

No. 661,533.

Patented Nov. 13, 1900.

A. G. HOHENSTEIN.
STEAM BOILER.

(Application filed July 30, 1900.)

(No Model.)

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FIG. 1.

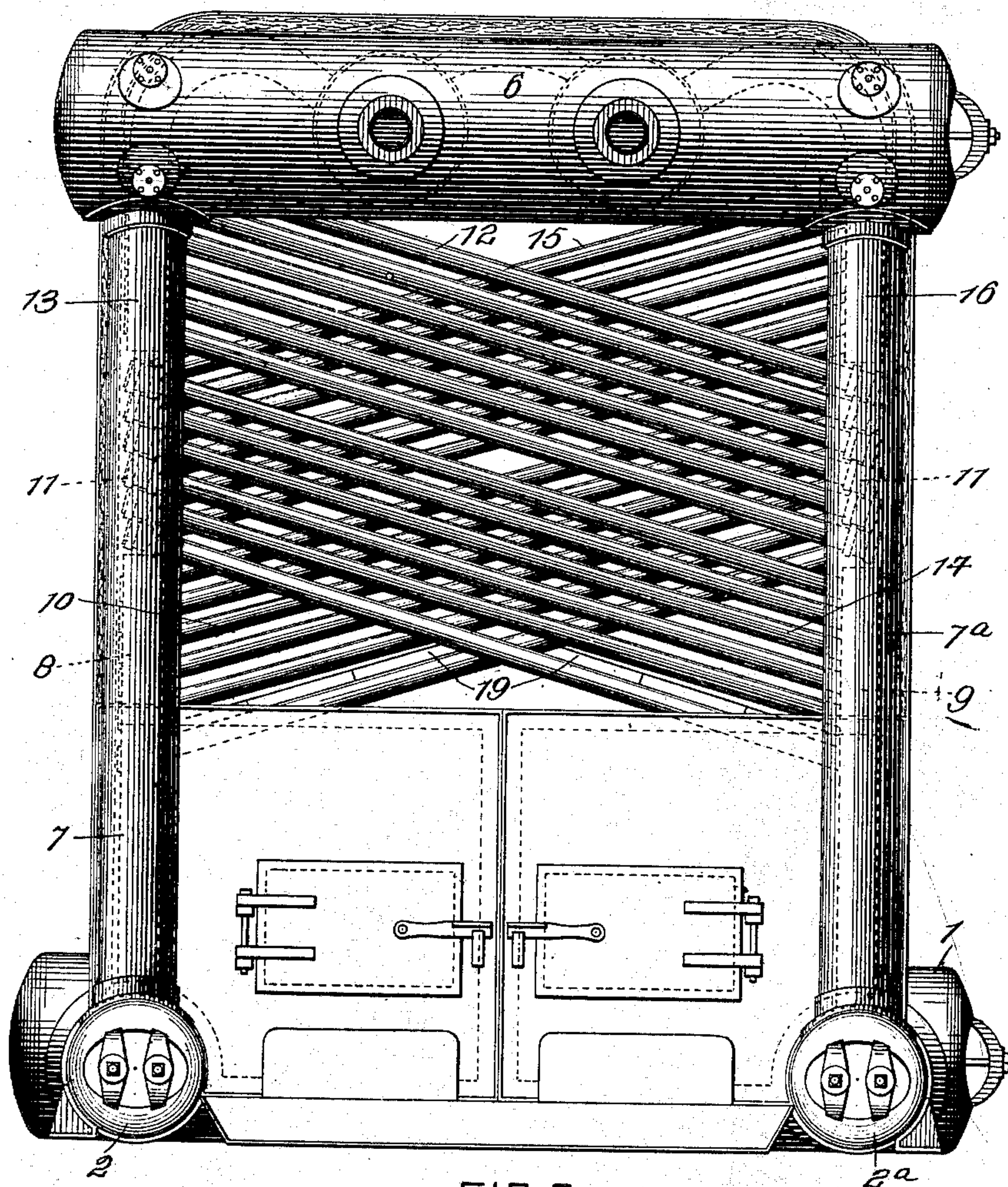
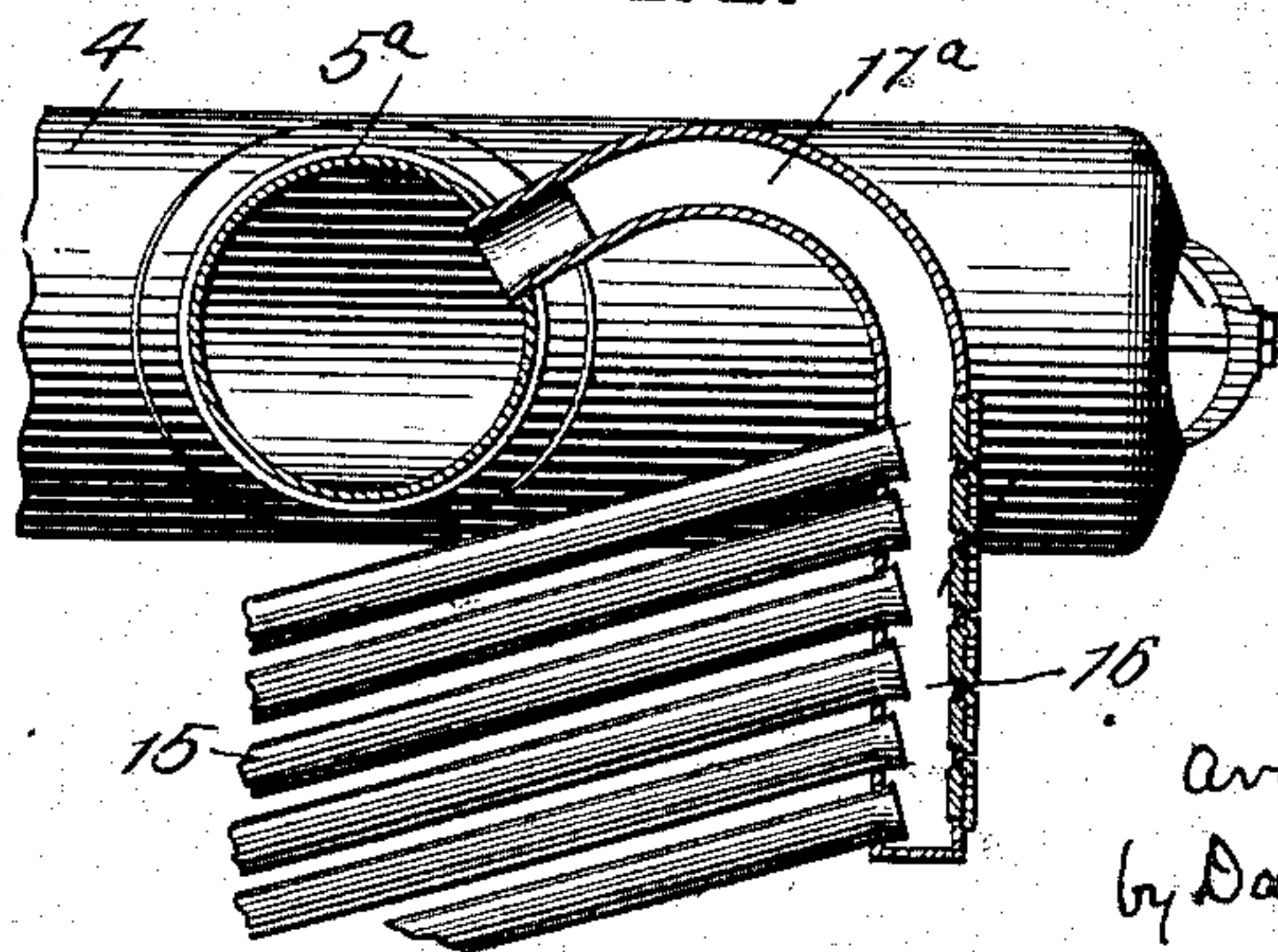


FIG. 5.



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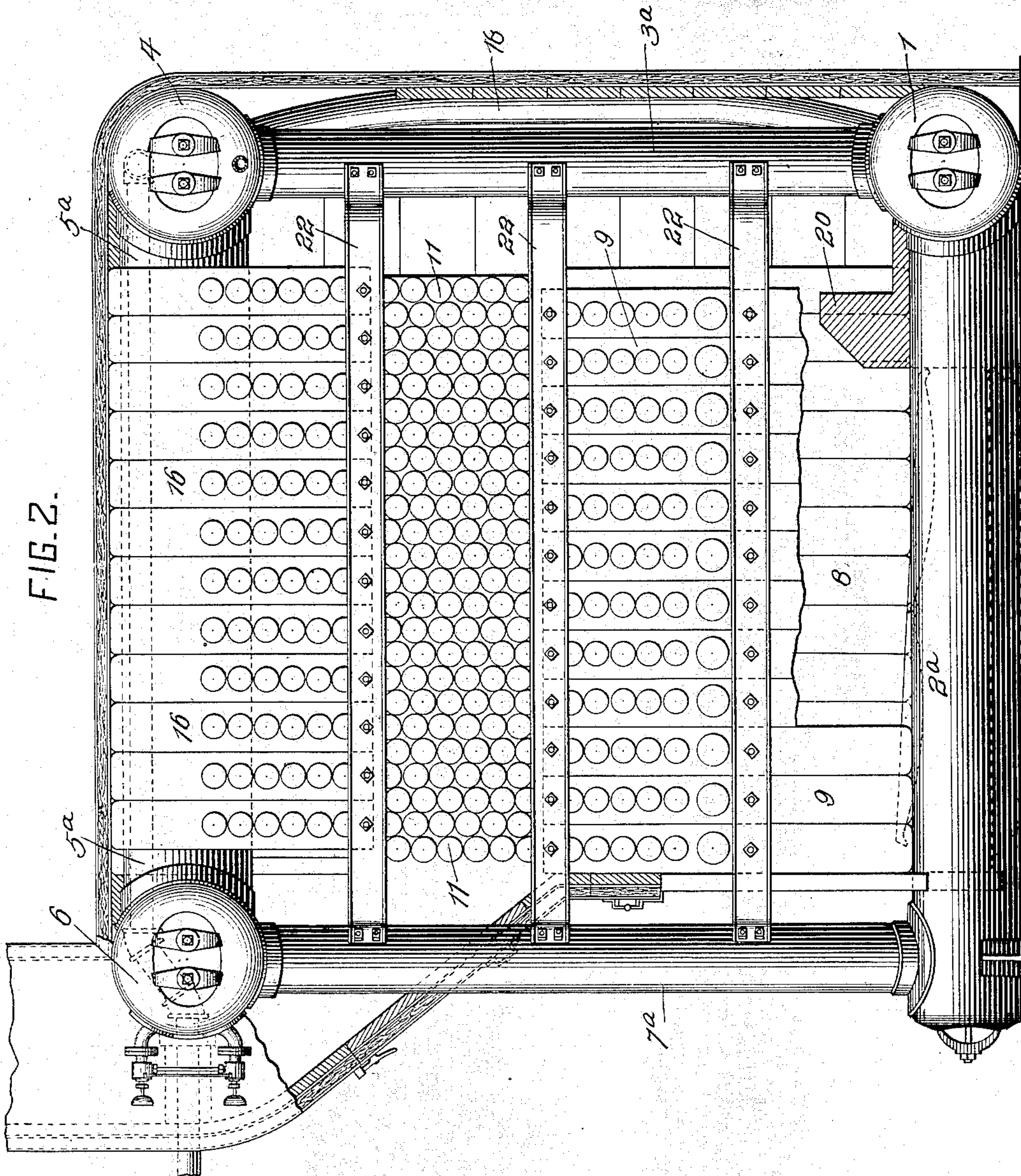
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4 Sheets—Sheet 2.



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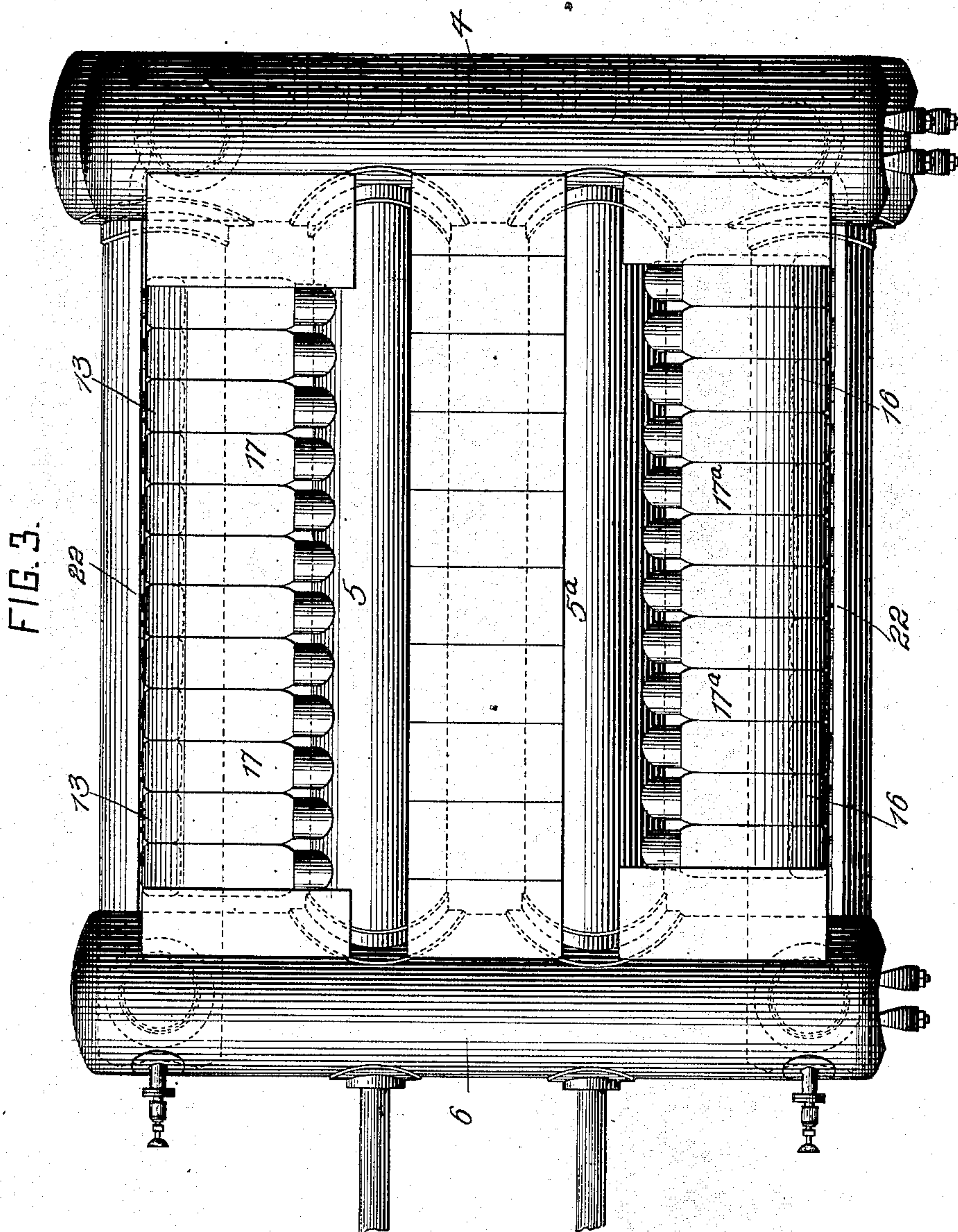
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4 Sheets—Sheet 3.



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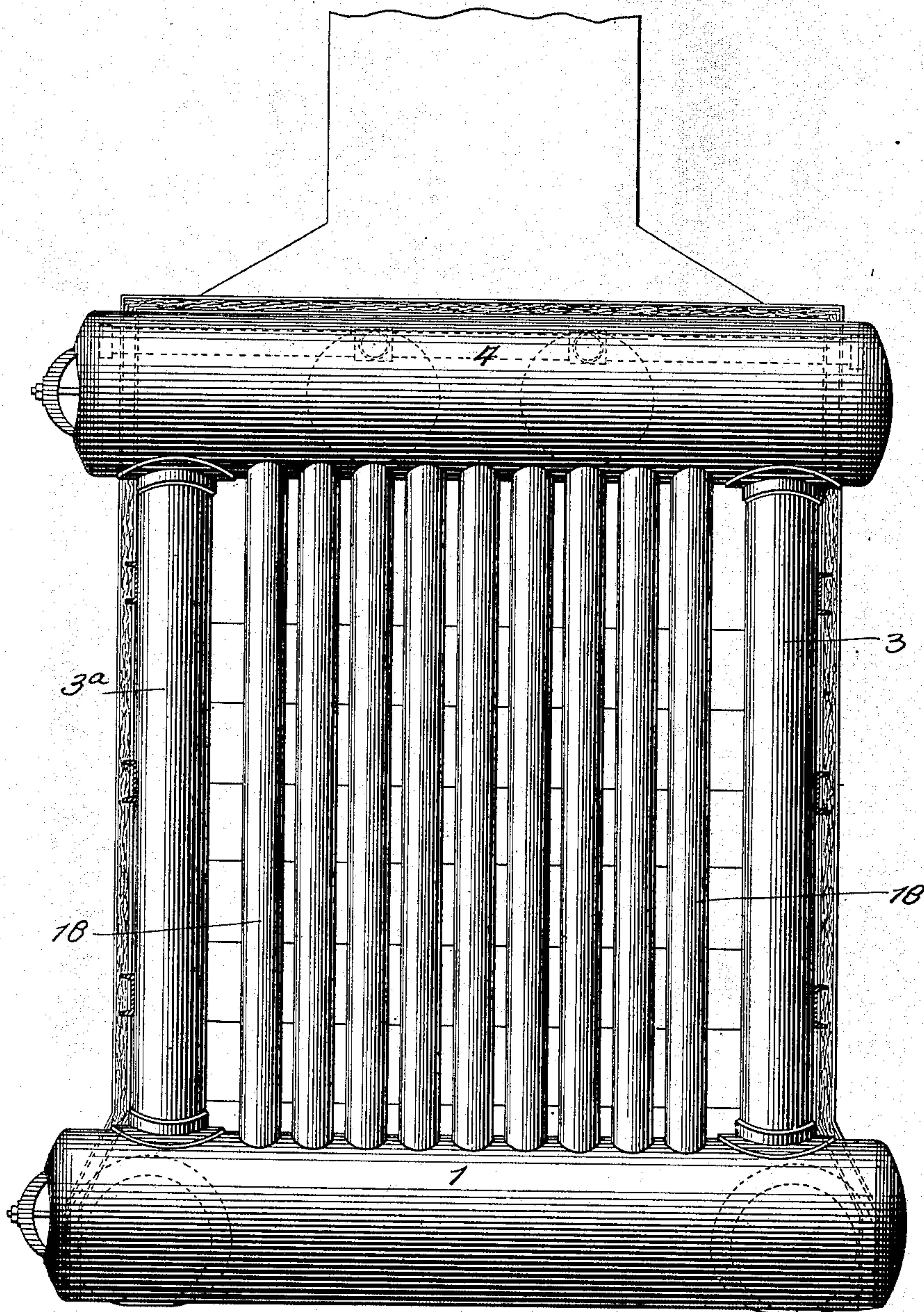
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FIG. 4.



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UNITED STATES PATENT OFFICE.

ARCHIE G. HOHENSTEIN, OF NEW HAVEN, CONNECTICUT.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 661,533, dated November 13, 1900.

Application filed July 30, 1900. Serial No. 25,267. (No model.)

To all whom it may concern:

Be it known that I, ARCHIE G. HOHENSTEIN, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented or discovered certain new and useful Improvements in Steam-Boilers, of which improvements the following is a specification.

The invention described herein relates to certain improvements in water-tube boilers of the class or type forming the subject-matter of applications, Serial No. 698,966, filed December 12, 1898, and Serial Nos. 5,437, 5,438, 5,439, and 5,440, filed February 16, 1900.

The present invention has for its object a construction of that class or type whereby such boilers are more readily adapted for marine purposes.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a front elevation of my improved boiler, a portion of the front casing being removed. Fig. 2 is a side elevation of the same, the side casing being removed. Fig. 3 is a top plan view. Fig. 4 is a rear elevation, and Fig. 5 is a sectional detail view.

The lower portion of my improved boiler consists of a rear drum 1 and two parallel or approximately parallel side drums 2 and 2^a, arranged at right angles or approximately at right angles to the rear drum and connected thereto at points adjacent to its ends. Tubular columns 3 3^a extend up from the rear drum, being connected thereto at points adjacent to the ends of the latter. These tubular columns, which serve as downtakes, as will be hereinafter described, support the upper rear drum 4, which is arranged parallel or approximately parallel to the lower rear drum and is connected to the columns 3 and 3^a at points adjacent to its ends. This upper rear drum is connected by drums 5 and 5^a with the upper front drum 6, which is supported by front tubular columns 7 and 7^a, resting upon the side drums 2 2^a at points adjacent to their front ends. The columns 7 and 7^a have their upper and lower ends connected, respectively, to the drum 6 and the side drums 2 and 2^a by any suitable means known in the art and also serve as downtakes

in the circulating system of the boiler. A series of headers 8 have their lower ends connected to the side drum 2, and a similar series of headers 9 have their lower ends connected to the side drum 2^a. The headers of each series are arranged in or approximately in contact with each other and form practically continuous or unbroken side walls for the fire-box of the boiler. A series of tubes 10 extend with an upward inclination from the side headers 8 across the combustion-chamber to points in line with the headers 9 on the opposite side of the furnace, but above the latter, and are connected by return-bends 11 of any suitable construction to a series of tubes 12, which extend with an upward inclination to the upper side headers 13, arranged above and in line with the lower headers 8. A series of tubes 14 extend with an upward inclination from the headers 9 across the combustion-chamber of the boiler to points in line with the side headers 8, where they are connected by return-bends 11 to a series of tubes 15, extending from the return-bends with an upward inclination to the opposite side of the boiler, where they are connected to upper headers 16. These upper headers are arranged in or approximately in contact with each other and form practically continuous walls for the sides of the upper combustion-chamber of the boiler. As clearly shown in Figs. 1, 3, and 5, the headers 13 and 16 have curved upper portions, forming goose-necks 17 17^a, which have their ends connected, respectively, to the drums 5 and 5^a. As shown in Figs. 2, 3, and 4, the upper and lower rear drums 1 and 4 are connected together by a series of vertical pipes 18, which form the rear wall of the combustion-chamber of the furnace. As these tubes receive the direct impact of the flames from the fire-box in their passage through the combustion-chamber toward the stack, they are made heavier than the other tubes forming the heating-surfaces, so as to withstand the destructive action of the flame.

As shown in Fig. 1, tiles 19, of refractory material, are placed upon the lower tubes of the series 10 and 14 and extend from the front of the boiler back to or approximately to a vertical plane passing through the bridge-wall 20 of the furnace, thus forming a closed

arch for the top of the main combustion-chamber. The products of combustion pass from this chamber over the bridge-wall and into a vertical passage between the series of cross-tubes and the vertical tubes 18. Thence the products of combustion and flame pass forward through the series of cross-tubes and under the drums 5 and 5^a and drum 6 to the stack, which is connected to the front end of the furnace. The upper headers, with their goosenecks, form the sides and a portion of the top wall of this return-chamber for the products of combustion, the remaining portions or portion of the top wall for this chamber being formed by the drums 5 and 5^a and a series of tiling extending across the opening between these drums.

The lower drums 1 and 1^a are made of a capacity greater than the delivering capacity of the lower series of headers 8 and 9, and these headers are made of a capacity greater than the delivering capacity of the series of tubes extending from them. Similarly the upper headers are made of a greater capacity than the tubes which deliver into them, and the cross-drums 5 and 5^a, with their upper front and rear drums, have a capacity sufficiently greater than the delivering capacity of the headers connected therewith and of the tubes 18 as to form ample steam-breaking space. The capacity of the downtake-columns 3 3^a and 7 7^a is made greater than the delivering capacity of the headers through which the water passes upwardly from the lower drums. It will be readily understood by those skilled in the art that by thus proportioning the several parts of the boiler a free and unrestricted circulation can be maintained at all times and also that ample steam-breaking space is afforded.

It is characteristic of my improved boiler that the upper drums are supported by the vertical columns, which serve as downtakes, and that the upper headers are supported by the cross-drums 5 and 5^a, connecting the upper front and rear drums, while the lower headers are supported by the lower side drums. The inclined cross-tubes form yielding and flexible connections between the two series of upper headers and the corresponding series of lower headers, so that the lower headers, whose upper ends are free or unconfined, can expand upwardly and the upper headers, whose lower ends are unconfined, can expand downwardly without any injury or straining of the other parts of the boiler. As the upper drums are free except as regards their supporting-columns, the latter can expand upwardly without any twisting or straining of the drums supported thereby.

As these boilers are especially designed for marine service, provision is made for supporting the headers laterally during any pitching or rolling of the vessel by means of channel-bars 22, which are secured to the vertical columns or downtakes and pass along outside of the upper and lower headers, as clearly

shown in Fig. 2. It is preferred to connect each header by bolts to these lateral braces; but in order that such connection between the channel-bars and the headers may not interfere with the expansive movement of the header vertical slots are formed through the channel-bars for the passage of these bolts, and thereby permitting of the longitudinal expansion of the headers.

It will be observed that practically all the walls of the combustion-chamber and the passages conducting the products of combustion to the stack are formed by the headers and tubes and drums forming the heating-surfaces of the boiler, thereby avoiding to a great extent the use of brick or tile. As the tubes 18, connecting the upper and lower rear drums, are subjected to a very high heat and the direct impact of flame, &c., from the combustion-chamber or fire-box, it may happen that an upward circulation will be established through them; but as the downtakes are proportioned so as to have a capacity greater than the combined delivering capacities of the lower headers and the tubes 18 such upward circulation through the tubes 18 will not affect the circulation through other portions of the boiler.

I claim herein as my invention—

1. In a boiler, the combination of two parallel or approximately parallel lower drums, tubular columns connected to said drums, two series of headers connected respectively to said drums, and forming the sides of the fire-box, two series of upper headers the headers of each upper series being connected by diverging banks of tubes to the headers of the corresponding lower series, and connected upper drums connected to the tubular columns and to the upper headers, substantially as set forth.

2. In a boiler, the combination of two parallel or approximately parallel lower drums, tubular columns connected to said drums, two series of headers connected respectively to said drums and forming the side of the fire-box, two series of upper headers, the headers of each upper series being connected by diverging banks of tubes to the headers of the corresponding lower series, two upper drums arranged at or approximately at right angles to the lower drums and connected to the tubular columns, the connection between the upper drums being connected to the upper series of headers, substantially as set forth.

3. In a boiler, the combination of two parallel or approximately parallel lower drums, two parallel or approximately parallel upper drums arranged at or approximately at right angles to the lower drums, tubular columns connecting the upper and lower drums, one or more drums connecting the upper drums, two series of lower headers connected respectively to the lower drums and forming the sides of the fire-box, two series of upper headers connected to the drum or drums forming the connection between the upper front and

rear drums, and two diverging banks or series of tubes connecting each series of lower headers with the corresponding series of upper headers, substantially as set forth.

5 4. In a boiler, the combination of two lower drums, two upper connected drums, tubular columns connecting the upper and lower drums, two series of lower headers connected to the lower drums, two series of upper headers having inwardly-bent necks connected to the connection between the upper drums, and two diverging banks of tubes connecting each of the upper series of headers with the corresponding lower series of headers, substantially as set forth.

15 5. In a boiler, the combination of two parallel or approximately parallel lower drums, a transverse drum connecting the latter at points adjacent to their rear ends, tubular

columns connected to said drums, two series 20 of headers connected respectively to the lower side drums and forming the sides of the fire-box, two series of upper headers the headers of each upper series being connected by diverging banks of tubes to the headers of the 25 corresponding lower series, connected upper drums connected to the tubular columns and to the upper headers, and a series of tubes connected to the lower transverse drum and to the upper drums and forming the rear wall 30 of the combustion-chamber, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ARCHIE G. HOHENSTEIN.

Witnesses:

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