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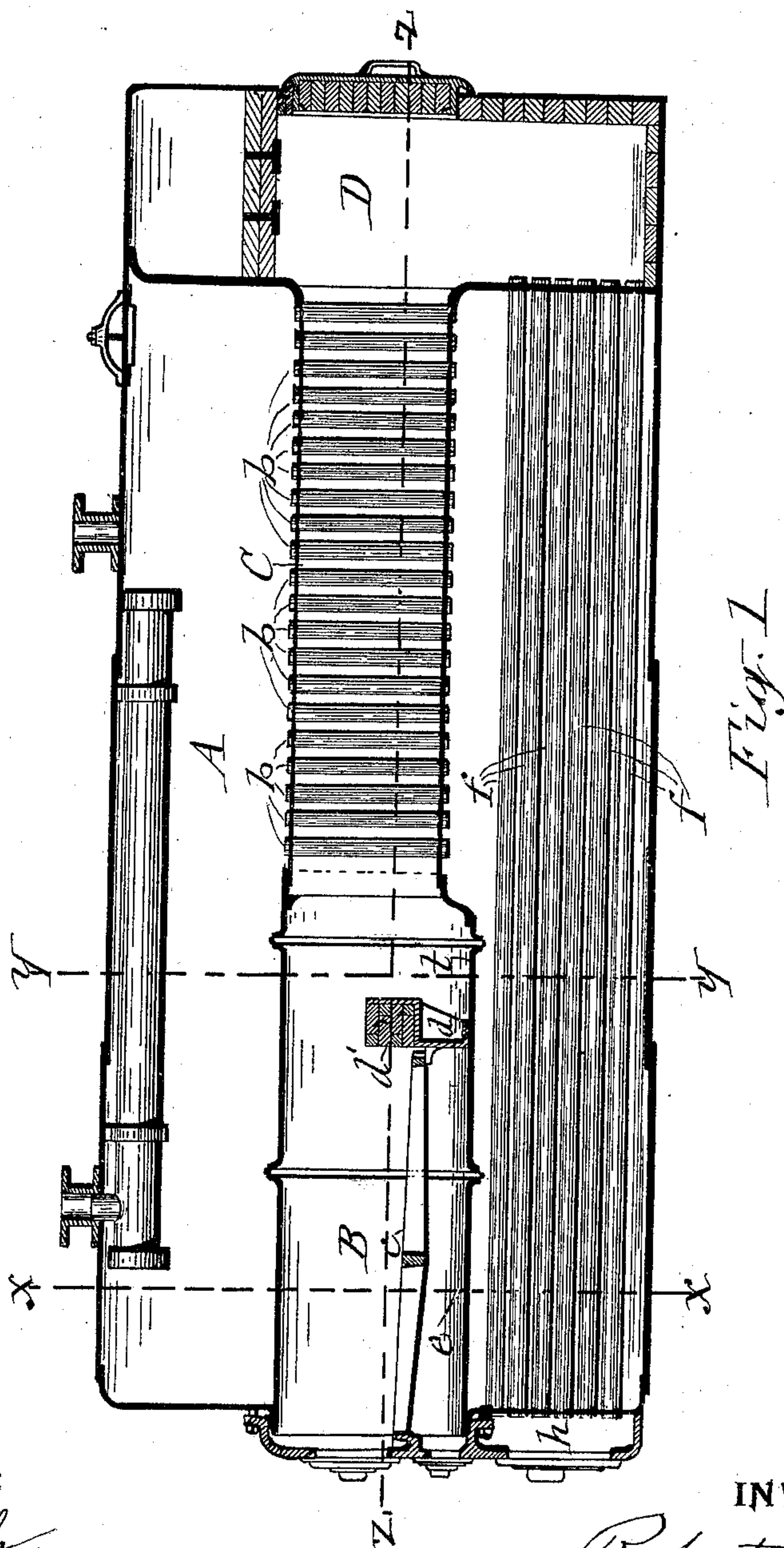
Patented Sept. 13, 1898.

R. JOY.  
STEAM BOILER.

(Application filed Dec. 20, 1897.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES:

*H. B. Smith.*  
*J. J. Laess.*

INVENTOR:

*Robert Joy*  
*By E. Laess*  
ATTORNEY

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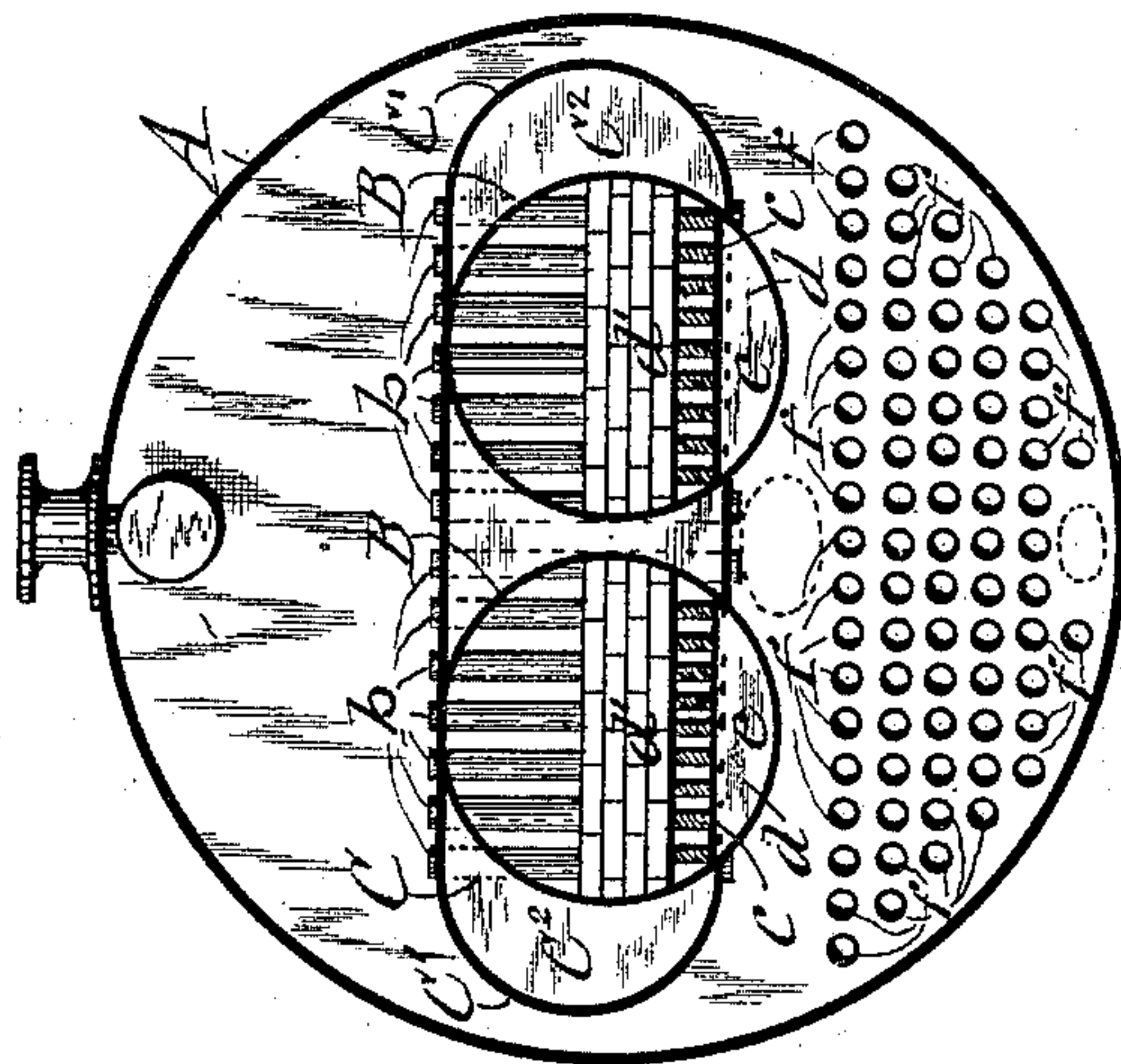
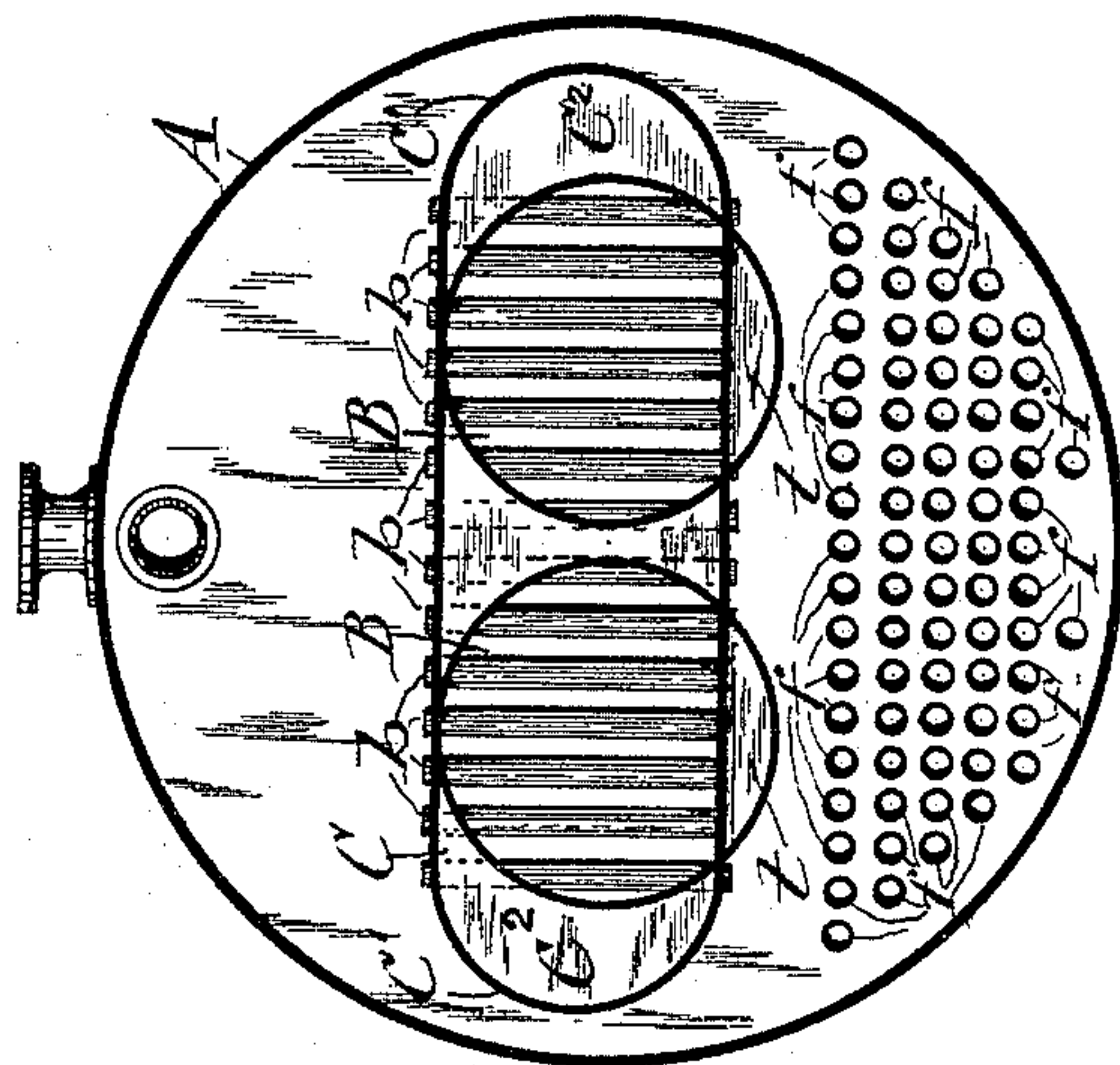
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J. J. Taass

INVENTOR  
4

INVENTOR  
Robert Joy  
By E. Laass  
ATTORNEY

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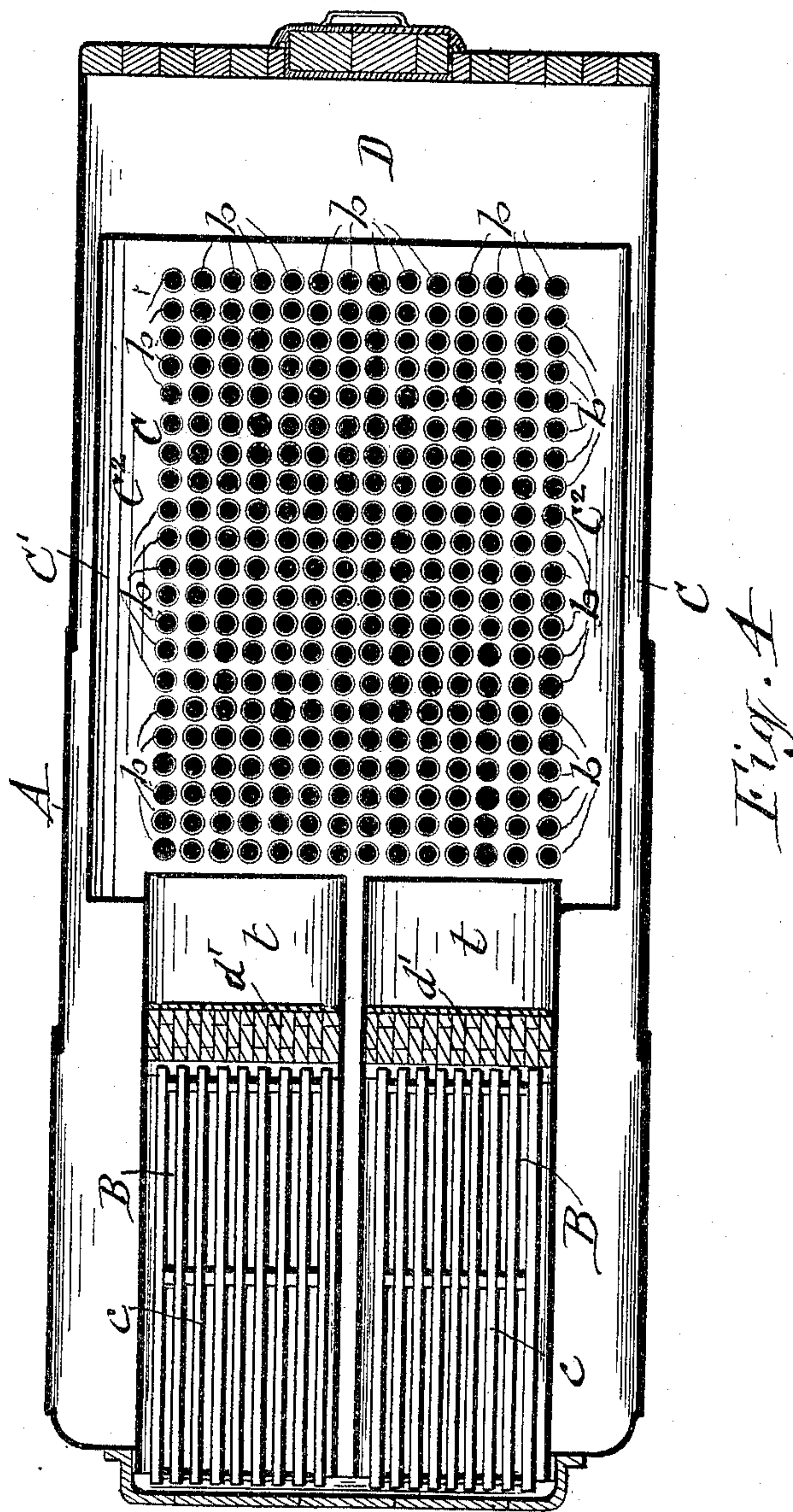
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*J. J. Laas*

INVENTOR

*Robert Joy*

*By E. Laas*

ATTORNEY



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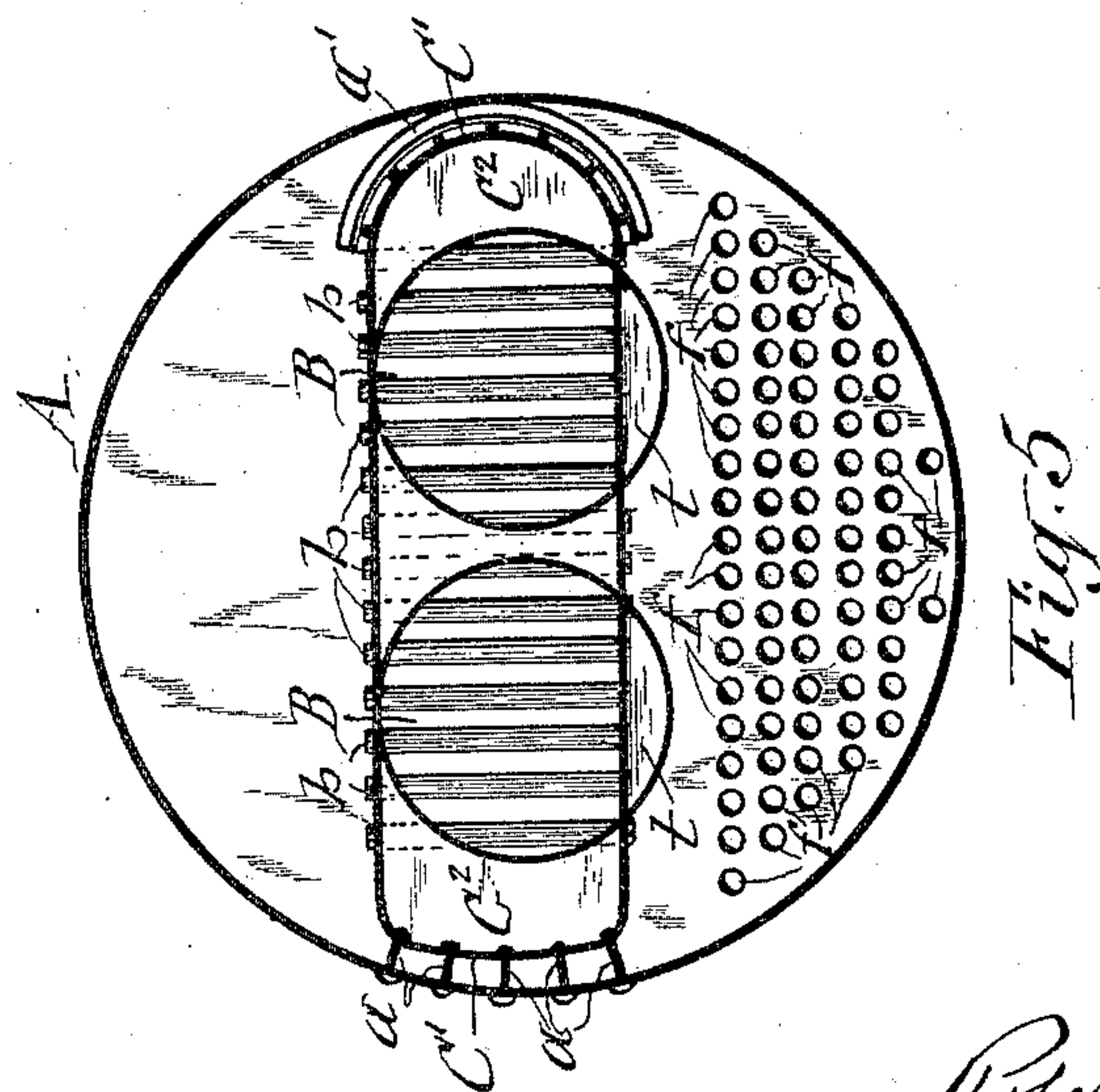
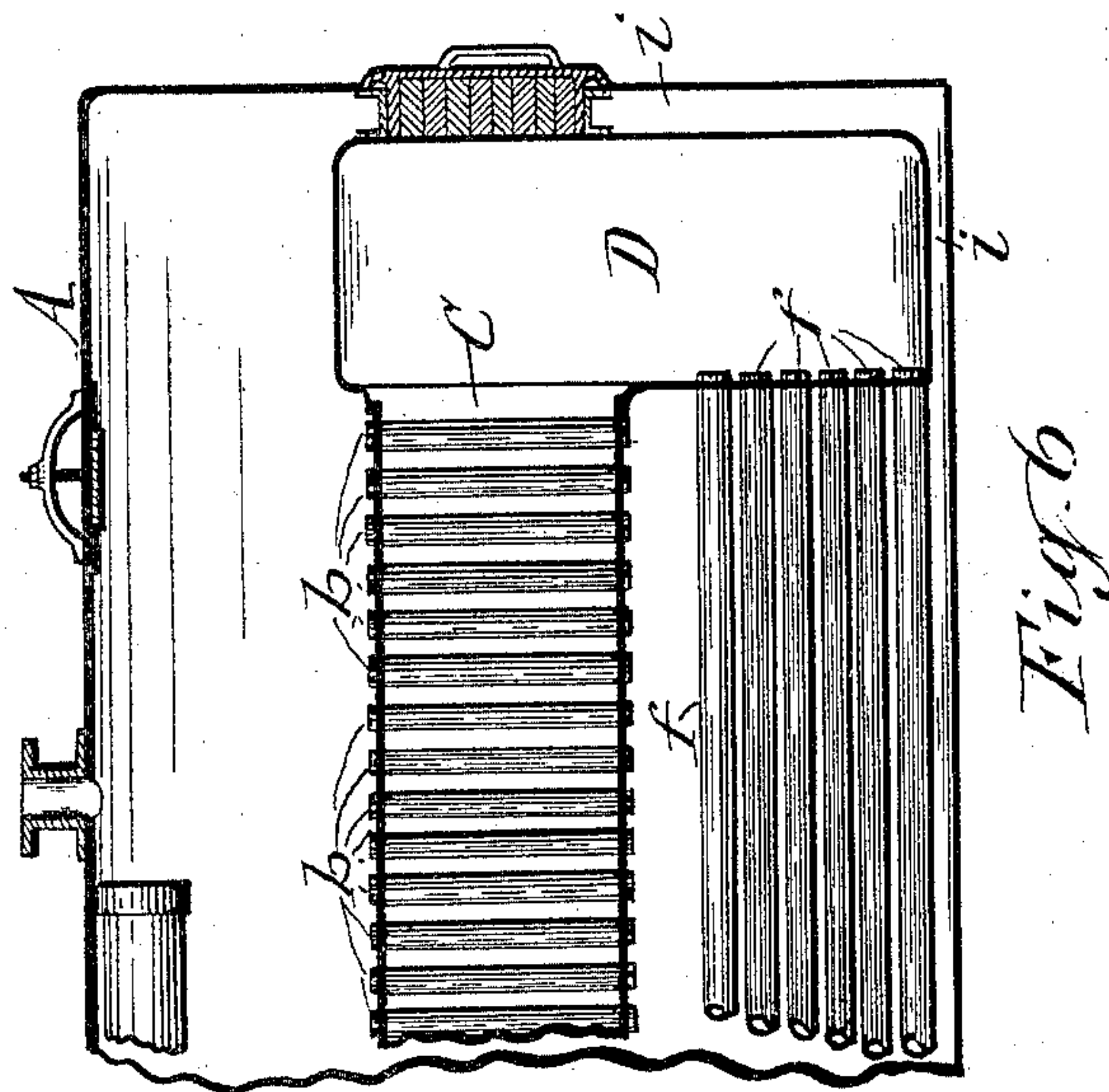
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WITNESSES :

H. B. Smith

J. J. Laess

INVENTOR

Robert Joy

By <sup>W. H.</sup> E. Laass

ATTORNEY



# UNITED STATES PATENT OFFICE.

ROBERT JOY, OF OSWEGO, NEW YORK.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 610,681, dated September 13, 1898.

Application filed December 20, 1897. Serial No. 662,621. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT JOY, of Oswego, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Steam-Boilers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to the class of steam-boilers which are disposed horizontally and have the fire-box located inside of the boiler and water-tubes extending across the interior of the direct fire-flue.

The object of the invention is to provide the boiler with greater and more effective heating-surfaces so arranged as to guard against undue choking of the circulation of the products of combustion and to otherwise enhance the efficiency of the boiler; and to that end the invention consists in the improved construction and combination of the component parts of the boiler, as hereinafter described, and summed up in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of a boiler embodying my invention. Figs. 2 and 3 are transverse sections respectively on lines X X and Y Y in Fig. 1. Fig. 4 is a horizontal longitudinal section on line Z Z in Fig. 1, showing the construction and connections of the fire-boxes and direct flue. Fig. 5 is a transverse section showing modifications of the construction of the direct flue, and Fig. 6 is a vertical longitudinal section of the front end portion of a boiler embodying further modifications of my invention.

Similar letters of reference indicate corresponding parts.

A denotes the main shell of the boiler, which is preferably cylindrical shaped and disposed horizontally. Inside of the rear end portion of said shell are arranged two fire-boxes B B, which I also prefer to form cylindrical, but are not arbitrarily so shaped. Said fire-boxes are disposed parallel, side by side, and extend from the rear end of the main shell A part way the length thereof, as shown in Fig. 1 of the drawings. The front end of the boiler is provided or formed with a combustion-chamber D, which may be formed with either dry walls, as represented in Fig. 1, or with water-walls *i*, as shown in Fig. 6 of the drawings.

From the inner ends of the fire-boxes to the aforesaid combustion-chamber extends the direct fire-flue C, which is elongated in a lateral direction and preferably formed of horizontal top and bottom plates and convex sides, as shown at C', which latter may be braced either by stay-bolts *a a*, connecting said sides to the main shell, or by steel or iron bows *a'*, secured to the exterior of the sides, as illustrated in Fig. 5 of the drawings.

The flat horizontal top and bottom plates of the flue C are of sufficient widths to form between them a rectangular space extending completely across the ends of the two fire-boxes B B and cause the convex sides of said flue to extend past the outer sides of the fire-boxes, as shown in Figs. 2 and 3 of the drawings.

Across the interior of the aforesaid rectangular space of the flue C extend vertical water-tubes *b b*, which have their ends secured in holes in the horizontal top and bottom plates of the said flue. The spaces inside of the convex sides of the flue are left without water-tubes to form thereat free passages C<sup>2</sup> for the products of combustion, while their passage through the central and main portion of the flue is to some degree obstructed by the vertical water-tubes *b b*, which tubes present a large amount of heating-surfaces exposed directly to the impingement of the products of combustion. The circulation of the products of combustion between the water-tubes is facilitated by the aforesaid free passages C<sup>2</sup> along the sides of the flue, affording relief to the retardation of said circulation by the interposition of the water-tubes.

The bottom plate of the flue C is in a higher plane than the bottoms of the fire-boxes B B, and the fire-grates *c c* extend from the front ends of the fire-boxes part way the lengths thereof and are supported at their inner ends on iron bridges *d*, forming back of them ash-pits *e*, separated from the inner ends of the fire-boxes. Upon each of said bridges is erected another bridge *d'*, preferably of fire-brick and rising sufficiently above the level of the grate to prevent the fuel from falling into the rear end portion of the fire-box. Said portion, being lower than the bottom of the flue C, forms a trap *t* between the bridge-wall and flue for



collection of cinders that may pass over the bridge-wall. Said trap thus serves to obviate accumulation of cinders in the flue.

*f f* represent return-flues, which are arranged beneath the fire-boxes and direct flue C and extend from the combustion-chamber D to a suitable smoke-box *h* on the rear end of the boiler. The products of combustion, passing through said return-flues and heating the same, cause the water in the lower portion of the boiler to be more effectually heated, and thus steam is more quickly generated.

What I claim as my invention is—

15 1. A steam-boiler comprising a horizontal main shell, a fire-box in the rear end portion of said shell, a combustion-chamber in the opposite end of said shell, a direct fire-flue extending directly from the fire-box to the  
20 combustion-chamber, water-tubes extending across the interior of said fire-flue, and return fire-flues disposed beneath the aforesaid direct flue and extending from the combustion-chamber to a smoke-box on the rear end of  
25 the boiler as set forth.

2. A steam-boiler consisting of a horizontal main shell, a plurality of separate and distinct fire-boxes in the rear end portion of said shell, a combustion-chamber on the opposite  
30 end of said shell, a laterally-elongated direct fire-flue extending directly from the said fire-boxes to the said combustion-chamber, vertical water-tubes extending across the interior of said fire-flue, and return-flues disposed  
35 beneath the direct fire-flue and extending from the combustion-chamber to the smoke-box on the rear end of the boiler as set forth and shown.

3. A steam-boiler consisting of a horizontal  
40 main shell, two fire-boxes disposed side by side inside of said shell and extending from the rear end of the boiler part way the length thereof, a combustion-chamber on the front end of the main shell, a laterally-elongated  
45 direct fire-flue extending from the inner ends of the fire-boxes to the combustion-chamber, vertical water-tubes extending across the interior of the direct flue, and return-flues disposed beneath the direct flue and extending  
50 from the combustion-chamber to a smoke-box on the front of the boiler as set forth.

4. The combination with the horizontal main shell, of cylindrical fire-boxes disposed side by side inside of the main shell and ex-

tending from the rear end of said shell part  
55 way the length thereof, a combustion-chamber on the rear end of the main shell, a laterally-elongated direct flue extending from the inner ends of the fire-boxes to the combustion-chamber and having its bottom in a higher  
60 plane than the bottoms of the fire-boxes, water-tubes extending across the interior of the direct flue, and return-flues beneath said direct flue and extending from the combustion-chamber to a smoke-box on the rear end of  
65 the boiler as set forth.

5. The combination with the horizontal main shell, of two cylindrical fire-boxes disposed side by side inside of the main shell and extending from the rear end of said shell  
70 part way the length thereof, the fire-grates extending from the outer ends of said fire-boxes part way toward the inner ends thereof, a bridge-wall at the ends of said grates, a combustion-chamber on the front end of the main  
75 shell, a laterally-elongated direct fire-flue extending from the inner ends of the fire-boxes to the combustion-chamber and having its bottom in a higher plane than the bottoms of the fire-boxes and joined thereat with vertical  
80 offsets forming cinder-traps between said offsets and the bridge-walls, water-tubes extending across the interior of said direct flue, and return-flues beneath the direct flue and  
85 extending from the combustion-chamber to a smoke-box on the rear end of the boiler as set forth.

6. The combination with the horizontal main shell, of fire-boxes disposed side by side inside of said shell and extending from the  
90 rear end thereof part way the length of said shell, a combustion-chamber on the opposite end of the main shell, a laterally-elongated direct flue extending from the inner ends of the fire-boxes to the combustion-chamber and  
95 formed with horizontal top and bottom plates and convex sides extending past the outer sides of the fire-boxes, and vertical water-tubes extending across the interior of the said direct flue between the horizontal top and  
100 bottom thereof and leaving free fire-passages along the convexed sides of the flue substantially as described and shown.

ROBERT JOY.

Witnesses:

B. W. BURLEIGH,  
C. A. BENTLEY.