

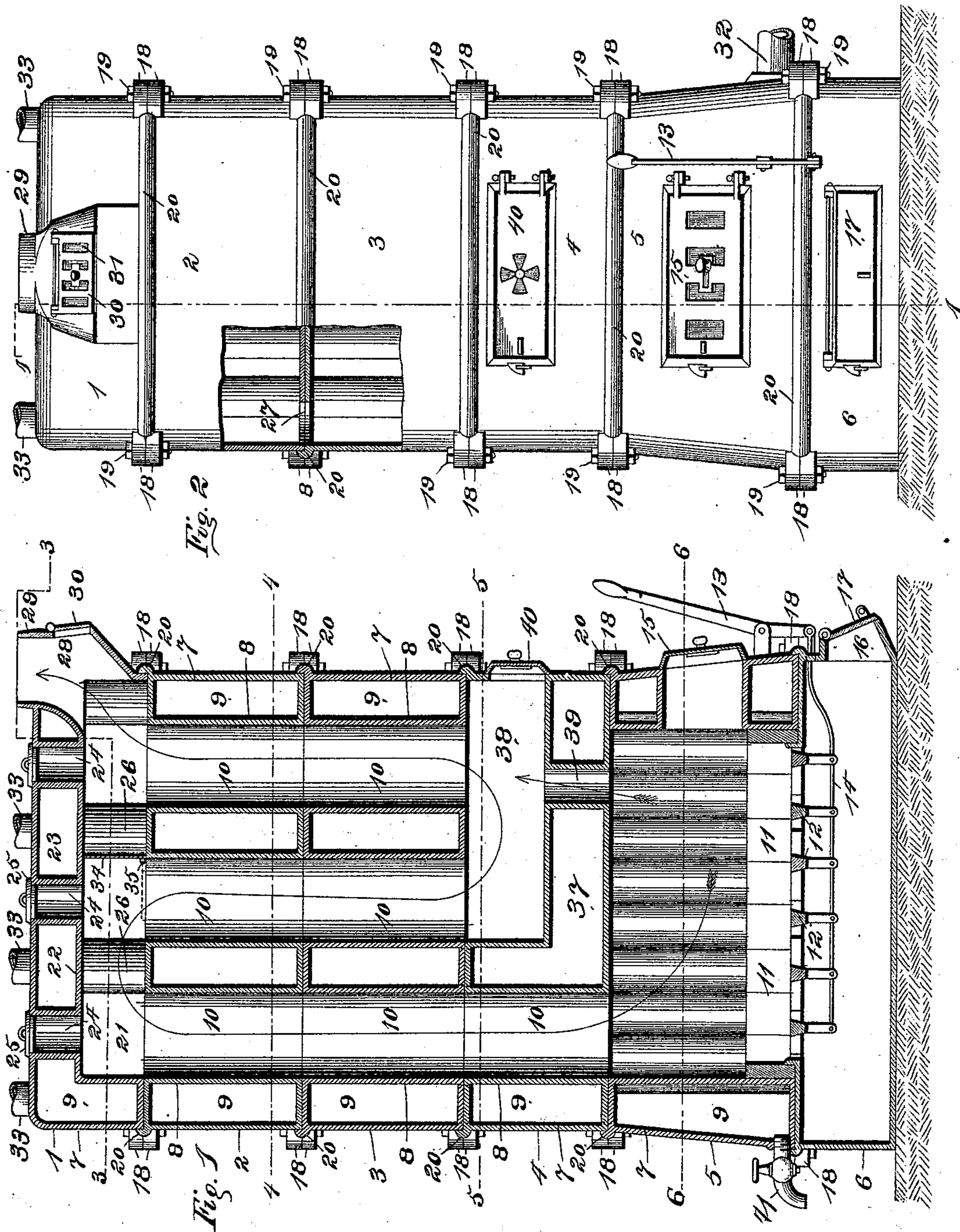
(No Model.)

2 Sheets—Sheet 1.

A. BOYCE.
STEAM BOILER OR HOT WATER HEATER.

No. 519,418.

Patented May 8, 1894.



Witnesses =
W. J. Samkey.
John Onders

Inventor:
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By Higdon & Higdon & Longan
Attys.

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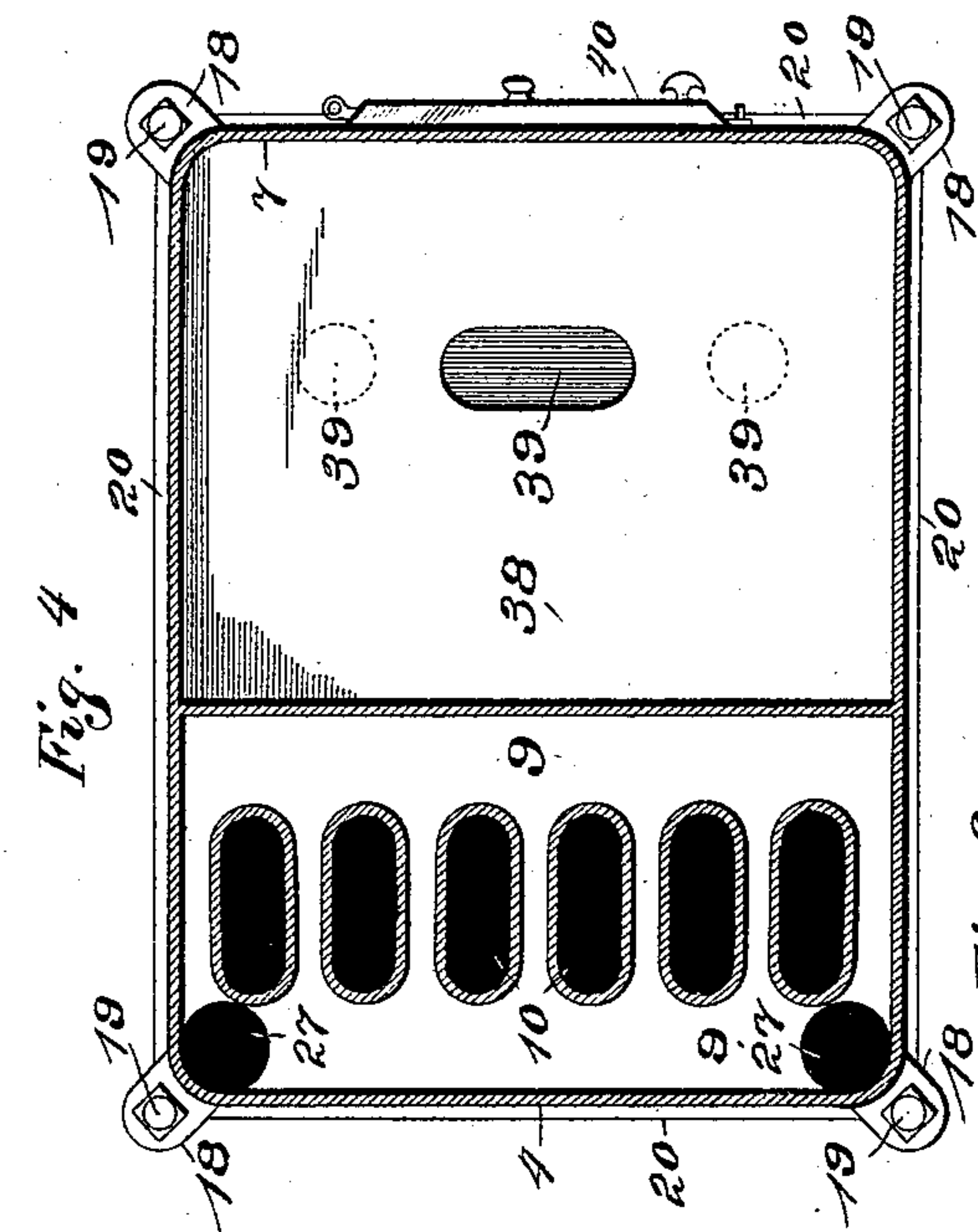


Fig. 4.

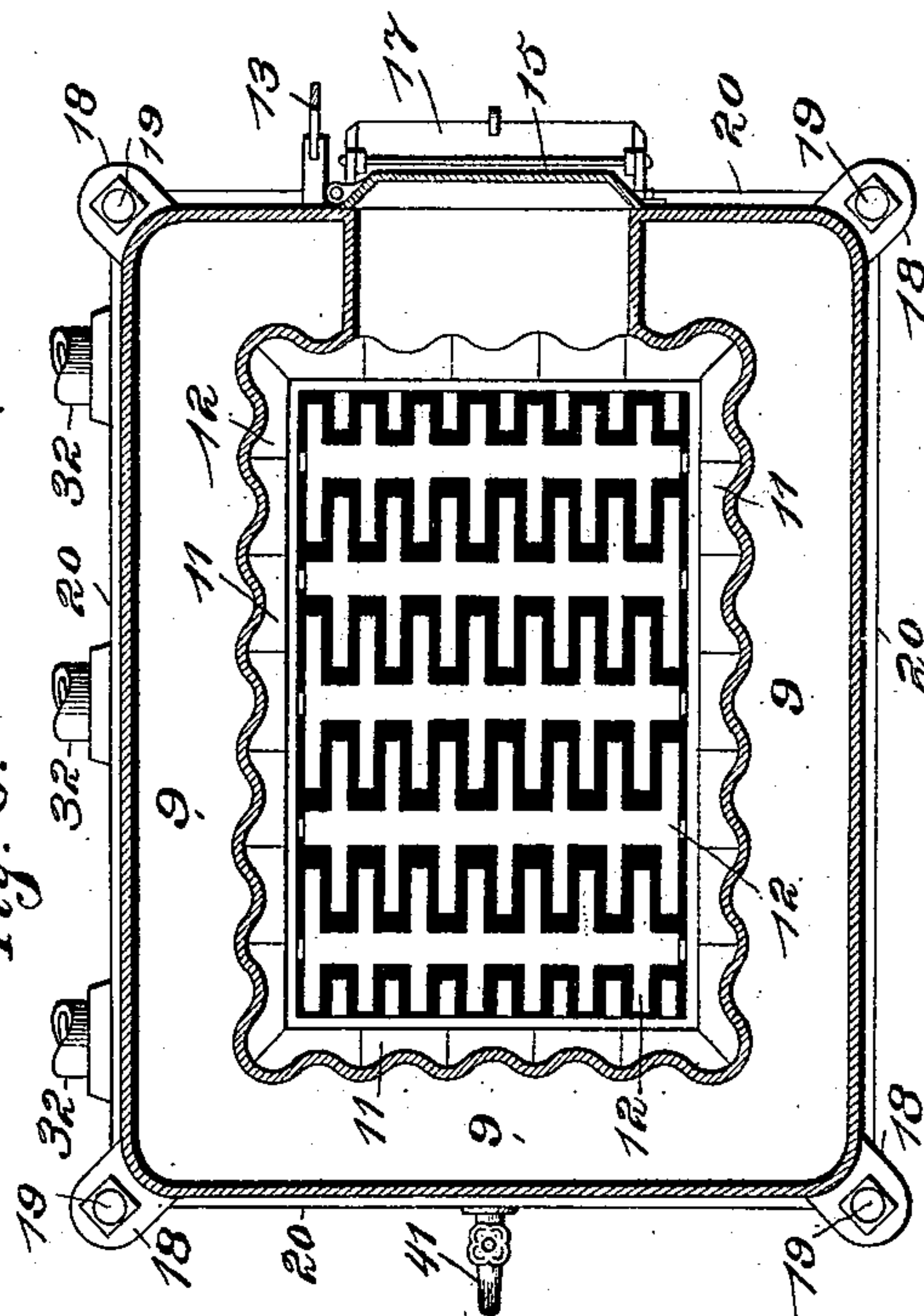


Fig. 6.

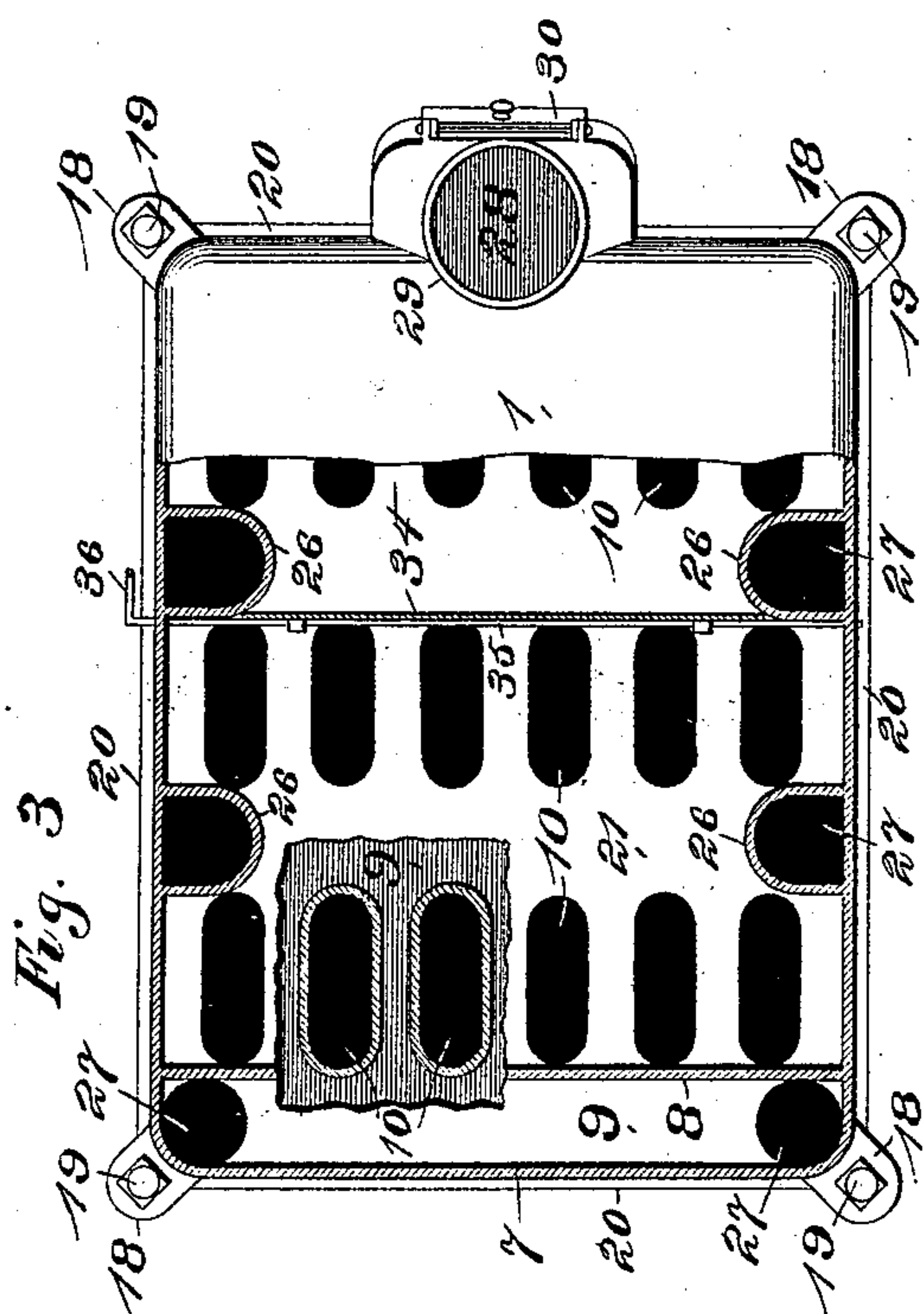


Fig. 3.

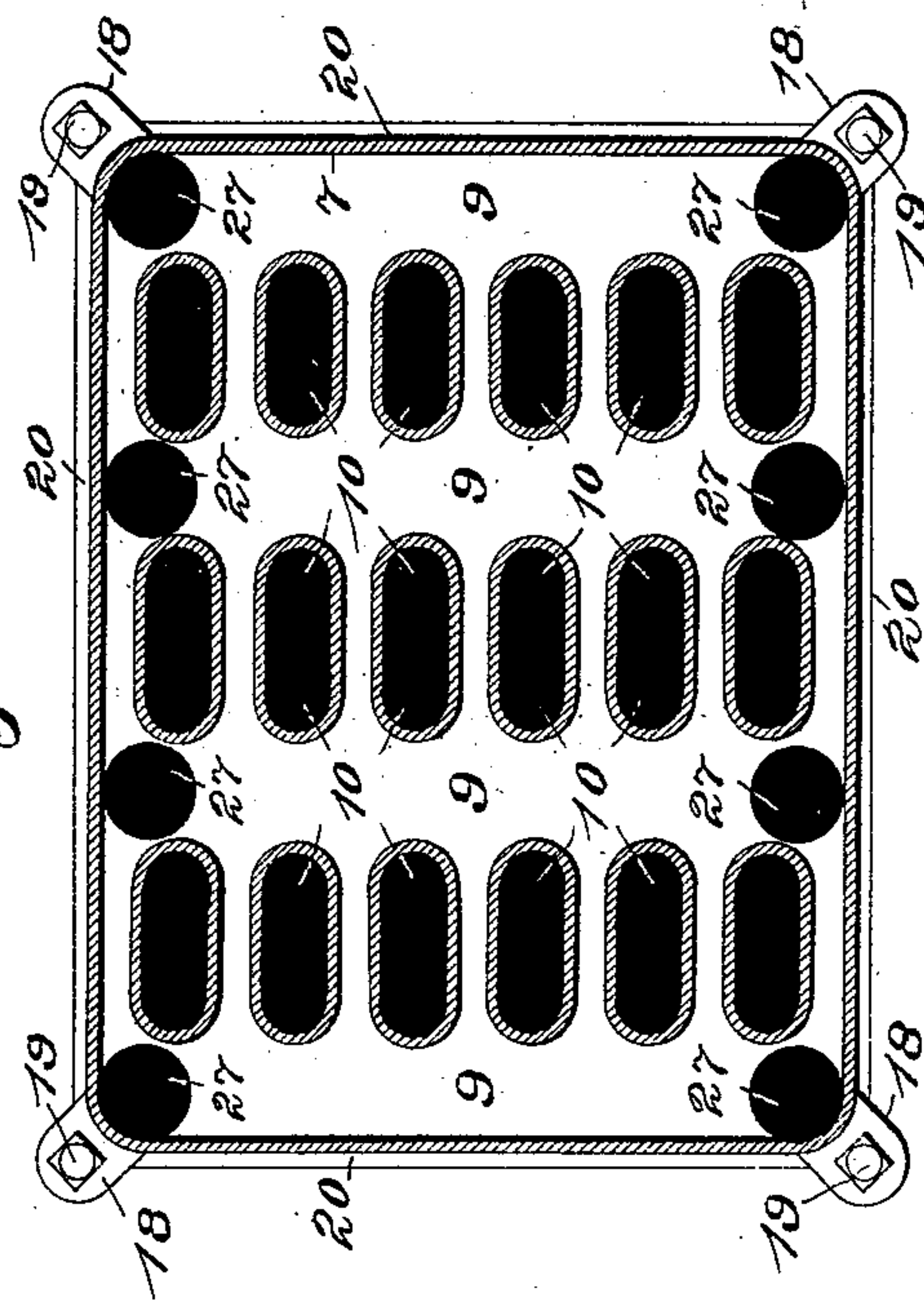


Fig. 5.

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UNITED STATES PATENT OFFICE.

ARTHUR BOYCE, OF ST. LOUIS, MISSOURI.

STEAM-BOILER OR HOT-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 519,418, dated May 8, 1894.

Application filed July 10, 1893. Serial No. 479,983. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR BOYCE, of St. Louis, State of Missouri, have invented certain new and useful Improvements in Steam-Boilers or Hot-Water Heater, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to "steam boilers or hot water heaters," and consists in the novel construction, combination and arrangement of parts hereinafter specified, and designated in the claims.

The object of my invention is to provide an improved device for use in heating buildings by either steam or hot water and for general use as a steam boiler, which shall act to consume the smoke produced in the fire-box, be very economical in consumption of fuel, of low cost, and simple in construction and operation.

In the drawings: Figure 1 is a sectional side elevation of my invention, taken on the line 1—1 of Fig. 2. Fig. 2 is a front elevation of same with parts broken away, and shown in section. Fig. 3 is a sectional plan view taken on the line 3—3 of Fig. 1. Fig. 4 is a similar view to the last, taken on the line 5—5 of Fig. 1. Fig. 5 is a similar view taken on line 4—4 of Fig. 1. Fig. 6 is a similar view taken on the line 6—6 of Fig. 1.

1, 2, 3, 4 and 5 indicate respectively a series of rectangular metallic casing-frames superposed one upon the other, and the lower one of the series mounted upon an ash-pit-frame 6. The frames 1, 2, 3, 4 and 5 each have an exterior shell 7 and an interior shell 8, with which a water-space 9 is in direct contact, and frames 2 and 3 have each three separate groups or series of short vertical fire-passages 10 surrounded by water-spaces and inclosed by said exterior shell, and said groups of passages being separated by a definite water space of greater width than the water-space between the passages of any one group. (See Figs. 3 and 5.) The fire passages 10 in groups of the frames 2 and 3 are in vertical alignment and communication. The frame 4 is also provided with a vertical series of fire passages 10 at a point adjacent its rear side, and which are in vertical alignment with the rear group of fire passages in said sections 2

and 3, also in communication therewith and with a fire-box having corrugated walls formed in the frame 5 which is next adjacent the ash-pit-frame 6. The corrugations of the fire box are located vertically, and the inner walls of said fire box are lined for a portion of their height with fire-brick 11 having sides in contact with the corrugations of the fire-box, and such sides are curved or corrugated to conform to the shape of said corrugations. (See Fig. 6.) The fire-box and ash-pit are provided with usual rocking grate-bars 12 operated by a hand-lever 13 and a connecting bar or rod 14, said hand lever being pivotally mounted upon the front of the boiler or heater, at one side of the fire-door 15. The front of the ash-pit is provided with an opening 16 normally closed by a hinged door or damper 17, which may be opened or closed to regulate the admittance of air to the fire in the fire-box. The object of having the walls of the fire-box corrugated is to increase the heating surface thereof over and above that which would be provided if said walls were plain. Each of the frames 1, 2, 3, &c., is provided with lugs 18 at each of its corners, and these lugs are provided with vertical bolt holes through which bolts 19 are passed and securely fastened together, the contiguous ends of adjacent frames, so that a water and steam-pipe joint is formed at the point of contact of each section with another, and each frame, except frame 1, has at its upper end and upon its four sides upwardly projecting flanges 20 which overlap the outer surface of the section above it. The upper section 1 acts as a cap for the boiler or heater, and formed in its under side is a smoke-box 21 which is in communication with the fire-passages 10 of the next adjacent frame 2. This smoke-box is provided with a horizontal inner shell 22 above which is located a steam or water space 23, and short vertical fire-passages 24 extend from said inner shell to the horizontal outer shell of said box, and are surrounded by said steam or water space, and are preferably in vertical alignment with the fire passages 10 of the next adjacent frame 2. At their lower ends the short passages 24 communicate with the smoke-box 21, and at their upper ends they open to the atmosphere and are provided with detachable caps

or plugs 25, which may be detached for the purpose of cleaning the fire-passages 10 of each frame.

I here show but two identical frames, indicated by the numerals 2 and 3, but I desire to state in this connection that a number of such frames is an important feature of my invention, and may be increased or diminished, according to the size and capacity of the boiler, adding additional frames of this construction of course increasing the heating surface, and detaching the same diminishing such surface.

The steam or water space 23 of the cap-frame 1 is connected to the water space 9 of the next adjacent frame, by short vertical passages 26, which are located at opposite sides of said frame 1, and project into the smoke-box 21 so as to be subjected to the action of the products of combustion therein. The water spaces of each frame are connected by vertical passages 27 formed in the horizontal ends of adjacent frames, at points adjacent the corners of said frames. (See Figs. 2, 3 and 4.)

28 indicates an outlet for the products of combustion, which is located at the front side of the smoke-box 21 and is provided with the usual pipe collar 29 for attachment of a smoke-pipe. The outlet 28 is in communication with the interior of said smoke-box. The front wall of the outlet 28 is provided with a hinged soot-door 30, and a damper slide 31.

32 indicates a feed-pipe or return-pipe connection which communicates with the lower portion of the water space of the fire-box frame 5, by means of which the return water of a system of steam or water-heating of a building, or by means of which feed-water, may be forced into the boiler.

33 indicates steam or hot water pipe connections at the top of the cap frame, by means of which the steam or hot water from the boiler may be discharged for the different uses desired.

34 indicates a damper which is located transversely of the smoke-box and secured upon a damper-rod 35, which latter has bearings in the opposite vertical walls of said chamber so that its ends project through said walls, and one of said ends is provided with a manipulating handle 36. This damper is normally in a vertical position as shown in Fig. 1, and when so placed, divides the smoke-box 21 at about the center of its length, and closes the passage therethrough to the exit 28.

37 indicates a comparatively thin water receptacle formed in the frame 4, and having horizontal walls located directly above the fire box, so that the water contained therein is subjected to the direct heat of said box. The interior of this receptacle communicates at its upper side with the water-space of the adjacent frame 3 above it, by means of the passages 27.

38 indicates an igniting chamber located above the water receptacle 37, and above the

fire-box, and is in communication with said fire-box by one or a series of vertical passages 39.

Although I have here shown but a single one of these passages in solid lines, yet I have indicated a series of them by dotted lines, (see Fig. 4,) and if so desired I may use either one or a series. The centrally located groups of fire-passages 10 in the frames 2 and 3 are in communication at their lower ends with the igniting chamber 38.

The operation is as follows: Upon a fire being started in the fire-box, the smoke and products of combustion pass rearward therein, and upward through the passage or passages 39, and upward through the aligned fire-passages 10 of the three frames 2, 3 and 4 adjacent the rear side of said frames and a portion of said products is thereby discharged simultaneously into the smoke-box 21 at the top of the boiler and into the igniting chamber 38 just above the fire-box, as indicated by the arrows in Fig. 1, and if the damper 34 is adjusted to the position in which it is shown in said Fig. 1, the portion of the said products which enters the smoke box, cannot pass direct to the exit 28, but is diverted downward through the central series or groups of fire passages in the frames 2 and 3 so that they enter the rear portion of the igniting chamber 38, and there meet and mingle with the products of combustion which pass upward from the fire-box through the vertical passage 39, and as the temperature of such last-named products is considerably higher than the products which have passed through the passages 10, it is presumed that the products having such high temperature act to consume or to aid in consuming the smoke which has made its way to the said igniting chamber. The remaining products of combustion pass directly upward through the groups of fire passages 10 in the frames 2 and 3, enter the forward portion of the smoke box in front of the damper 34 and make their exit at 28. It will be observed that the passage 39 forms a direct vertical connection between the said box and said chamber, and that said passage is always open. When it is desired to create a stronger draft the damper 34 is thrown downward until it partially covers the upper ends of the group of fire passages 10 which is centrally located in the frame 2, and then the smoke and products of combustion pass directly through the smoke box to the exit 28.

For the purpose of cleaning the igniting-chamber 38, I provide a door 40 in the front wall of said chamber, which may be opened for such purpose.

41 indicates a drain-cock or blow-off connection which is applied to the lower portion of the frame 5 and is in communication with the water-space thereof, and by means of which water may be drained from the boiler, in washing out same, &c.

What I claim is—

1. The improved steam boiler or hot-water heater, comprising a number of sectional rectangular frames superposed and bolted to each other upon a base-frame, a smoke box formed
 5 in the upper portion of the boiler, a water or steam-space above and below said smoke-box, a fire-box formed in the lower portion of the boiler, an igniting chamber, formed in the boiler intermediate of said smoke box and
 10 said fire-box, a comparatively thin water receptacle formed in the boiler directly above the fire-box so that its lower wall will be subjected to the direct action of the heat of said fire-box, and said water-receptacle being lo-
 15 cated directly beneath said igniting-chamber and provided with a passage which places the said igniting-chamber and said fire-box in direct communication, and separate fire-passages which connect said fire box to said
 20 smoke-box and said igniting-chamber to the smoke-box, substantially as herein specified.

2. The improved steam-boiler or hot-water heater, constructed with an exterior shell, a fire-box, a smoke-box at the top, an igniting
 25 chamber above said fire-box but separate therefrom, a direct communication between said fire-box and said igniting-chamber, a group of long fire-passages surrounded by water-space and connecting said fire-box with said
 30 chamber at the top of the boiler, the direc-

tion of draft in said long passages and in said connection between the fire-box and the igniting-chamber being upward, a series of shorter fire-passages connecting said chamber at the top with said igniting chamber, and
 35 in which the direction of draft is downward, and a third series of passages connecting said igniting-chamber direct with a smoke-pipe connection, substantially as specified.

3. An improved steam boiler or hot-water
 40 heater, having a series of frames containing water-spaces and located one above the other, end-plates separating said water spaces, fire-passages connecting said plates and forming continuous passages from the fire-box upward
 45 to a smoke box, thence downward to an igniting-chamber and upward to the smoke outlet, a direct passage connecting the upper portion of the fire box with said igniting-chamber, grate bars located in the fire-box, an
 50 ash pit under said grate-bars, and a damper in said smoke-box, substantially as herein specified.

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

ARTHUR BOYCE.

Witnesses:

W. J. SANKEY,
 EDWARD EVERETT LONGAN.