

(No Model.)

2 Sheets—Sheet 1.

L. HALLBAUER.
STEAM BOILER FURNACE.

No. 566,311.

Patented Aug. 25, 1896.

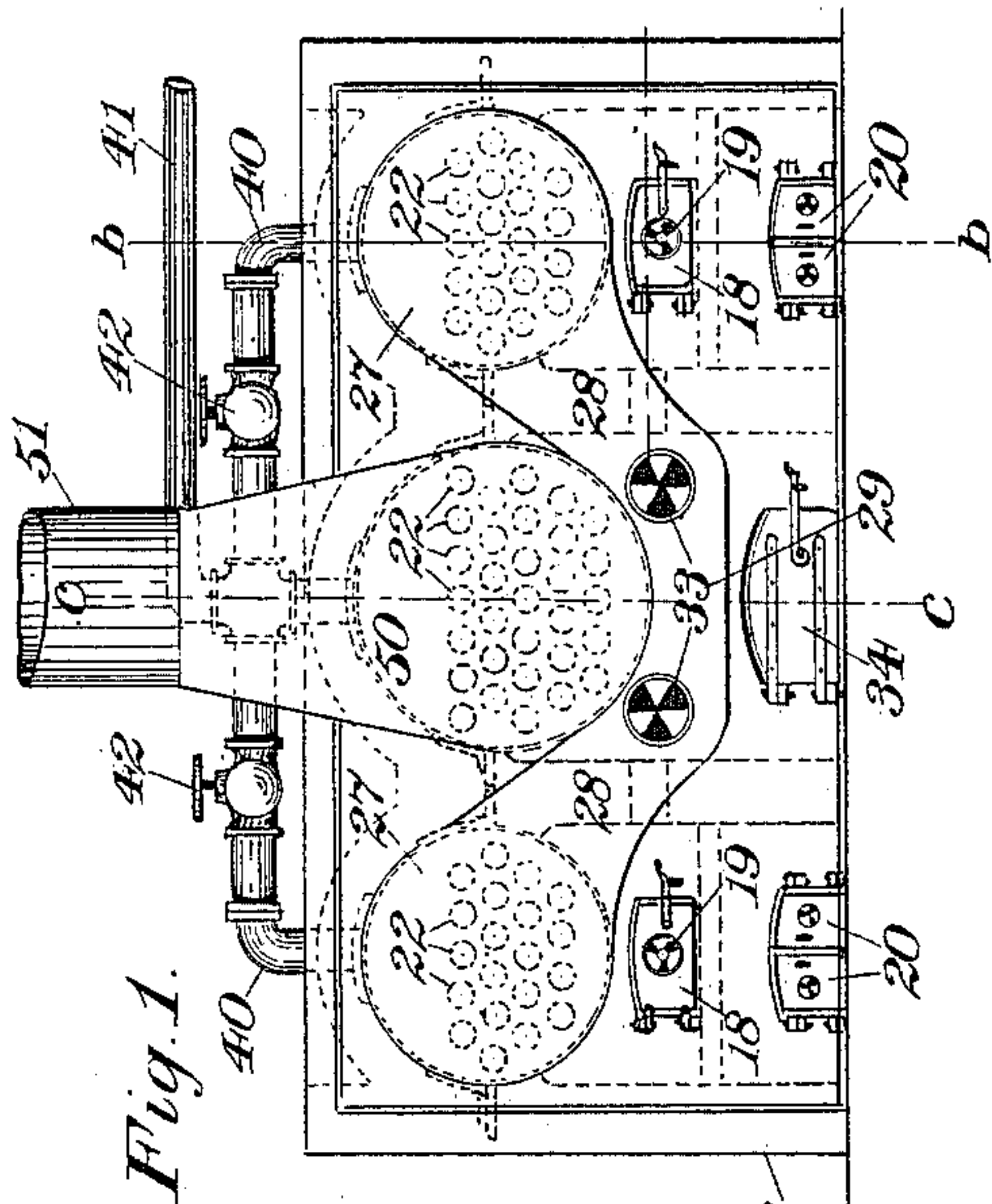


Fig. 1.

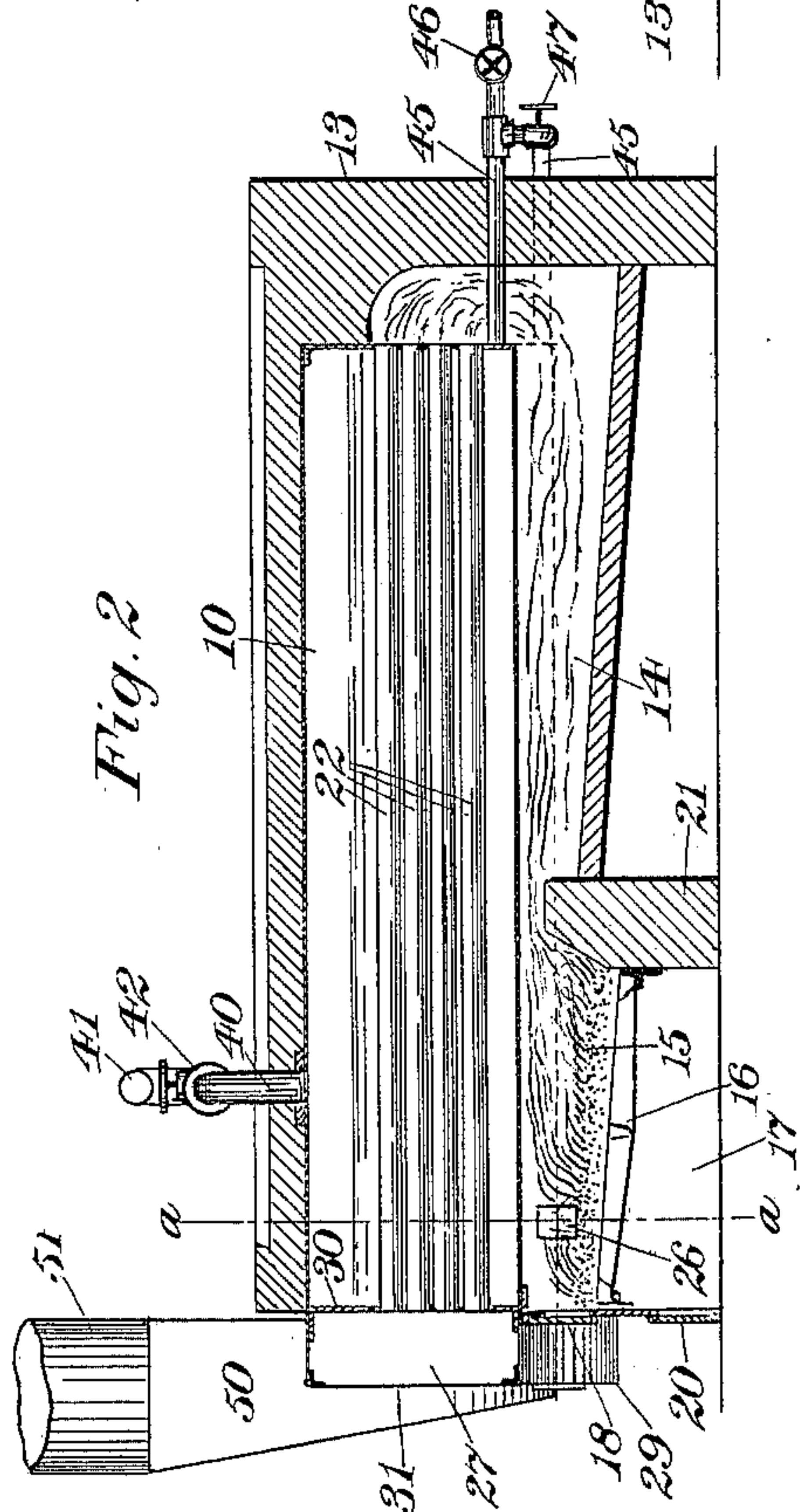


Fig. 2.

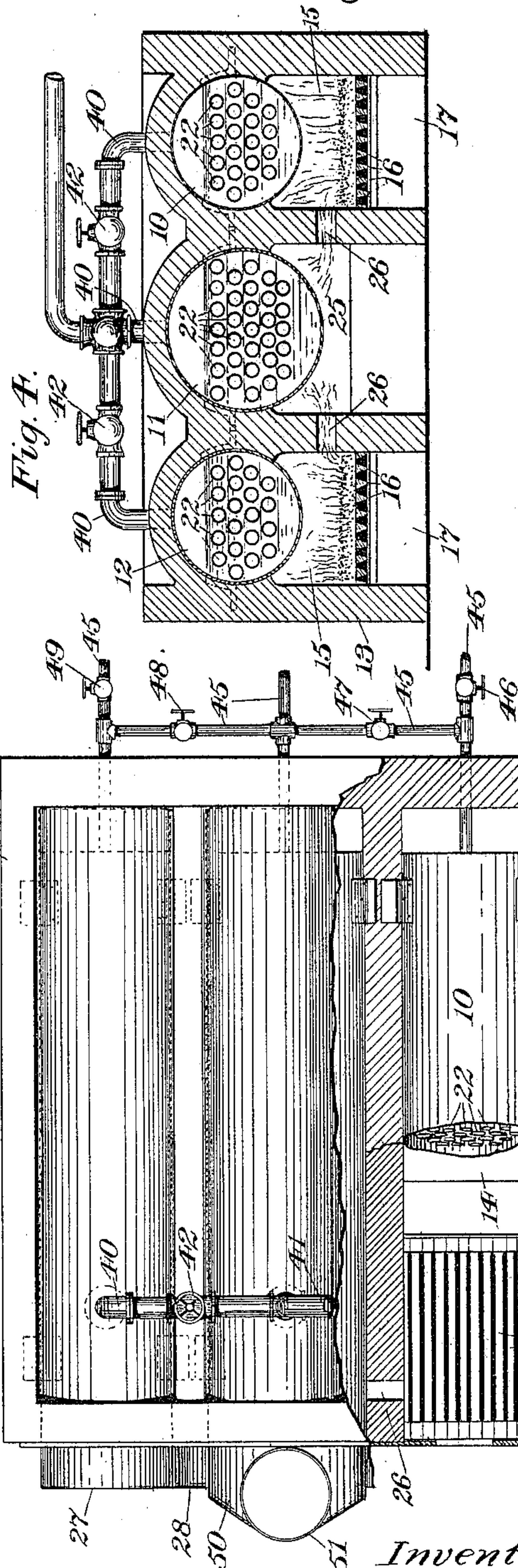


Fig. 3.

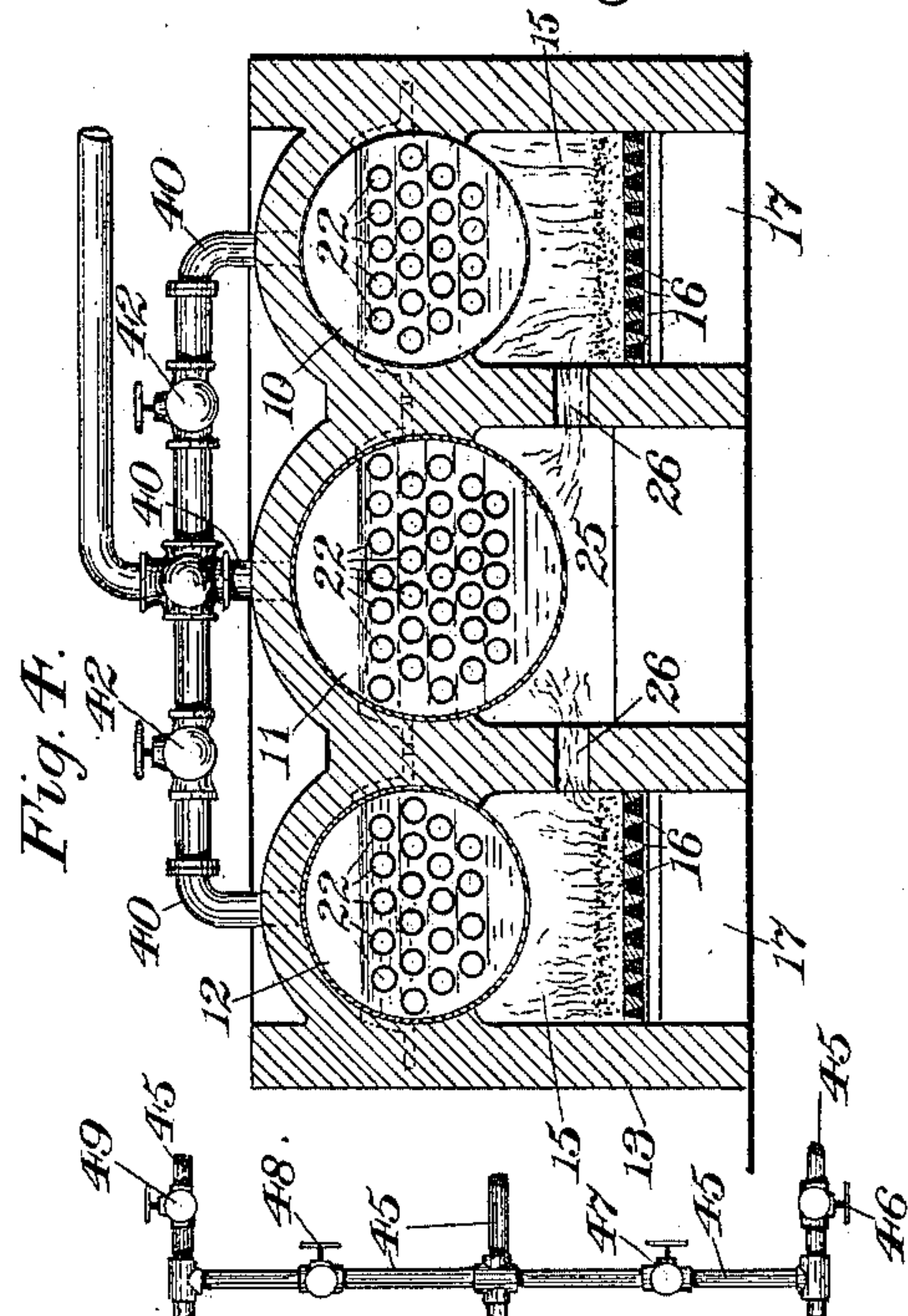


Fig. 4.

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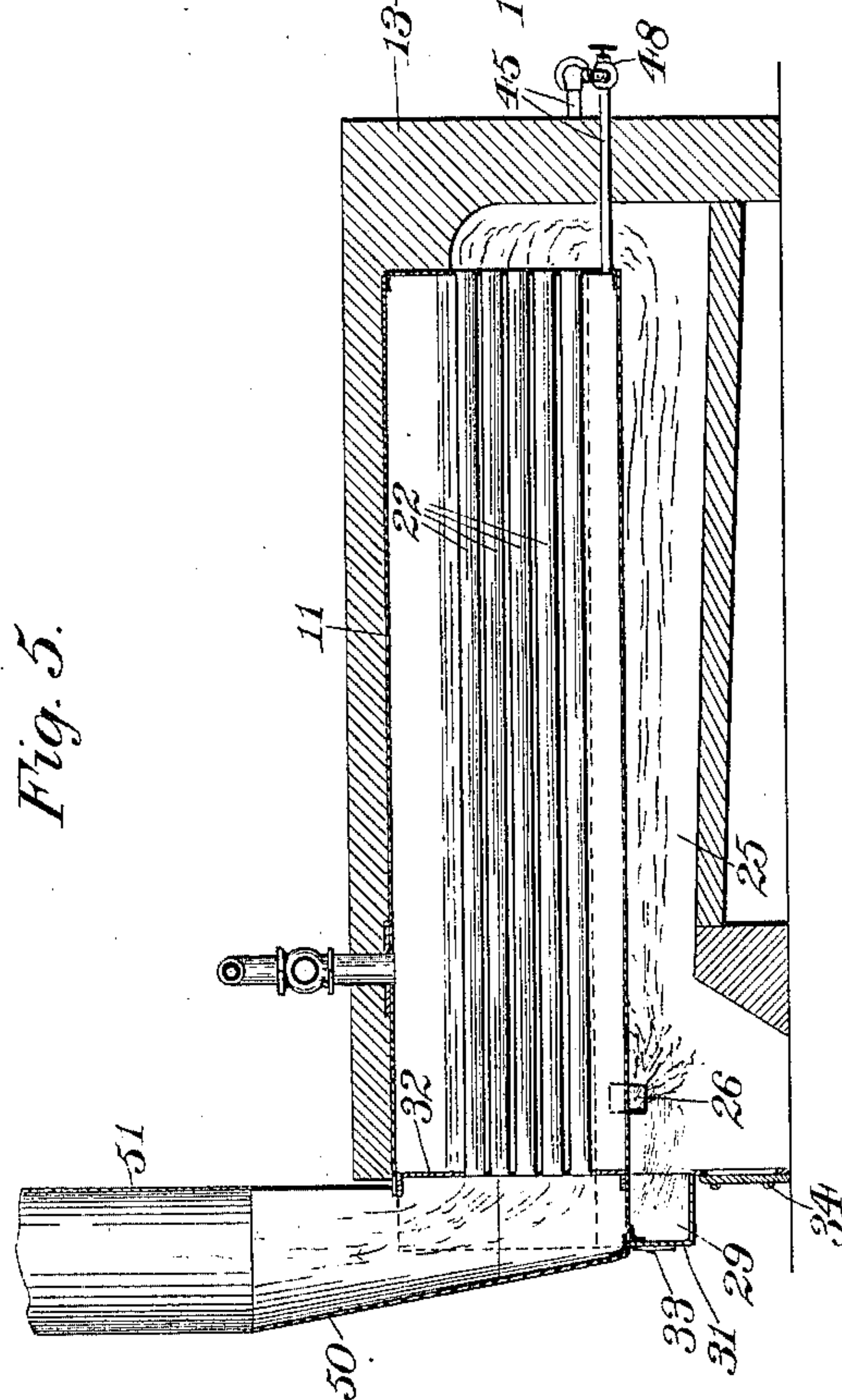
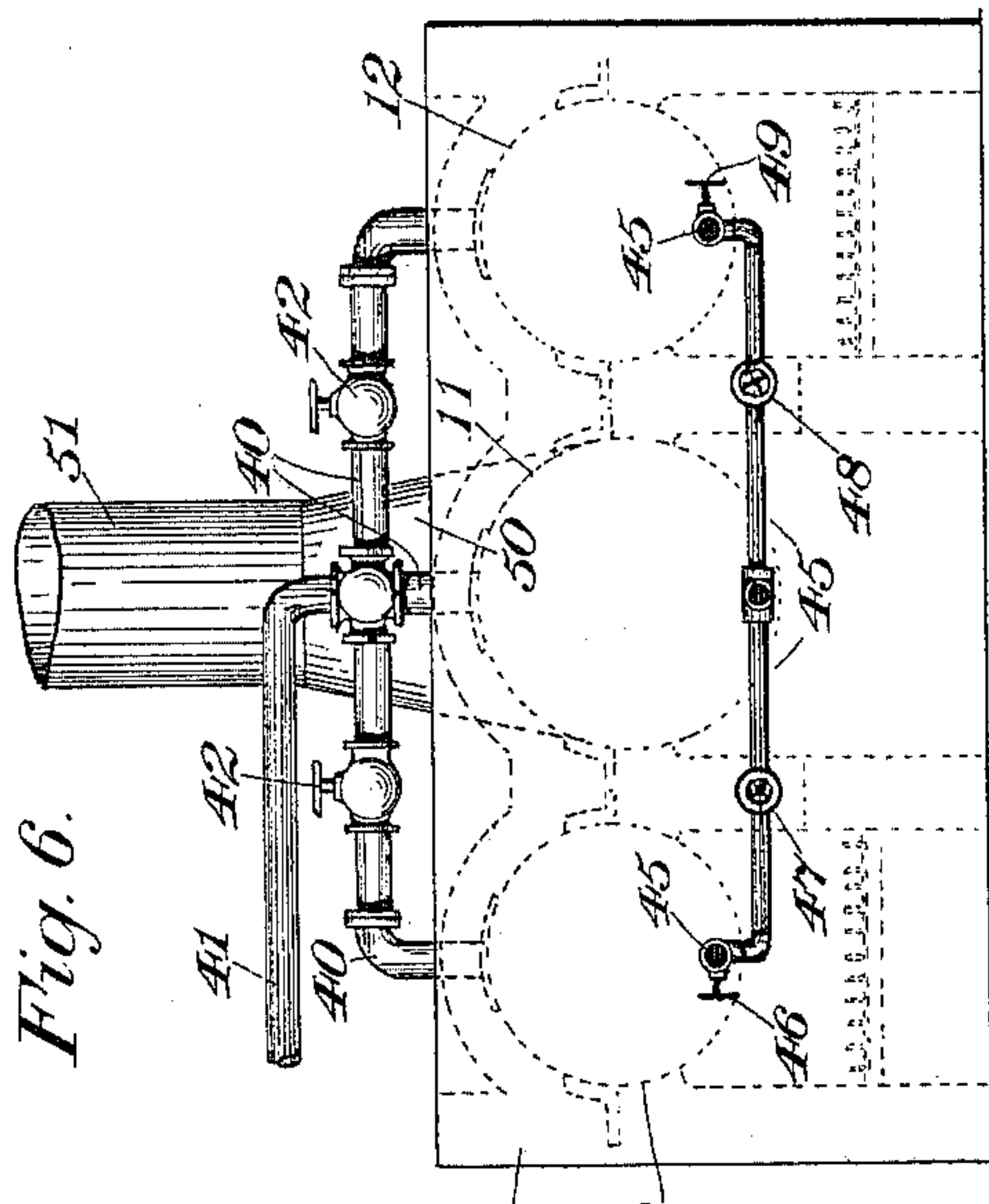
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

LOUIS HALLBAUER, OF MERIDEN, CONNECTICUT.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 566,311, dated August 25, 1896.

Application filed September 27, 1895. Serial No. 563,872. (No model.)

To all whom it may concern:

Be it known that I, LOUIS HALLBAUER, a citizen of the United States, residing at Meriden, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Steam-Boiler Furnaces, of which the following is a specification.

This invention relates to furnaces more particularly designated as "steam-boiler" furnaces, and the object of the invention is to provide an apparatus in which particles of combustion and combustible gases will be more thoroughly consumed and the heat generated during their consumption more fully utilized.

A further object of the invention is to provide an apparatus in which the combustion in one portion thereof will be constantly maintained, although the fires in another portion of the apparatus may be running low.

A further object of the invention is to provide an apparatus in which the feeding of the fuel-chambers will have no appreciable effect on the combustion in another portion of the apparatus, and the combustion thereby maintained without interruption and with less care on the part of the fireman.

In the accompanying drawings, forming part of this specification, Figure 1 is a front view of one form of a steam-boiler furnace constructed to accomplish the purpose above set forth, and showing parts thereof in dotted lines. Fig. 2 is a longitudinal partly-sectional view taken in line *b b*, Fig. 1, showing one of the boilers and its combustion-chamber. Fig. 3 is a top view of the steam-boiler furnace, a part thereof being broken away to show in section one of the combustion-chambers and its boiler in position relatively thereto. Fig. 4 is a cross-sectional view, partly in full lines, taken in line *a a*, Fig. 2. Fig. 5 is a longitudinal partly-sectional view taken in line *c c*, Fig. 1, and showing the secondary or auxiliary combustion-chamber and its boiler in position relatively thereto; and Fig. 6 is a rear end view of the steam-boiler furnace.

It is obvious that my invention can be embodied in other forms of boilers and other kinds of furnaces from that shown and described herein having analogous devices for

producing and disposing of products of combustion; but for the purposes of this specification the same will be described in connection with a steam-boiler furnace substantially similar to that shown.

My invention consists, in a general way, of a series of steam-boilers, one or more of said boilers having a furnace-chamber consisting of a primary or original combustion-chamber and a fuel-chamber or fire-box adjacent thereto, and one or more of said boilers having a secondary combustion-chamber in which the products of combustion drawn from the original combustion-chamber are ignited by means of a flame or highly-heated products drawn from the fuel-chamber of the other boiler, together with means for conveying the products of combustion from the original combustion-chamber of the boiler to the secondary combustion-chamber, and in the preferred form thereof herein shown and described the steam-boiler furnace consists of a series of three boilers 10, 11, and 12, preferably disposed and enclosed in suitable masonry 13. These boilers are preferably disposed side by side, and the middle boiler 11 of the series is preferably somewhat larger than the other boilers, but is so disposed, however, that the upper portion thereof will preferably be on a horizontal plane with its adjacent companion boilers.

Below each of the smaller boilers 10 and 11 a furnace-chamber is formed in any suitable way, and embodies a combustion-chamber 14, which will be hereinafter designated as the "primary" or "original" combustion-chamber, and the usual fuel-chamber or fire-box 15 adjacent to the combustion-chamber, and having the usual grate-bars 16, adapted to support the fuel, and also having an ash-pit 17 below the fire-box.

Furnace-doors 18, provided with suitable drafts 19, permit access to the fuel-chambers 15, and through which doors the fuel is thrown to feed the furnace. The ash-pits 17 are likewise provided with similar doors 20 for removing the ashes therefrom and having suitable draft-regulators therein.

The usual bridge-walls 21 divide the combustion-chambers from the ash-pits and fire-boxes and form a means of supporting one end of the grate-bars 16, which grate-bars are supported thereon and adjacent to the for-

ward end of the fuel-chambers in any suitable way.

All of the boilers are provided with any desired number of flue-tubes 22, extending
5 from head to head thereof, and through which the heated gases and products of combustion are adapted to pass from the rear ends of the combustion-chambers to the forward ends of the boilers.

10 The secondary or auxiliary combustion-chamber 25 is formed adjacent to and preferably underneath the middle boiler 11, and in this chamber the combustible gases and products of combustion that have not been
15 consumed in the primary combustion-chambers are again ignited and practically consumed and the heat generated therefrom utilized for heating the water in the boiler 11. This secondary combustion-chamber is
20 constructed in any suitable manner, and communicates with the fuel-chambers by means of passage-ways 26, formed through the walls of the masonry dividing the boilers from each other, and through which passage-ways the
25 flame or heated products of combustion from the fuel-chambers are drawn to ignite the gases and products of combustion conducted to such secondary chamber.

In order to conduct the non-consumed combustible gases and products from the primary
30 combustion-chambers 14 to the secondary combustion-chamber 25, so that the same may be substantially consumed and the heat generated therefrom utilized, at the forward end
35 of each small boiler 10 and 12 a chamber 27 is formed, having openings at that portion thereof adjacent to the middle boiler 11, and these chambers 27 are connected with each other by means of downwardly-inclined pas-
40 sages 28, terminating adjacent to the lower portion of the forward end of the middle boiler 11 in a chamber 29, opening into the secondary or auxiliary combustion-chamber 25. These downwardly-extending passages
45 28 are in the nature of downtake-flues leading from the chambers 27—into which the ends of the flue-tubes 22 open—to the chamber 29, opening into the secondary or auxiliary combustion-chamber 25.

50 The chambers 27 and 29 and downtake-flues 28 are shown located outside of the masonry 13 adjacent to the front of the boilers; but it is understood that they might be built inside the same or at any other suitable place, if de-
55 sired, and constructed in any suitable way; but in the construction shown, however, in the preferred form thereof, the end boilers 10 and 11 have their cylindrical walls extending beyond the heads 30 of the boilers and have
60 openings cut therein at that portion adjacent to the middle boiler 11. A suitable casing 31 is provided for closing the ends of these chambers and extends downwardly therefrom adjacent to the forward end of the middle
65 boiler 11, forming the downtake-flues 28 and the chamber 29, opening into the secondary or auxiliary combustion-chamber 25 beneath

the boiler 11, the top wall of this chamber 29 being formed by the under wall of the middle boiler 11, extending forward beyond its
70 head 32.

The front wall of the chamber 29 is provided with suitable dampers 33 for the admission of fresh air to the chamber 29 and the combustion-chamber 25, and in the form
75 shown these dampers are preferably of the usual rotary type.

Below the chamber 29 the secondary combustion-chamber 25 is provided with a suitable door 34 for the removal of ashes and the
80 proper cleaning of said chamber.

The boilers are provided with suitable steam-pipes 40 in connection with each other and in connection with the main steam-pipe 41. Suitable valves 42 are also disposed in
85 the pipes 40, whereby the steam can be shut off from either one or both of the small boilers 10 and 12, so that steam can be used only from the main boiler.

Suitable connecting-pipes 45, provided with
90 suitable valves 46, 47, 48, and 49, are provided for connecting the boilers with each other, whereby one or more boilers may be in operation while the remaining boiler or boilers are out of use. For instance, if the boilers 10
95 and 11 are in use the valve 48, connecting the boiler 12 with the boiler 11, would be closed and the valve 49 opened to permit the blow-off of the boiler 12.

Adjacent to the forward head of the boiler
100 11 a smoke-box 50 is constructed in any suitable way, into which the flue-tubes 22 from the main or middle boiler 11 open, and connected with this smoke-box is the usual smoke-stack 51 for conveying the smoke from the
105 apparatus. The sides or side plates of this smoke-box may, if desired, constitute a part of the upper walls of the downtake-flues 28.

Any suitable means (not shown) for feeding the boilers may be provided.
110

In the operation of this improved apparatus the combustible gases or products of combustion generated in the primary or original combustion-chambers 14 of the furnace-chambers under the boilers 10 and 12 are carried by the draft to the rear ends of the boilers 10 and 12, and thence through the flues 22 in said boilers, in which the combustion thereof ceases, and the combustible gases and products are then carried into the chambers
115 27 at the forward ends of said boilers, from whence they are drawn downwardly through the downtake-flues 28 into the chamber 29, opening into the secondary or auxiliary combustion-chamber 25 below the middle boiler
120 12, and are drawn under said boiler and into said combustion-chamber 25 and the unconsumed combustible gases and products again ignited by the flame or heated products coming through the passage-ways 26 from the
125 fire-boxes or fuel-chambers 14, air sufficient to support combustion being admitted into the combustion-chamber 25 through the dampers 33. The remaining small portion of the

unconsumed gases or products of combustion generated in the secondary combustion-chamber 25 are then carried to the rear of the chamber and through the flue-tubes 22 in said middle boiler 11, and into the smoke-box 50, and then conveyed therefrom by the smoke-stack 51. By this improved construction the unconsumed gases and products of combustion coming from the original or primary combustion-chambers 14 are substantially consumed when they reach the secondary combustion-chamber 25 and the heat thereof utilized adjacent to the middle boiler 11 for heating the water therein. Furthermore, by this construction either one of the furnaces, in connection with the boilers 10 and 11, may be fired independently of the other, whereby, by the running of one of the side boilers, the middle boiler can also be kept in operation, and whereby the combustion in the secondary chamber is maintained at all times; also, by this improved construction, in case the fires adjacent to one of the primary combustion-chambers are running low, the combustion in the secondary chamber would be maintained, and hence the apparatus requires less care on the part of the fireman than is ordinarily the case. Moreover, by this improved construction the flame or jet carried to the secondary combustion-chamber through the passage-way 26 from the fuel-chamber of one boiler will not be put out when the door of the fuel or combustion chamber of the opposite side boiler is opened to feed the fire-box.

Having thus described my invention, I claim—

1. In an apparatus of the class specified, the combination of a series of separate and independent boilers; one of said boilers having a furnace-chamber comprising a fire-box and a primary combustion-chamber adapted to heat the same; and the other boiler having an independent combustion-chamber without a fire-box, operatively connected with said furnace-chamber and adapted to heat said boiler by the combustible material drawn from the primary combustion-chamber when ignited by the flame or heated products of combustion drawn from the fire-box of the furnace-chamber, substantially as set forth.

2. In an apparatus of the class specified, the combination of a boiler having a furnace-chamber comprising a fire-box and an original combustion-chamber; an independent second boiler having a secondary combustion-chamber independent of and separated from the furnace-chamber; means for conveying combustible products from the furnace-chamber to the secondary combustion-chamber; and means directly connecting the fire-box of the furnace-chamber with the secondary combustion-chamber of the second boiler to convey a flame or heated products of combustion into said secondary combustion-chamber, to ignite the combustible products conveyed thereto from the furnace-chamber.

3. In an apparatus of the class specified,

the combination of a boiler having a furnace-chamber comprising a fire-box and an original combustion-chamber; an independent second boiler having a secondary combustion-chamber independent of and separated from the furnace-chamber; flues extending through said first boiler, for conveying combustible products from the furnace-chamber to the secondary combustion-chamber; a passage-way directly connecting the fire-box of the furnace-chamber with the secondary combustion-chamber of the second boiler to convey a flame or heated products of combustion into said secondary combustion-chamber, to ignite the combustible products conveyed thereto from the furnace-chamber; and flues extending through the second boiler and in communication with the secondary combustion-chamber.

4. In an apparatus of the class specified, the combination of three independent boilers; a furnace-chamber below two of said boilers, and comprising a fire-box and an original combustion-chamber; and a secondary combustion-chamber below one of said boilers, and independent of and separated from said furnace-chambers; means for conveying combustible products from the two furnace-chambers to the secondary combustion-chamber; and means directly connecting the fire-boxes of the two furnace-chambers with the secondary combustion-chamber to convey a flame or heated products of combustion into said secondary combustion-chamber, to ignite the combustible products conveyed thereto from the furnace-chambers.

5. In an apparatus of the class specified, the combination of a series of independent boilers disposed side by side; furnace-chambers below the outer boilers thereof, and comprising a fire-box and an original combustion-chamber; and the intermediate boiler having a secondary independent combustion-chamber below the same and intermediate of the furnace-chambers and separated therefrom; flues extending through the outer boilers and in communication with the furnace-chambers and downtake-flues, connecting said flues and secondary combustion-chamber, to convey combustible products from both of the furnace-chambers of the outer boilers to said secondary combustion-chamber; and transverse passage-ways directly connecting both fire-boxes of the furnace-chambers with the secondary combustion-chamber to convey a flame or heated products of combustion to said secondary combustion-chamber, to ignite the combustible products conveyed thereto from the furnace-chambers.

6. In an apparatus of the class specified, the combination of a series of boilers disposed side by side, the outer boilers of the series having furnace-chambers below the same comprising original combustion-chambers and fire-boxes, and the intermediate boiler of the series having a secondary combustion-chamber below the same and independent of and

separated from said furnace-chambers; each of said outer boilers having flues extending therethrough and in communication with the furnace-chambers, and having a chamber adjacent to one end thereof into which said flues open; a chamber adjacent to and opening into the secondary combustion-chamber; flues connecting the chambers adjacent to the outer boilers with the chamber opening into the secondary combustion-chamber; and passage-ways directly connecting the fire-boxes of the furnace-chambers with the secondary combustion-chamber to convey a flame or heated products of combustion to said secondary combustion-chamber, to ignite the combustible products carried thereto from the furnace-chamber.

7. In an apparatus of the class specified, the combination of a series of independent boilers disposed side by side, the outer boilers of the series having furnace-chambers below the same comprising original combustion-chambers and fire-boxes, and the intermediate boiler having a secondary combustion-chamber below the same and independent of and separated from said furnace-chambers; each of said outer boilers having flues extending therethrough in communication with the furnace-chambers, and having a chamber adjacent to one end thereof into which the said flues open; a chamber adjacent to and opening into the secondary combustion-chamber; means for admitting fresh air to said combustion-chamber; flues connecting the outer boiler-chambers with the chamber opening into the secondary combustion-chamber; and passage-ways directly connecting the fire-boxes of the furnace-chambers with the secondary combustion-chamber to convey a flame or heated products of combustion to said secondary combustion-chamber, to ignite the combustible products carried thereto from the furnace-chambers.

8. In an apparatus of the class specified, the combination with a series of independent boilers disposed side by side, the outer boilers thereof having furnace-chambers below the same, comprising original combustion-chambers and fire-boxes, and the intermediate boiler having a secondary combustion-chamber below the same and independent of and separated from said furnace-chamber; each of said outer boilers having flues extending therethrough in communication with the fur-

nace-chambers, and having a chamber adjacent to one end thereof into which said flues open; a chamber adjacent to and opening into the secondary combustion-chamber; flues connecting the chambers adjacent to the outer boilers with the chamber opening into the secondary combustion-chamber; passage-ways directly connecting the fire-boxes of the furnace-chambers with the secondary combustion-chamber to convey a flame or heated products of combustion to said secondary combustion-chamber, to ignite the combustible products carried thereto from the furnace-chambers; flues extending through the intermediate boiler and in communication with the secondary combustion-chamber; and means adjacent to the downtake-flues, into which the flues of the intermediate boiler open to convey the smoke from the secondary combustion-chamber.

9. In an apparatus of the class specified, the combination of three independent boilers disposed side by side, the intermediate boiler thereof extending below the outer boiler; a furnace-chamber below each of the outer boilers thereof, and comprising a fire-box adjacent to one end thereof and a combustion-chamber in the rear thereof, and the intermediate boiler having a secondary combustion-chamber below the same and extending from end to end thereof; a longitudinal wall separating the furnace-chambers from the secondary combustion-chamber; flues extending through the outer boilers of the set and communicating with the original combustion-chambers in the rear of said boilers; downtake-flues at the forward ends of each outer boiler into which the boiler-flues open, said downtake-flues opening into the secondary combustion-chamber beneath the intermediate boiler; transverse passages extending through said walls and directly connecting the fire-boxes with the secondary combustion-chamber; flues extending through the inner boiler of the set and communicating with the secondary combustion-chamber in the rear of said boiler; and a smoke-box at the forward end of the intermediate boiler, and into which the flues thereof open.

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