

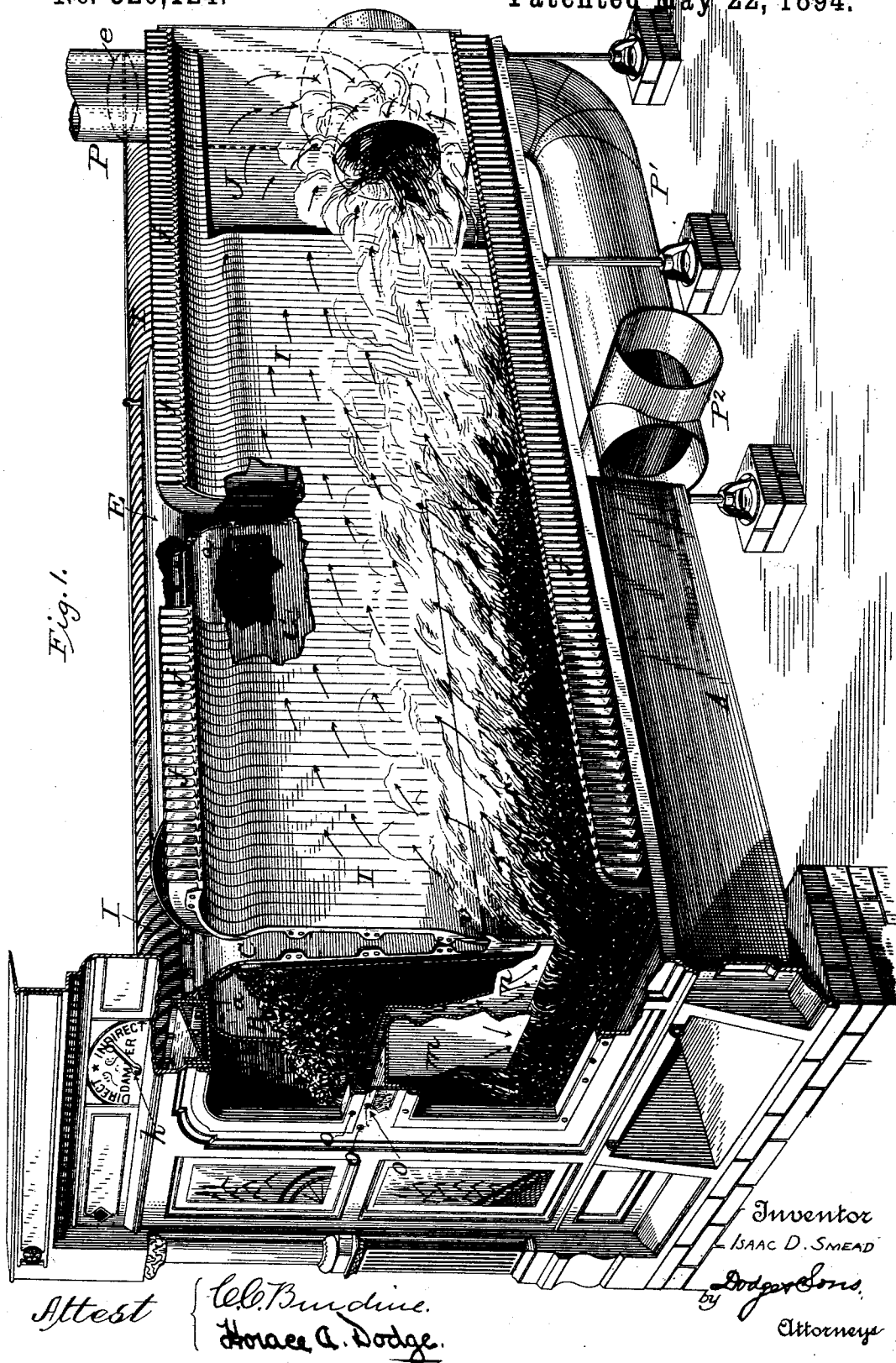
(No Model.)

3 Sheets—Sheet 1.

I. D. SMEAD.  
FURNACE.

No. 520,124.

Patented May 22, 1894.



(No Model.)

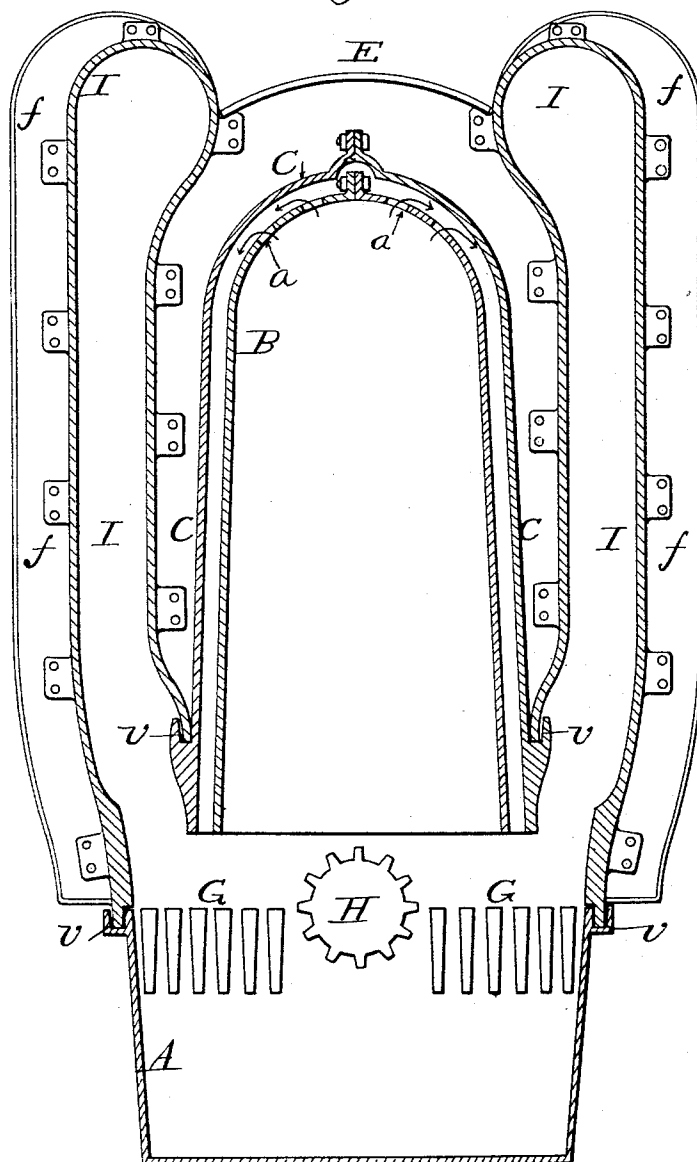
3 Sheets—Sheet 2.

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*Fig. 2.*



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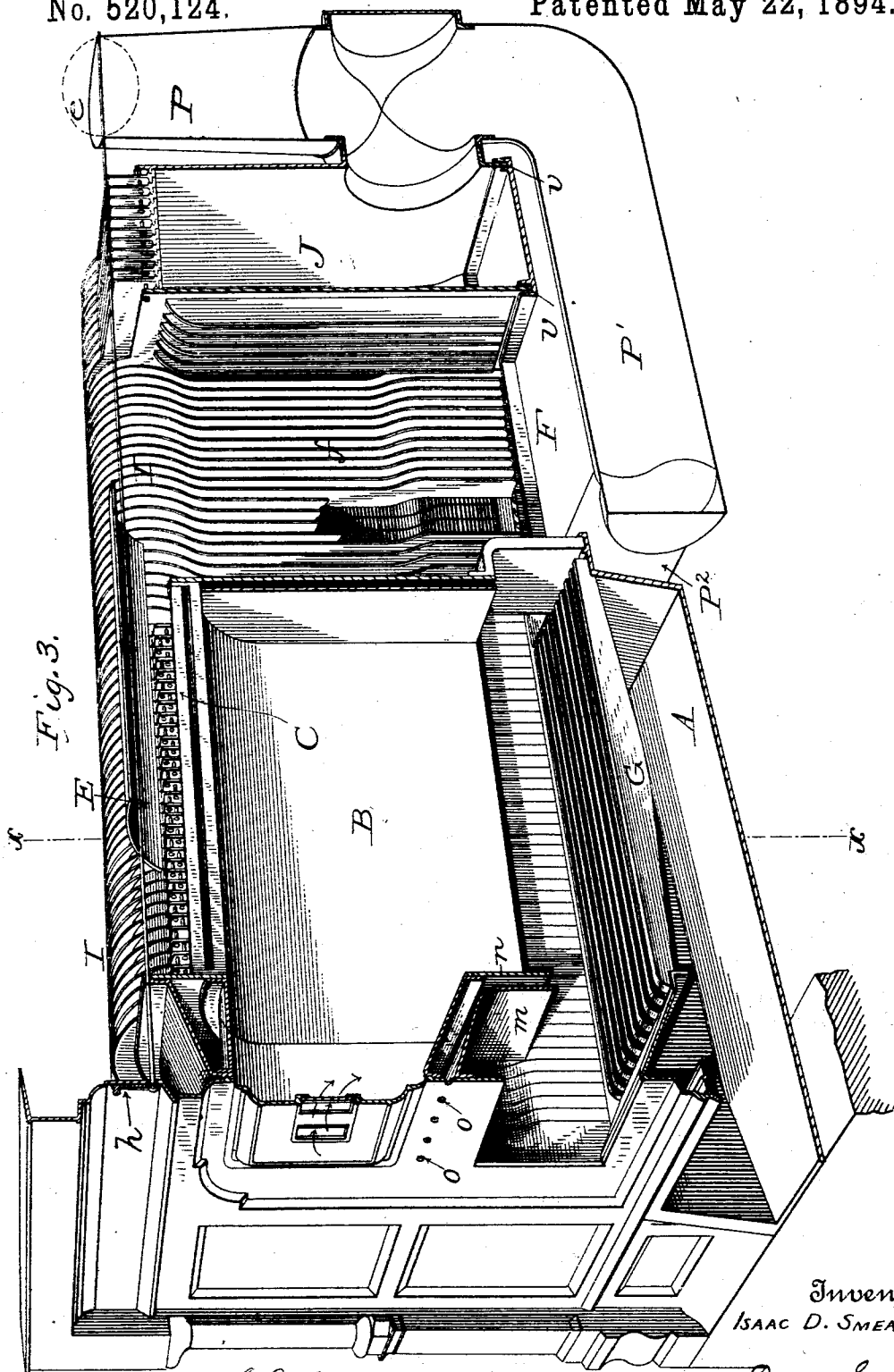
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# UNITED STATES PATENT OFFICE.

ISAAC D. SMEAD, OF TOLEDO, OHIO.

## FURNACE.

SPECIFICATION forming part of Letters Patent No. 520,124, dated May 22, 1894.

Application filed December 27, 1893. Serial No. 494,879. (No model.)

*To all whom it may concern:*

Be it known that I, ISAAC D. SMEAD, a citizen of the United States, residing at Toledo, in the county of Lucas and State of Ohio, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My present invention relates to furnaces for warming large buildings, and the invention consists in certain novel features of construction, as hereinafter more fully set forth.

Figure 1 is a perspective view of the furnace, with the side of one of the combustion chambers broken away. Fig. 2 is a vertical longitudinal section shown in perspective, and Fig. 3 is a transverse vertical section on the line  $x-x$  of Fig. 2.

The object of my present invention is to produce a magazine furnace of a form and capacity by which it shall be adapted for use in public buildings, such as school houses, churches, court houses and the like, and in which the air that supports the combustion shall be heated and mingled with the flame and hot gases, thereby securing a more perfect combustion and preventing the formation of smoke to a much greater extent than usual, and at the same time provide means for the most effective radiation of the heat so as to warm an unusually large volume of air. To accomplish these results I construct my improved furnace as represented in the accompanying drawings, in which—

A represents the ash pit, which as shown in Fig. 2, extends only about one half the length of the furnace. Over this I construct a box or magazine B, oblong in form with a curved or rounded top as shown in Fig. 2, and inclose it at the sides and rear with a casing C set at a little distance therefrom so as to leave a narrow space for the passage of air, as indicated by the arrows in Fig. 2, the air entering through openings  $a$  in the upper portion of the walls of the magazine B, said holes or slots extending in one or more rows along both sides and across the back end of the magazine or coal reservoir, the air entering the magazine at the front through openings in the magazine door, there being a slide to graduate or regulate the supply of air, as represented in Fig. 3, in which a portion of the door and slide are shown in position.

Underneath this magazine B I locate the grate bars G, a set at each side, with a rotary section H in the center, to feed or work the coal outward laterally upon the stationary bars G. At each side of the magazine, I construct a combustion chamber I, preferably made up of a series of cast iron sections bolted together, as described in my Patent No. 501,109, each of these sections being provided with a wide projecting flange  $f$  as shown more clearly in Fig. 2, these sections and flanges being also shown in Figs. 1 and 3. These combustion chambers are made very narrow, high and long, the space within them at the narrowest point being but about four inches wide while their height is from four to five feet, and their length being at least fifty per cent. greater than that of the magazine which is four feet long by sixteen inches wide, internally. As shown more clearly in Fig. 3, these combustion chambers extend for a considerable distance to the rear of the magazine, and at their rear ends open into a chamber J, (technically termed the breeching,) which chamber extends the full width of the furnace, and like the combustion chambers is made up of a series of cast iron flanged sections of the proper form, bolted together as represented in Figs. 1 and 3. At the rear this chamber is provided with an opening and collar for attaching the smoke pipe P, which serves for a direct draft in starting the fire, and which is provided with a valve or damper  $e$  for closing the same and directing the smoke or products of combustion downward through the pipe P' P<sup>2</sup> and thence to the chimney, the same as in my patent above mentioned, this damper being operated by a handle  $h$  at the front as shown in Figs. 1 and 3.

In rear of the magazine, and between the extended sides of combustion chambers I, an opening F is made in the base plate as shown in Fig. 3, this opening occupying the entire space between the magazine casing and the breeching or rear chamber J, and transversely between the two side chambers I, thus forming a large opening for the admission of air from below, to be warmed. To prevent this air from passing directly upward and out, I cover this space above with a curved plate E which rests at its edges upon or against the walls of the side chambers I, I, as shown more

clearly in Fig. 2, this plate being somewhat longer than the opening F, and preferably inclined so as to deflect or direct the air toward the front, thereby causing it to pass along on each side in the narrow space between the casing of the magazine and the wall of the side chambers, by which means it will be heated. This plate E, may be made of any length desired, and may be adjusted forward or back, or made to extend the entire length and be stationary, and be provided at or near its front end with an opening and collar for attaching a hot air pipe to conduct the heated air to any point desired, separate and apart from the flues which conduct the warm air from the furnace generally. This feature will necessarily be varied to adapt it to the various situations and conditions under which the furnace will be used, but in any event the plate will be used of greater or less length to confine and direct the air in contact with the walls of the combustion chambers I, as above stated.

The furnace is provided with three doors—the upper one opening into the magazine, the one next below opening into the fire chamber, and the lower one into the ash pit, these doors with the exception of a portion of the upper one not being shown, as their presence will be understood, as a matter of course.

The manner of connecting the side chambers I to the body is clearly shown in Fig. 2, and consists in casting the ash pit and bottom plate in rear thereof with a groove *v*, into which the lower edge of the outer wall of the chamber I is set, the lower edge of the inner wall of said chamber fitting into a similar groove cast on the casing C of the magazine, and the bottom plate in rear thereof, the joint thus formed being filled with cement. The front ends of the walls of these chambers I are bolted to the front plate, and their rear ends are in like manner bolted to the front wall of the rear chamber J. As shown in Fig. 3 the grooves *v* extend entirely around the base and serve to connect the walls of the breeching or rear chamber J as well as the walls of the chambers I. In the front plate between the upper and the second door I make a series of holes *o*, for the admission of air, and to the inside of the front plate I secure two plates *m* and *n*, so located as to leave a narrow space between them, these plates being curved or bent downward as shown in Fig. 3, they thus forming a channel extending across the front for conveying the air which enters the holes *o* down to near the burning coal on the grate where it is mingled with the flame and heated gases arising from the coal,—this air of course being heated by passing in contact with or between the plates *m* and *n*, and which from their position are kept hot. In like manner the air which enters the magazine passes through the holes *a*, and thence down the narrow space between the walls of the magazine and the casing which incloses it; and thus there is delivered a thin sheet of

pure warm air all around the base of the magazine, and just above the burning coal where it is mingled with the hot gases, thus insuring a much more perfect combustion, creating great heat, and at the same time preventing, to a great extent at least, the formation of smoke. By this construction the cheapest forms of coal, and even coal slack can be burned with success.

By making the combustion chambers very narrow, the heat arising from the burning fuel is brought into direct contact with their walls, thus heating them quickly and effectually, and by making these walls of great extent and providing their exterior with the great number of unusually wide flanges the heat is radiated therefrom to the air which surrounds them in the most effectual manner.

It will of course be understood that the furnace as a whole is to be incased with brick work, with openings at the base for the admission of the large volume of air to be warmed, as shown in my prior Patent No. 501,109.

In practice, a small portion only of the air for the support of combustion enters through the grate from the ash pit, after the fire is thoroughly started, the great bulk of it entering through the magazine and the holes in front, and as above explained is delivered all around at a point just above the burning fuel where it mingles with the hot gases, on a plan similar to that of the Argand burner.

I do not claim broadly as my invention the idea of passing the air through the magazine and between it and a surrounding casing as I am aware that such a plan is shown in the patent to S. T. Bryce No. 319,062; nor do I claim herein the plan of using the flanged sections as that is shown in my prior patent No. 501,109, but

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

1. The herein described furnace consisting of the oblong fuel reservoir B inclosed by a shell or case C, with openings in the upper portion of the walls of the reservoir and a narrow opening at the bottom between the reservoir and its shell or casing, a grate below said reservoir, and two separate combustion and heating chambers I located at the opposite sides of said reservoir, said chambers extending rearwardly beyond the reservoir and being connected at their rear ends to a chamber J located in rear of the reservoir, with an opening F for the admission of air to be heated between the reservoir and the rear chamber J, all constructed and arranged to operate substantially as shown and described.

2. In combination with the fuel reservoir and its inclosing shell or case, with a space between said reservoir and case, the narrow elongated combustion and heating chambers I arranged at the sides of the reservoir, with a space between them and the shell of the reservoir for the passage or entrance of the

air to be warmed, said chambers opening along their lower edge into the space between the bottom of the fuel reservoir and the grate, substantially as shown and described.

5 3. In combination with the central elongated fuel reservoir and its inclosing case, with a space between said reservoir and case, the separate combustion and heating chambers I at the sides thereof with an air space  
10 between them and the reservoir and its case, said chambers extending above the top of the reservoir and its case, and the plate E above the reservoir and reaching from the wall of one chamber to that of the other, substantially  
15 as and for the purpose set forth.

4. The combination in a furnace, of the cen-

tral fuel reservoir, the separate side combustion and heating chambers, with stationary grate bars at the sides and a rotary longitudinal bar or roller located centrally under the  
20 fuel reservoir and projecting above the grate bars at the sides for working or feeding the fuel laterally to the mouths of the combustion chambers at the sides, substantially as shown and described.

25 In witness whereof I hereunto set my hand in the presence of two witnesses.

ISAAC D. SMEAD.

Witnesses:

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WM. A. MILLS.