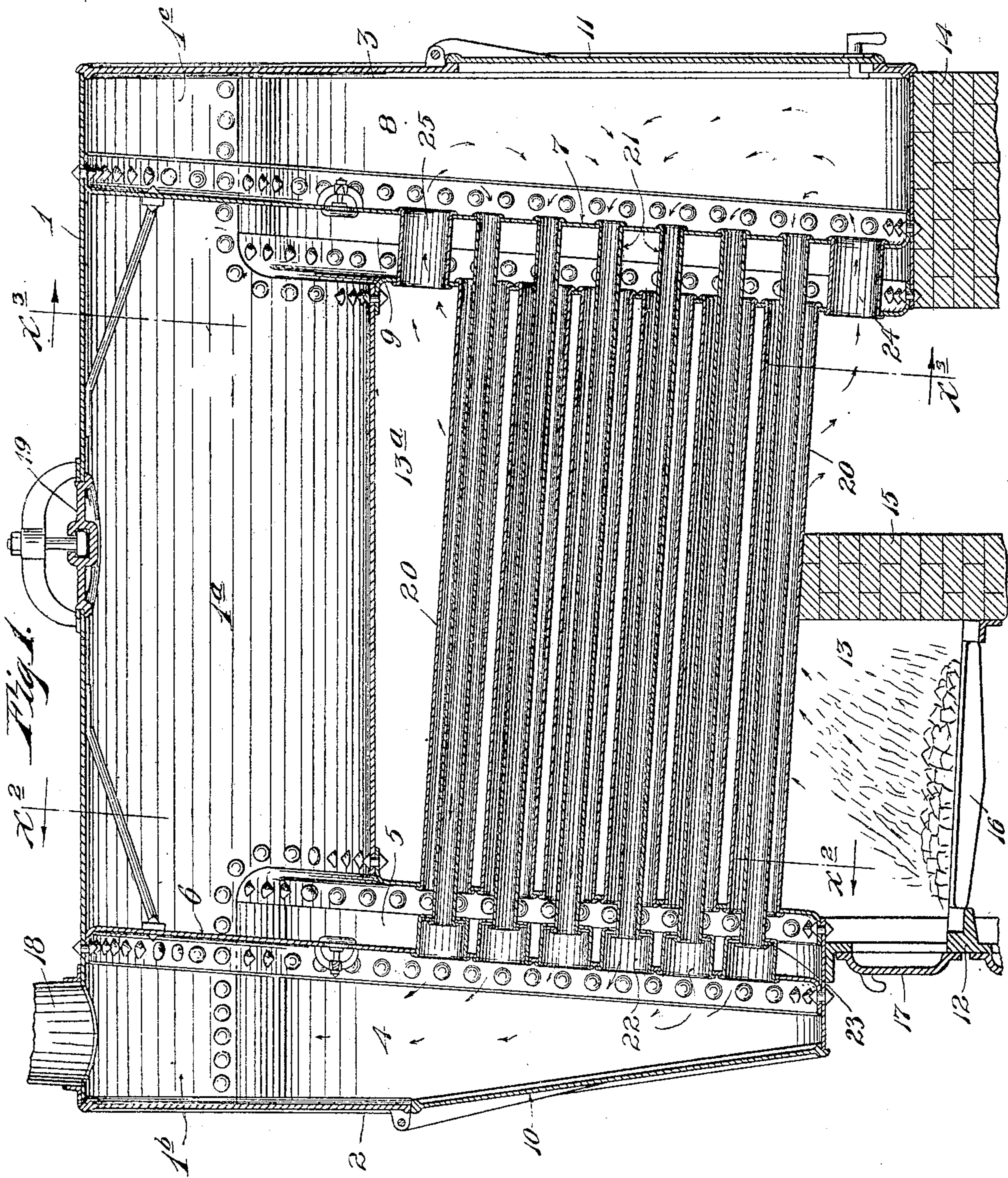


No. 795,406.

PATENTED JULY 25, 1905.

W. MORAN.
RETURN FLUE BOILER.
APPLICATION FILED SEPT. 20, 1904.

2 SHEETS—SHEET 1.



Witnesses.

G. W. Jappan.

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Inventor:
William Moran
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2 SHEETS—SHEET 2.

Fig. 3.

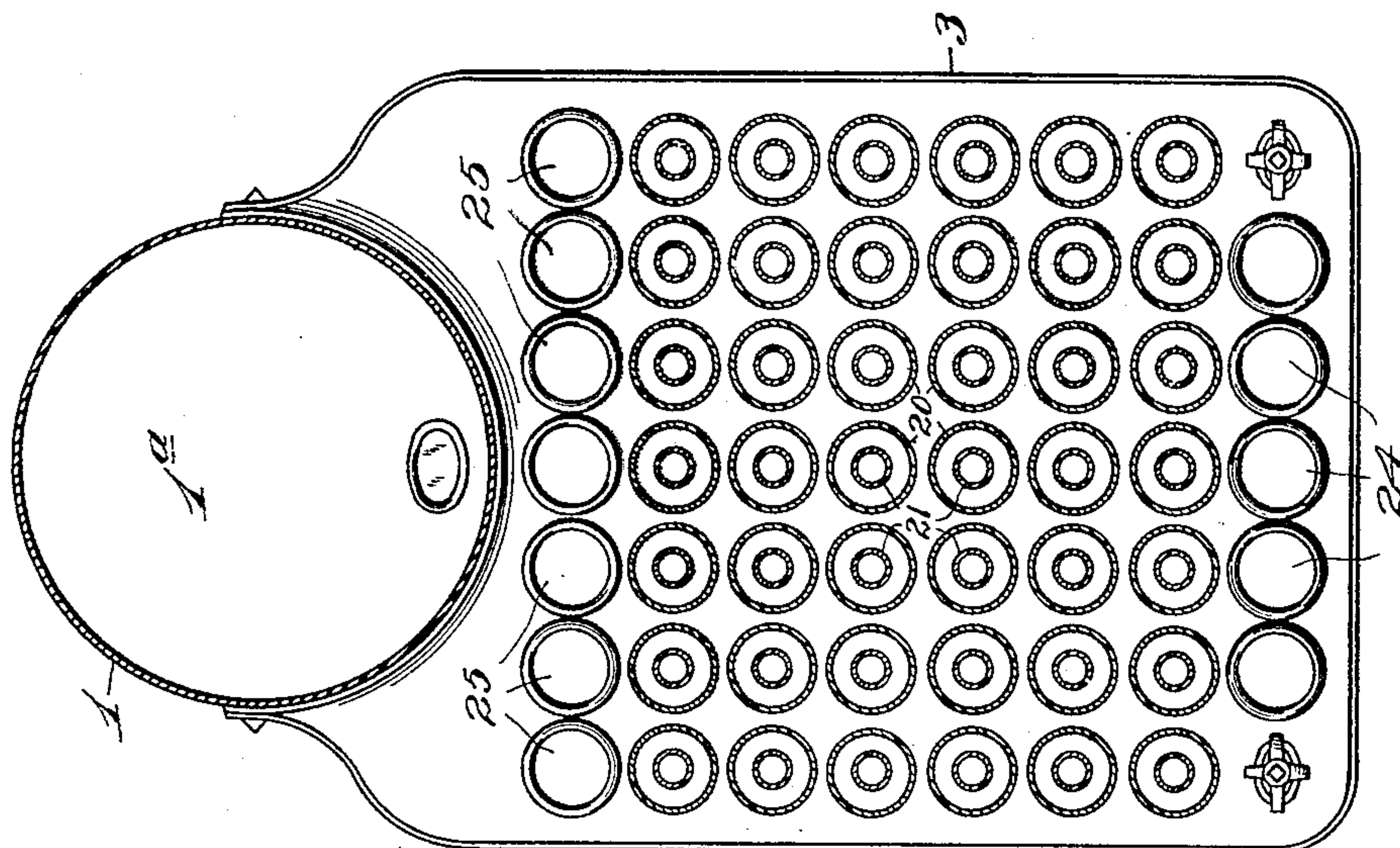
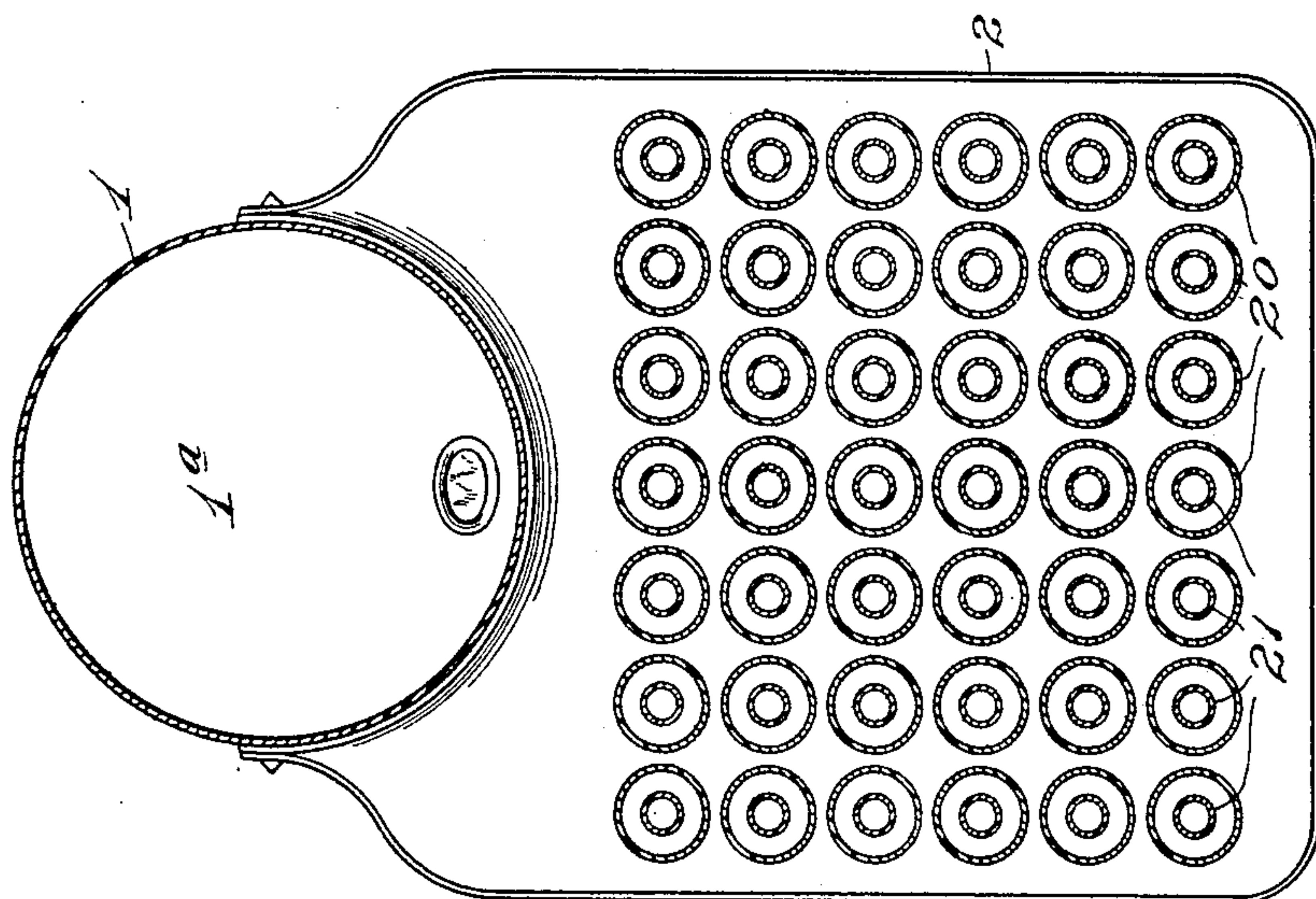


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM MORAN, OF HOPKINS, MINNESOTA.

RETURN-FLUE BOILER.

No. 795,406.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed September 20, 1904. Serial No. 225,214.

To all whom it may concern:

Be it known that I, WILLIAM MORAN, a citizen of the United States, residing at Hopkins, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Return-Flue Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to return-flue boilers, and has for its object to improve the same in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

In the accompanying drawings, which illustrate my invention, like characters indicate like parts throughout the several views.

Figure 1 is a vertical section taken centrally through a horizontal boiler from front to rear designed in accordance with my invention. Fig. 2 is a transverse vertical section taken on the line $x^2 x^2$ of Fig. 1, and Fig. 3 is a transverse vertical section taken on the line $x^3 x^3$ of Fig. 1.

The numeral 1 indicates a horizontally-disposed and preferably cylindrical sheet-iron shell, which at its ends is formed with depending transversely-expanded leg-sections 2 and 3. The leg-section 2 is divided into two compartments 4 and 5 by a vertically and transversely disposed partition-plate or flue-sheet 6, that extends to the top of the cylindrical shell 1 and cuts off from the main chamber 1^a thereof the forward end portion 1^b of said shell. In a similar manner the vertically and transversely extended partition-plate or through-sheet 7 divides the leg 3 into compartments 8 and 9 and extends to the top of the shell 1, cutting off from the main chamber of the shell a rear end section 1^c. As shown, large hinged doors 10 and 11 open, respectively, into the compartments or chambers 4 and 8 to afford ready access to the flues presently to be described.

As shown, the legs 2 and 3 of the boiler rest, respectively, on the cast front-plate 12 of the fire-box 13 and on the rear wall 14 of a brick foundation, which foundation also involves a bridge wall or partition 15.

The numeral 16 indicates the grates of the fire-box, and the numeral 17 indicates a door which opens into the fire-box through the front wall 12 in the usual manner.

The numeral 18 indicates the smoke-stack, which opens from the upper section 1^b of the chamber 2.

The numeral 19 indicates a manhole-stopper shown as applied to the intermediate upper portion of the boiler-shell 1.

The numeral 20 indicates a plurality of approximately horizontal but slightly-inclined water-tubes, which extend through the enlarged section or combustion-chamber 13^a of the fire-box 13 and through the inner plates of the legs 2 and 3, being, as shown, expanded at their extreme ends to form steam-tight joints with said plates. Extending concentrically through each of these relatively large water-tubes 20 is a relatively small flue 21. The rear ends of these flues 21 are passed through the flue-sheet or partition-plate 7 and are expanded to form steam-tight joints therewith. At their forward ends the flues 21 connect with stub flues or thimbles 22, which are passed through the flue-sheet or partition-plate 6 and are expanded to form steam-tight joints therewith. The forward ends of the flues 21 are expanded to form steam-tight joints with inturned angular flanges 23 of the stub flues or thimbles 22. The stub-flues 22 are of the same diameter as the tubes 20 or slightly larger, so that when they are removed from the flue-sheet 6 openings are afforded, through which the said tubes 20 may be passed to remove them from working positions or to place them in working positions.

Below the lower tubes 20 a plurality of relatively large and short flues 24 are passed through the compartment or chamber 9 and at their ends are expanded to form steam-tight joints with the flue-sheets 7 and with the inner plate of the leg 3. Above the upper tubes 20 similar flues 25 extend through the said compartment 9 and are expanded at their ends to form steam-tight joints with the flue-sheet 7 and with the inner plate of the leg 3.

The fire-pot space, including the expanded portion 13^a thereof, may be treated as the primary combustion-chamber, and the chamber or compartment 8 of the leg 3 may be treated as the secondary combustion-chamber. The chamber 4, including the space marked 1^b, constitutes what is usually designated as the "smoke-box." The chamber 1^a of the shell 1 and the compartments 5 and 9 of the legs 2 and 3, respectively, constitute the boiler proper. The

said chambers or compartments 5 and 9 and the annular passages formed within the tubes 20 outside of the flues 21 will always be filled with water, while the shell-chamber 1^a will of course be partly filled with water, so as to leave space for steam at the top thereof. The flues 21 and stub-flues 22 constitute the return-flues of the boiler.

The arrows marked on Fig. 1 indicate the lines of travel of the flame and products of combustion, and by reference thereto it will be noted that the flames pass first from the fire-box proper, 13, between and around the tubes 20 and up into the expanded portion 13^a of the primary combustion-chamber. The part of the flame or products of combustion will pass upward and through the flues 25 into the secondary combustion-chamber 8, while a part thereof will be drawn downward and will pass through the flues 24 into the lower portion of said secondary combustion-chamber. From the secondary combustion-chamber the flames or products of combustion are drawn through the return-flues 21 22 into the smoke-box 4 and from thence out through the smoke-stack 18.

It will be seen that the flames or products of combustion are caused to twice act upon the water contained in the tubes 20 and are caused to act upon both sides of the columns of water contained in the compartments 5 and 9 and are caused to act upon the end portions as well as the lower portion of the body of water contained within the shell-compartment 1^a. It is therefore obvious that with this arrangement an exceedingly large amount of heat-radiating surface is exposed to the water, from which it results that a boiler of high efficiency is provided. As also evident, a boiler is provided in which easy access may be had to the flues for the purposes of repair or replacing of flues.

From what has been said it will be understood that the boiler described is capable of

modification within the scope of my invention as herein set forth and claimed. Many of the novel features of construction may be incorporated into a vertical boiler without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a return-flue boiler having approximately parallel water-legs and a plurality of water-tubes connecting said legs, a primary combustion-chamber, located between said water-legs, a secondary combustion-chamber located outward of one of said water-legs, a smoke-box located outward of the other water-leg, flues passed through one of said water-legs above and below said water-tubes connecting said primary and secondary combustion-chambers, and return-flues passed through said water-tubes and connecting said secondary combustion-chamber with said smoke-box, substantially as described.

2. In a horizontal return-flue boiler, the combination with a horizontally-extended boiler-body having depending water-legs, of a combustion-chamber located between said water-legs, a secondary combustion-chamber located outward of one of said water-legs and extending upward across one end of said boiler-body, a smoke-box located outward of the other water-leg and extending upward across the other end of said boiler-body, flues connecting said primary and secondary combustion-chambers, water-tubes connecting said water-legs, and return-flues extending through said water-tubes and connecting said secondary combustion-chamber with said smoke-box, substantially as described.

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

WILLIAM MORAN.

Witnesses:

E. W. JEPPESEN,

FRANK D. MERCHANT.