

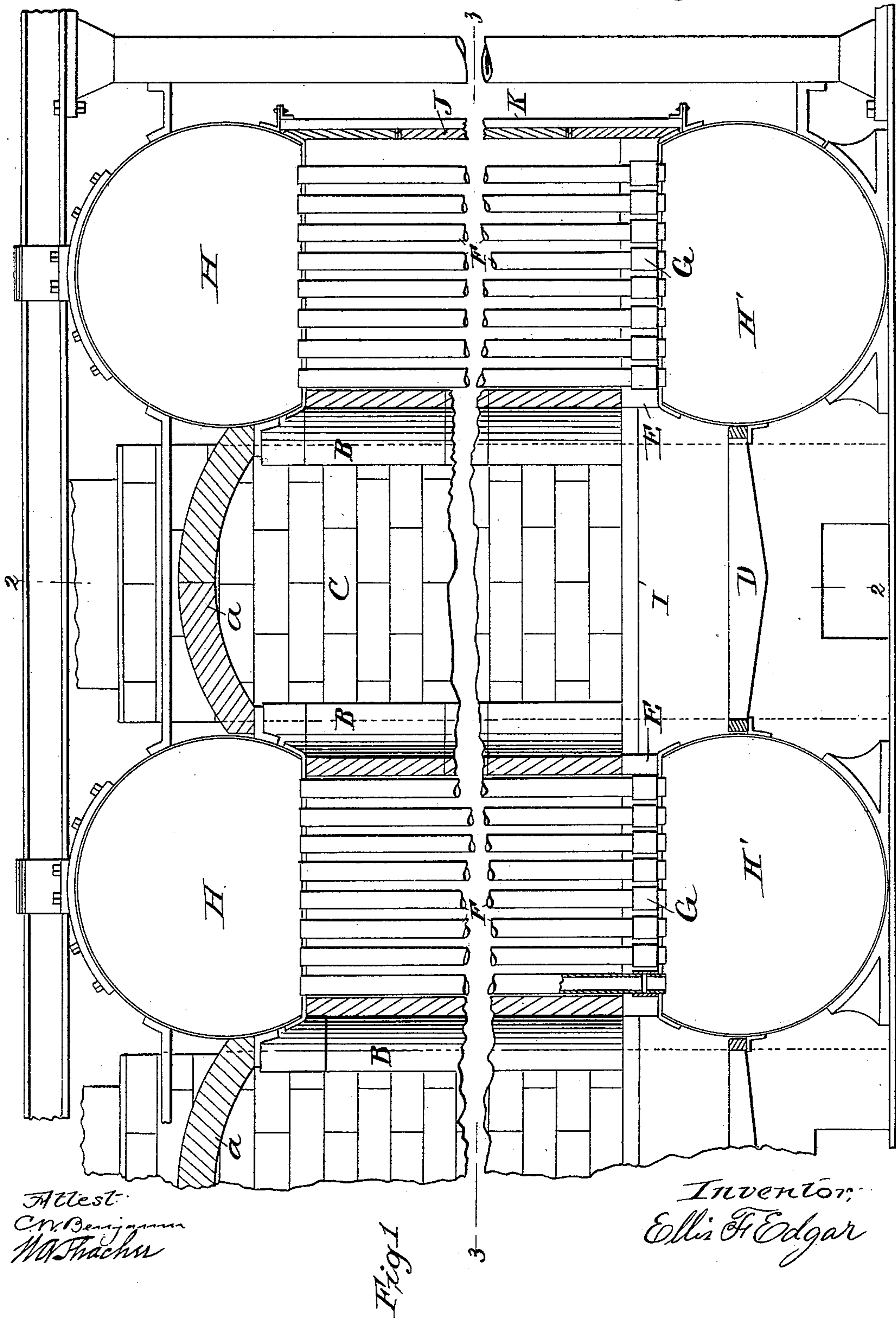
(No Model.)

3 Sheets—Sheet 1.

E. F. EDGAR.
WATER TUBE BOILER.

No. 602,501.

Patented Apr. 19, 1898.



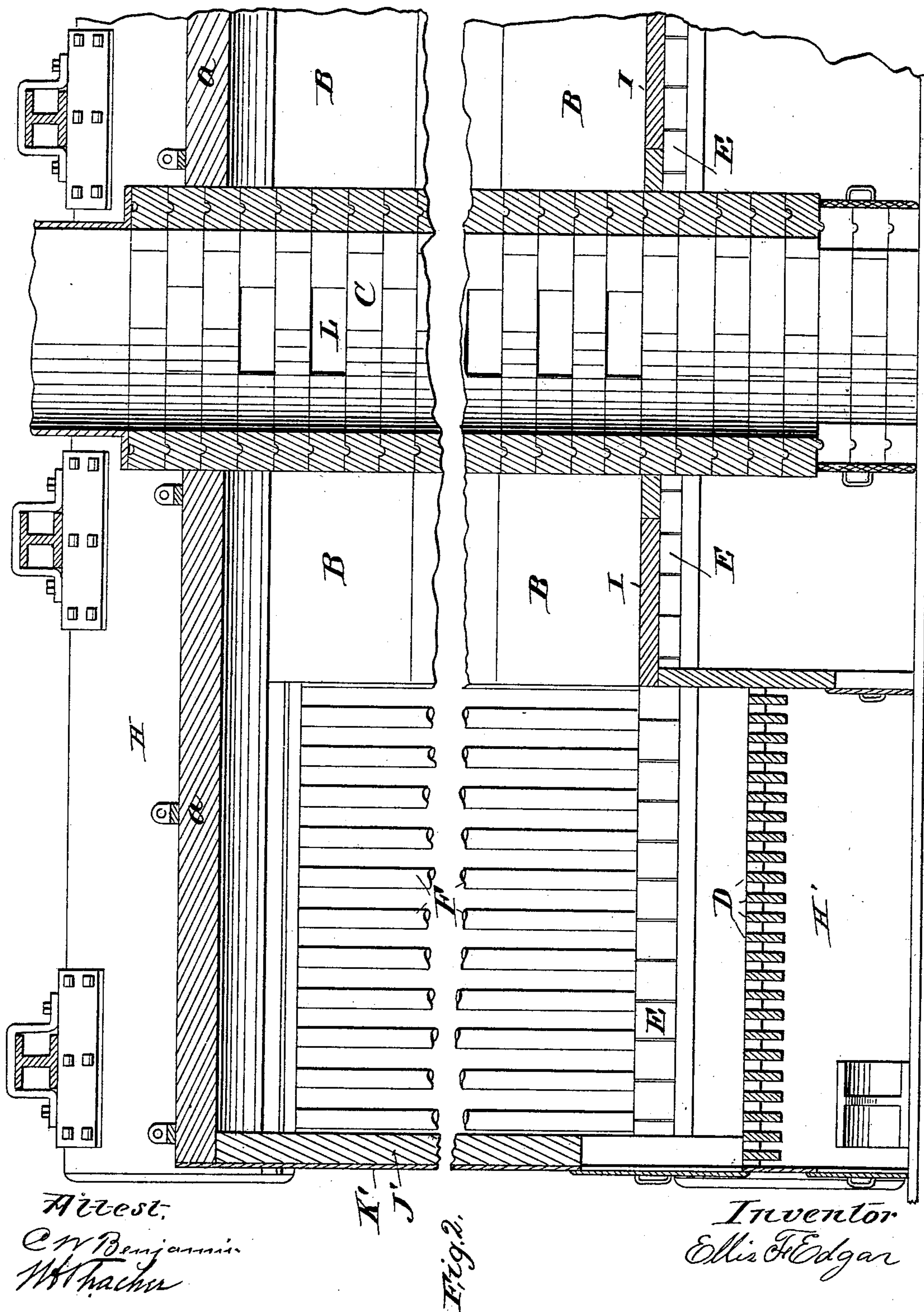
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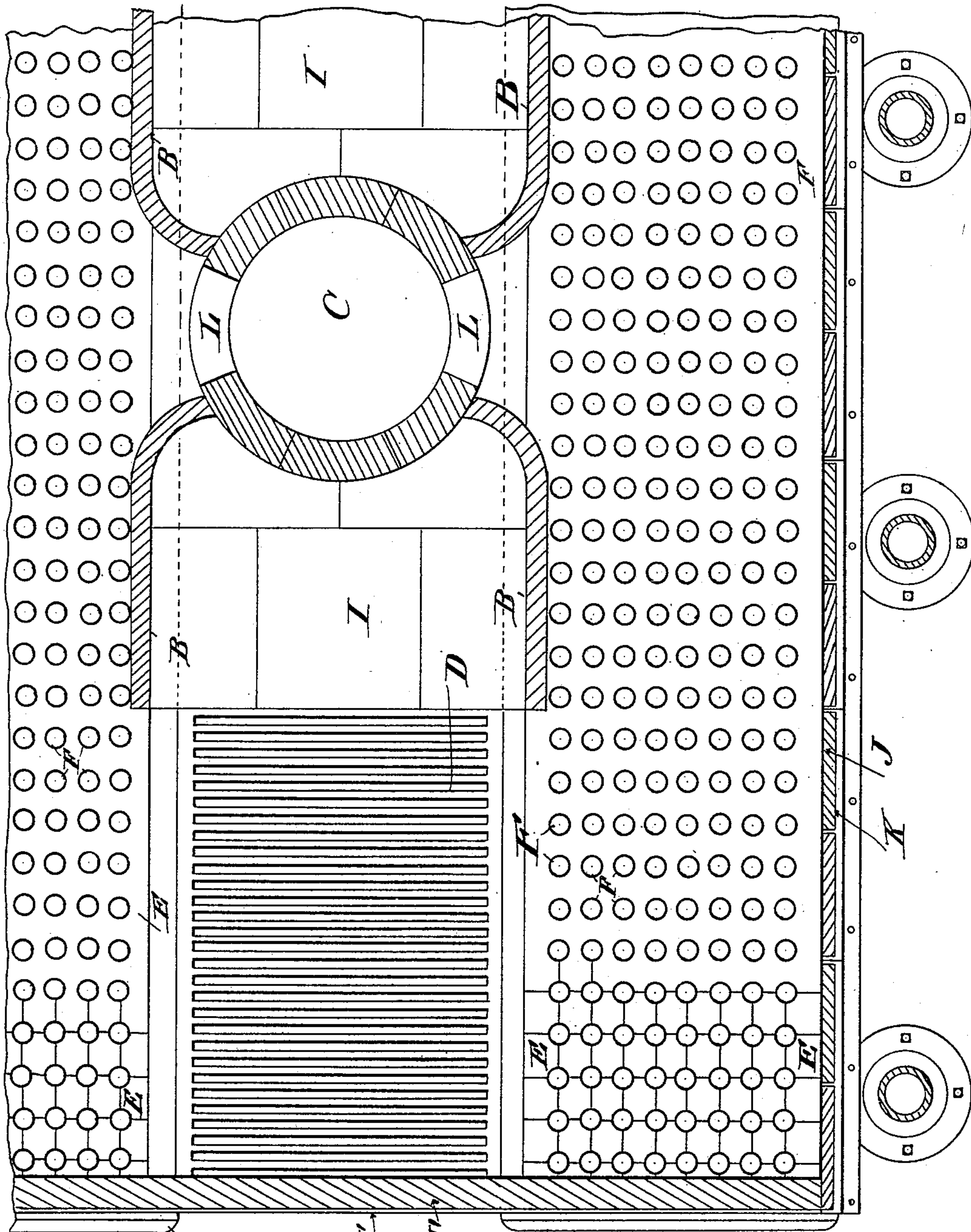
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3 Sheets—Sheet 3.

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Attest
C. V. Benjamin
Witness

Fig. 3.

Inventor:
Ellis F. Edgar

UNITED STATES PATENT OFFICE.

ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 602,501, dated April 19, 1898.

Application filed March 29, 1897. Serial No. 629,641. (No model.)

To all whom it may concern:

Be it known that I, ELLIS F. EDGAR, a citizen of the United States of America, and a resident of Woodbridge, county of Middlesex, State of New Jersey, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same, in which—
10 Figure 1 is a vertical front cross-section of one furnace, with one outside casing on the right hand of drawing and part of another furnace on the left hand. Fig. 2 is a vertical side section showing front outside casing on the left of drawing and a vertical side section of draft-flue C and draft-exits L into said flue C. Fig. 3 is a cross-section of a part of Fig. 1 at line 3 3, showing outside casing on the right-hand side of the drawing, lettered
15 J and K, and front casing J' and K', grate D, combustion-chamber between grate D and draft-flue C, and walls B B, and showing the passage of gas from grate and combustion-chamber, through water-tubes, to draft-exits
20 L, to flue C.

In inventing this boiler I had in view several objects:

First, to produce a high furnace temperature, which is produced by placing fire-clay arch A over the grate, so that as the heat rises it radiates back to the fire-bed, producing a high temperature, by which means I am enabled to burn more coal per square foot of grate with the same draft than as though I
30 had any of the water-heating surface over the fire, the heat being radiated back on the heating-surface of the water-tubes on either side of the grate, and the combustion-chamber in the manner it is constructed will greatly
35 aid in producing this high furnace temperature, which is a well-known factor to produce a high efficiency both in evaporation and economy. It is a well-known theory the greater the furnace temperature the greater the possible efficiency, provided the heating-surface
40 is so constructed as to absorb the heat before passing to the draft-exit. You will see by my construction that what heat is not absorbed on either side of the grate is forced to
45 pass around fire-clay walls B B between the water-tubes to the draft-exits L, which gives

this boiler an opportunity of absorbing all the heat that is practical to be absorbed.

Second, a simple and durable construction with straight tubes that can be easily cleaned 55 and the tubes can be taken in and out through the furnace, the tubes being put in as shown in Fig. 1, where one of the tubes is shown broken away. The short nipple is screwed into the lower drum, then the tube run up 60 into the upper drum, then the coupling screwed down on the nipple, and then the tube brought down from above and screwed in the coupling to within about half an inch of the nipple, so that the water can come in 65 contact with said coupling. The tube is expanded in the upper drum. The said couplings are protected from the fire by small fire-bricks E, as shown in Figs. 1, 2, and 3.

Another important feature is by the construction there can be a series of furnaces 70 and drums connected by water-tubes between said furnaces—for illustration, a construction which I prefer, of three furnaces and four sections of drums and water-tubes connecting, that giving two sections with fire on 75 either side. The two outer sections are inclosed on the outside by a casing, as shown in the right hand of Fig. 1, which will admit of some loss by radiation, where, in case 80 if I constructed with only one grate and one section on either side, I would have more chance for loss by radiation through the outside casing unless I made my drums connected by the water-tubes so wide that the construction 85 would not be practical, as it would increase the weight to too great an extent per horse-power. This boiler can be made in large sizes. I prefer so to make it double-end firing—that is, long drums, as shown in 90 Figs. 2 and 3, a part of the length, with the draft-flue in the center. Here I only show one grate and combustion-chamber and part of the combustion-chamber on the other side of draft-flue C. I do not show a full length, 95 as it would not admit of it on the sheets without making the proportions so small that they could not be understood; but I think I have made the operation clear enough to be understood with the drawings as rendered. 100

Draft-flue C may be connected to a smoke-stack either from the top or bottom. Where

there is a series of furnaces and draft-flue C, they may be connected together and joined into one smoke-stack, or there may be a series of smoke-stacks.

5 Means are provided for taking the dust out at the bottom of draft-flue C, when it is so needed, through doors, as shown in the drawings in Fig. 2. This would be necessary when the smoke-exit is at the top of draft-flue C.
10 I prefer having more of draft-exits L on the lower end of flue C as a rule in construction, but do not confine myself to so construct; nor do I confine myself to the exact drawings as shown, as I may make some departures in
15 the construction of either the drums H or H', as they may in some cases be constructed entirely cylindrical and the tubes might be on an incline; but I prefer the construction shown.

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

1. The combination in a water-tube boiler of a furnace, water-and-steam drums H, located one on either side of said furnace and above
25 said furnace, said water-and-steam drums H, having means for supporting between said drums and above the line of tube-sheet of said drums wall A, the said furnace being located directly under said wall A, as shown,
30 and between water-tubes connecting said water-and-steam drums H, to water-drums H', all for the purpose set forth and substantially as shown and described.

2. The combination in a water-tube boiler
35 of a furnace, wall A, over said furnace, water-and-steam drums H, and water-drums H', connected by water-tubes, located on each side of said furnace, and walls B, B, located between the water-tubes and combustion-chamber and grate, whereby the gases are forced
40 to pass around walls B, B, at that end of walls B, B, next to the furnace-door, between the water-tubes as described and for the purpose set forth, all substantially as shown and de-
45 scribed.

3. The combination in a water-tube boiler of a furnace, wall A, over said furnace, water-and-steam drum H and water-drum H', connected by water-tubes, located on each side of said furnace, and walls B, B, draft-flue C,
50 draft-exits L into said draft-flue C, all substantially as shown and described.

4. The combination in a vertical water-tube boiler of a series of water-tubes, located on either side of a furnace, said water-tubes being connected into water-drum H' as shown
55 and described and protected by fire-clay bricks E, as shown and described, having outside casing K and J, and K' and J', as shown and described, walls B, B, as shown and de-
60 scribed, draft-flue C and draft-exits L and fire-clay wall A, located over said furnace, all substantially as shown and described.

5. The combination in a water-tube boiler of a series of furnaces, divided by a series of
65 water-tubes, with a deflecting-wall located above said furnace, and a draft-flue or a series of draft-flues located between the series of water-tubes and at that end of the furnace opposite the fire-door all substantially as
70 shown and described.

6. The combination in a water-tube boiler, of a series of furnaces, with a series of water-tubes located on either side of said furnaces, and a series of incombustible walls, located
75 above said furnaces, with a draft-flue located between the said furnaces and between the series of water-tubes, with draft-openings into said flue and combustion-chambers on each side of said flue between the furnaces and
80 said flue or flues, all substantially as shown and described.

Signed at New York, in the county of New York, and State of New York, this 26th day of March, A. D. 1897.

ELLIS F. EDGAR.

Witnesses:

B. S. WISE,

C. W. BENJAMIN.