

(No Model.)

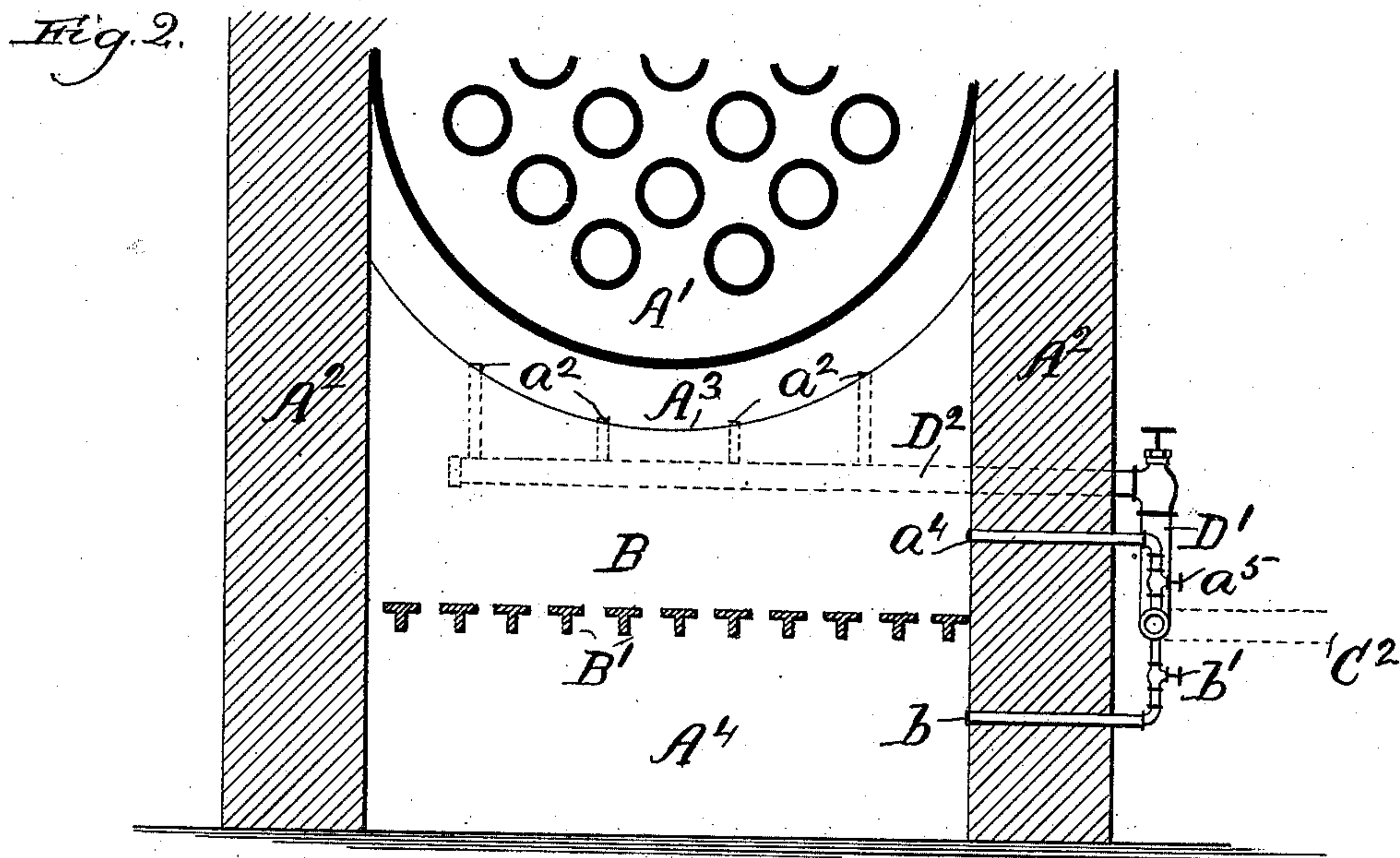
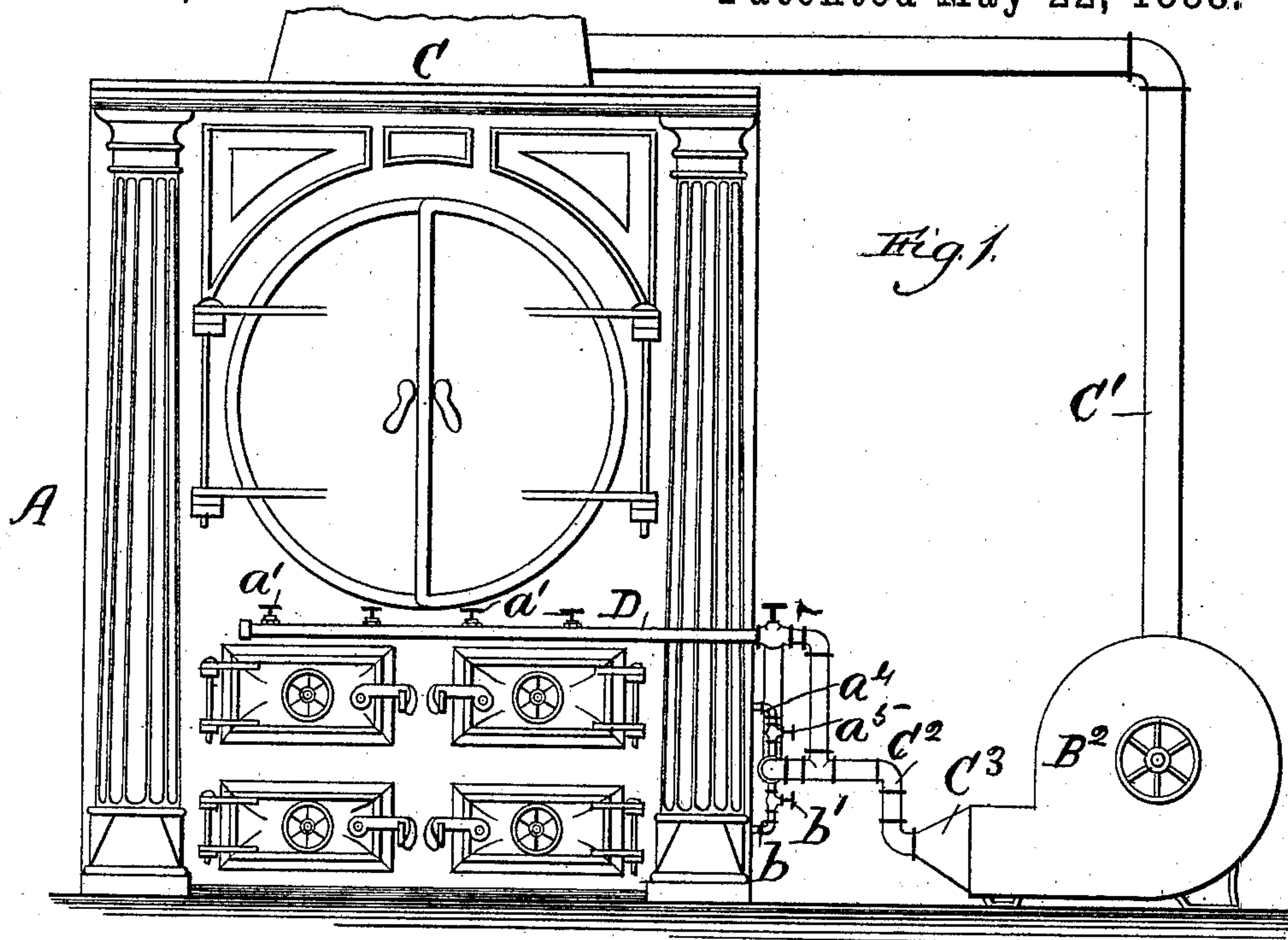
2 Sheets—Sheet 1.

J. D. LEE.

SMOKE CONSUMING FURNACE.

No. 383,310.

Patented May 22, 1888.



Witnesses:

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L. M. Freeman.

Inventor:

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2 Sheets—Sheet 2.

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Fig. 3.

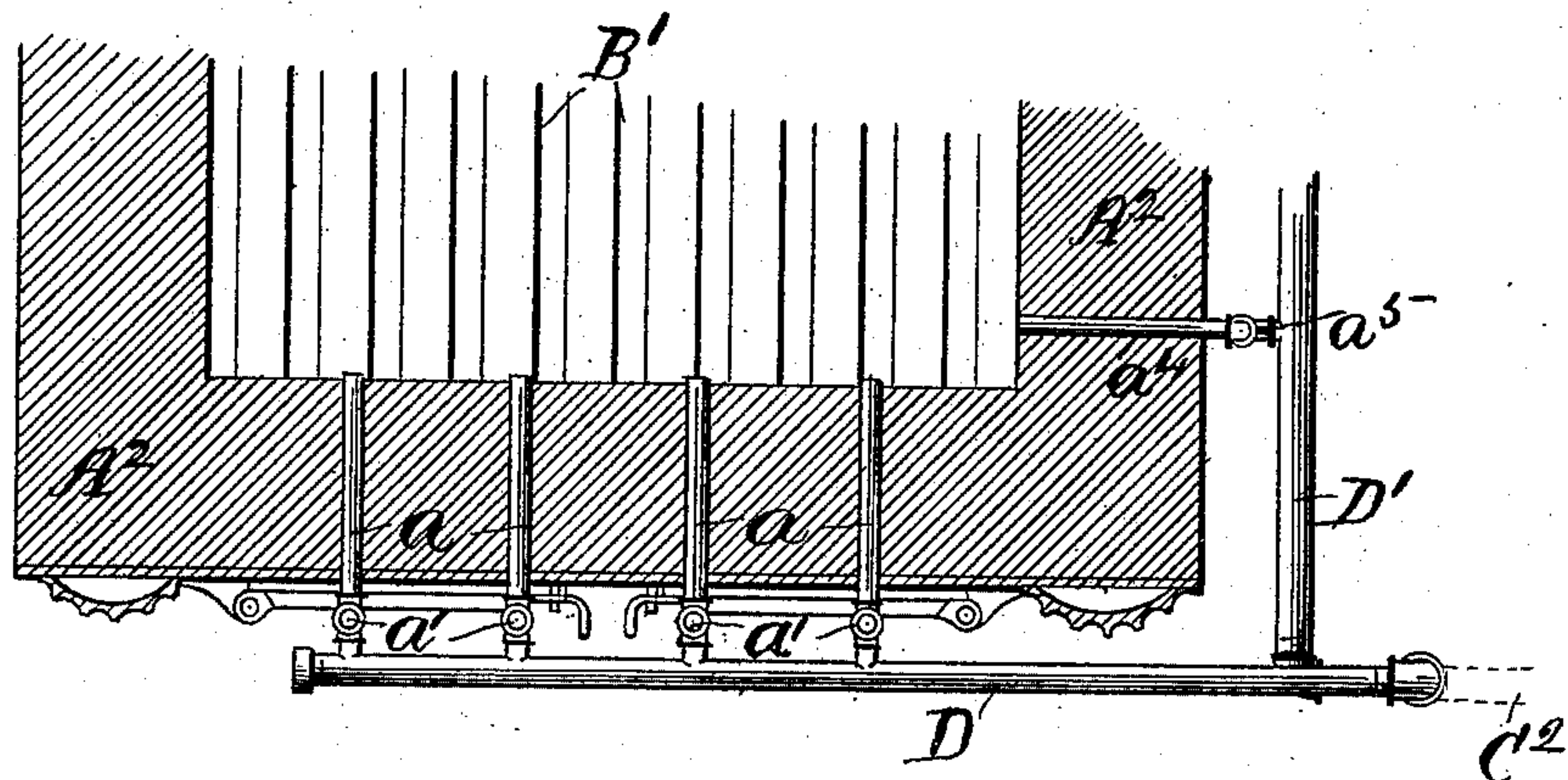
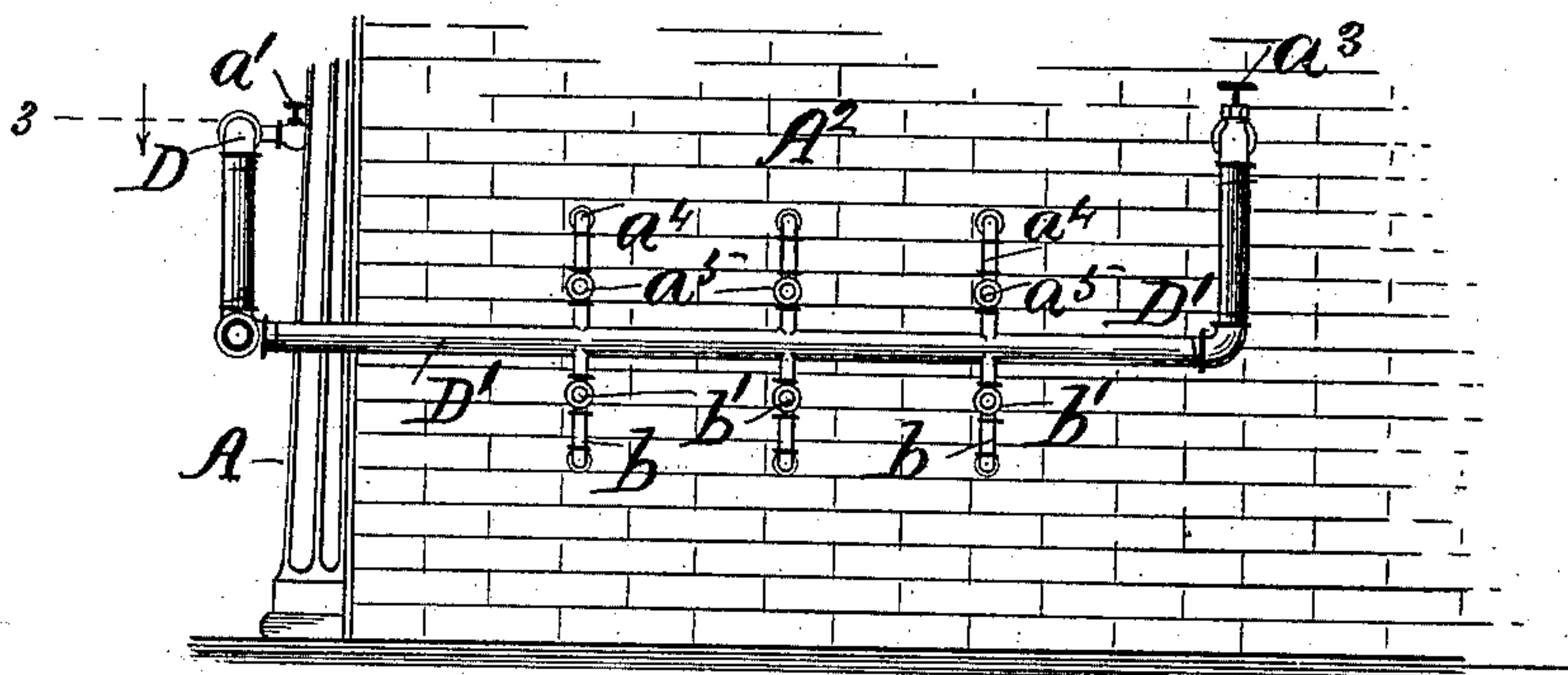


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES D. LEE, OF CHICAGO, ILLINOIS.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 383,310, dated May 22, 1888.

Application filed February 16, 1888. Serial No 264,212. (No model.)

To all whom it may concern:

Be it known that I, JAMES D. LEE, of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a full, clear, and exact description, that will enable others to understand and make use of the same, reference being had to the accompanying drawings, forming a part of this specification.

The object of this invention is to provide an arrangement for taking hot air from the smoke-stack after being heated by passing through the furnace, and returning the same to the combustion-chamber for the purpose of creating a more perfect union and combustion of all the inflammable gases contained in the fuel, thereby consuming and utilizing such combustible gases as would otherwise escape into the outer atmosphere in the form of smoke.

Figure 1 is an elevation of a boiler-front embodying my improved features; Fig. 2, a vertical transverse section through the combustion-chamber; Fig. 3, a broken-away horizontal section of the boiler-front, showing a portion of the combustion-chamber in the plane 3, Fig. 4; and Fig. 4, a partial side elevation of the masonry inclosing the combustion-chamber and boiler, showing the relative position and arrangement of the air-distributing pipes.

Referring to the drawings, A represents the boiler-front; A', the boiler; A², the inclosing-walls; A³, the line of the bridge-wall; A⁴, the ash-pit; B, the combustion-chamber, and B', the line of the grate-bars.

The general construction of the boiler-furnace is of the ordinary character, my improved device being adapted to be applied to and used in connection with any of the usual steam-generating apparatuses.

The fan B² is usually located at some convenient point adjacent to the boiler, (see Fig. 1,) and is connected with the smoke-stack C by the pipe C', through which heated air is drawn from the stack and forced into the furnace through the discharge-pipe C². The discharge end C³ of the fan is contracted and the discharge or delivery pipe C² is of a less diameter than that of the pipe C', whereby the heated air drawn from the stack is forced into the furnace under a pressure for the purpose

of increasing the draft and aiding in the process of combustion.

The horizontal pipe D, which is a branch of the main supply-pipe C², extends along the outside of the boiler-front and just above the furnace doors, as shown in Fig. 1.

Connected to the branch pipe D, and extending inward and at right angles therefrom, (see Fig. 3,) are a number of short pipes or tubes, a, which terminate flush with the front lining of the furnace and open into the front side of the combustion-chamber. Each of these tubes is provided with the independent stop-valves a', by which the volume of heated air admitted into the combustion-chamber may be conveniently regulated as circumstances may require. A second branch pipe, D', connecting with the main delivery-pipe C², extends along outside (see Fig. 4) of the wall inclosing the furnace. The branch pipe D' terminates at about the center of the bridge-wall, and has the pipe D², which is a continuation of the same, connected at right angles thereto. The pipe D² is embedded transversely in the bridge-wall, as indicated by the dotted lines in Fig. 2.

Inserted in the pipe D², and projecting upward therefrom, are a number of vertical tubes, a², opening flush with the upper side of the bridge-wall, so that an additional or fresh supply of air may be injected at this point in the form of jets and caused to commingle with the constituents of combustion passing over the bridge-wall, and thereby increasing the inflammability of the same. The air-supply entering the pipe D² is regulated by means of the valve a³. A number of small angular pipes, a⁴, are inserted in the upper side of the branch pipe D' and extend a little way upward from the same, and then turn inward at right angles and pass through the inclosing-wall (see Figs. 2 and 4) and open into the combustion-chamber above the line of the grate-surface. Each of these pipes is supplied with a stop-valve, a⁵, so that air may be admitted through one or more of the terminal discharge-pipes. The companion pipes b are inserted in the under side of the pipe D' and project downwardly and inwardly therefrom, passing through the wall and opening into the ash-pit, as shown in Fig. 2, so as to permit a portion of the heated air drawn from the smoke-stack to be intro-

duced underneath the grate-bars. The pipes *b* are provided with stop-valves *b'*, for the proper regulation of the air-currents.

The illustration and description are confined to but one side of the boiler and furnace; but it is obvious that the improvement may be applied to both sides with the same facility. By this arrangement the air that is heated to a high temperature and charged with inflammable gases is drawn from the stack and returned to be injected into the furnace at different points simultaneously, or the introduction so controlled and regulated by the different pipes and valves as to afford the best possible results under the various conditions attending the generation of steam and the consumption of smoke.

In order to create a perfect combustion, the volume of air supplied must not be much in excess nor greatly deficient. The means for introducing the air should also be arranged so that the volume admitted to the combustion-chamber may be varied and controlled to a nicety and introduced at different points simultaneously or independently, as circumstances may require. Sometimes the hot air will only need to be introduced above the grate-bars and through the bridge-wall; again, underneath the bars alone or all the different points illustrated at once.

By the means herein set forth and the careful attention of the attendant the process of combustion can be conveniently carried on in such a manner as to consume all or nearly all the smoke given out from the fuel.

The device is adapted to be used in connection with either hard or soft coal with but very little alteration or a radical departure from the spirit of this improvement.

The heated air should be taken from the stack as close to the boiler as circumstances will permit of, in order to obtain the highest temperature, and thereby greatly assist in the promotion of combustion and the utilization of the products that are wasted under the ordinary arrangement.

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

1. In a smoke-consuming appliance, the combination, with the stack or smoke-passage, of a fan, a pipe connecting said stack and fan, a delivery-pipe attached to the discharge side of said fan, the branch pipe *D'*, connected with the main delivery-pipe, a number of small angular pipes, *a'*, inserted in and extending upward and inward from the pipe *D*, terminating flush with the interior surface of the furnace-wall and opening into the combustion-chamber above the line of the grate-bars, the series of companion pipes *b*, inserted in and projecting downward and inward from the pipe *D'*, and passing through the furnace-wall and opening into the ash-pit, and the stop-valves inserted in said pipes, whereby heated air may be supplied above and underneath the grate-bars and at different points simultaneously or independently, as set forth.

2. In a smoke-consuming appliance, the combination, with the smoke-passage, of a fan located intermediate between said passage or stack and the boiler-furnace, a pipe connecting the stack and fan, a supply or delivery pipe connected to the discharge side of said fan, the horizontal pipe *D*, forming a branch and continuation of the delivery-pipe *C'*, and extending along the outside of the boiler-front, the series of short pipes *a*, extending inward from the pipe *D* and opening into the front side of the combustion-chamber, the branch pipe *D'*, running along the side wall, the pipe *D''*, connected with the pipe *D'* and embedded transversely in the bridge-wall, and the series of jet-tubes *a''*, extending upward from the pipe *D''* and opening on a level with the upper side of the bridge-wall, whereby the heated air and gases drawn from the smoke-stack may be conducted into the front side and back part of the combustion-chamber simultaneously or independently, substantially as and for the purpose set forth.

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