

No. 735,849.

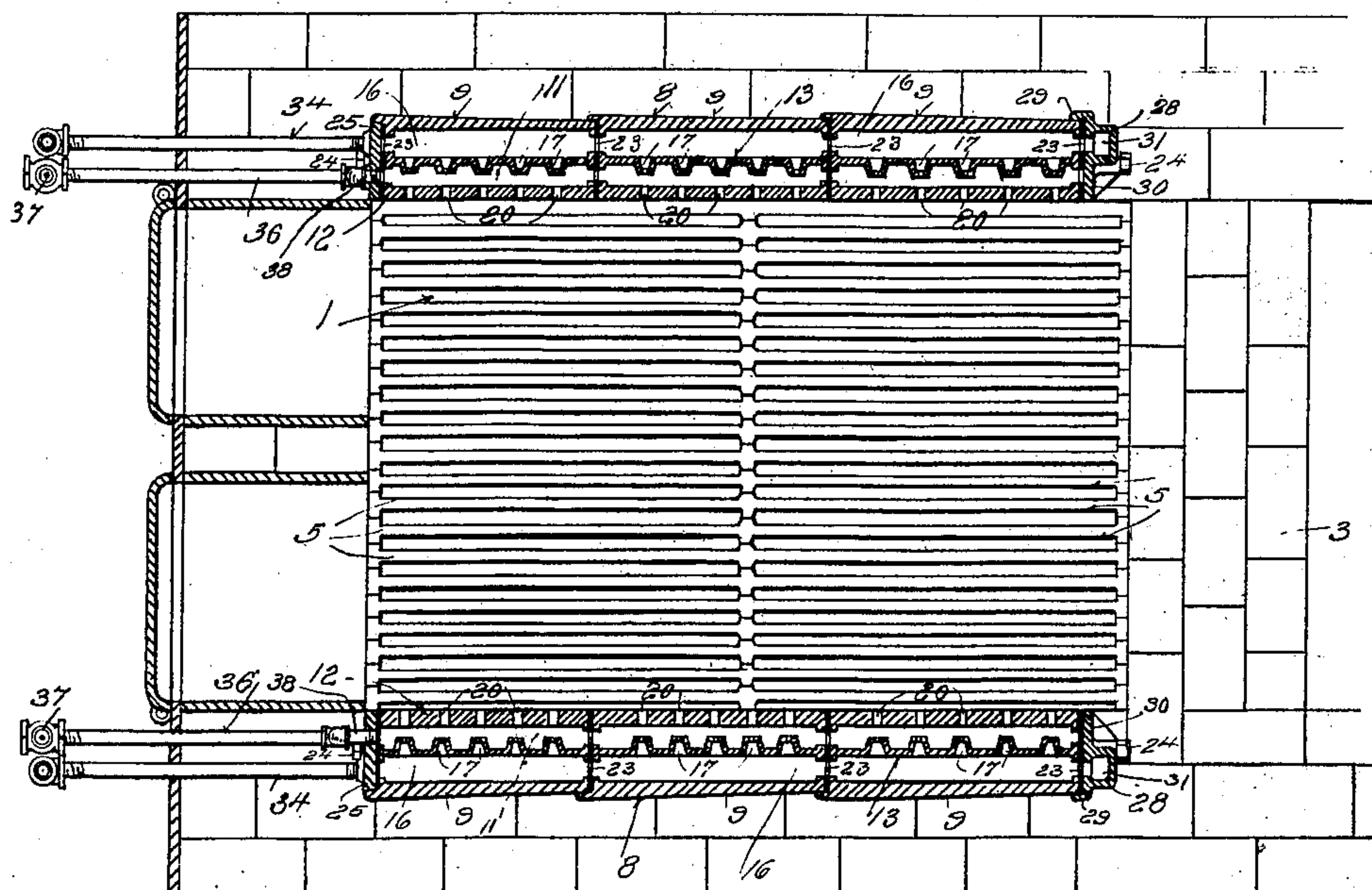
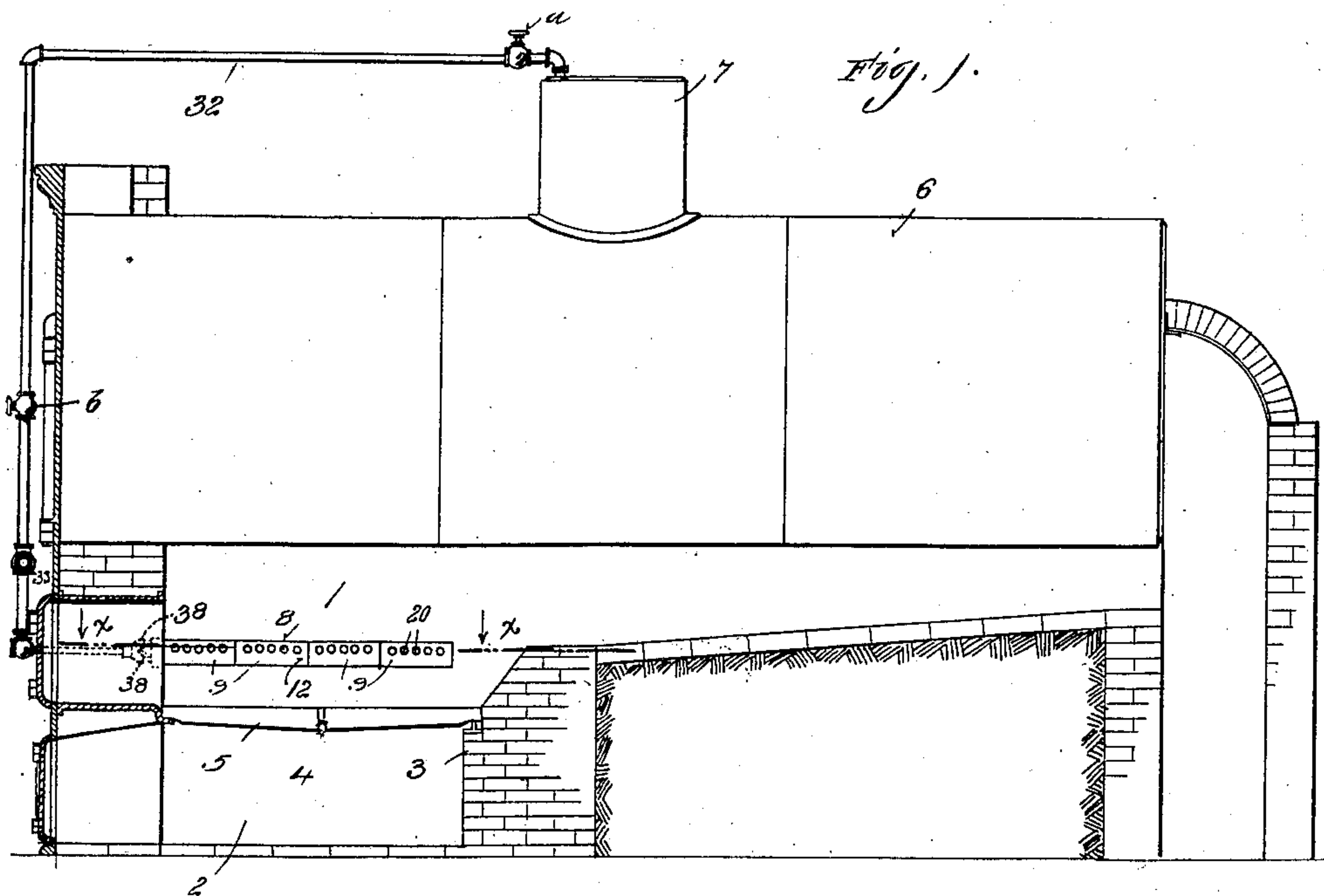
PATENTED AUG. 11, 1903.

G. C. WAY.
BOILER OR OTHER FURNACE.

APPLICATION FILED AUG. 26, 1901.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES:

J. C. Dawley.
F. H. Schaefer.

INVENTOR.

George C. Way,
BY *H. A. Tulliver*
ATTORNEY.

No. 735,849.

PATENTED AUG. 11, 1903.

G. C. WAY.
BOILER OR OTHER FURNACE.

APPLICATION FILED AUG. 26, 1901.

NO MODEL.

2 SHEETS—SHEET 2.

Fig. 3.

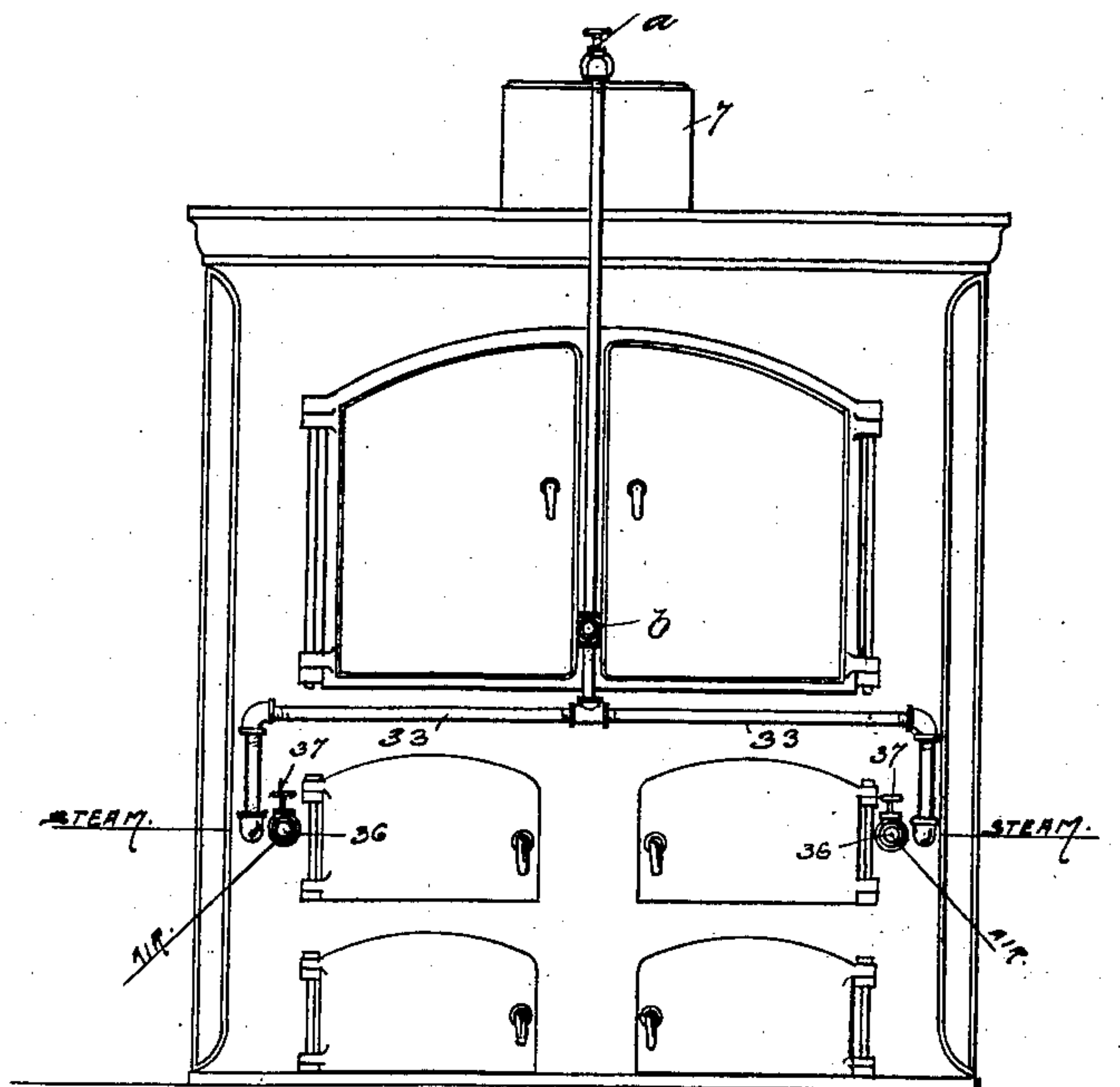


Fig. 5.

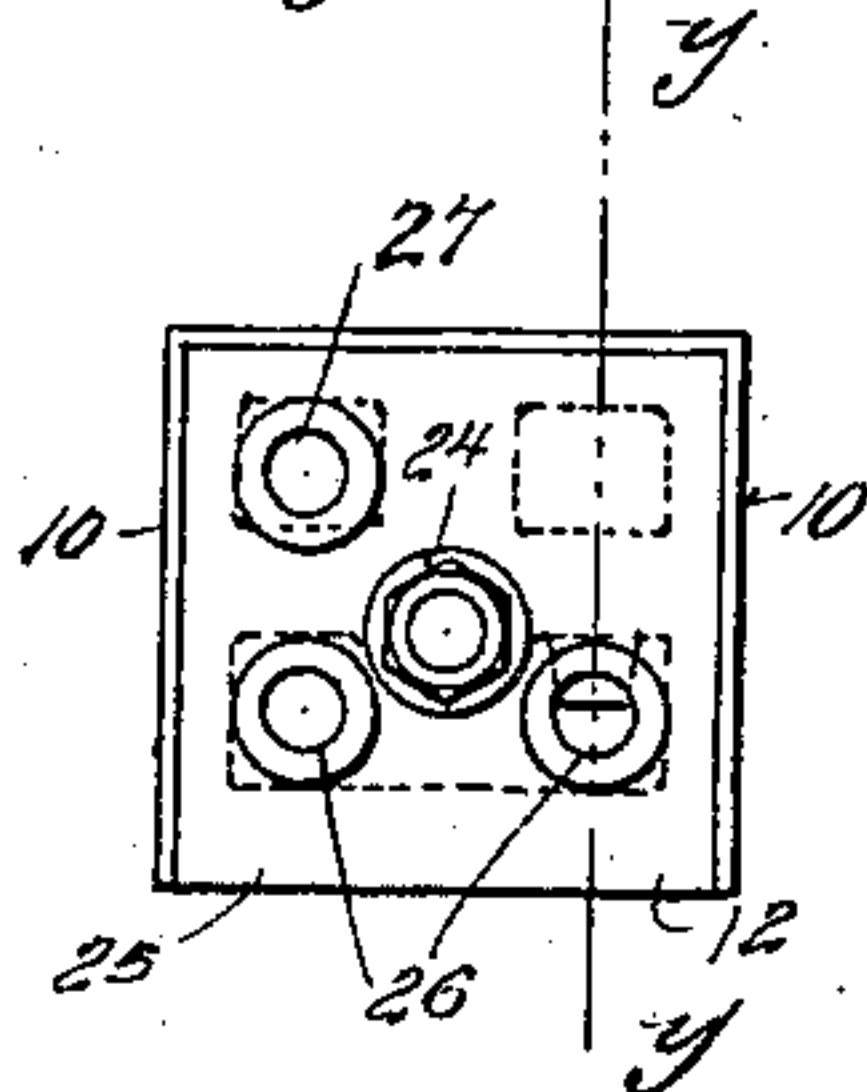


Fig. 4.

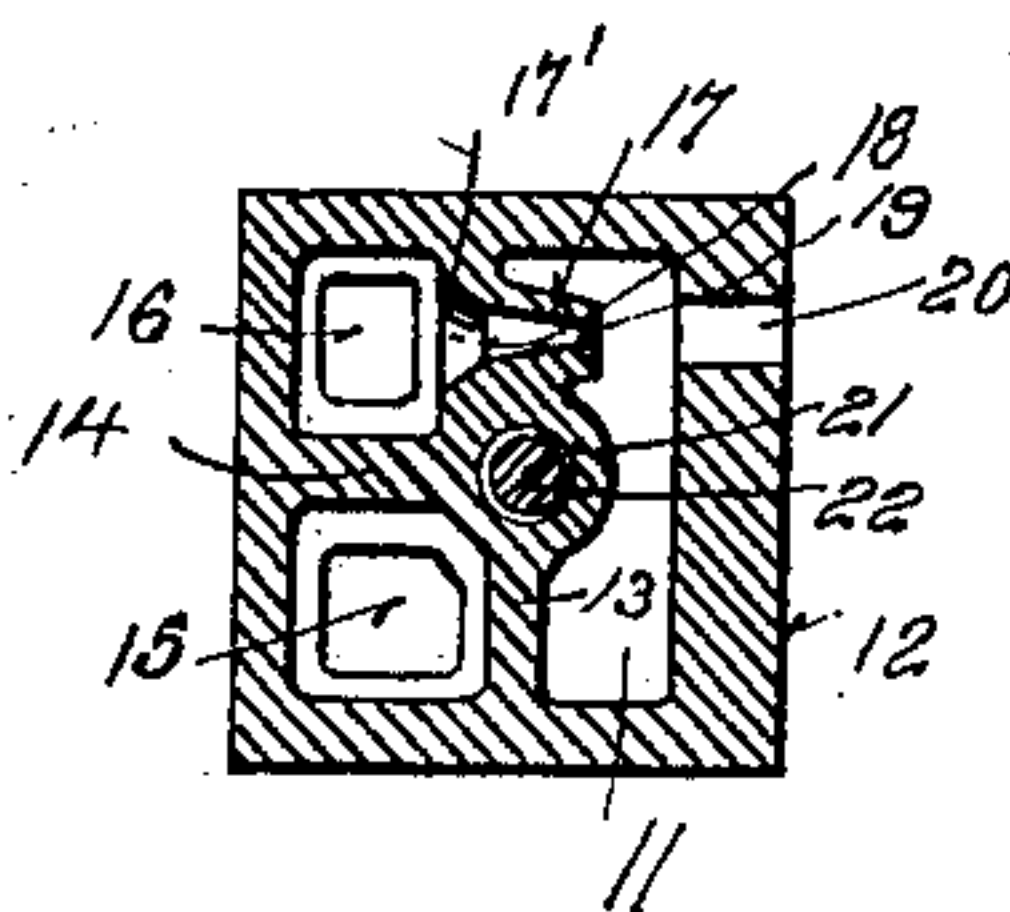
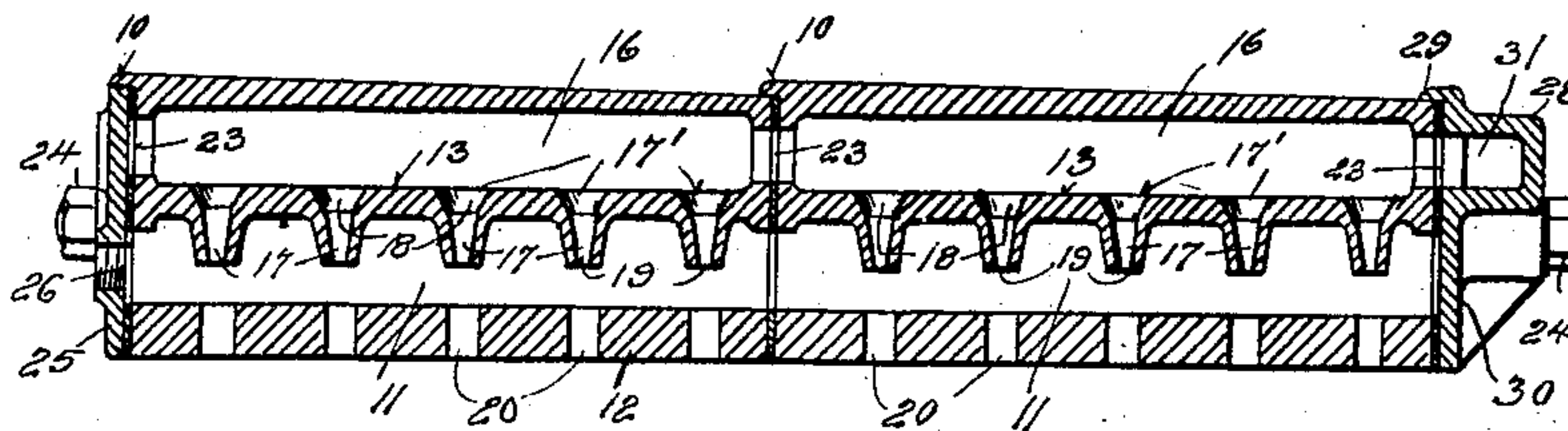
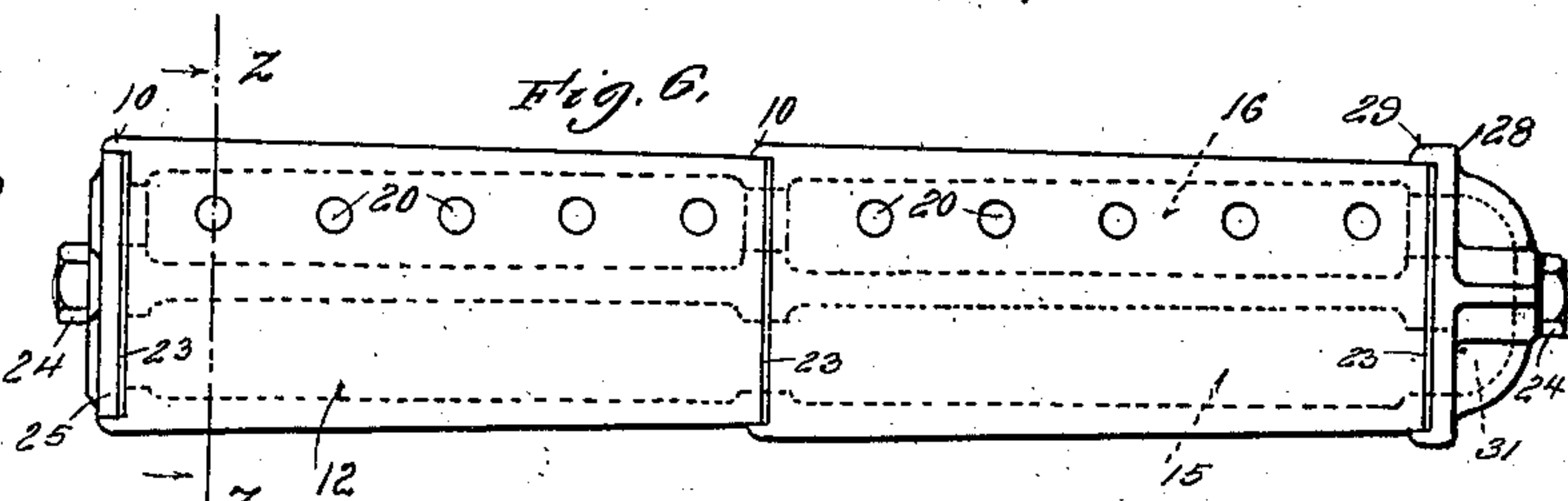


Fig. 7.

Fig. 6.



WITNESSES:

J. C. Danoley.
F. W. Schaefer.

George C. Way, INVENTOR.

BY H. A. Goulmin, ATTORNEY.

UNITED STATES PATENT OFFICE.

GEORGE C. WAY, OF CINCINNATI, OHIO, ASSIGNOR OF SEVEN-TWELFTHS
TO CHARLES L. STEELE AND HARRY BARR, OF SPRINGFIELD, OHIO,
AND BENJAMIN H. BARR, OF KANSAS CITY, MISSOURI.

BOILER OR OTHER FURNACE.

SPECIFICATION forming part of Letters Patent No. 735,849, dated August 11, 1903.

Application filed August 26, 1901. Serial No. 73,279. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. WAY, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Boiler or other Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to improvements in boiler and other furnaces, and has for its object to provide a construction whereby combustion may be promoted and the production of smoke diminished or avoided.

15 More specifically, it relates to that class of apparatus in which decomposed steam and air are introduced into the furnace or fire-box above the grate, so as to commingle with the products of combustion, and thereby increase
20 the amount of heat produced from a given amount of fuel and at the same time cause a combustion of such a character as to prevent the production of offensive smoke.

The particular object of the present invention is to produce a device of this character
25 which shall be of high efficiency and great durability and which may be constructed of parts or units of such a character that the structure may be adapted for use with furnaces of various dimensions by building the
30 device up of a number of units corresponding with the size of the furnace.

To these and other ends the invention consists in certain novel features, which I will
35 now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a view, partly in section and partly in elevation, of a structure showing my improvements embodied in one form in a boiler-furnace.
40 Fig. 2 is a plan section of a similar structure, taken on a line corresponding with the line xx of Fig. 1 and looking in the direction of the arrows, the structure differing, however,
45 from that shown in Fig. 1 in the number of units employed. Fig. 3 is a front elevation of the structure shown in Fig. 1. Fig. 4 is a plan section, taken on the line yy of Fig. 5,
50 of a superheater and mixer composed of two units. Fig. 5 is an elevation of the left-hand

end of Fig. 4. Fig. 6 is a view of the inner or fire-box face of the structure shown in Fig. 4, and Fig. 7 is a sectional view taken on the line zz of Fig. 6.

In the said drawings, as I have already
55 stated, my invention is shown applied to a boiler-furnace which may be of any approved construction. That chosen for illustration comprises a fire-box or furnace proper, 1, having side walls 2 and a bridge-wall 3 and
60 divided from the ash-pit 4 by a suitable grate 5.

6 indicates the boiler, and 7 the steam-dome thereof. Within the side walls of the furnace at a suitable distance above the grate-
65 bars are located the combined superheaters and mixers, each of which is designated as a whole by the reference-numeral 8. These superheaters are preferably embedded in the brickwork of the wall, with their exposed
70 faces flush with the surfaces thereof. Each superheater is built up of a plurality of units or sections 9, preferably constructed of cast-iron in a single piece, although other suitable materials—such as graphite, fire-clay, &c.—
75 may be employed. Each unit is preferably in the form of a rectangular block, tapering slightly externally from end to end at its top, bottom, and rear sides and being provided at its larger end with a flange 10, surrounding the
80 said three sides and adapted to receive and form a seat for the smaller end of the adjacent unit, as indicated in Figs. 4 and 6. Each block has formed through it longitudinally
85 on the side adjacent to the furnace an air-passage 11, extending from the top to the bottom wall of the block and bounded on the furnace side by a relatively thickened wall 12, while the opposite side is bounded by a vertical partition 13. The rear half of the
90 block is divided by a horizontal partition 14 into two steam-passages 15 and 16, one of which constitutes a receiving-passage, while the other constitutes a return-passage. In the present instance I have shown the lower
95 passage as the receiving-passage and the upper passage as the return-passage. The partition 13 is provided with a plurality of nozzles 17, extending from the passage 16 into but not through the air-passage 11, each nozzle
100

zle being provided with a tapering orifice 18, terminating in a jet-aperture 19 within the chamber 11. The furnace-wall 12 of the chamber 11 is provided opposite each nozzle 5 17 with an outlet-aperture 20 in line with the jet-orifice of the nozzle and extending from the air-chamber to the interior of the furnace. The point of junction of the partitions 13 and 14 is provided with a longitudinal aperture 10 21 to receive a connecting-bolt 22, to be hereinafter further referred to.

Each combined superheater and mixer is built up of a plurality of units or sections 9, the number employed being dependent upon 15 the total length which it is desired to give the superheater and this in turn depending upon the dimensions of the furnace.

In Figs. 4 and 5 I have shown a structure composed of two units the ends of which are 20 brought together so that the small end of one unit fits within the seat formed in the large end of the adjacent unit by the flange 10. The several apertures of the two units register and communicate with each other at their 25 ends, and the joint is made steam and air tight by a packing 23 of asbestos or other suitable material. The bolt 22 passes through all the units and is provided at its ends with nuts 24, which bear against suitable caps at 30 the ends of the structure. The cap at the front end, which is indicated at 25, fits within the seat at the large end of the front unit and is made tight by a gasket 23. This cap has a central aperture to receive the connect- 35 ing-bolt 22 and is provided with openings 26, which communicate with the air-passage 11, and with an opening 27, which communicates with the steam-receiving passage 15. These openings are threaded or otherwise arranged 40 for connection with the pipes hereinafter referred to. The cap 28 at the rear end of the superheater has a flange 29, which fits around the top, bottom, and back of the small end of the rear unit and is packed by an interposed 45 gasket 23. The body of this rear cap (indicated at 30) closes the rear end of the air-passage 11; but the rear part of said cap is provided with a semicircular passage 31, (shown in section in Fig. 4 and in dotted 50 lines in Fig. 6,) which constitutes a return-passage connecting the steam-receiving passage 15 with the return-passage 16.

Steam under pressure is supplied to the steam-receiving passage 15 from any suitable 55 source. In the case of a structure such as that illustrated I employ a supply-pipe 32, connected at one end with the steam-dome 7 and having at the forward end of the boiler branches 33, which communicate with sup- 60 ply-pipes 34, screwed into the openings 27. Each pipe 34 is provided with a regulating-valve 35, by means of which the admission of steam into each superheater may be regulated and controlled. Each superheater is 65 also provided with an air-supply pipe 36 provided at the end of the boiler with a control-

ling-valve 37 and having branch pipes 38, which are screwed into the openings 26 at the front end of the air-passage 11.

The apparatus thus organized operates in 70 the following manner: Steam being admitted into the superheater passes first along the receiving-passage 15 the entire length of the device and returns along the return-passage 16. The location of the superheater is such 75 that during the travel of the steam it is exposed to a temperature sufficiently high to cause its decomposition, and the gases thus produced, issuing through the nozzles 17, 80 pass across the air-chamber 11 and out through the mixing-apertures 20, carrying along with them portions of the air in the air-chamber, which latter has also been super- 85 heated. The hydrogen gas of the decomposed steam commingling with the oxygen supplied by the entrained air produces an intensely hot flame within the fire-box at the level of or slightly above the burning fuel therein, and this flame serves to thoroughly 90 consume those portions of the products of combustion which would otherwise escape in an unconsumed or partially-consumed condition, and thereby produce black smoke and at the same time cause a waste of fuel. In 95 other words, the unconsumed particles of carbon from the fire on the grate will be consumed by the flame from the superheater, as well as the carbon monoxid and other combustible gases which might otherwise escape 100 through the chimney. The admission of the steam and air and the relative proportions thereof can be readily regulated by means of the valves provided for that purpose at the front of the boiler.

The structure is economical, for the reason 105 that being built up of units of a definite size these units may be produced at a comparatively slight cost in large quantities, and from them superheaters of different sizes may be built without requiring each size to be 110 specially constructed. The device is, moreover, durable, for the reason that each unit is cast or formed in a single piece, while the jet-nozzles are not exposed directly to the heat of the furnace, but are protected there- 115 from, as well as from breaking or clogging, by means of the wall 12, which forms a shield therefor. Moreover, since the superheater as a whole is built up of separate sections, each of comparatively short length and great 120 durability, it is not exposed to the danger of injury or destruction by warping from the heat, which danger it would undergo if constructed in a single piece.

Although I have shown for purposes of 125 illustration an embodiment of my invention in which it is applied to a boiler-furnace, I do not wish to be understood as restricting its application to such furnaces, as it might be employed in connection with annealing or 130 smelting furnaces or in connection with furnaces for other purposes; nor do I wish to be

understood as limiting myself to the precise details of construction and arrangement of parts illustrated in the accompanying drawings, as it is obvious that these may be varied without departing from the principle of my invention. For instance, although I have shown two superheaters and mixers as employed located in the side walls of the furnace their number and location may be varied.

Referring again to the nozzle 17, it will be seen that their upper ends 17' are counter-sunk—a preferable construction for the more ready entrance of the fuel. It will still further be observed that while the cock or cut-off *a* is used to entirely cut off or stop the passage of steam the cock *b* is used to regulate the quantity of steam passing to the branches 33.

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

1. The combination, with a furnace, of a combined superheater and mixer for steam and air located in the wall of the furnace above the grate and composed of a plurality of similar relatively short units connected together end to end in a right line parallel with the adjacent wall-face and having registering longitudinal steam and air passages, the latter adjacent to the furnace and having openings into the same, and the former having jet-nozzles extending into the continuous air-passage thus formed, opposite and in line with the furnace-openings, substantially as described.

2. The combination, with a furnace, of a combined superheater and mixer for steam and air built into the furnace and composed of a plurality of relatively short units connected together end to end in a right line, each unit being provided at one end with a seat to receive the adjacent end of the adjacent unit, the several units being further provided with registering longitudinal steam and air passages, the latter adjacent to the furnace and having openings into the same, and the former having jet-nozzles extending into the continuous air-passage thus formed, opposite and in line with the furnace-openings, each unit being provided with a central apertured sleeve, and means for uniting the units, comprising suitable end caps and a longitudinal bolt passing through the central sleeves of the several units, substantially as described.

3. A combined superheater and mixer for furnaces having formed through the portion thereof adjacent to the furnace a longitudinal air-passage closed at one end, connected with the atmosphere at the other end, and having openings into the furnace, said superheater and mixer being provided on the opposite side with two longitudinal steam-passages, the one a receiving-passage connected with a steam-supply, and the other a return-

passage connected with the farther end of the receiving-passage, the superheater being provided with a partition between the return-steam passage and air-passage having jet-nozzles extending into the air-passage and terminating therein opposite the openings from said air-passage into the furnace, substantially as described.

4. A combined superheater and mixer for furnaces having in the side of its body adjacent to the furnace a longitudinal air-passage having openings into the furnace, said superheater having in its other side two longitudinal steam-passages, the one a receiving-passage and the other a return-passage, and a partition between the air-passage and steam-return passage provided with jet-nozzles extending into the air-passage and terminating therein opposite the openings from said air-passage into the furnace, said superheater being composed of a plurality of similar sections united end to end, a securing-bolt passing longitudinally through all the sections, a cap at the forward end of the superheater adapted to close the front end of the steam-return passage and having openings into the air-passage and steam-receiving passage, and a cap at the rear end of the superheater adapted to close the rear end of the air-passage and having a return-passage connecting the steam receiving and return passages, the connecting-bolt passing through said caps and being provided with securing devices at its ends, substantially as described.

5. A unit for a combined superheater and mixer having a body rectangular in cross-section and tapering on three sides and provided at its larger end with flanges on the three tapering sides forming the seat, said unit being hollow internally and being provided with an approximately central vertical partition forming on the side adjacent to the non-tapering side of the unit a longitudinal air-passage, the space on the other side of the vertical partition being divided by a horizontal partition into upper and lower steam-passages, the upper portion of the vertical partition being provided with jet-nozzles extending from the upper steam-passage into and terminating within the air-passage, the meeting of the two partitions being provided with a longitudinal aperture to receive a retaining-bolt, and apertures being formed in the non-tapering wall of the air-chamber opposite the respective jet-nozzles, substantially as described.

6. A unit for a combined superheater and mixer having an integral body rectangular in cross-section and provided with an external seat at one end, said unit being hollow internally and being provided with an approximately central vertical partition forming, on the side adjacent to the fire-box, a longitudinal air-passage, apertures formed in the outer wall of said air-passage adjacent to the fire-box, a steam-passage formed on the opposite

side of the central partition, the latter being provided with jet-nozzles extending from the steam-passage into and terminating within the air-passage opposite the apertures in the outer wall thereof, and a central longitudinal opening in the vertical partition to receive a connecting-bolt, substantially as described.

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

GEORGE C. WAY.

Witnesses:

E. O. HAGAN,

F. W. SCHAEFER.