provide a heater by which all the useful results secured by the heater of my previous patent may be attained and in which also the highest level of water may be placed at a comparatively low point. To this end the preliminary heating portion of the apparatus is arranged at a low level near the main heating portion and below the top thereof, the greater part of its bulk being below the normal level of water in the heating-chambers when the apparatus is used as a steam-generator.

Some of the structures in which the invention may be embodied are illustrated in the accompanying drawings, forming a part of this specification, in which—

Figure 1 represents a cross-section of one part of a sectional boiler. Fig. 2 represents a longitudinal central section of such a boiler, taken on line 2 2 of Fig. 1. Fig. 3 represents a sectional plan of the boiler, taken on line 3

3 of Fig. 1. Fig. 4 is a view similar to Fig. 1, showing a slightly-different internal arrangement of the boiler. Fig. 5 is a fragment of a similar view showing a modification. Figs. 6, 7, 8, and 9 show a boiler constructed in a somewhat-different manner, but having the same essential elements, and in these views Fig. 6 represents a vertical section, Fig. 7 a plan, partly in section on line 7 7 of Fig. 6, Fig. 8 a vertical cross-section on line 8 8 of Fig. 7, and Fig. 9 a sectional plan taken on line 9 9 of Fig. 6.

Referring first to Figs. 1, 2, and 3, it will be seen that this type of boiler is made up of a number of flat sections placed side by side and connected together, each section having a chamber *a*, which is directly above the fire-box *b*, and having at its sides chambers *c*, which extend downward on the sides of the fire-box. *e* is a grate and *f* an ash-pit. The bottom of the chamber *a* is composed of a wall *g*, which constitutes the crown-sheet of the fire-box and against which the flames and hot gases given off by the combustion of the fuel impinge and deliver their heat. The hottest part of the fire is in the space above the grate and directly beneath the crown-sheet, so that this part of the fire and the crown-sheet constitute the main source of heat, and the chamber *a* is in the closest possible proximity thereto, while the chambers *c*, which receive the return-water and constitute the preliminary heating portions of the apparatus, are arranged where they receive less of the direct heat from the fire and are therefore at a greater distance from the main source of heat than is the chamber *a*. Each of the sections has an outlet *h*, leading from the top of the main heating-chamber into the adjacent section of the heater, and one of the sections, preferably the one at the rear of the heater, has its outlet *h'* connected to the supply end of the heating system of pipes for the building. The return end of the heating system is connected at *i* to the lower part of the rear chamber *c*, which chambers are connected together by passages *j* through the walls thereof, so that a free circulation through all the sections of the heater is permitted. The chambers *c* of the sections are also provided with passages *k*, extending entirely through and partitioned off from the interior of the chambers in the portion nearest the fire-box and passages *l* near the outer sides of the chambers, the corresponding similar passages of each of the sections being in alinement.

The section of the heater next to the rear section is provided with a bridge-wall m , and the rearmost section has a chamber n extending on each side so as to open into the innermost passages k . The front section also has on each side of the fire-box a chamber o , into which open both sets of passages k and l , but which has no direct communication with the fire-box. By reason of this arrangement the smoke and gases resulting from the combustion of the fuel pass over the bridge-wall m and into the chamber n , where they divide and pass forward on both sides of the heater to the inner passages k into the chamber o in the foremost section, where they are deflected and caused to pass through the passages l into the chamber or smoke-bonnet p , from which an outlet q conducts them to the stack or chimney. Thus the passages and chambers constitute flues which form the only outlet for the products of combustion and conduct them twice through the preliminary heating-chambers, where they heat the return-water to a certain extent after having imparted the greater portion of their heat to the water in the main heating-chamber and have become somewhat cooled. Thus the return-water is given a preliminary degree of heat in the chambers c and is caused to circulate in a natural manner from the bottom to the upper part thereof, where it overflows the partitions r , which separate the chambers, into the main heating-chamber, where it receives its final increment of heat and is converted into steam which passes through the outlet h and h' into the heating systems.

The heater shown in Fig. 4 is similar in all respects to that above described, except that the heating-chamber is provided with water-legs s , extending downward on each side of the fire-box and separating the preliminary heating-chambers from direct contact with the fire. This form also has walls t , which extend from one side wall to the other of the section and project below the water-level of the main heating-chamber, whereby the water flowing from the preliminary chambers is carried below the water-level into the lower part of the main heating-chamber before it can mingle freely with the water therein. If desired, the partitions r and t may be omitted entirely and the chambers a and c thrown together to form practically a single continuous chamber of which the lower part is the preliminary heating portion and the upper part the main heating portion. Such a construction is illustrated in Fig. 5. The walls t may also be used with the heater of Fig. 1.

In the form of heater shown in Figs. 6 to 9 the principles of the invention are shown applied to a horizontal sectional boiler in which a' represents the main heating portion, having water-legs s' surrounding the fire-box, and c' c^2 are sections which are connected together to receive the return-water, constitut-

ing thereby the preliminary heating portion. The lowermost sections c^2 are U-shaped in plan and support the grate e' and section c' , which in its lower portion is U-shaped at the rear and circular at the front, surrounding entirely the fire-box and supporting the main heating portion which rests upon it. This section c' has an upward extension c^3 , having an outlet-passage u' into the main heating portion, and flues k' lead from the sides of the fire-box immediately below the crown-sheet g' downward and rearward into a box n' , within and between the lower sections c^2 , from which flues l' conduct the products of combustion through the upward extensions c^3 to the chimney. The return end of the heating system is connected to the pipes i' , which open into the sides of the sections c^2 . It will be seen that sections c' c^2 together constitute the preliminary heating portion, into the lower part of which the return-water is fed and through which pass the outlet-flues for the products of combustion. Thus the water is heated therein to a preliminary degree and is caused to circulate upwardly until it overflows through the passage u' into the main heating-chamber, in which a wall t' is provided to deflect the water below the level in the chamber a' . Openings v and w are provided by which access may be had from outside to the flues k' and chambers n' for the purpose of cleaning them. Proper elements may also be provided for the other type of heater.

These types of heater may be used either for supplying steam or hot water for heating purposes, and when steam is to be generated the level of water in the chambers a or a' will be kept low enough to provide a steam-dome in such chambers; but when water is simply to be heated without converting it into steam all the chambers will be entirely filled. It will be seen that in each of the forms of heater described there is a preliminary heating portion by which the same advantageous results may be obtained as are possible with the heaters of my prior patent—that is, the hottest water of the system is contained in a position where it is acted on by the hottest gases given off by the fire and is protected by the return-water chambers from being acted on by any except the hottest gases, while those gases which have already given up a part of their heat are led so as to act upon the return-water in such a way that the coolest gases act upon the coolest water, and that also the preliminary heating-chambers are located beside and mainly below the main heating-chamber, so that the water-level in them is little higher than the water-level in the main heating-chambers, and thus it is possible to have the water-level at a very low point and secure efficient drainage from the heating system even when the space wherein the heater may be located is

but a slight amount below the support for the radiators.

Above the upper edges of the walls t and t' and between the same and the top of chamber a a' , respectively, are passages or vents x and x' , which are provided to permit the escape of steam or air generated and trapped in the preliminary chambers from such chambers into the main heating-chamber, whence the air or steam may pass into the system. The vents also permit the pressure to be equalized on both sides of the walls t t' , whereby danger of undesirable currents being set up from one chamber to another due to excess of pressure in either chamber is avoided.

What I claim is—

1. In a heating system for buildings, a heating apparatus having a main heating portion located in close proximity to the main source of heat and adapted to be connected with the supply end of a system of heating-pipes, and a preliminary heating portion located beside said main heating portion, having provisions at its lower part for connection with the return end of the system and opening at its upper part into the main heating portion, whereby the water supplied by the return-pipe is caused to rise in the preliminary heating portion and then to flow into the main heating portion, where it receives the final increment of heat.

2. In a heating system for buildings, a heating apparatus having a main heating portion and a preliminary heating portion opening into, and located below the top of, the main heating portions, said portions having provisions for connection respectively with the supply and return ends of the heating system, and the main heating portion being close to the hottest part of the fire and so arranged that the hottest water is acted upon only by the hottest gases and is protected from contact with the cooler gases, while the preliminary heating portion is arranged to be acted on by gases which have delivered a part of their heat to the main heating portion.

3. In a heating system for buildings, a heating apparatus having a main heating portion located in close proximity to the main source of heat and adapted to be connected with the supply end of a system of heating-pipes, a preliminary heating portion located beside said main heating portion, having provisions at its lower part for connection with the return end of the system and opening at its upper part into the main heating portion, and a gas-outlet leading from the fire-space through the preliminary heating portion, whereby the water supplied by the return-pipe is first heated partially by the products of combustion and caused to rise in the preliminary heating portion and then to flow into the main heating portion, where it receives the final increment of heat.

4. In a heating system for buildings, a heat-

ing apparatus having a main heating portion located in close proximity to the main source of heat and adapted to be connected with the supply end of a system of heating-pipes, a preliminary heating portion located beside said main heating portion, having provisions at its lower part for connection with the return end of the system and opening at its upper part into the main heating portion, and a system of passages leading from the fire-space through the preliminary heating portion to an outlet, for conducting through such portion the products of combustion after they have given up a portion of their heat to the water in the main heating portion, whereby the water supplied by the return-pipe is first heated partially by the products of combustion and caused to rise in the preliminary heating portion and then to flow into the main heating portion, where it receives the final increment of heat.

5. A heating apparatus for buildings, having a main heating portion in close proximity to the main source of heat and adapted to be connected with the supply end of a system of heating-pipes, a preliminary heating portion located beside the main heating portion and below the top thereof, having provisions at its lower part for connection with the return end of the system and opening at its upper part into the main heating portion, and flues leading from the fire-chamber through the preliminary heating portion, and surrounded by the water therein, to an outlet for carrying off the products of combustion, whereby the water supplied by the return-pipe is heated partially and caused to flow upwardly through the preliminary heating portion into the main heating portion where it receives the final increment of heat, and whereby a relatively low level of water in the heater is permitted.

6. A steam-heating apparatus for buildings, having a steam-generating chamber in close proximity to the main source of heat, a water-receiving portion located mainly below the water-level in the steam-chamber, having provisions at its lower part for connection with the return end of a system of heating-pipes and opening at its upper part into the steam-chamber, and passages leading from the fire-box through the preliminary heating portion to an outlet for conducting therethrough the products of combustion after they have delivered a part of their heat to the water in the steam-chamber, whereby the return-water is heated and a low water-level in the heater permitted.

7. In a heating system a heating apparatus having a main heating portion located in close proximity to the main source of heat and adapted to be connected with the supply end of a system of heating-pipes, a preliminary heating portion beside and below the main heating portion having provisions at its lower

part for connection with the return end of
the heating system and having an opening at
its upper part communicating with the main
heating portion, and a wall or partition in the
5 main heating portion connected to the walls
thereof and extending laterally across said
opening and downward below the water-level,
there being provided a vent-space between

the upper edge of said wall or partition and
the top of the main heating portion.

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

WILLIAM S. WASHBURN.

Witnesses:

ARTHUR H. BROWN,
E. BATCHELDER.