

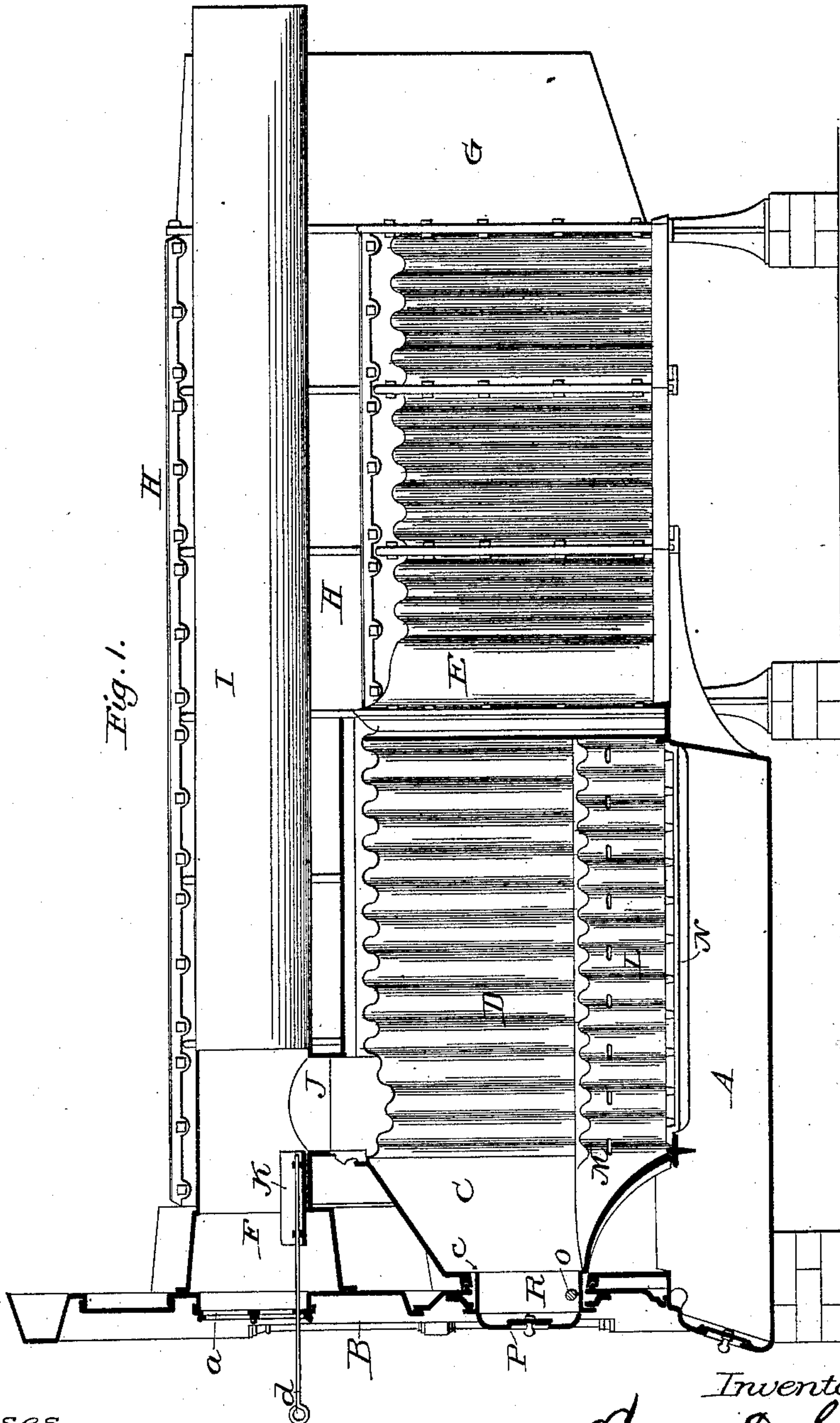
(No Model.)

4 Sheets—Sheet 1.

I. D. SMEAD.  
HOT AIR FURNACE.

No. 370,981.

Patented Oct. 4, 1887.



Witnesses.

James I. Duhamel  
Walter S. Dodge

Inventor;

Isaac D. Smead  
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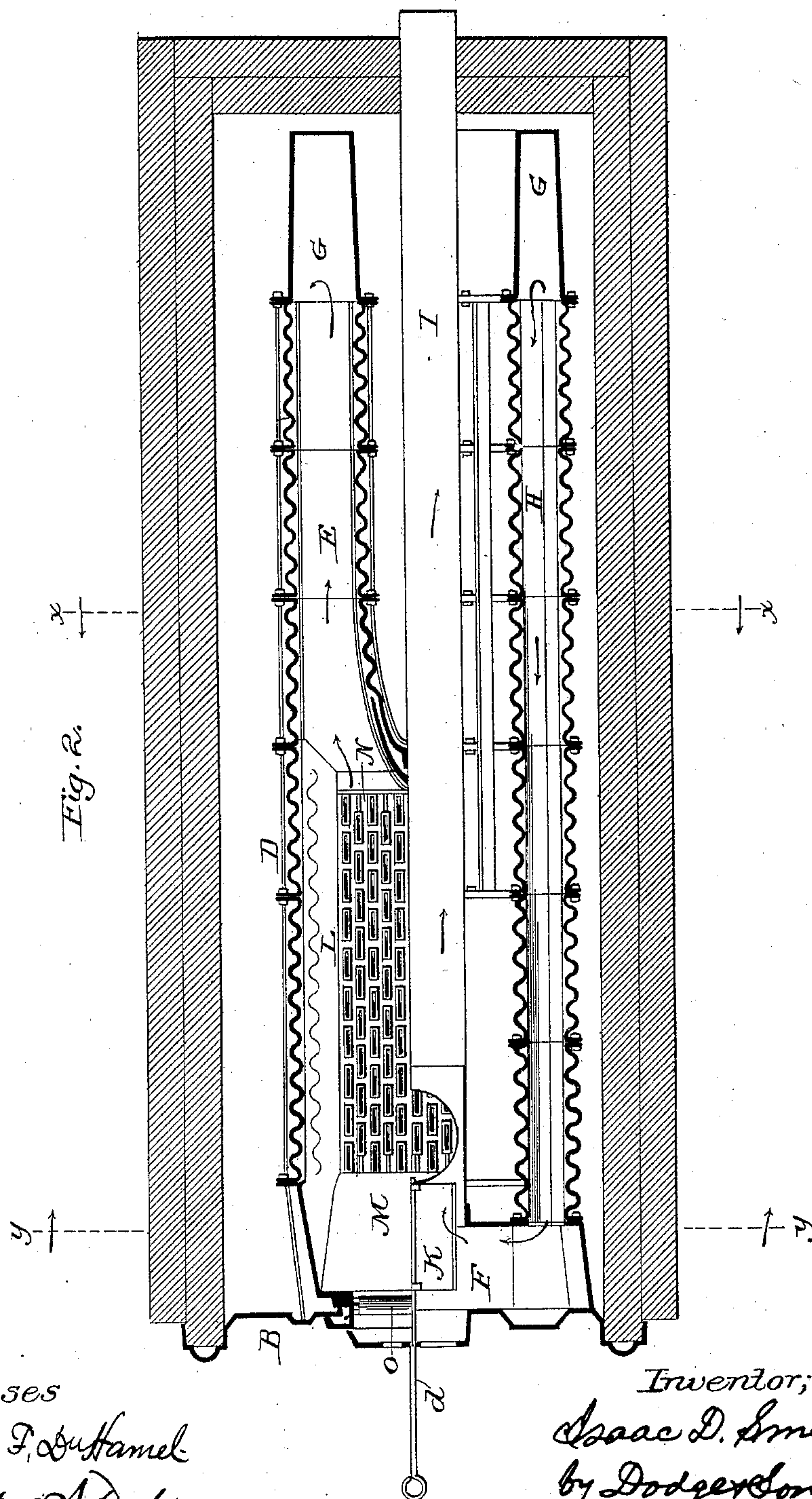
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(No Model.)

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Fig. 4.

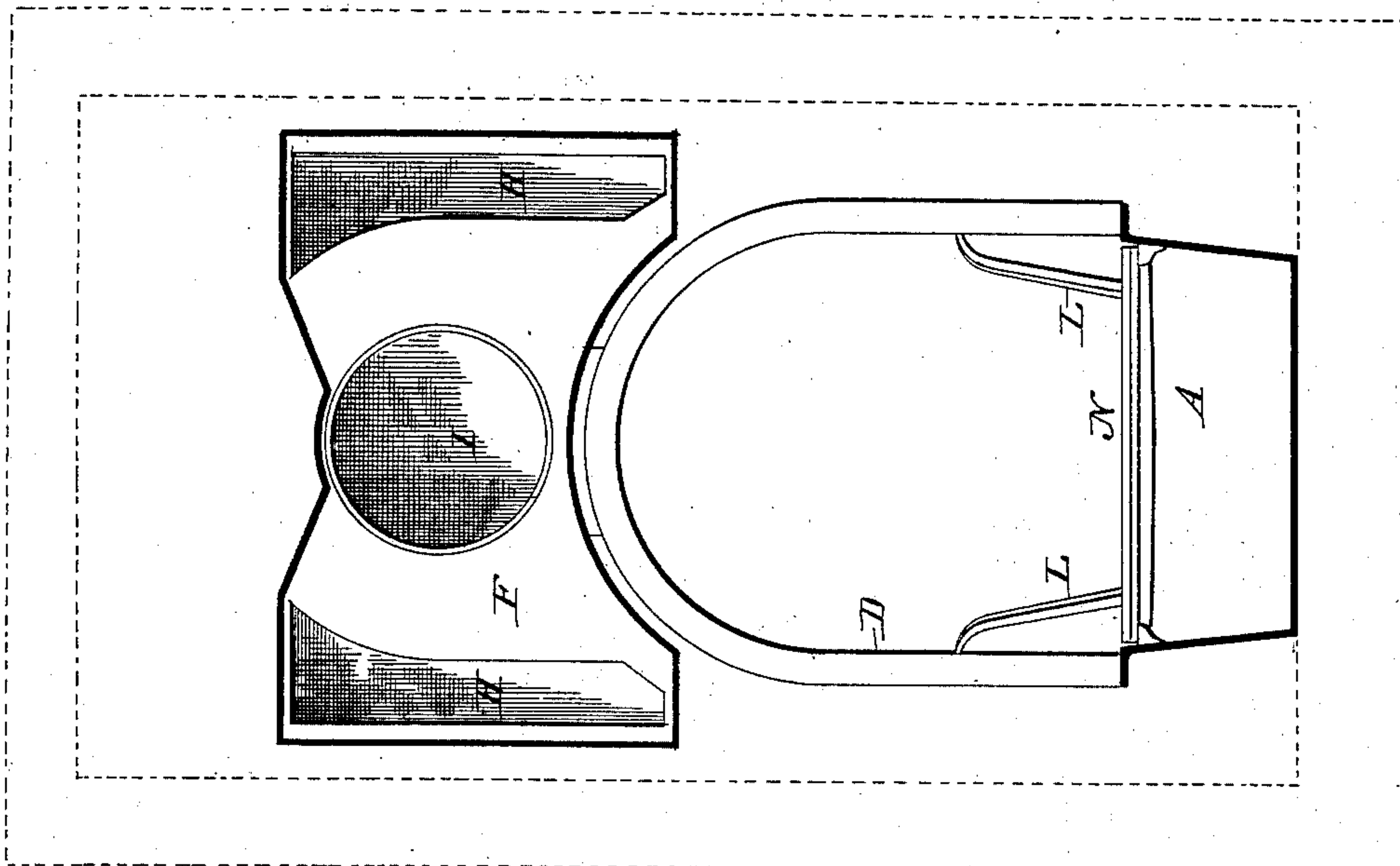
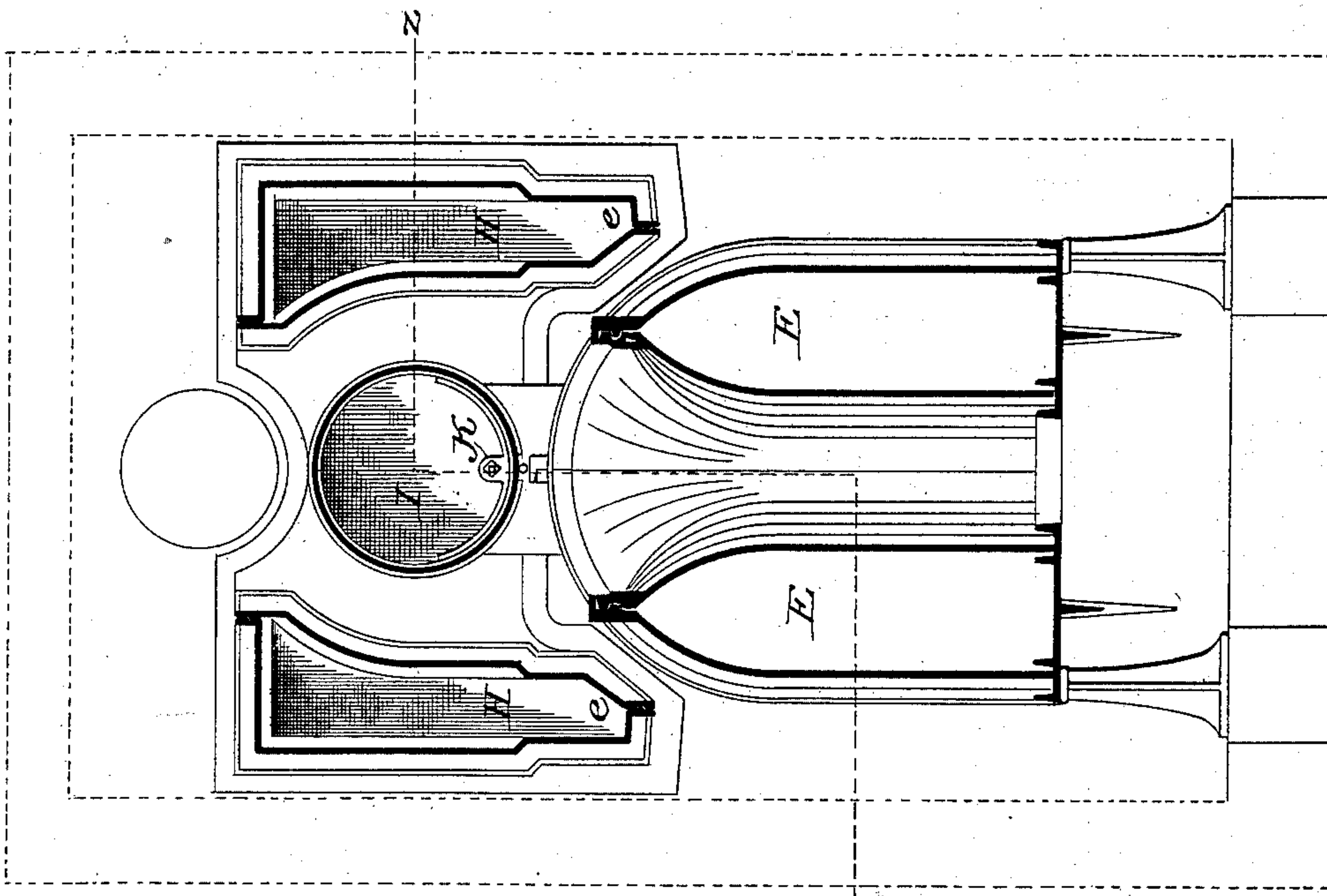


Fig. 3.



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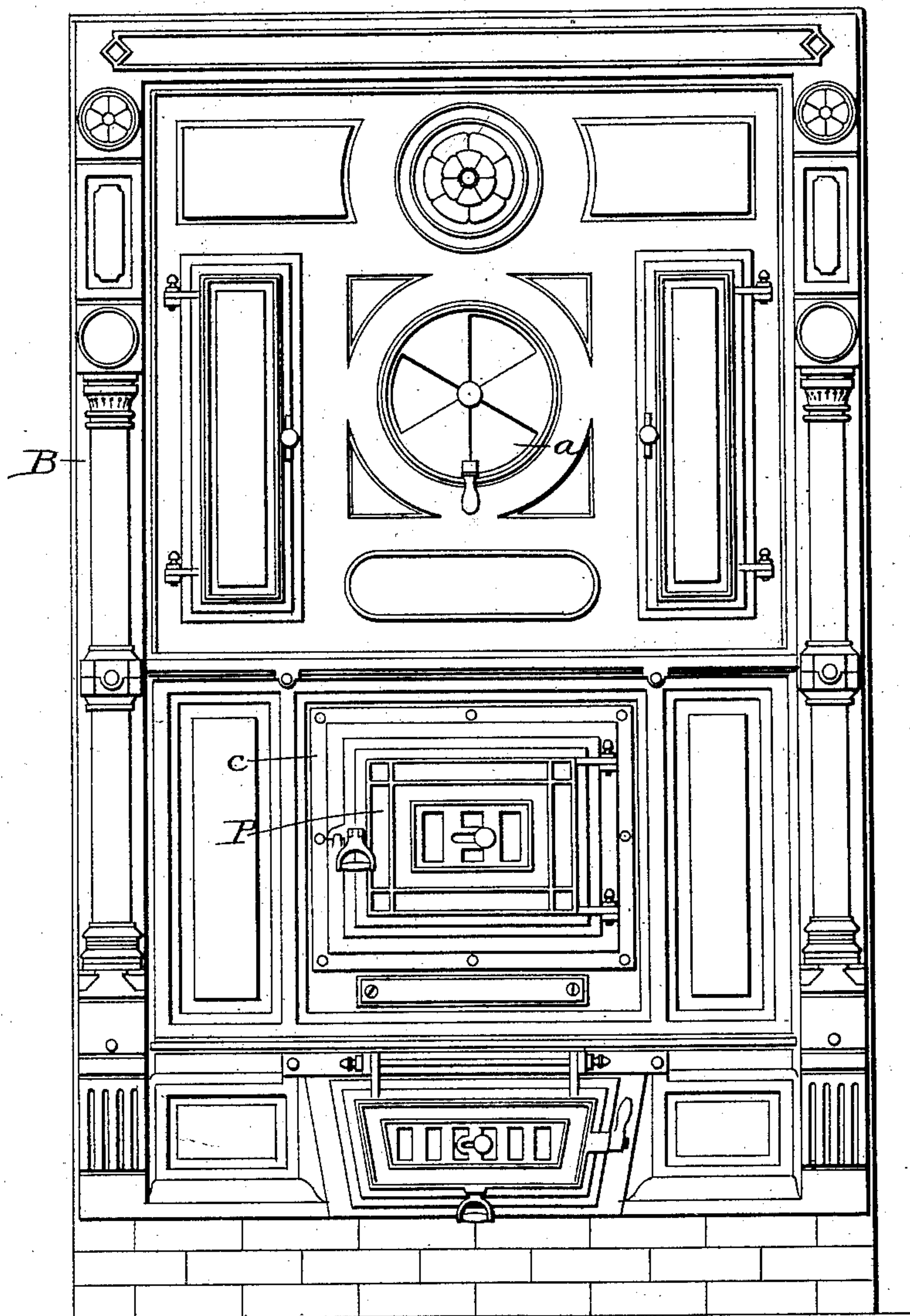
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*Fig. 5.*



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# UNITED STATES PATENT OFFICE.

ISAAC D. SMEAD, OF TOLEDO, OHIO.

## HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 370,981, dated October 4, 1887.

Application filed January 31, 1887. Serial No. 226,099. (No model.)

*To all whom it may concern:*

Be it known that I, ISAAC D. SMEAD, of Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention relates to hot-air furnaces; and the invention consists in certain novel features of construction, as hereinafter more fully described and claimed.

Figure 1 is a side elevation with the front portion shown in vertical section. Fig. 2 is a longitudinal section on the line  $z z$  of Fig. 3. Fig. 3 is a transverse vertical section on the line  $x x$  of Fig. 2, looking toward the front. Fig. 4 is a similar sectional view on the line  $y y$  of Fig. 2, and Fig. 5 is a front elevation.

This invention is an improvement on that style of air warmers or furnaces known to the public as the "Ruttan" or "Ruttan-Smead" furnace, and which are used for warming and ventilating large buildings—such as large school-buildings, churches, court-houses, and the like. The general form or construction of these heaters as heretofore made is well known to the public, and is fairly shown in Patents Nos. 289,865 and 315,040, to which reference is made for illustration.

The objects of my present invention are to so construct the heater as to expose a large amount of heating-surface to the air to be warmed, to so form or shape the return-flues as to lessen the accumulation of soot and ashes upon the interior surface thereof, and to make the furnace as a whole of less height without reducing its radiating surface and increase its heating capacity, and also to improve the same in minor details.

The fire box or body of my improved furnace is made, essentially, as heretofore, as shown in Figs. 1 and 4, in which D indicates the body; C, the front portion of the same; A, the ash-pan; N, the grate; L, the side linings; M, the front lining, and P the fuel-door. At the rear end of the fire-box D, I add two long and relatively-narrow combustion or heat chambers, E, the form of which in cross-section is shown in Fig. 3 and in plan view in Fig. 2, they being separated by a space for the upward passage of the air between them. To the rear

end of these chambers E, I secure a breeching, G, as shown in Figs. 1 and 2, these breechings being extended upward above the top of the fire-box and chambers E high enough to connect with the return-flues H, one on each side, as shown in Fig. 1, the relative position of these return-flues being more clearly shown in Figs. 3 and 4. These return-flues H, as shown, have their sides vertical or nearly so, in order that the fine ashes and soot which are carried into them by the draft will all or nearly all be deposited at the lower and narrow part,  $e$ , instead of covering from one-third to one-half of the inner surface, as is the case when round tubes are used. By this construction I reduce very largely the loss of radiation of the heat caused by the accumulation of ashes and soot in the ordinary horizontal tubes or pipes heretofore used. These flues or tubes H, I make quite deep vertically and wider at top than bottom, so as to secure an amount of radiating-surface equal to or greater than was afforded by the series of round tubes formerly used for return-flues. It is obvious that their form in cross-section may be varied more or less so long as their sides are vertical or so nearly so that the ashes will not rest on the same and the requisite amount of heating-surface is provided. I have made them wider at top than at bottom, and have curved their inner walls so they incline inward as they rise to enable the air to impinge thereon more fully and also force it against the smoke-pipe I, which, as shown in the several figures, is arranged directly over the fire-box D and midway between and parallel with the two return-flues H. At their front ends these return-flues H enter or connect with a breeching or chamber, F, located over the front end of the fire-box, as shown in Figs. 1, 2, and 3, the smoke-pipe I extending from this chamber F directly backward, as shown in Figs. 1 and 2, there being a circular valve,  $a$ , arranged in the furnace-front directly opposite the smoke-pipe, for the admission of air when it is desired to check the draft or reduce the heat.

In these furnaces as formerly made the direct draft was through an opening made in the top of the front part, C, of the fire-box, as shown in Patent No. 326,598, and which led into



the front breeching or chamber. The result of such construction was that when the direct draft was used the heat and flame were brought directly against the front plate, unduly heating the same and causing a loss of heat by its radiation at the front and outside of the inclosing-walls. To obviate this I now make the opening for the direct draft through the top of the fire-box, in rear of the front part, C, and connect it by a collar or short tube, J, directly to the smoke-pipe I, as shown in Figs. 1 and 3, and provide a semicircular slide-damper, K, to open and close the same at will by means of a rod, d, which projects at the front, as shown in Figs. 1 and 2. By this arrangement the heat and flame from the fire-box are conducted direct into the smoke-pipe I at some distance from the front and do not enter the front breeching or chamber F at all, and therefore do not heat the front plate of the furnace, as formerly.

Instead of hanging the door P to the front plate direct, as heretofore, I provide a separate frame, R, which has a flange, c, that projects inward far enough to lap over and cover the joint between the front part, C, of the fire-box and the front plate, as shown in Fig. 1. The door P is hung to this frame R, and the frame is bolted to the furnace-front in such manner that the frame R, with the door attached, can be taken off bodily, when it is desired, for any purpose. The flange c, lapping over and covering the joint between the front plate and the front end of the part C of the fire-box, also renders the latter more secure and less liable to leak in case of the warping of the plates. In the lower part of this door-frame R, I mount a roller, O, (shown in section in Fig. 1 and partly shown in plan in Fig. 2,) the object of which is to aid in putting in large lumps of coal and also in putting in and removing the linings L, grate N, &c.

By this construction I obtain many advantages. By providing the two extension-chambers E in rear of the fire-box I secure a large increase of surface for the air to come in contact with, the air in this, as is usual with this class of heaters, being delivered at the bottom or underneath the furnace, and of course passes upward in contact with both walls of each extension-chamber E, some passing up outside of them and a part passing up between them. By constructing and locating the return-flues H as shown I am enabled to drop the smoke-pipe I down into the space between these flues, as shown clearly in Figs. 1 and 3, whereas formerly it was located above the return-flues, which, being usually twelve in number and arranged in two tiers transversely above the fire-box, necessitated placing the smoke-pipe above them, thus requiring a height of space for the furnace that sometimes made it difficult to set it in low basements and left but a small hot-air chamber above it. By this improvement I am enabled to set the furnace in much lower basements, and also to

secure a much larger heat-chamber above it, and which, as is well known, is always desirable in order to secure the best results.

I have shown the return-flues H as having their lower edges extending a little below the top of the fire-box, which is rounded or arched at the top; and it is obvious that, if desired, they may be made to extend still farther down, and thus increase the extent or area of their radiating-surfaces without increasing the height of the furnace as a whole. So, too, it is obvious that the extension-chambers E can be used to advantage with other forms of return-flues, as well as with those shown; but I prefer the style of return-flues shown for the reasons already stated.

It will be seen that by the construction shown I secure an unusually large heating-surface, and by bringing a large volume of air in contact with this large radiating or heating surface I am enabled to convey into the rooms of a building a large volume of fresh air at a comparatively low temperature, but little, if any, above that at which it is suitable to be inhaled, thus securing to the inmates a mild balmy atmosphere which has not been robbed of its moisture to anything like the extent that it is when heated by the ordinary pot-furnaces in general use. Another great advantage of this plan is, that a much larger volume of fresh air is introduced into the building, and with suitable exhaust-flues a much more thorough ventilation is secured, and this in the case of school-buildings, theaters, and all buildings in which a large number of persons are assembled is a matter of vital importance.

Having thus fully described my invention, what I claim is—

1. A furnace-body composed of a fire-box, D, and the two combustion-chambers E directly in rear of the fire-box at the opposite sides thereof, with a vertical opening or space for the passage of air between said chambers E, substantially as and for the purpose set forth.

2. The combination, in a furnace, of the fire-box D, the rear extended chambers, E E, the return-flues H H, and the front chamber, F, all constructed and arranged to operate substantially as shown and described.

3. The combination, in a furnace, of a fire-box and one or more return-flues, H, connected to the rear part of the furnace-body in such a manner as to receive the products of combustion and convey them back to the front end, said flue or flues having their side walls made essentially vertical with the narrow space along their lower edge, substantially as and for the purpose set forth.

4. The combination, in a furnace, of the elongated body, the two return-flues H at opposite sides, connected to the body at its rear end, the chamber F at the front, and the smoke-pipe I, connected to said chamber and extending from thence backward between said



return-flues on a line even with or below the top of the same, substantially as and for the purpose set forth.

5 The combination, in a furnace, of the elongated body, the return-flues H, chamber F, and smoke-pipe I, said smoke-pipe being connected to the body by a direct-draft flue, J, located at some distance from the front, with

a damper, K, for opening or closing the same, said parts being arranged to operate substantially as described.

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