

(No Model.)

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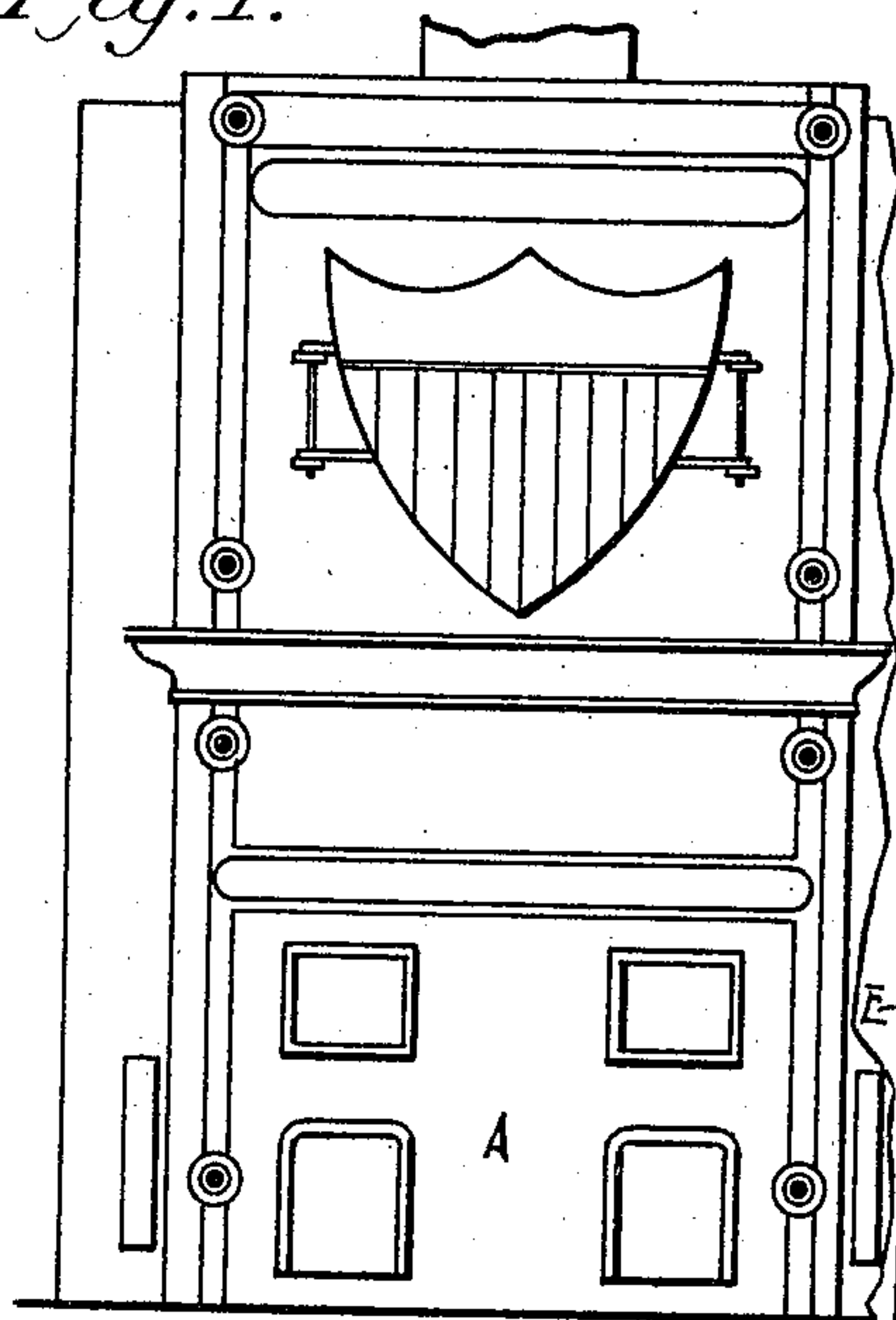
F. REYNOLDS.

SMOKE CONSUMING STEAM BOILER FURNACE.

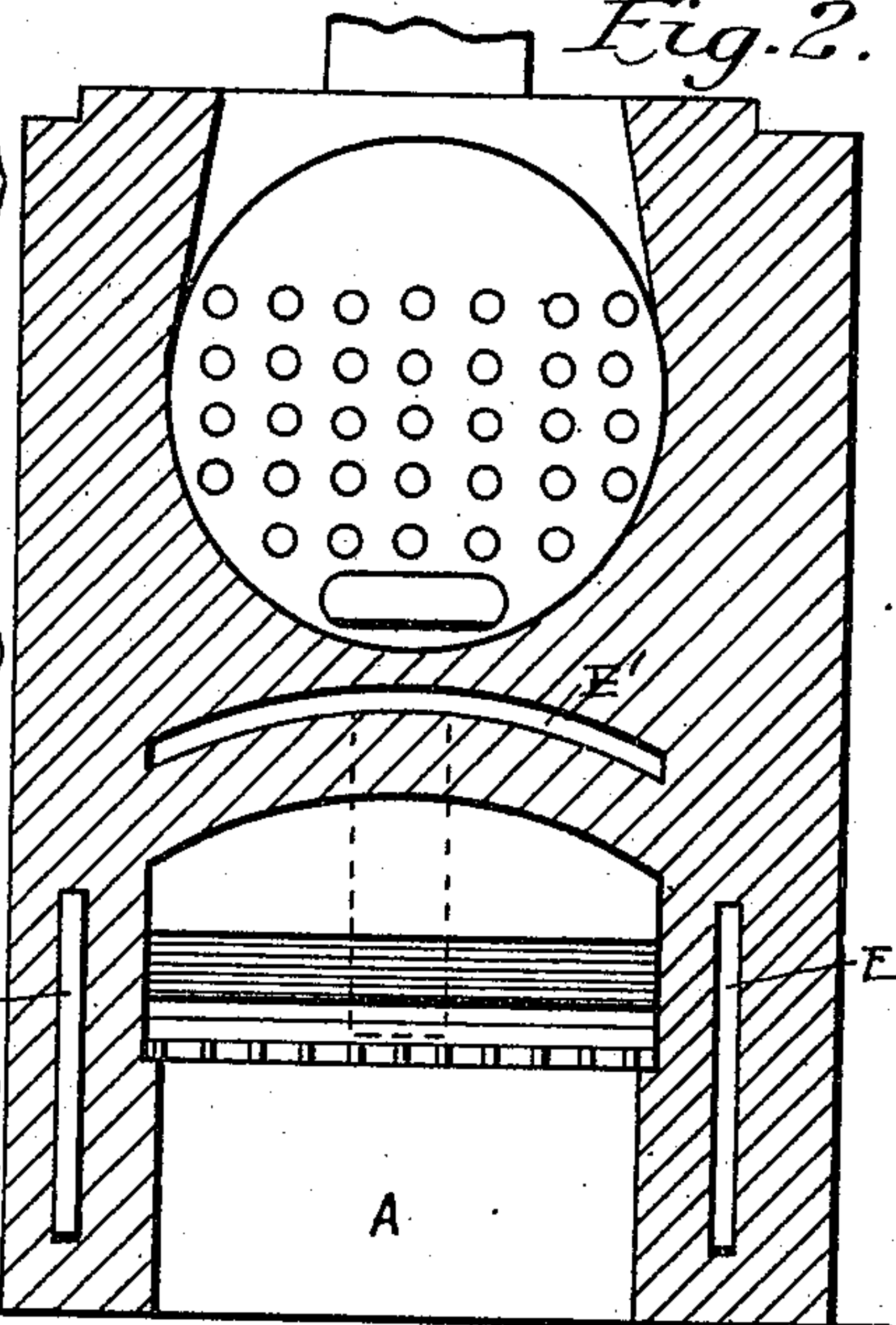
No. 486,167.

Patented Nov. 15, 1892.

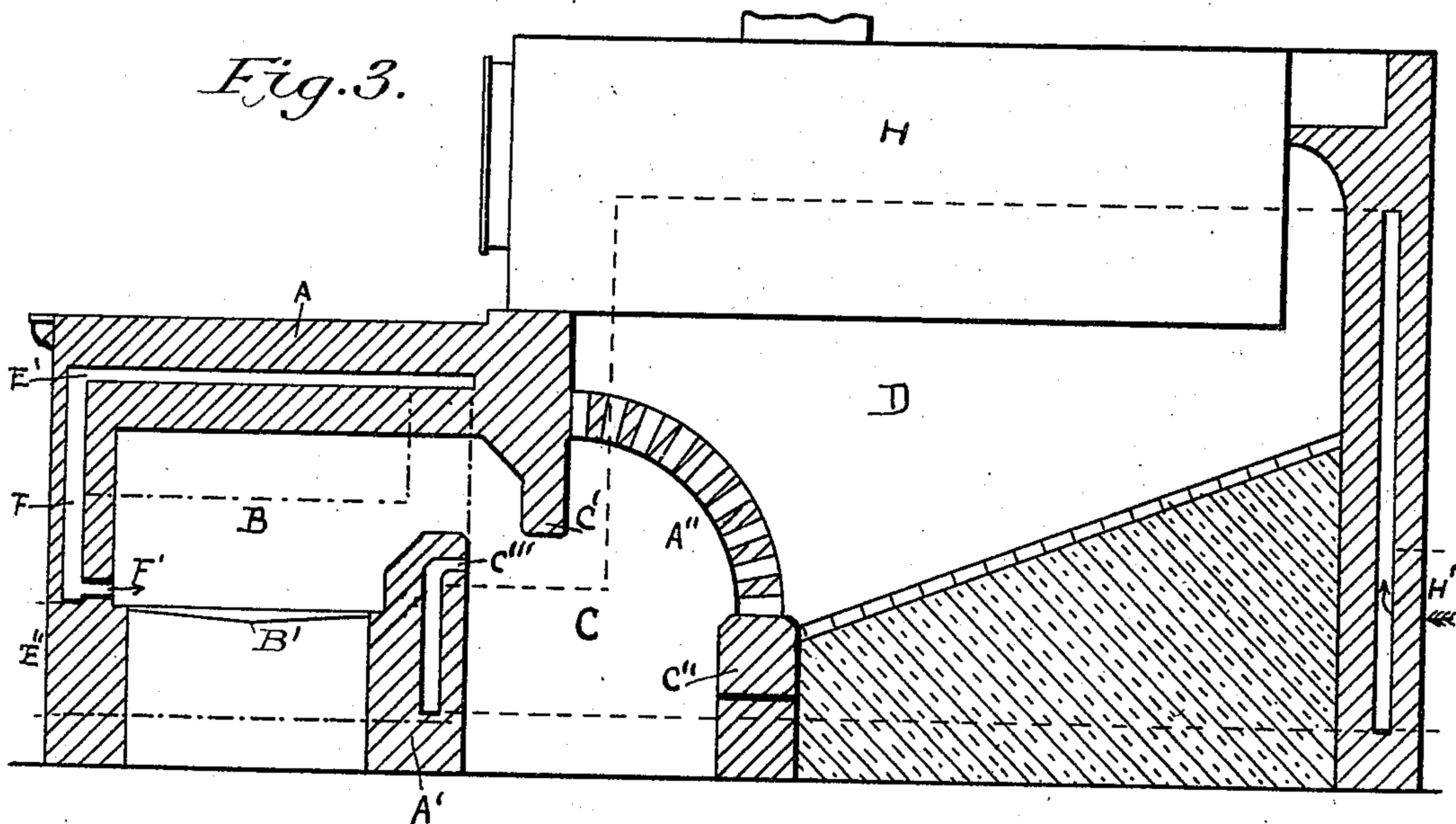
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



*Frank Reynolds*

Inventor

Witnesses

*H. Weber*

*W. Donahoe*

By his Attorney

*E. M. Sues*

(No Model.)

2 Sheets—Sheet 2.

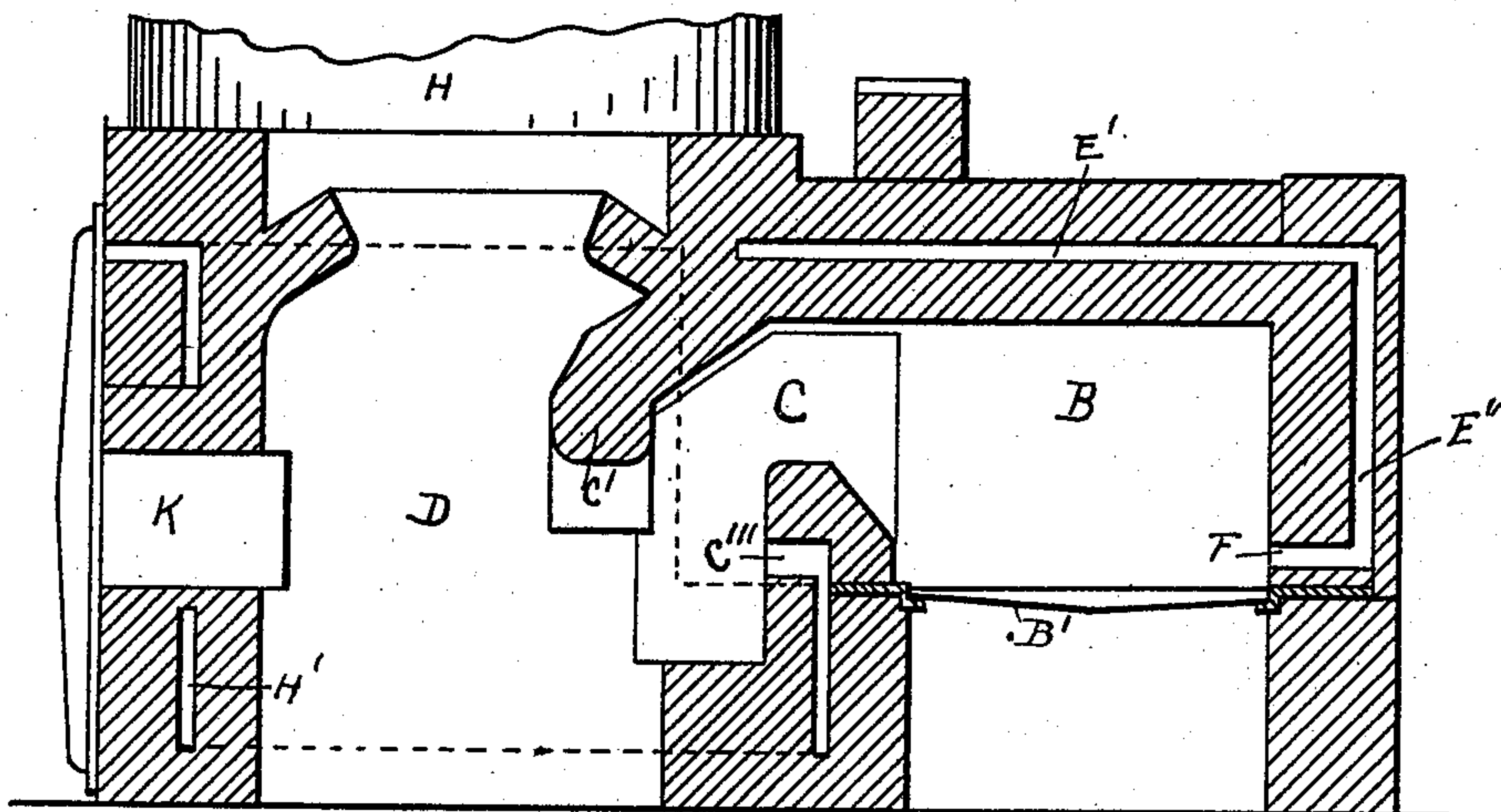
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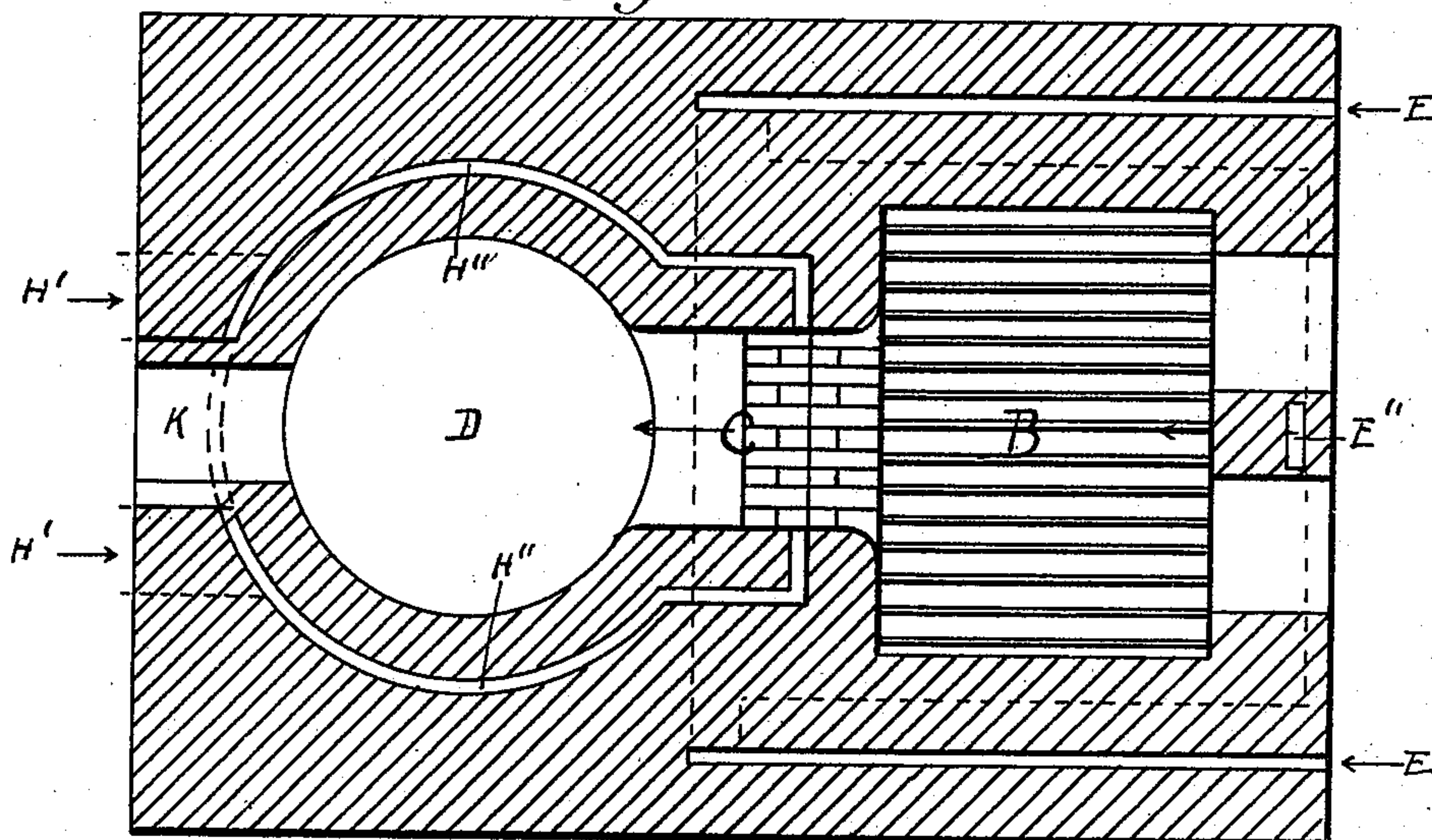
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*Fig. 4.*



*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

FRANK REYNOLDS, OF OMAHA, NEBRASKA, ASSIGNOR OF ONE-HALF TO  
ALONZO B. HUNT, OF SAME PLACE.

## SMOKE-CONSUMING STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 486,167, dated November 15, 1892.

Application filed August 29, 1891. Serial No. 404,151. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK REYNOLDS, of Omaha, in the county of Douglas and State of Nebraska, have invented certain useful  
5 Improvements in Smoke-Consuming Steam-Boiler Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the invention, such as will enable  
10 others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention has relation to new and novel smoke-consuming steam-boiler fur-  
15 naces.

The object of this invention is to provide a steam-boiler furnace wherein the smoke may be consumed before leaving the furnace, as will be described more fully hereinafter, and  
20 finally pointed out in the claims.

In the accompanying drawings, Figure 1 shows a front view of a horizontal steam-boiler furnace; Fig. 2, a transverse sectional view through the combustion-chamber. Fig.  
25 3 shows a longitudinal sectional elevation. Fig. 4 shows a sectional elevation of an upright furnace embodying my invention, and Fig. 5 a horizontal sectional view thereof.

Similar letters of reference refer to corre-  
30 sponding parts.

A represents a steam-boiler furnace of any suitable dimension, constructed of fire-brick or any other suitable material, comprising the combustion-chamber B, the intermediate  
35 chamber C, and the furnace D, as clearly shown in Figs. 3 and 4.

The combustion-chamber B is provided with the grate-bars B' and is in communication with the flue or intermediate chamber C.  
40 The walls of the chamber are built in two parts, so as to provide the air-pocket, as shown. This pocket comprises the independent vertical flues E E—one upon each side—and the top horizontal flue E', which communicates  
45 at the rear with the two side flues E E, descending in front by means of a narrow vertical flue F, leading into the combustion-chamber B, as shown by the outlet-opening marked F'. The rear wall A' within the  
50 chamber B terminates a suitable distance below the top of the chamber, so as to leave a con-

tracted opening communicating with the intermediate chamber C.

The intermediate chamber C forms properly a part of the main combustion-chamber D, 55 and is provided at a point near the wall A' with a transverse downwardly-extending deflecting-wall C', which ends approximately on a line with the wall A', as illustrated in Fig. 3. At the rear the intermediate chamber C 60 is provided with an arch A'', having a suitable number of openings, which starts from the wall C'' and curves forward toward and against the wall C'.

The furnace D is of suitable masonry, with- 65 in the upper portion of which rests the boiler H in communication at the rear with the furnace, as illustrated. The walls of the furnace are also provided with an interior air space or pocket running the full length of the wall 70 until a point at the forward end where the space is contracted, so as to lead into the transverse wall A' and ending at the opening C'', leading into the chamber C, as shown in dotted lines in Fig. 3. The furnace is built 75 so as decrease in capacity as it nears the rear wall, so that the heat is focused or crowded before leaving and entering the boiler, as will be understood by referring to Fig. 3. The openings within the arch A'' offer a means of 80 communication between the chamber C and the furnace D. At the rear I provide an opening H', covered by means of a suitable slide, so as to offer open-air communication with the chamber C. In Fig. 3 I have shown by means 85 of an arrow the entrance of the air and at C'' its exit. In front I provide a slide-covered opening E'', by means of which the air enters the space surrounding the combustion-chamber, making its escape at the point marked F'. 90

All the masonry is of the best fire-brick, and when the furnace has been constructed according to my description the operation of my device is as follows: The heat from the burning fuel within the combustion-chamber 95 passes first into the intermediate chamber C and then through the openings within the arch A'' into the furnace D, escaping through the boiler into the chimney. As the combustion-chamber becomes warmer, the air within 100 the wall-space becomes expanded and heated and escapes into the fire-box or combustion-



chamber, materially aiding the combustion. The air within the walls of the furnace escapes into the intermediate chamber C, intensifying the heat to such a degree that the smoke particles are practically consumed, the smoke passing off in vapors devoid of any floating particles, making the furnace a smoke-consuming device, and thus fulfilling the aim and object of this invention.

10 In Figs. 4 and 5 I have shown, respectively, a vertical sectional elevation and a transverse sectional view of my smoke-consuming furnace as arranged for a vertical boiler.

As in the arrangement of the horizontal device, I divide the furnace into the combustion-chamber B, the intermediate chamber C, and the furnace D, running to a focus at the upper end immediately below the boiler H.

20 In the arrangement of the furnace for the vertical boiler the curved wall is eliminated, the heat being directed against the depending wall C', and then entering directly into the furnace D. To facilitate cleaning the furnace, I provide the opening K, closed by means of a suitable door.

The operation is as in the preceding case, the air entering by means of the openings E, thence into the horizontal pocket E', down the vertical flue E'', and out at F, in the rear, entering at the opening marked H', circulating about the vertical way H'', and out at C'', leading into the furnace, as shown in Figs. 4 and 5.

35 The device is exceedingly simple of construction, efficient, and readily operated. The air within the wall spaces or pockets is converted by the great heat into inflammable gases, and as such enter both the combustion-chamber and furnace, and thus assist in intensifying the heat, thereby raising it to such a degree that the floating products of combustion are disintegrated, leaving the chimney in the form of smokeless vapors.

45 It will be noticed that by my arrangement of the instrumentalities the heat in leaving the combustion-chamber is crowded or focused into a smaller chamber, into which there is a continued flow of combustible vapors. From this chamber the heat is per-

mitted to enter into the furnace of greater capacity than the intermediate chamber, the outlet of this furnace being again contracted, so that the heat is again crowded in leaving, as illustrated in the several figures.

Having thus described my invention and the best method I know of operating the same, what I claim as new, and desire to secure by United States Letters Patent, is—

1. In a boiler-furnace, the arrangement of a fuel-chamber provided with independent vertical flues upon the sides and communicating at the rear with a horizontal top flue and in front with a vertical flue leading into said fuel-chamber, the rear wall of said chamber terminating a suitable distance below the top, a communicating intermediate chamber of smaller capacity than said fuel-chamber and provided at a point near said rear wall with a transverse downwardly-extending deflecting-wall and an arch having a number of openings leading into a furnace, and open-air flues surrounding said furnace and leading into said intermediate chamber, said furnace decreasing in capacity at the rear, so that the heat is focused or crowded before entering the boiler-flues, all substantially as and for the purpose set forth.

2. In a boiler-furnace, the combination of the fuel-chamber B, provided with the flues E, E', and F, leading into said chamber, the wall A', the chamber C, provided with the deflecting-wall C' and arch A'', walls C' and C'', and the furnace D, provided with an open-air pocket leading into the wall A' and escaping into the chamber C, all arranged so that the heat in leaving the fuel-chamber is focused into the smaller chamber C and from this into the furnace D of greater capacity, the outlet of this furnace being contracted, so that the heat is again focused in leaving, all substantially as and for the purpose set forth.

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

FRANK REYNOLDS.

Witnesses:

G. W. SUES,  
A. B. HUNT.