

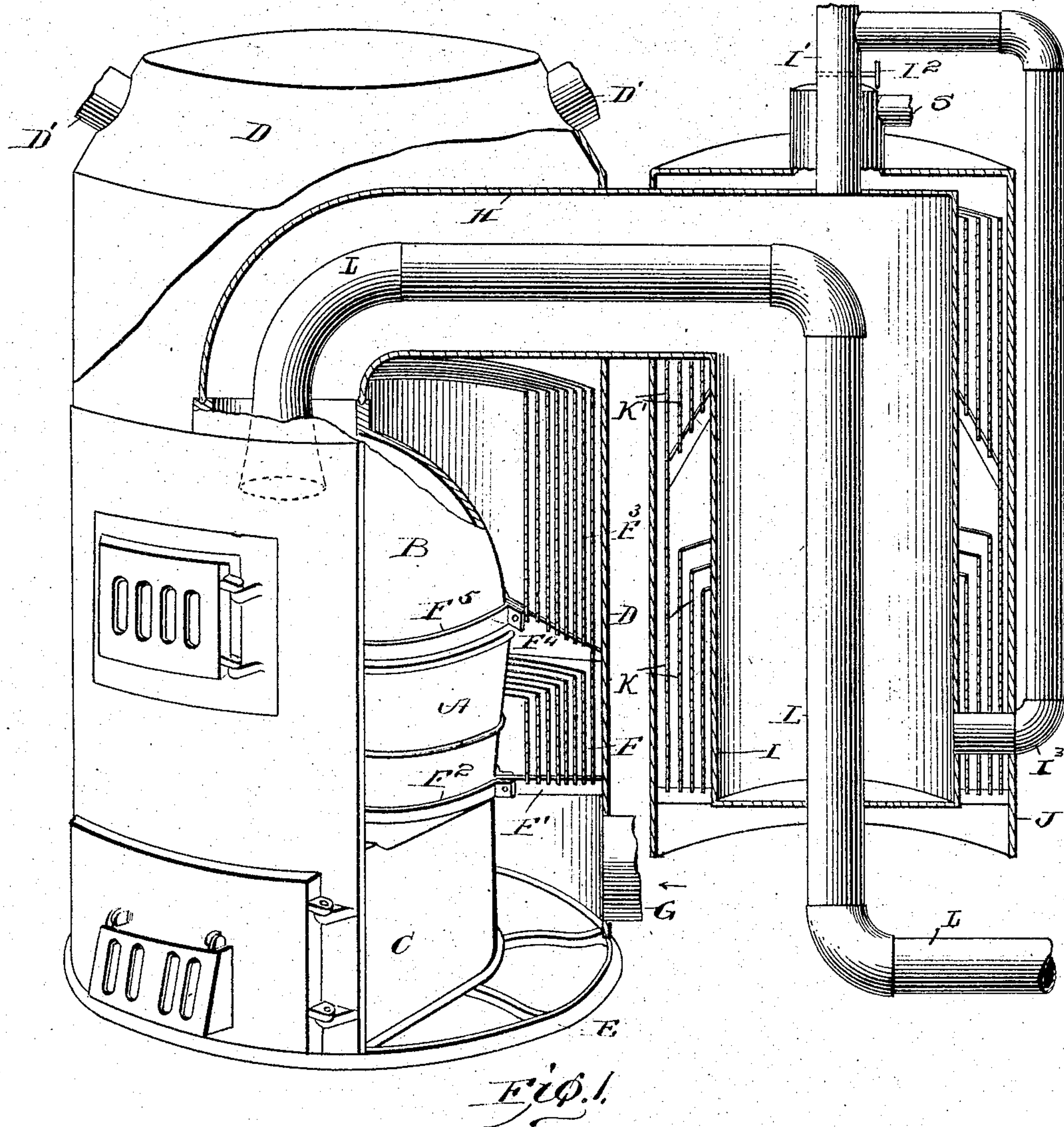
No. 781,308.

PATENTED JAN. 31, 1905.

S. P. SMITH.  
FURNACE.

APPLICATION FILED NOV. 3, 1903.

2 SHEETS—SHEET 1.



Witnesses

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Inventor

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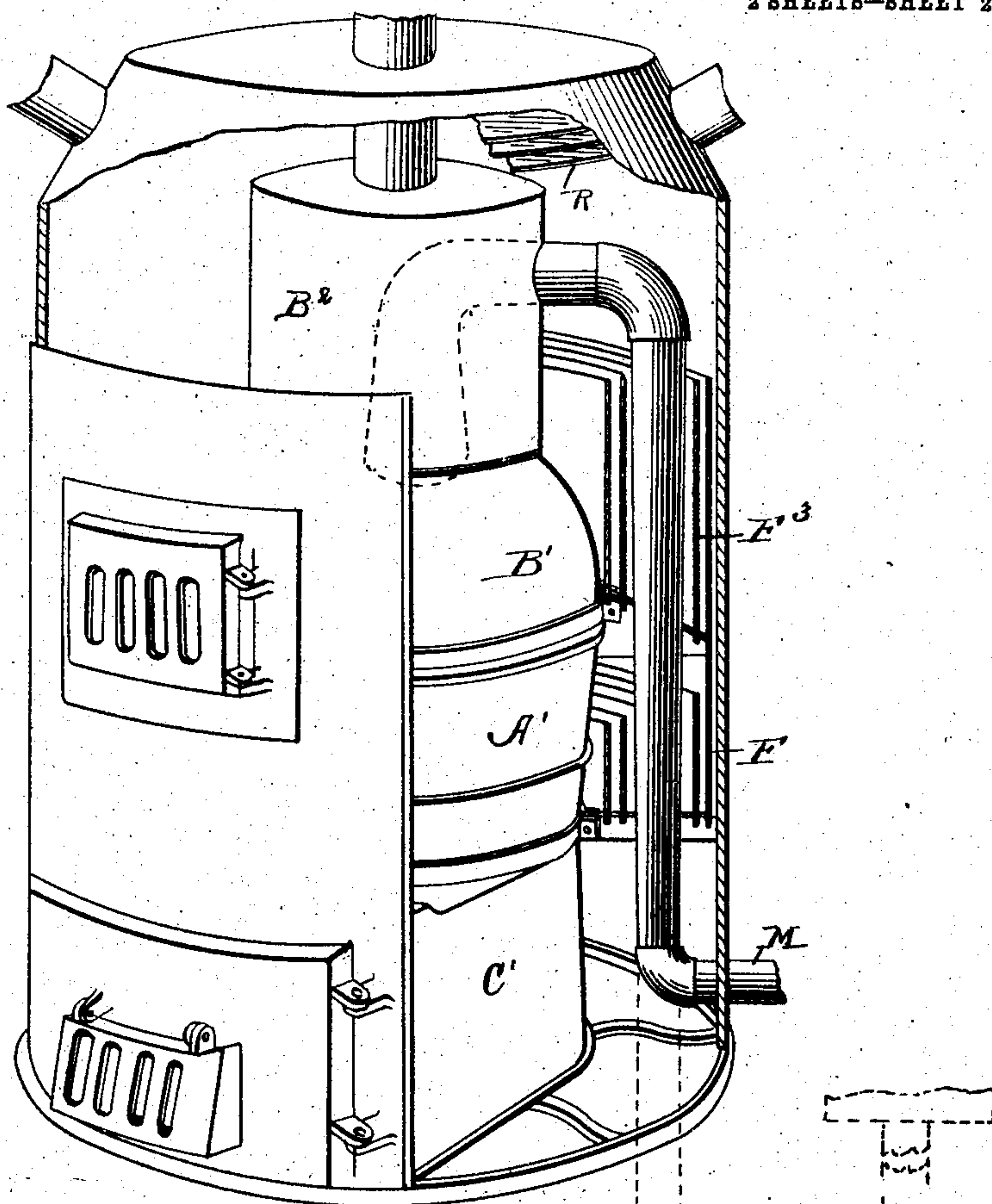
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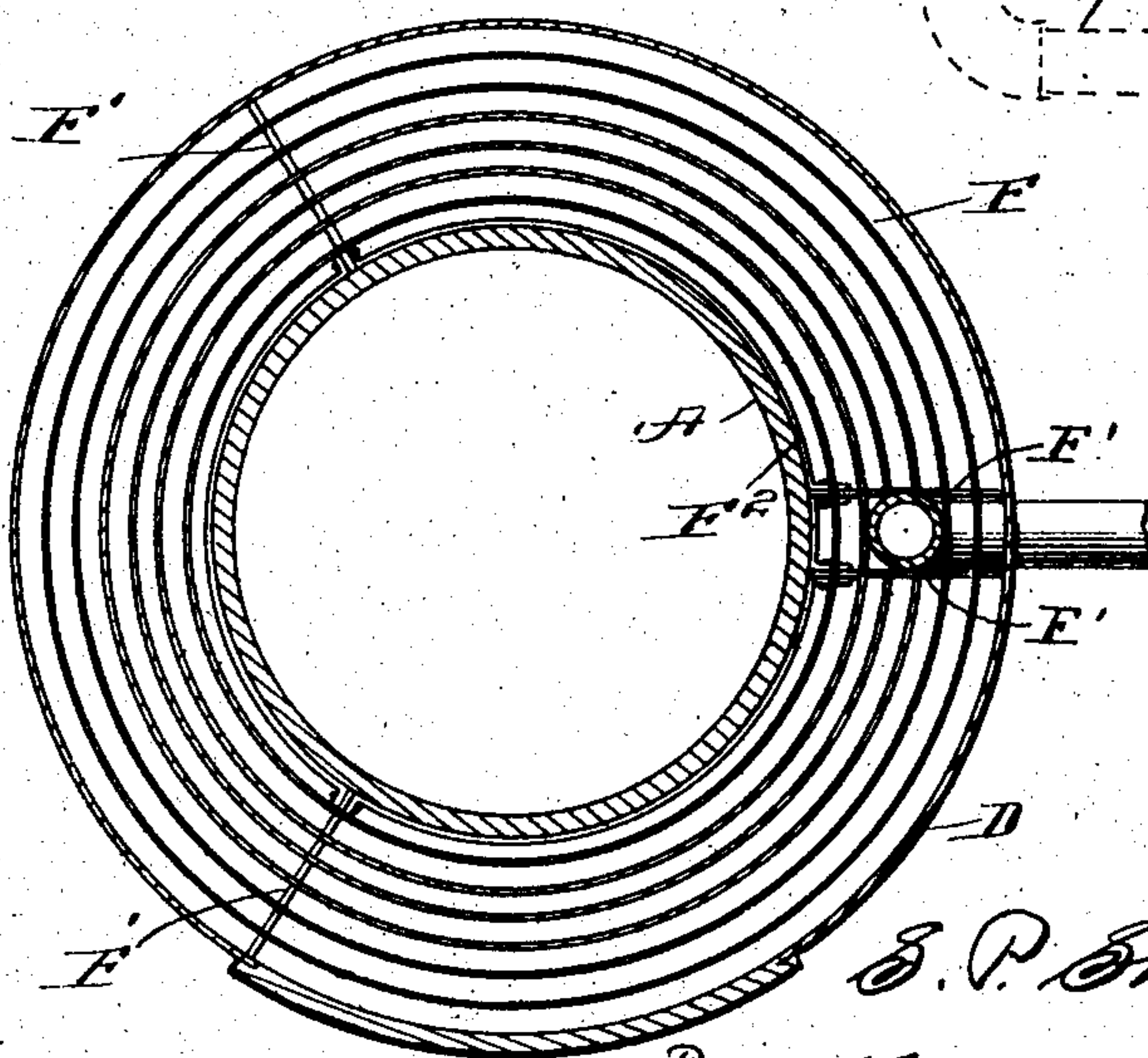
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2 SHEETS—SHEET 2.

*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

SOLOMON P. SMITH, OF WATERFORD, NEW YORK, ASSIGNOR TO FUEL SAVING COMPANY, OF UTICA, NEW YORK, A CORPORATION OF NEW YORK.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 781,308, dated January 31, 1905.

Application filed November 3, 1903. Serial No. 179,736.

*To all whom it may concern:*

Be it known that I, SOLOMON P. SMITH, a citizen of the United States, residing at Waterford, in the county of Saratoga and State of New York, have invented new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to furnaces, and especially to hot-air furnaces employed for heating dwellings, for example; and the general object is to increase the effective heat obtained from a given amount of fuel. To this end an extraordinary volume of heated air for combustion is supplied upon the surface of the burning mass of fuel, and provision is made for intercepting and utilizing the heat that is usually thrown out into the space about the furnace where it is useless or more commonly a distinct evil in heating, for example, a cellar which it is desired to keep cool. In thus supplying air I secure perfect combustion before the gases leave the fire-chamber and at the same time avoid overheating consequent upon forcing a large amount of air through the fuel. It follows that little heat and no sub-oxidized carbon passes to the chimney.

Air is a poor conductor of heat, yet radiant heat passes through it very readily. It is possible to intercept this heat, as well as other heat, by inclosing the furnace in a suitable heavy jacket; but as the use of such jacket is expensive, as it causes rapid destruction of the furnace within it and as it largely increases the loss through the chimney, it is not employed practically. All the desirable results may, however, be obtained by using a series of suitable and suitably-arranged plates about the fire-chamber, and at the same time the overheating and loss through the chimney may be made materially less than in the ordinary furnace.

In the accompanying drawings, Figure 1 is a perspective view, partly in section, showing one embodiment of my invention. Fig. 2 is a like view showing a slightly-modified arrangement. Fig. 3 is a horizontal section through the fire-pot of Fig. 2.

In the figures, A represents a fire-pot such

as is used in many ordinary furnaces; B, a dome above the fire-pot and forming with it the combustion-chamber; C, an ordinary ash-pit, and D the usual thin metal jacket resting upon a ring E and having suitable hot-air pipes D' for supplying apartments to be heated. Encircling the lower part of the fire-pot are slightly-separated concentric cylindrical plates F, preferably of dull or black sheet-iron. These rest in suitable notches in radial arms F', shown as supported by rings F'' upon the fire-pot. These plates are successively wider as the distance from the fire-pot increases, so that their upper edges form a series of ascending steps. A little above this set of plates is a second set, F<sup>3</sup>, supported in arms F<sup>4</sup>, held by a ring F<sup>5</sup>, the arrangement being such that the lower edges of this set lie in the surface of a downwardly-expanding cone. Between the two sets and the jacket D is a similar plate extending from the bottom to the top of the two sets. Air to be heated is admitted through a pipe G and rises in thin strata between the plates of the lower set. The strata nearest the fire-pot are more rapidly heated, and hence rise faster than those more distant. The various strata entering the space between the two sets, which is a sort of mixing-chamber, commingle, and then the air rises through the spaces between the plates of the upper set and passes out through the pipes D'. Radiant heat passes through the air itself, but is intercepted in a great degree by each plate which it meets, the plate being correspondingly heated, and the heated plate at once gives up its heat to the air, which is constantly passing over its surface, the result being that the jacket D feels cool to the hand even when the combustion is at a maximum. Another result is that the fire-pot and adjacent parts are far less highly heated than is ordinarily the case, from the fact that the air passes over the surfaces next the fire with unusual velocity. From the top of the dome a large pipe H passes upward and then outward through the jacket D to a closed drum I. From the top of this drum a pipe I', provided with a damper I<sup>2</sup>,



leads to any suitable chimney. From the lower part of the drum a pipe I<sup>3</sup> passes outward and upward, joining the pipe I' at a point beyond the damper. Obviously this construction allows sending the products of combustion to the pipe I' from either the top or the bottom of the drum. The drum is enveloped by a downwardly - open jacket J, analogous to the jacket D, and between the drum and jacket are sets K K' of plates similar to the plates F F<sup>3</sup>, already described. It is possible to admit aid for supporting combustion through the ash-pit, as in ordinary furnaces; but this is not done except occasionally in starting a fire. Instead I obtain practically complete combustion with comparatively slow burning by admitting a very great volume of downwardly-directed hot air over the upper surface of the burning fuel. This is accomplished by means of a pipe L, which passes axially upward through the drum I and axially along the pipe H and terminates in a bell-mouth in the dome B.

Fig. 2 shows a simpler construction, the drum and connected parts being omitted. In this case the dome B' is shown as having an upwardly-extending part B<sup>2</sup>, the combustion-supporting air being taken into the furnace through a pipe M, which passes upward among the plates K K' and thence laterally into the dome, where it turns downward and terminates as before. This pipe gradually increases in diameter to compensate for the gradual expansion of the passing air as its temperature rises. Under some circumstances the pipe M may take air from the lower portion of the space to be heated, and for preventing reverse currents it is sometimes carried far below the bottom of the furnace and returned, as suggested at M', Fig. 2.

In either form the plates for intercepting heat may be carried nearly to the top of the furnace, and in either the top of the furnace may be provided with plates R, similar in function to the plates F or K. In the modified form a small amount of heat passes to the chimney; but in the primary form this amount may be reduced to the lowest point consistent with the necessary draft, and practically no heat is lost when the products of combustion pass through the pipe L<sup>3</sup>.

What I claim is—

1. The combination with a furnace, of a conduit adapted to deliver downwardly upon the burning fuel a constant hot-air current in volume many times that needed to supply the oxygen theoretically necessary to oxidize the fuel being consumed.

2. The combination with a furnace having a fire-chamber closed below and an inclosing jacket for retaining air to be heated, of a drum alongside the furnace, a duct leading the products of combustion from the furnace into the drum, a conduit leading such products from the drum, and a pipe leading through said drum and duct and delivering downwardly upon the burning fuel.

3. The combination with a furnace having a fire-chamber closed below and an inclosing jacket, of a drum alongside the furnace, a duct leading products of combustion from the furnace into said drum, a conduit leading such products from the drum at the top and provided with a damper, a conduit leading from the bottom of the drum, and a pipe leading through said drum and duct and delivering air downwardly upon the burning fuel.

4. The combination with a furnace, of a set of concentric, slightly-separated plates surrounding the lower portion of the fire-chamber, a second similar set so far above the first set as to leave a mixing-chamber between the two sets, means for introducing air below the first set, and means for conducting away air rising from the second set.

5. The combination with a furnace having a fire-chamber and an air-retaining jacket, of a set of slightly-separated, concentric cylindrical plates surrounding the lower portion of the fire-chamber and successively increasing in width as the distance from the fire-chamber increases, a second similar set at some distance above the first set, a pipe admitting air to the jacket below the first set, and pipes conveying air from the space above the second set.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SOLOMON P. SMITH.

Witnesses:

JOHN B. McMILLAN,  
GEO. E. LA DUE.