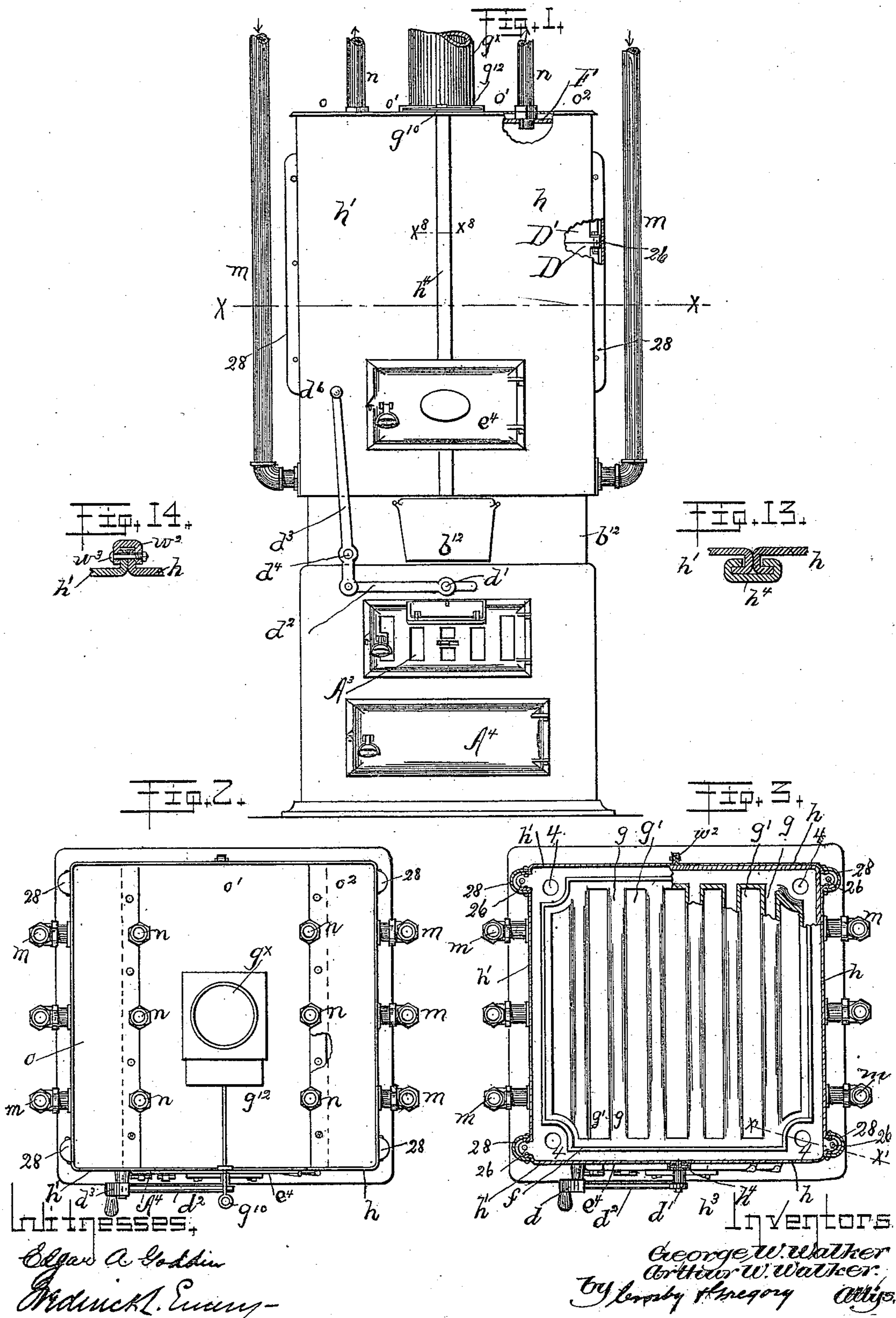


3 Sheets—Sheet 1.

No. 442,651.

Patented Dec. 16, 1890.



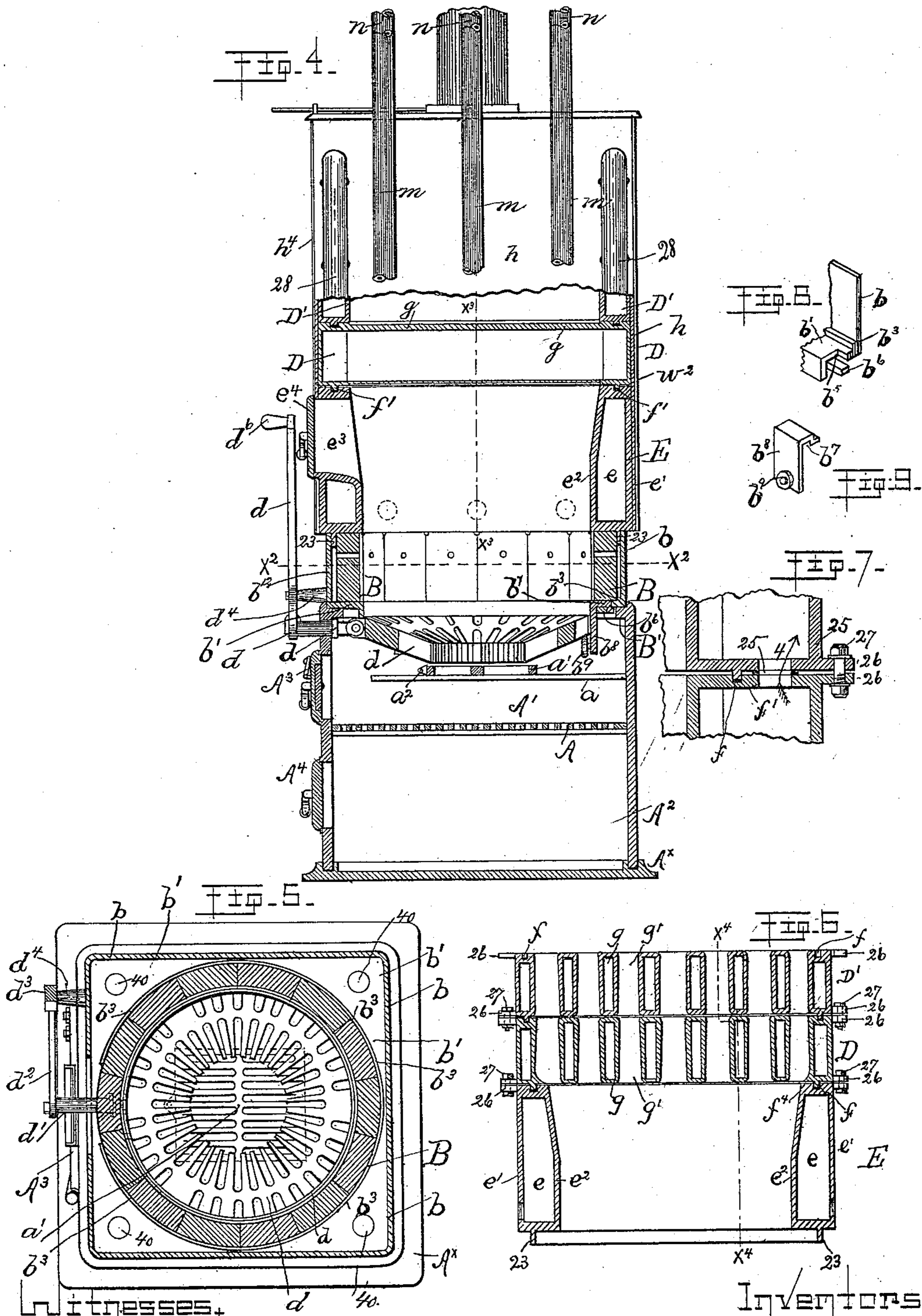
(No Model.)

3 Sheets—Sheet 2.

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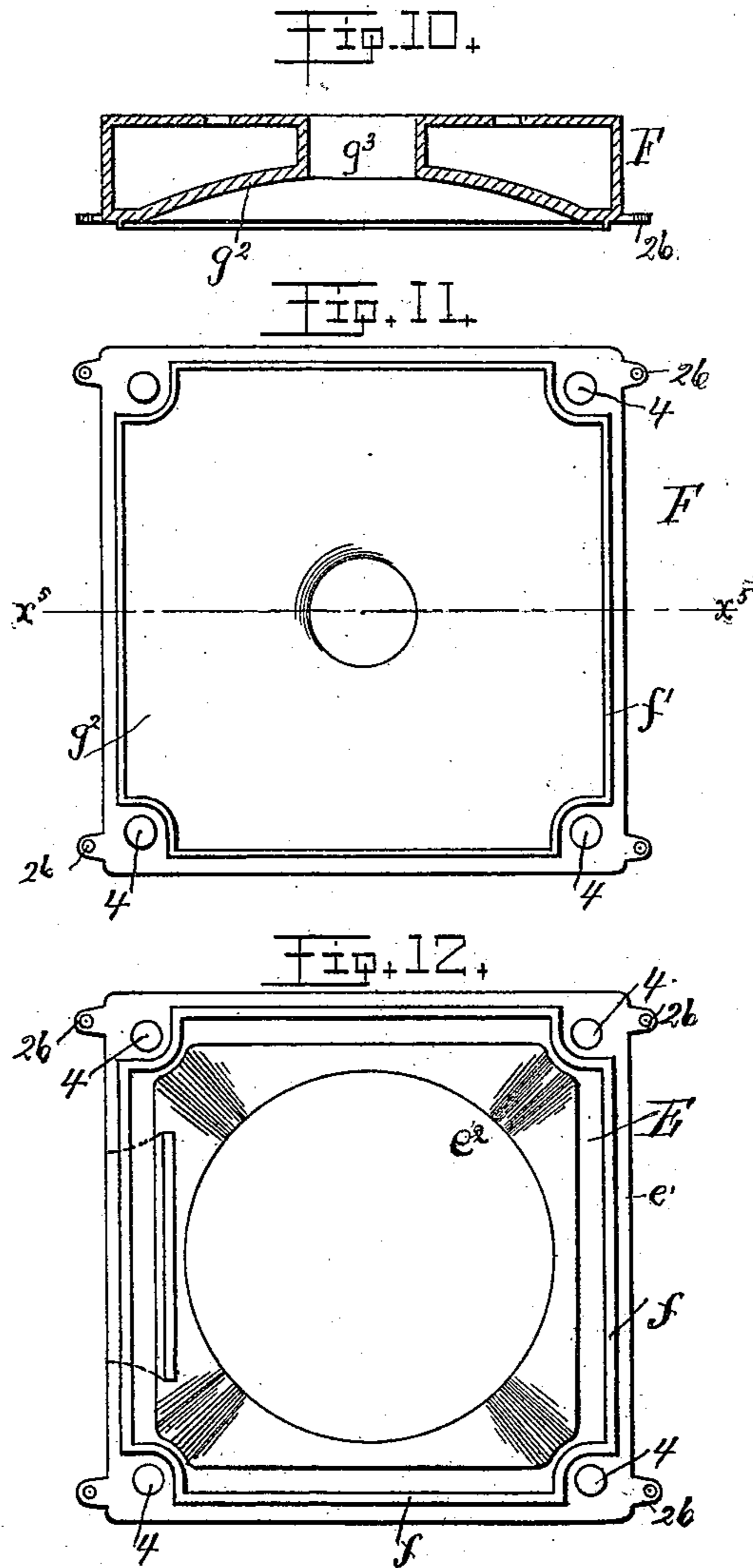
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# UNITED STATES PATENT OFFICE.

GEORGE W. WALKER AND ARTHUR W. WALKER, OF MALDEN,  
MASSACHUSETTS.

## HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 442,651, dated December 16, 1890.

Application filed March 7, 1890. Serial No. 342,972. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE W. WALKER and ARTHUR W. WALKER, both of Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Hot-Water Heaters, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

10 This invention has for its object to improve that class of hot-water heaters in which the different sections are superimposed and connected together to permit the water to circulate vertically through all the sections and  
15 along the cross-tubes or passages thereof.

In our improved heater the combustion-section between the upper end of the fire-pot section, or that which is lined with fire-bricks or other usual blocks, and the circulatory sections, is made with double walls, the outer wall being shown as quadrangular in cross-section, while the inner wall is substantially circular in cross-section, the inner wall tapering outwardly from its lower toward its upper  
20 end, to thus afford more space for the products of combustion, such increase of space affording better opportunity for more complete combustion, the space between the two walls being filled with water, which when heated rises through the circulatory sections above.  
25 The circulatory sections and the combustion-section are provided with ears, which are bolted together outside, as usual. We have inclosed these sections in a sectional or divisible jacket held together by suitable detachable locking devices, so that the said jacket may be easily applied to or be removed from the heater whenever desired without breaking steam-joints, the jacket having  
30 pockets to embrace the ears, which are so bolted together. Providing the jacket with pockets or hoods extended outwardly enables the main body of the jacket to be brought closer to the circulatory and combustion sections than would otherwise be possible. The  
35 top plate is also divisible or made in parts, so as to be readily removable without breaking steam-joints. The circulatory sections are so arranged one above the other that their cross-tubes stand over each other in vertical lines,  
40 thus leaving vertical flue-spaces between the

tubes of the different superimposed sections, such arrangement of the tubes and flues enabling a person through the door of the combustion-section to insert a flue cleaner or  
55 poker up through the flues of all the sections to clean them, which could not be done if the cross-tubes were staggered, as usual. Arranging the tubes one over another in a vertical plane also leaves open flue-spaces  
60 through the pile of circulatory sections, so that the reflection from the fire is enabled to shine up through the flue-spaces of the circular sections to the under side of the covering-section. Each circulatory section immediately about the water inlet and outlet pas-  
65 sages is preferably planed for the reception of suitable packing, and a rib on each section enters a groove of the other section, which groove is luted or packed to prevent  
70 the escape outwardly of any gases from between the sections.

Figure 1 is a front elevation of a hot-water heater embodying our invention; Fig. 2, a top or plan view thereof; Fig. 3, a section in the  
75 line  $x$ , Fig. 1, one of the circulatory sections being partially broken out. Fig. 4 is a partial elevation and section of the heater. Fig. 5 is a section in the line  $x^2$ , Fig. 4. Fig. 6 shows a vertical cross-section in the line  $x^3$  of  
80 the combustion-section and two circulatory sections mounted thereon, the dotted line  $x^4$  showing the section for Fig. 4. Fig. 7 is an enlarged detail of the circulatory sections and the packing and rib and groove. Fig. 8 is a  
85 sectional detail of the curb and support for the fire-pot lining; Fig. 9, one of the series of brackets, which is shown as shaped to enter notches in the ledge or shelf of the fire-pot section; Fig. 10, a section of the covering-section  
90 of the heater in the line  $x^5$ ; Fig. 11, an under side view of the covering-section. Fig. 12 is a plan view of the combustion section; and Fig. 13, an enlarged section in the line  $x^3$  to show the locking-slide for the removable  
95 jacket. Fig. 14 is a sectional detail of a modified form of locking device for the jacket.

The ash-grate A divides the base of the heater into a space A' and ash-pit A<sup>2</sup>, each provided with a suitable door, as A<sup>3</sup> A<sup>4</sup>. The  
100 base has at its opposite sides like tracks  $a$ , on which rest loosely the sliding center grate

$a'$ , it having a suitable projection, as  $a^2$ , adapted to be engaged by a hook or poker when it is desired to reciprocate the sliding center grate, on which the center of the mass of fuel rests, to thus shake the center of the said mass rather than the outer sides of the mass resting against the fire-brick lining B.

Viewing Fig. 5, it will be seen that there is considerable space between the outer sides of the fire-bricks and the interior of the metal wall  $b$ , and this space is made to communicate with the fire-pot by suitable passages 40, (see Fig. 5,) so that air admitted into the ash-pit may rise into the space outside of the fire-bricks, and passing over, between, or through the said fire-bricks enter the combustion-chamber  $b$  and commingle with the products of combustion.

As shown, the bottom  $b'$  has at intervals (see Fig. 8) openings  $b^5$  and bars  $b^6$ , with which are engaged the hooks  $b^7$  of the legs  $b^8$ , three or more, at suitable intervals apart, the said legs having rolls  $b^9$ , on which rest the lower side of the ring-grate  $d$ , having a concaved upper side and open center.

The ring-grate  $d$  is adapted to support the the outer walls of the mass of burning fuel, and has jointed to it a stud  $d'$ , extended outwardly through a slot in the base, (see Fig. 4,) the said stud receiving on its end a link  $d^2$ , jointed to the short arm of a hand-lever  $d^3$ , pivoted on a stand  $d^4$ , secured to or forming part of the wall  $b$ , the upper end of the said lever having a handle  $d^6$ . The space between the outer side of the lining B and the interior of the wall  $b$  aids in preventing undue radiation of heat through the said wall.

We have shown the fire-pot section as a separate piece set on a shoulder  $B'$  of the base-section; but the wall  $b$  of the fire-pot section might be integral with the base-section, and in such case the bottom plate or support  $b'$  might, and preferably would, be a separate plate.

The portion of the heater from the grate  $d$  to the top of the fire-bricks constitutes the fire-pot section.

The combustion-section E, cast in one piece by the employment of a suitable core, to thus leave a water-chamber  $e$  between the outer quadrangular wall  $e'$  and the inner circular wall  $e^2$ , has a feed-opening  $e^3$ , through which the fuel will be supplied to the fire-pot section when the door  $e^4$  is open. The lower end of the combustion-section rests on the wall  $b$ , and has preferably a lip 23 to act against the upper edge of the fire-brick, the lip 23 corresponding with lip  $b^3$ ; but the lip 23 is not absolutely necessary. The outer wall of the combustion-section E is shown as quadrangular externally, (see Fig. 12;) but the inner wall  $e^2$  is of substantially circular form, as shown in said figure, the wall  $e^2$  gradually tapering upwardly and outwardly, as shown in Figs. 3, 4, 6, and 12, to thus leave inclined walls and form a combustion-chamber of greater area than would be the case if the

inner wall  $e^2$  was vertical, and being circular the coal will settle readily along the wall  $e^2$ . The combustion-section supports the lowermost of the circulatory sections D D', &c., all alike, there being any desired number of such sections, one on top of the other, and finally at the top there is a hollow covering-section F. The upper end of the section E and the upper end of each circulatory section are grooved, as at  $f$ , and the under side of each circulatory section and the covering-section have a lip  $f'$ , the said grooves  $f$ , provided with a suitable packing or luting, receiving the lips  $f'$  air-tight. The contiguous faces of the combustion and circulatory and covering sections are preferably planed true to and about the water-passages 4 from one to the other of said sections, a packing, as 25, being added about the said passages, as shown in Fig. 7.

The circulatory sections D D', &c., have hollow cross-tubes  $g$ , with flue-spaces  $g'$  between, and the said sections are so mounted, one above the other, that the tubes come in vertical lines, thus leaving the spaces  $g'$  open vertically clear up to the bottom plate  $g^2$  of the covering-section F, the said section having a delivery-opening  $g^3$  for the products of combustion. The tubes  $g$  of the superimposed sections are substantially as deep as the sections, and they substantially touch each other to thus form hollow walls between the flue-spaces, the shape of the tubes being such as to afford the maximum amount of tube-surface exposed to heat, and they are of such shape as to practically form well-defined vertical flue-spaces. The spaces  $g'$  may be readily cleaned by a flue cleaner or poker inserted at the door  $e^4$ . The several sections have ears 26 at their corners which are united by bolts 27. The combustion-section and sections above it are inclosed in a jacket made in sections, as herein shown, two sections  $h h'$  of sheet-iron, the flanged edges or lips of the jacket-sections being united as shown at the back and front of the heater.

Fig. 13 on a large scale shows the lips of the parts  $h h'$  united by a grooved locking-strip  $h^4$ , the latter strip being adapted to be moved vertically and slid off the lips to leave the sections  $h h'$  free to be removed from the heater without breaking steam-joints. The sections  $h h'$  may be joined in like manner at the back of the heater, or the out-turned flanges may be covered by a grooved strip  $w^2$  and bolted together, as in Fig. 14, by bolts  $w^3$ . The jacket portions have pockets 28 to embrace or inclose the ears 26, thus enabling the jacket to fit the sections D D', &c., more snugly. The shape of the pockets is best shown in the section, Fig. 3.

In the manufacture of a furnace it is a great desideratum to gain compactness, and at the same time to produce a furnace having a certain capacity for giving heat, so as to occupy the least possible space, for the smaller the space the less the amount of cast-iron to enter into the production of the fur-

nace. By fitting the jacket quite snugly to the circulatory sections and providing the jacket with the pockets to fit the ears, it is possible to make the base and top of the furnace—viz., the cast-iron parts, which are quite expensive—of very much smaller area than though the jacket were large enough to entirely surround not only the circulatory sections, but the ears also. So by the employment of the pockets referred to, to inclose the ears, the parts *B'* and the parts *o o'*, &c., may be made of considerably less area and consequently of less weight, reducing the cost of the furnace.

The water enters the chamber *E* through the pipes *m* and rises through the openings in the corners of the circulatory sections, passing through the tubes *g* more or less, where it is heated as well as in the chamber *E*. The hot water leaves the heater through the pipes *n* in the cover or top section *F*. The top plate is made in three pieces *o o' o''*, so that it may be removed without breaking steam-joints.

The smoke-pipe *g<sup>x</sup>* will be provided with a suitable damper *g<sup>12</sup>*, controlled by a suitable handle *g<sup>10</sup>*.

The light of the fire is free to shine up through the spaces *g'* to the under side of the cover-section, the under side of which is shown in Fig. 10.

Fig. 14 is a sectional detail of a modified form of locking device, it consisting of the U-shaped bar lapped over the flanged edges of the casing and bolted through.

The fire-pot section, with its lips or projections to retain the fire-brick in place when inserted through the door *b<sup>12</sup>*, form the subject-matter of another application, Serial No. 367,716, filed on the 10th day of October, 1890.

We claim—

1. The base-section and the fire-pot section, combined with the water-holding chambered combustion-section of quadrangular shape externally and circular internally, and a superimposed circulatory section, substantially as described.

2. The base-section and the fire-pot section, combined with the water-holding chambered combustion-section having an external quadrangular wall and an internal circular wall, the said internal wall sloping upwardly and outwardly to increase the space in the combustion-chamber, and a superimposed circulatory section, substantially as described.

3. The combination, with the superimposed combustion and circulatory and covering sections having ears bolted together, of a jacket provided with pockets to embrace and cover the said ears, substantially as described.

4. The combination, with the combustion-section having connected circulatory pipes *m* at its opposite sides and the superimposed circulatory and covering sections having ears bolted together, of a sectional or divisible jacket surrounding said sections and interposed between them and the said pipes *m*, and removable locking devices whereby the jacket may be applied or removed without breaking steam-joints, and with the divided or sectional top plate and pipes attached to the covering-section, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GEO. W. WALKER.  
ARTHUR W. WALKER.

Witnesses:

FREDERICK L. EMERY,  
B. DEWAR.