

(No Model.)

3 Sheets—Sheet 1.

O. D. ORVIS.  
STEAM BOILER FURNACE.

No. 538,273.

Patented Apr. 30, 1895.

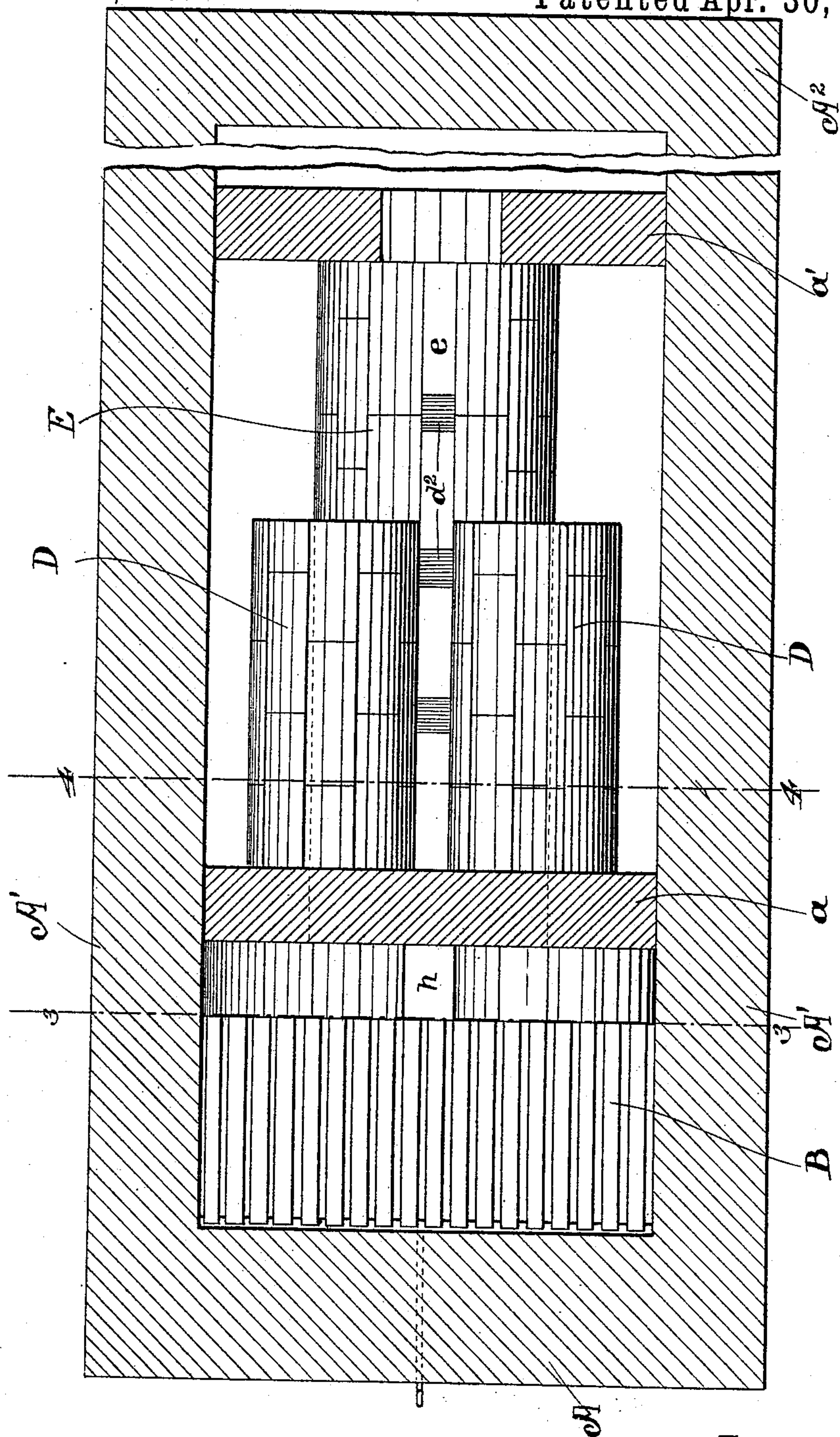


Fig. 1.

Witnesses.

R. F. W. Beardsley.  
Spencer Ward

Inventor.  
Orel D. Orvis  
By Louis K. Gibson  
Attorney.



(No Model.)

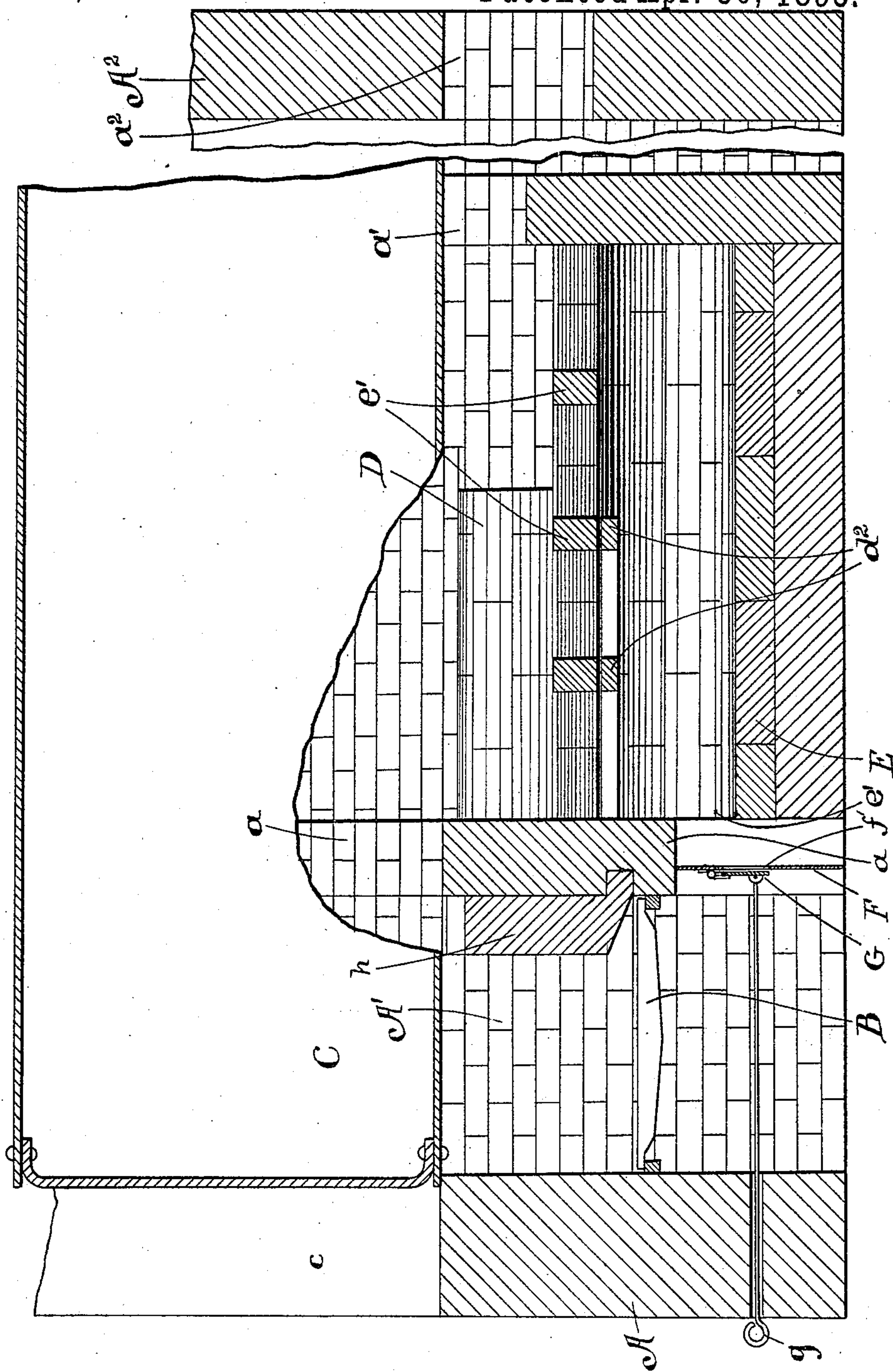
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Fig. 2.



Witnesses.

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(No Model.)

3 Sheets—Sheet 3.

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Fig. 4.

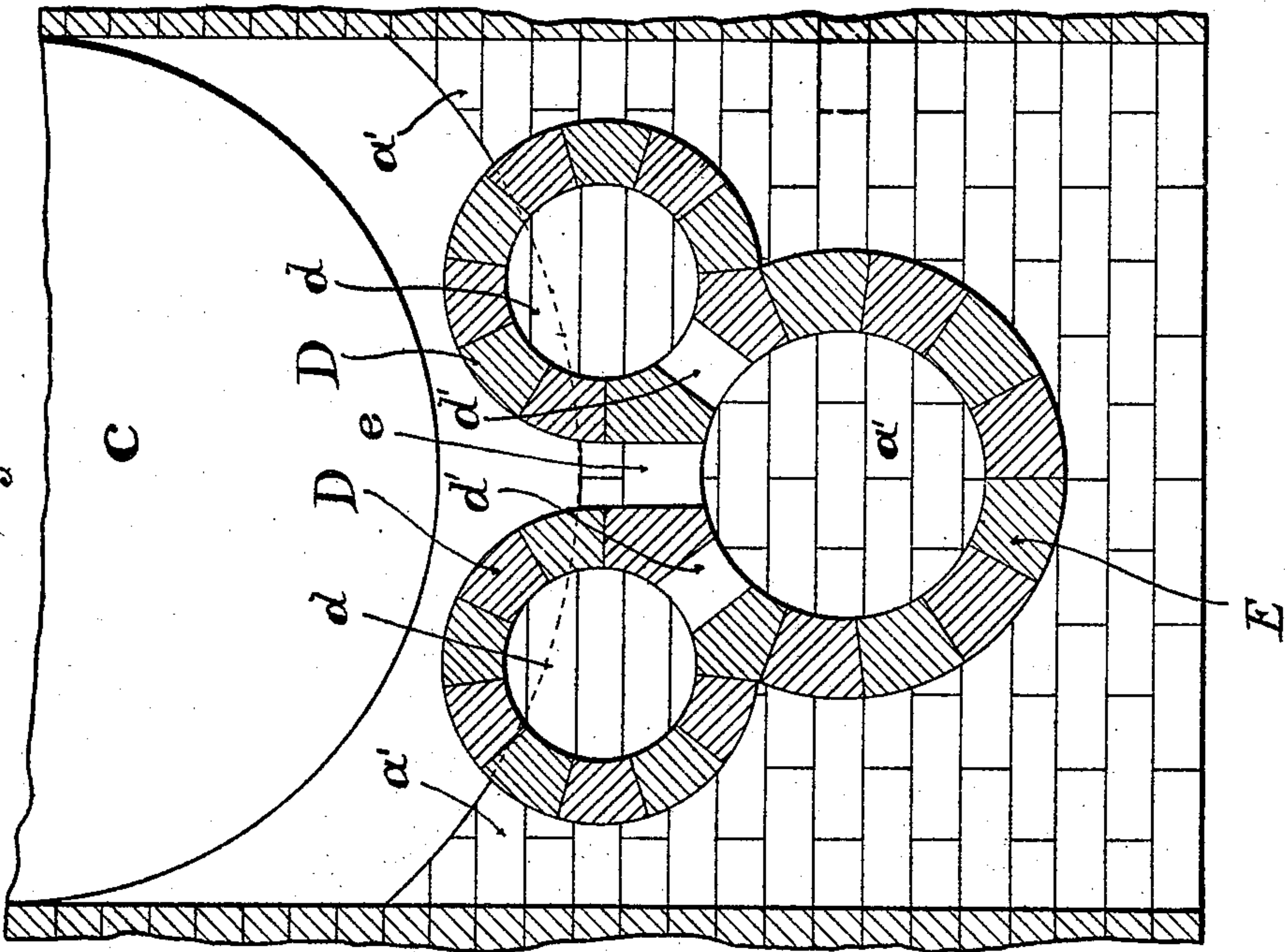
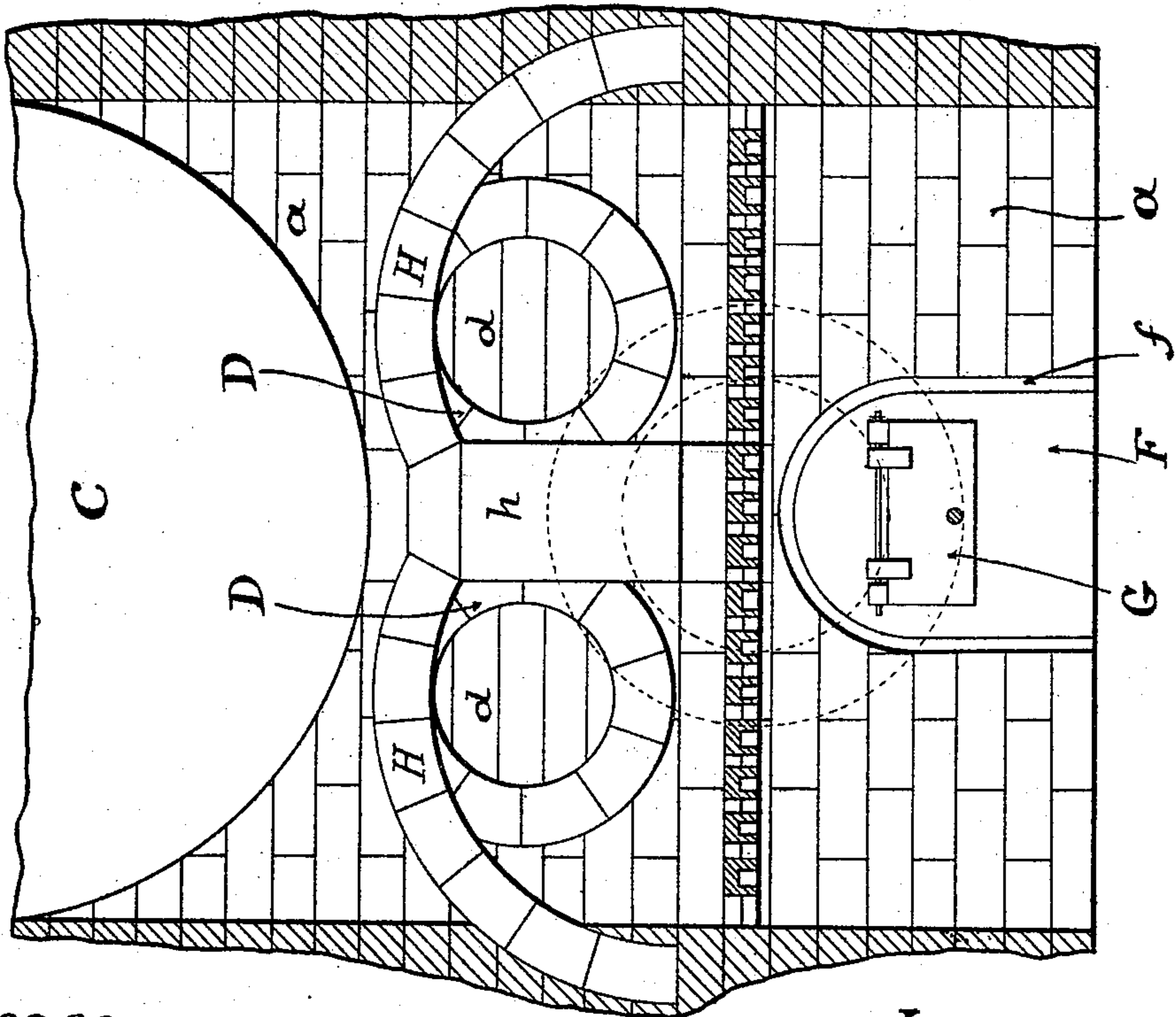


Fig. 3.



Witnesses.

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Orel D. Orvis  
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# UNITED STATES PATENT OFFICE.

OREL D. ORVIS, OF CHICAGO, ILLINOIS.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 538,273, dated April 30, 1895.

Application filed June 30, 1894. Serial No. 516,169. (No model.)

*To all whom it may concern:*

Be it known that I, OREL D. ORVIS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have  
5 invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to steam boiler furnaces; its object being to secure complete combustion of the carbon and other inflammable gases distilled from the coal.

The invention consists of retort flues leading from the fire box and opening laterally to  
20 a larger combustion flue, into which a supply of air is fed and from which the products of combustion escape through a long, narrow, lateral opening, combustion being then complete.

In the accompanying drawings, Figure 1 is a plan view of my furnace, taken immediately below the boiler. Fig. 2 is a central vertical longitudinal section. Fig. 3 is a transverse vertical section, looking back from the fire  
30 box taken upon the line 3—3 of Fig. 1. Fig. 4 is a similar view taken back of the fire box upon the line 4—4 of Fig. 1.

The furnace is built with the usual front, side and rear walls, marked in the drawings  
35 respectively A, A', A<sup>2</sup>. The grate is of ordinary form and is shown at B. The boiler is represented at C, and the smoke flue leading to the stack at c.

At the rear of the grates is located a transverse partition, a, extending to the boiler. Flues, D, D., preferably two in number, of ample capacity to carry off the products of the combustion in the fire box, lead back through the partition, a, a short distance and  
45 have their rear ends closed, as shown at d. Between and below the flues, D, D., is built another and larger flue, E, which extends from the partition, a, to a bridge wall, a', located farther back than the rear ends of the flues,  
50 D, D.

Lateral passages, d', d', lead from the flues, D, D., throughout their entire length back of

the partition, a, to the flue, E, and a lateral passage, e, leads from the flue, E, upwardly between the flues, D, D., into the chamber inclosed by the walls, A', A', the boiler and the partition, a. The rear end of the flue, E, is closed by the bridge wall, a'.

An opening, f, is formed in the partition, a, below the grates, B, and leading to the flue, E. This opening, f, in the partition, a, is closed by a removable plate, F, having an aperture, f', closed by a flap door, G, hinged above it. A thrust rod, g, is attached to the door, G, and extends through the front wall, A, and serves as means for controlling the door, G, for the admission of air to the flue, E, from the ash pit, in such quantities as may be desired.

The walls of the flues, D, D., and E are preferably of masonry and stay blocks, d<sup>2</sup> and e' are set in their lateral openings, d', e, to prevent them from closing together.

A hood, in the form of a forwardly projecting arch, H, covers the front end of each of the flues, D, D., the inner end of the arches, H, H, resting upon a bracket, h, anchored to the partition, a, and their outer ends being supported by the side walls, A', A', of the furnace. At a<sup>2</sup> is shown the usual opening  
75 in the rear wall, A<sup>2</sup>, of the furnace, for convenience of access to its rearward chambers.

The fire box is roofed by the boiler, C, so that the advantage of direct radiation upon the boiler from the burning fuel is secured. The arches, H, H, are also exposed to the direct radiation from the burning fuel and become heated to a high degree, so that the gases enter the flues, D, D., at a high temperature. These flues serve as retorts and being closed at their outer ends and discharging only to another retort, become very hot, thereby insuring the delivery of the gases to the combustion flue, E, at such a temperature that they are ready to unite with the air introduced into the flue, E, through the aperture, f', and the open end, e', of the flue, and perfect combustion is thereby secured.

The retort flues, D, D., being shorter than the combustion flue, E, and the passages, d, d, being so arranged that the gases from the two flues, D, D., are thrown together with great velocity in the forward end of the combustion flue, where the air is brought directly into



contact with them, complete combustion is assured by the perfect intermingling of the gases with the air.

In ordinary practice, the heat is concentrated upon the forward one-third of the boiler. By conveying the combustible gases into a longitudinal combustion flue having a long, narrow discharge passage opening toward the boiler, I am able to greatly increase the area of the boiler surface to which the heat is directly applied, thereby increasing the efficiency of the furnace for steam production, while escaping the bad effects upon the boiler incident to the concentration of the heat upon a small portion of its surface. The bridge wall being located immediately back of the combustion flue holds the hot vapors close to the boiler.

The opening, *f*, in the partition, *a*, is of sufficient size to enable a man to pass through it, for the purpose of cleaning the flue, *E*. It is not essential that the air be introduced through this opening, as it may be brought in through some other passage if desired. I prefer this construction as being simple and for the reason that it conveys the air through the hot ash pit, and thereby raises its temperature considerably before it enters the combustion flue.

I claim as my invention—

1. The combination with a fire box, of the retort flues, *D, D*, leading therefrom and having their rear ends closed, a combustion flue, *E*, passages *d', d'*, leading from the retort flues to the combustion flue, and a passage, *e*, leading from the combustion flue, substantially as described.

2. The combination with a fire box, of a retort flue leading from the fire box, and a hood above the front end of such flue and extending forwardly into the fire box, substantially as described.

3. The combination with a fire box, of retort flues leading from the fire box, a combustion flue, *E*, having a discharge passage, *e*, passages leading from the retort flues to the combustion flue, and means for delivering a supply of air to the combustion flue, substantially as described.

4. The combination in a steam boiler furnace, with the boiler, *C*, of a fire box, a partition, *a*, forming the rear wall of the fire box and extending to the boiler, retort flues leading from the fire box through the partition, *a*, and having their rearward ends closed, a combustion flue, *E*, having a longitudinal discharge opening, passages leading from the retort flues to the combustion flue, a bridge wall back of and closing the rearward end of the combustion flue, an ash pit below the grates, and a passage from the ash pit to the combustion flue, substantially as described.

5. The combination in a steam boiler furnace, with the boiler, *C*, of a fire box, a partition, *a*, forming the rear wall of the fire box and extending to the boiler, retort flues leading from the fire box through the partition, *a*, and having their rearward ends closed, arches extending forwardly from the partition, *a*, and inclosing the ends of the retort flues, a combustion flue, *E*, having a longitudinal discharge opening, passages leading from the retort flues to the combustion flue, a bridge wall back of and closing the rearward end of the combustion flue, an ash pit below the grates, and a passage from the ash pit to the combustion flue, substantially as described.

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

OREL D. ORVIS.

Witnesses:

LOUIS K. GILLSON,  
SPENCER WARD.