

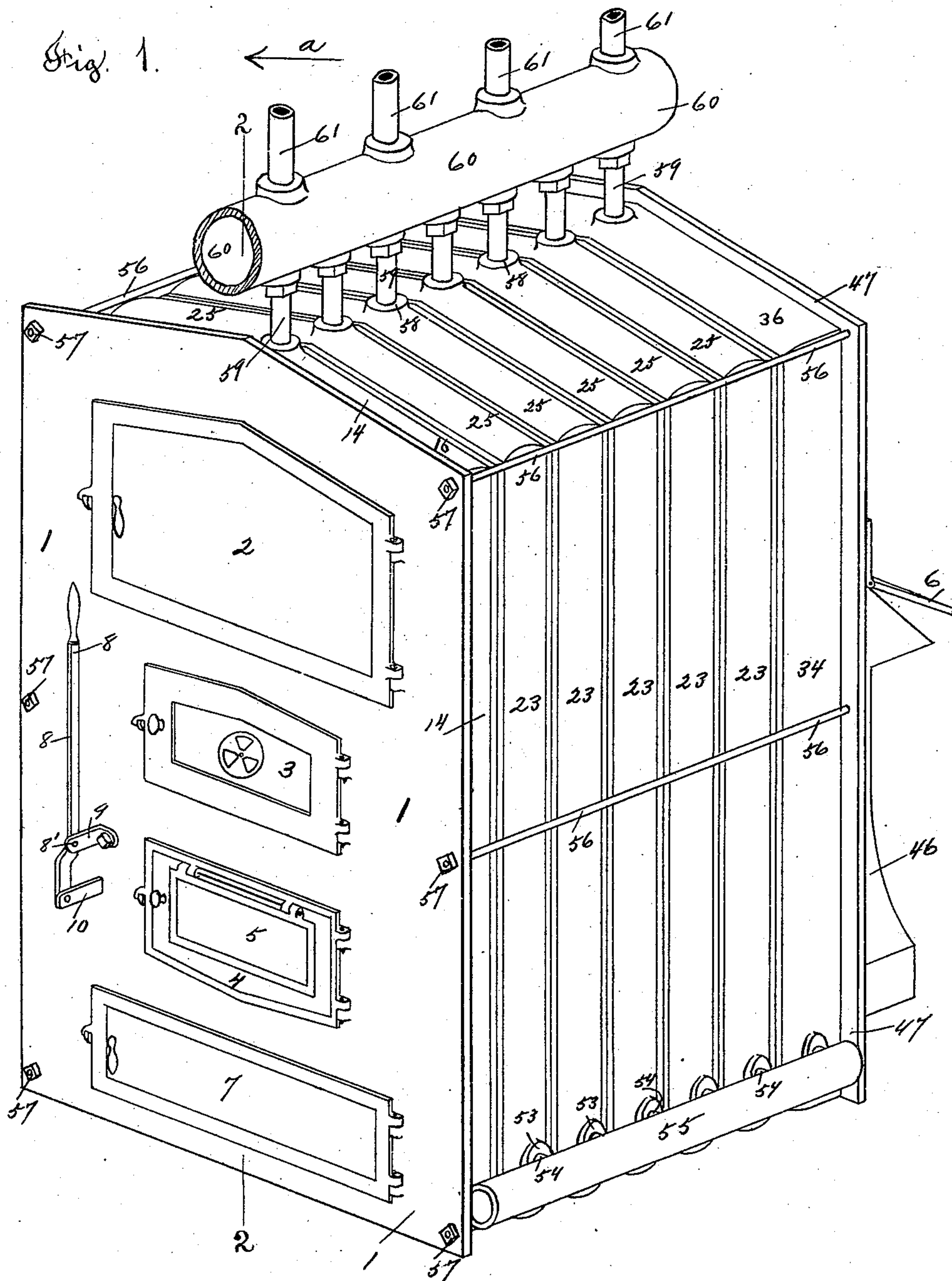
(No Model.)

5 Sheets—Sheet 1.

M. VALVA.
STEAM OR HOT WATER HEATER.

No. 549,947.

Patented Nov. 19, 1895.



Witnesses
Allwington
M. J. Galvin.

Inventor
Michael Valva
By his Attorneys
John E. Dewey

(No Model.)

5 Sheets—Sheet 2.

M. VALVA.
STEAM OR HOT WATER HEATER.

No. 549,947.

Patented Nov. 19, 1895.

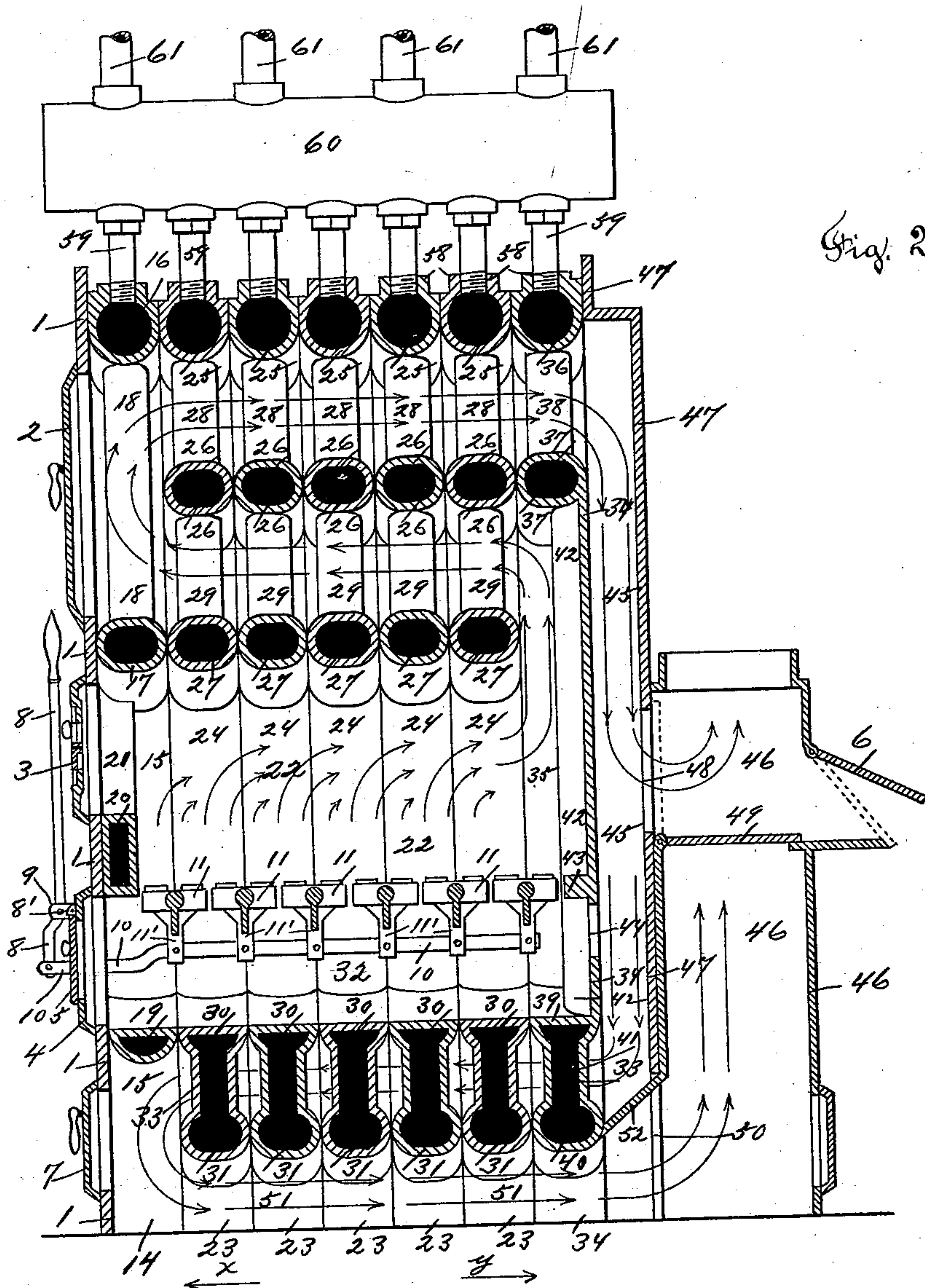


Fig. 2.

Witnesses
Al. Whiting
M. J. Galvin

Inventor
Michael Valva

By his Attorney

John C. Dewey

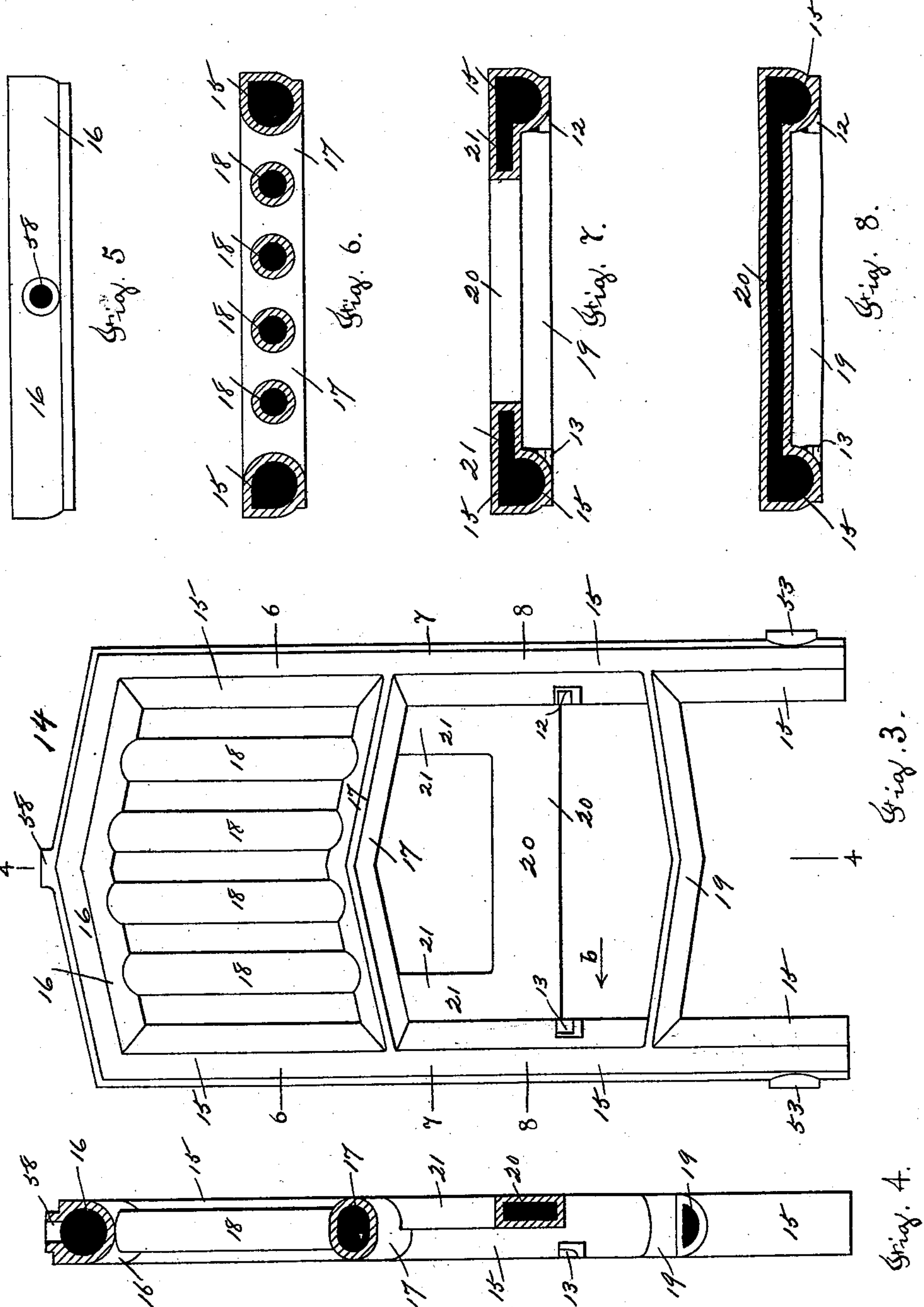
(No Model.)

5 Sheets—Sheet 3.

M. VALVA.
STEAM OR HOT WATER HEATER.

No. 549,947.

Patented Nov. 19, 1895.



Witnesses
A. L. Whiting
M. J. Galvin

Inventor
Michael Valva
By his Attorney
John C. Dewey

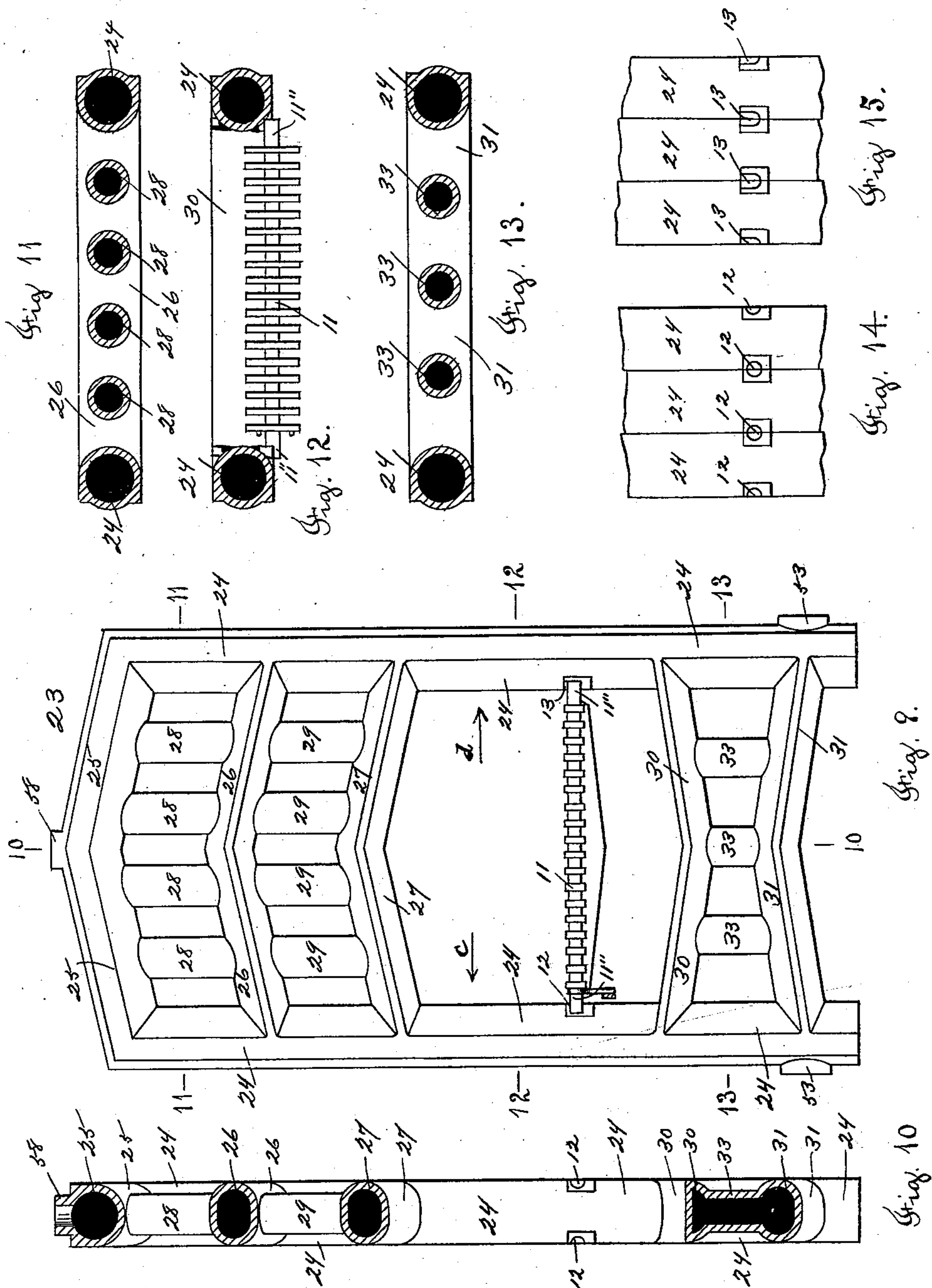
(No Model.)

5 Sheets—Sheet 4.

M. VALVA.
STEAM OR HOT WATER HEATER.

No. 549,947.

Patented Nov. 19, 1895.



Witnesses
A. Whiting
M. J. Galvin

By his Attorney.

John E. Dewey

Inventor
Michael Valva

(No Model.)

5 Sheets—Sheet 5.

M. VALVA.
STEAM OR HOT WATER HEATER.

No. 549,947.

Patented Nov. 19, 1895.

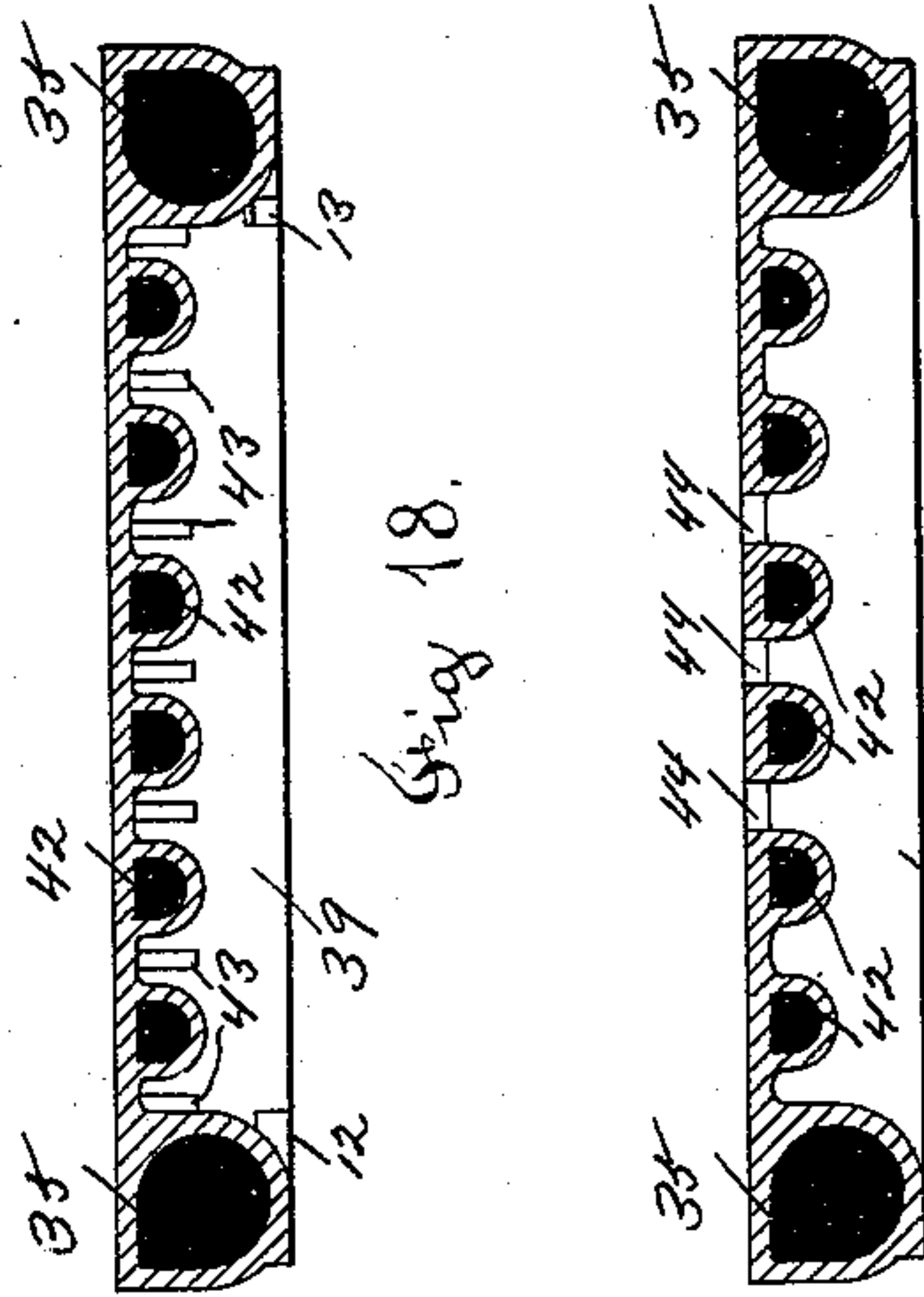


Fig. 18.

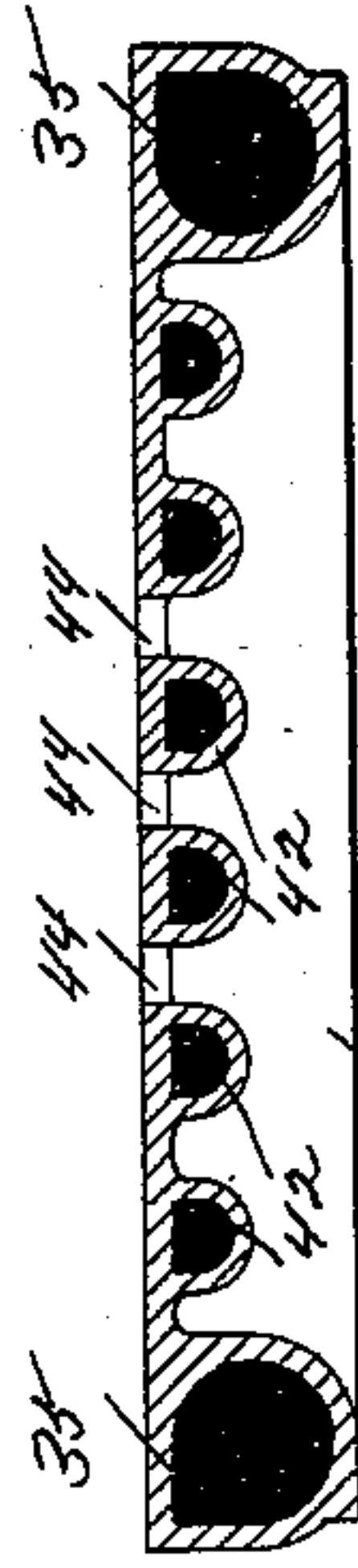


Fig. 19.

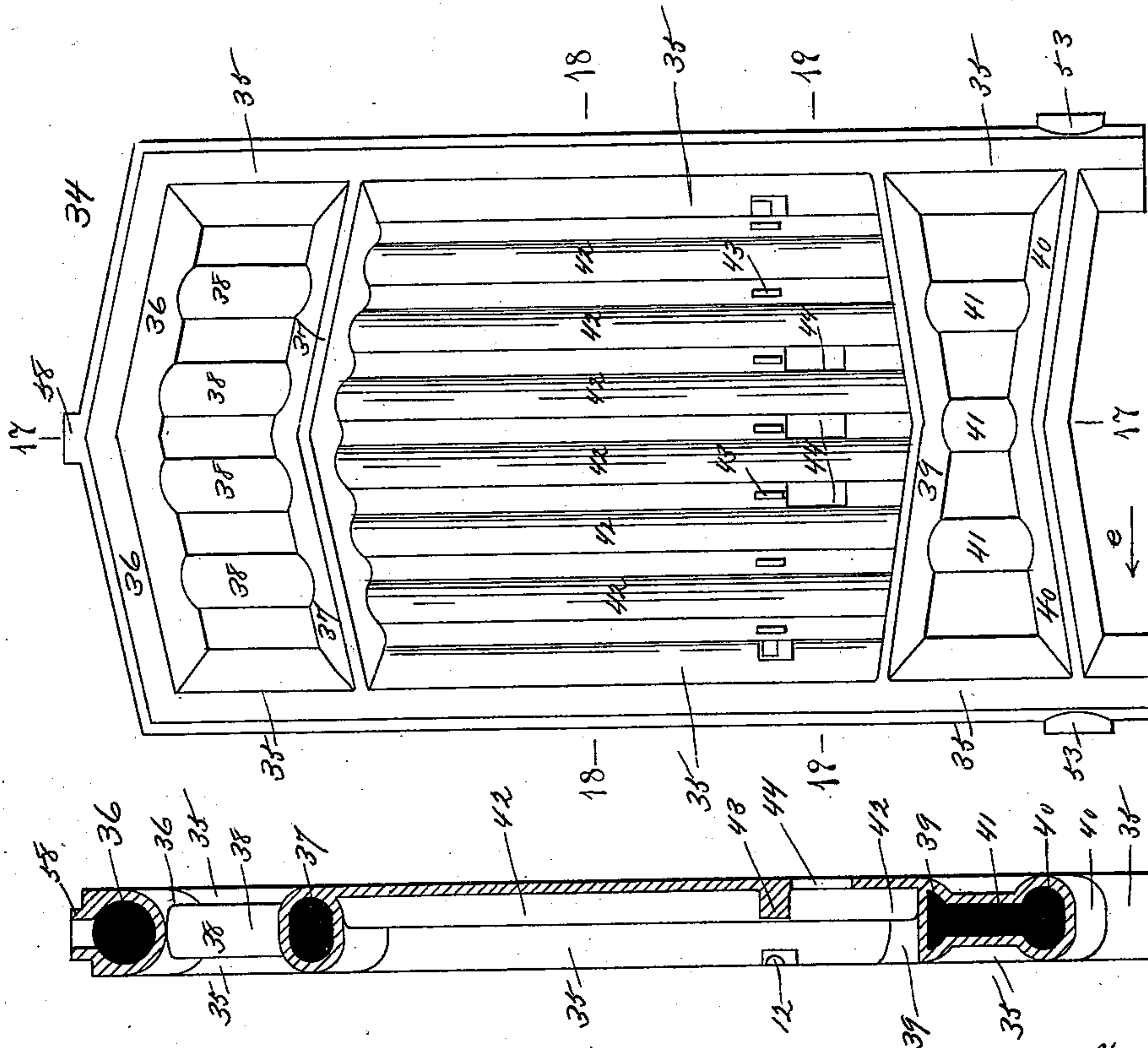


Fig. 16.

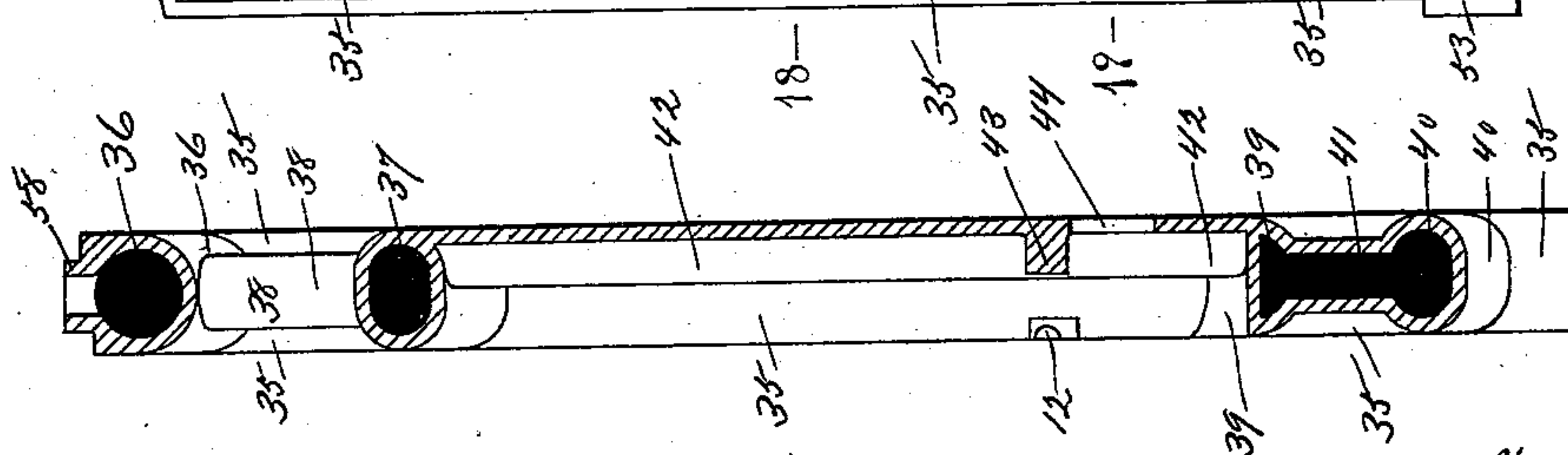


Fig. 17.

Witnesses
A. Whiting
M. J. Galvin

By his Attorney

John C. Dewey—

Inventor
Michael Valva

UNITED STATES PATENT OFFICE.

MICHAEL VALVA, OF WORCESTER, MASSACHUSETTS.

STEAM OR HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 549,947, dated November 19, 1895.

Application filed May 27, 1895. Serial No. 550,782. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL VALVA, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Steam or Hot-Water Heaters, of which the following is a specification.

My invention relates to steam or hot-water heaters designed for steam or hot-water circulation in which are employed a series of flat vertical sections, a greater or less number of sections being employed to provide the desired heating capacity; and the object of my invention is to improve upon the construction of heaters of the class above referred to and to provide a heater of simple construction and operation in which there is a large heating-surface and in which the products of combustion are utilized to the fullest extent by circulating above and back of the fire-pot and under the ash-pit.

My invention consists in certain novel features of construction of my steam or hot-water heater, and more particularly in the construction and arrangement of the vertical sections provided with water-spaces between and around which the heating-gases from the fire-pot circulate, as will be hereinafter fully described, and the nature thereof indicated by the claims.

I have shown in the drawings my heater as a hot-water heater; but the same construction may also be used for steam, in which case the upper portions of the sections will be filled with steam instead of water.

Referring to the drawings, Figure 1 is a front isometric view of a heater of my improved construction. Fig. 2 is a central vertical section on line 2 2, Fig. 1, looking in the direction of arrow *a*, same figure. Fig. 3 is a rear view of the front section of the heater located immediately at the front of the fire-pot and looking in the direction of arrow *x*, Fig. 2. Fig. 4 is a central vertical section on line 4 4, Fig. 3, looking in the direction of arrow *b*, same figure. Fig. 5 is a top view of Fig. 3. Figs. 6, 7, and 8 are respectively cross-sectional views, taken at lines 6 6, 7 7, and 8 8, Fig. 3. Fig. 9 is a face view of an intermediate section of the heater. Fig. 10 is a central vertical section on line 10 10,

Fig. 9, looking in the direction of arrow *c*, same figure. The grate is not shown in this figure. Figs. 11, 12, and 13 are respectively cross-sectional views taken at lines 11 11, 12 12, and 13 13, Fig. 9. Fig. 14 is a detached view of a portion of the side of the fire-pot and ash-pit, looking in the direction of arrow *c*, Fig. 9, showing the holes for the ends of the grate-bars. Fig. 15 corresponds to Fig. 14, but shows the opposite side, looking in the direction of arrow *d*, Fig. 9, showing the U-shaped openings for the detachable ends of the grate-bars. Fig. 16 is a face view of the back section or the section located immediately at the rear of the fire-pot, looking in the direction of arrow *y*, Fig. 2. Fig. 17 is a vertical cross-section on line 17 17, Fig. 7, looking in the direction of arrow *e*, same figure. Figs. 18 and 19 are respectively cross-sectional views taken at lines 18 18 and 19 19, Fig. 16.

As above stated, my heater consists of a series of vertical sections intermediate the front plate and back plate of the heater, all of said sections being of similar construction, except the front section (shown in Fig. 3) and the back section. (Shown in Fig. 16.) In this instance I have shown five intermediate sections between the front and back sections, but more or less may be used, if desired.

In the accompanying drawings, 1 is the front plate of the heater, having a clean-out door 2 at the upper part thereof, a fuel-door 3, an ash-pit door 4, provided with a drop-door 5, which may be connected with the air-check draft 6 below the smoke-outlet at the rear of the heater in any ordinary way, and a lower clean-out door 7. The shaker-handle 8 of the grate is in this instance pivoted at 8' on a stand 9, bolted to the front plate 1, and is attached at its lower end to the bar 10, to which are connected the downwardly-extending arms 11' on one end of the grate-bars 11, as shown in Fig. 2, in the ordinary way. The grate-bars 11 are provided with rounded heads 11'', which extend at one end into a circular recess or depression 12 in the inner side of the sections of the heater and at the other end into a U-shaped recess 13 in the opposite side of the sections, (see Figs. 14 and 15,) so that the ends of the grate-bars 11,

extending into the circular recesses 12 on the side where the shaker-bar 10 is, will be prevented from coming out as the grate is shaken, while the other ends of the grate-bars are free to be raised in case it is desired to remove the bars. In this instance the circular recesses 12 and the U-shaped recesses 13 are arranged at the point where the sections butt or meet, as shown in Figs. 14 and 15, half of the recess being in one section and the other half being in the other section, as shown in said figures. The outer edges of said recesses are flush with the inner sides of the sections, as shown in Fig. 9. In case an additional section is added it is only necessary to insert an additional grate-bar.

The front section 14 of the heater (see Fig. 3) consists of the side tubes 15, connected at their upper ends by the cross-tubes 16 and 17, which in turn are connected by vertical tubes 18, in this instance four in number. The lower ends of the side tubes 15 form the water-legs and are connected by a hollow cross-bar 19. A hollow flat cross-bar 20 connects the side tubes 15 between the cross-tube 17 and cross-bar 19. Said bar 20 is of less thickness than the thickness of the side tubes 15 (see Fig. 4) and is located at the front of the section, just above and in front of the grate. (See Fig. 2.) Two vertical flat hollow bars 21 connect the cross-bar 20 at its ends with the cross-tube 18 and open into the side tubes 15. (See Fig. 7.) Said two vertical bars 21, in connection with the cross-tube 18 and cross-bar 20, form a water-lining around the fuel-door 3 to protect the front plate 1 from the heat from the fire-pot 22. The two cross-tubes 16 and 17 and cross-bar 19 are of the same diameter as the side tubes 15, while the vertical tubes 18 are of less diameter. (See Figs. 4 and 6.) The intermediate sections 23, in this instance five in number, are all of similar construction, and therefore a description of one will answer for all.

The section 23 (see Fig. 11) consists of the two side tubes 24, connected at their upper ends by the three cross-tubes 25, 26, and 27. The two upper cross-tubes 25 and 26 are connected by vertical tubes 28, in this instance four in number, and the cross-tubes 26 and 27 are also connected by a similar number of vertical tubes 29. The vertical tubes 28 and 29 are of less diameter than the side tubes 24 and cross-tubes 25, 26, and 27. (See Figs. 10 and 11.)

The lower ends of the side tubes 24 in the intermediate sections 23 are connected by a hollow cross-bar 30 and a cross-tube 31. The cross-bar 30 is semicircular in cross-section, the plane top furnishing a flat surface for the floor of the ash-pit 32. (See Fig. 2.) The cross-bar 30 and cross-tube 31 are connected by vertical tubes 33, in this instance three in number, which are of less diameter than said cross bar and tube and the side tubes. (See Figs. 10 and 13.) The lower cross-tube 31 is located above the lower ends of the side

tubes 24 to leave a chamber or space 51 below the tubes 31 of the intermediate sections 23 and the bottom of the heater. (See Fig. 2.)

The back section 34 consists of two side tubes 35, connected at their upper ends by two cross-tubes 36 and 37, which in turn are connected by the vertical tubes 38 and correspond to the cross-tubes 25 and 26 and vertical tubes 28 in the intermediate sections 23. The lower ends of the side tubes 35 are connected by a hollow cross-bar 39 and a cross-tube 40, which in turn are connected by the vertical tubes 41 and correspond to the cross-bar 30 and cross-tube 31 and vertical tubes 33 in the intermediate sections 23. Intermediate the cross-tube 37 and the cross-bar 39 the back section 34 is made solid, as shown in Fig. 2, to form a solid back for the fire-pot 22 and the ash-pit 32.

On the solid portion of the section 34 are a series of vertical tubes 42, in this instance six in number, connecting the cross-tube 37 with the cross-bar 39 to form a water-back for the fire-pot and ash-pit. Extending between the vertical tubes 42, at the lower part thereof, are lugs 43, (see Fig. 18,) which fill the spaces between the tubes 42 at the rear of the grate, as shown in Fig. 2.

In the lower part of the back section 34, just below the grate, are, in this instance, three openings 44, leading into the ash-pit 32 to furnish egress for the dust from the ash-pit.

The back plate 47 of the heater is preferably made of the shape shown in Fig. 2 to furnish a chamber or space 45 at the rear of the back section 34. An opening 48, provided with a damper 49, leads directly into the smoke-pipe section 46, to the upper end of which is attached the smoke-pipe. (Not shown.)

The smoke-pipe section 46 has an opening 50 at its lower inner part, which connects it with the chamber 51 in the lower part of the heater, as shown in Fig. 2, and a division 52 cuts off the chamber 45 at the back of the heater from said opening 50.

Each of the vertical sections is provided with a boss 53 on opposite sides near the bottom. The bosses 53 are adapted to receive short pipe connections 54, whose opposite ends are screwed into a pipe or drum 55 at each side of the heater near the bottom thereof. (See Fig. 1.) Said drums serve to clamp and hold the several vertical sections securely together in the usual way, while the front and back plates are secured together by the rods 56 and nuts 57. The upper end of each vertical section is also provided with a boss 58, adapted to receive a short pipe connection 59. The opposite ends of said pipe connection 59 are secured to a drum 60, and out of said drum lead pipes 61 in the ordinary way. The lower drums 55 serve as water connections to insure perfect circulation, and the top drum 60 serves as a steam-dome, from which steam may be delivered through the pipes 61 in the usual way.

From the above description, in connection with the drawings, the operation of my heater will be readily understood by referring to Fig. 2.

5 When the fire is started, the damper 49, leading into the smoke-pipe section 46, is opened, as shown by full lines, and the cold-air damper 6 closed, as shown by dotted lines, so that the gases and products of combustion
10 will pass from the upper part of the heater through the chamber 45 and the opening 48 in the back plate 47 directly into the smoke-pipe section 46, as shown by the arrows, Fig. 2. After the fire is fully kindled, and in the
15 ordinary use of the heater, the damper 49 is closed, as shown by dotted lines, so that the gases and products of combustion will pass down under the ash-pit 32 and through the chamber 51 in the lower part of the heater
20 from the front to the rear of the heater and into the smoke-pipe section 46, as indicated by the arrows, Fig. 2. It will thus be seen that the heated gases will pass from the rear upper part of the fire-pot into the spaces be-
25 tween the lower set of vertical tubes 29 in the intermediate sections 23 and through said spaces from the rear to the front of the heater, and then through spaces between the vertical tubes 18 in the front section 14 of the heater,
30 and then rearwardly to the back of the heater through the spaces between the upper set of vertical tubes 28 in the intermediate sections 23 and the vertical tubes 38 in the back section 34, and then down through the chamber
35 45 at the rear of the heater and into and through the spaces between the vertical tubes 41 in the back section 34 and the vertical tubes 33 in the intermediate sections 23 from the back to the front of the heater directly
40 under the ash-pit and into the space under the lower cross-bar 19 in the front section 14, and then rearwardly into and through the chamber 51 at the lower part of the intermediate sections 23 and the back section 34 and
45 into the smoke-pipe section 46, as shown in Fig. 2.

The advantages of my heater will be readily appreciated by those skilled in the art.

I surround the fire-pot with a series of wa-
50 ter-tubes, leaving only an opening at the rear upper part for the escape of the gases and an opening for the fuel door, and I provide for the circulation of the gases directly over the fire-pot, from the rear to the front of the
55 heater, and then through the upper part of the heater, from the front to the rear thereof, and down through the back of the heater and directly under the ash-pit, from the rear to the front of the heater, and then through the
60 lower part of the heater, from the front to the rear thereof, into the smoke-pipe section, thus utilizing the whole interior of the heater for the circulation of the heating-gases, and producing a heater of great heating capacity.

65 It will be understood that the details of construction of my heating apparatus may be varied, if desired.

I am familiar with the construction of heaters shown and described in United States Letters Patent Nos. 460,469, 468,423, and 525,274, 70 and I do not intend to claim herein what is set out in said patents.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is— 75

1. In a heating apparatus, a front vertical section, having side tubes, and two cross tubes at its upper part between said side tubes, and vertical tubes connecting said cross tubes, and a hollow cross bar at its lower part, at a point 80 below the grate of the heater, and forming a portion of the ash pit floor, and a flat hollow cross bar above said hollow cross bar, and on a level with the grate of the heater, and two vertical flat hollow bars, connecting said flat 85 cross bar with the lower cross tube, of the two upper cross tubes, to furnish a water space around the fuel door of the heater, substantially as set forth.

2. In a heating apparatus, an intermediate 90 vertical section, having side tubes, and three cross tubes at its upper part connecting said side tubes, and two sets of vertical tubes, one set between the two upper cross tubes, and the other set between the middle and lower 95 cross tube, and a hollow cross bar and a cross tube at its lowest part, connecting said side tubes, the lowest cross tube above the lower ends of the side tubes, to leave a chamber in the bottom of the heater, and vertical tubes 100 between said cross bar and cross tube, to furnish passages below the ash pit of the heater, substantially as set forth.

3. In a heating apparatus, the back section, having side tubes, and two cross tubes 105 at its upper part connecting said side tubes, and vertical tubes between said cross tubes, and a hollow cross bar and a cross tube at its lower part, and vertical tubes between said cross bar and cross tube, and a solid back, be- 110 tween the cross tube and cross bar intermediate the top and bottom cross tubes, said back provided with vertical tubes connecting said cross tube and cross bar, substantially as set forth. 115

4. In a heating apparatus, the back section, having side tubes, and two cross tubes at its upper part, connecting said side tubes, and vertical tubes between said cross tubes, and a hollow cross bar and a cross tube at its 120 lower part, and vertical tubes between said cross bar and cross tube, and a solid back, between the cross tube and cross bar intermediate the top and bottom cross tubes, said back provided with vertical tubes connecting 125 said cross tube and cross bar, and openings leading to the ash pit of the furnace, substantially as set forth.

5. A heating apparatus, consisting of a series of vertical sections, having vertical side 130 tubes, and cross tubes and hollow cross bars connecting said side tubes, and vertical tubes connecting said cross tubes and cross bars, and having spaces between said vertical

tubes, and cross tubes and cross bars, through which spaces the heating gases pass, from the upper rear part of the fire pot, over the fire pot to the front of the heater, and then through
5 the upper part of the heater to the back of the heater, and then down between the back section and the back plate of the heater, and under the ash pit to the front of the heater, and then through the lower part of the heater
10 to the back of the heater, and into the smoke pipe, substantially as set forth.

6. In a heater, the combination with a se-

ries of vertical sections, having recesses or depressions in their inner sides, at the point where the sections butt or meet, so that one- 15 half of the recess or depression is in one section, and the other half in the adjoining section, of grate bars provided with cylindrical ends adapted to extend into said recesses or depressions, substantially as set forth.

M. VALVA.

Witnesses:

JOHN C. DEWEY,
M. J. GALVIN.