

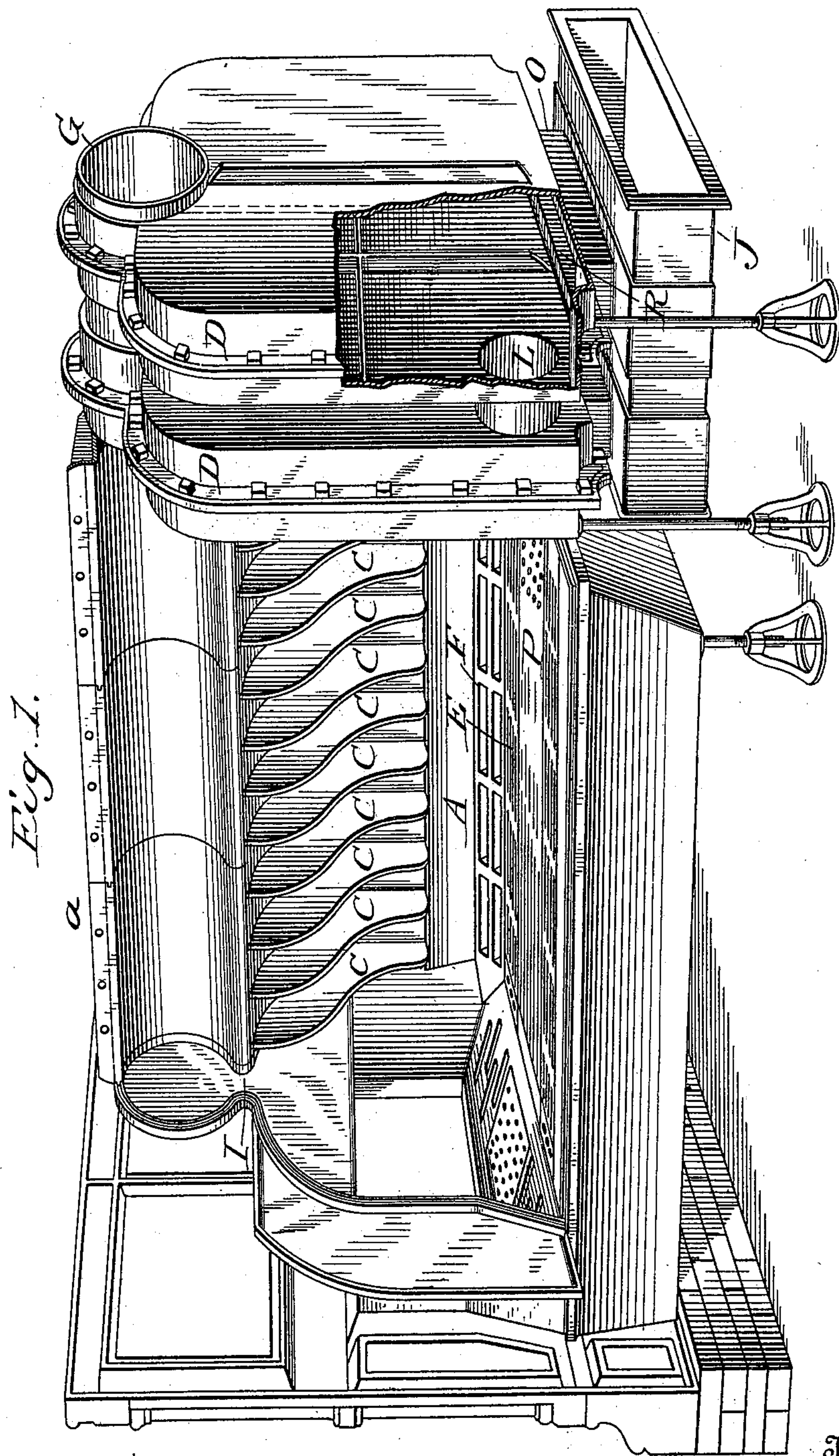
(No Model.)

3 Sheets—Sheet 1.

I. D. SMEAD.
WARM AIR FURNACE.

No. 599,022.

Patented Feb. 15, 1898.



Witnesses
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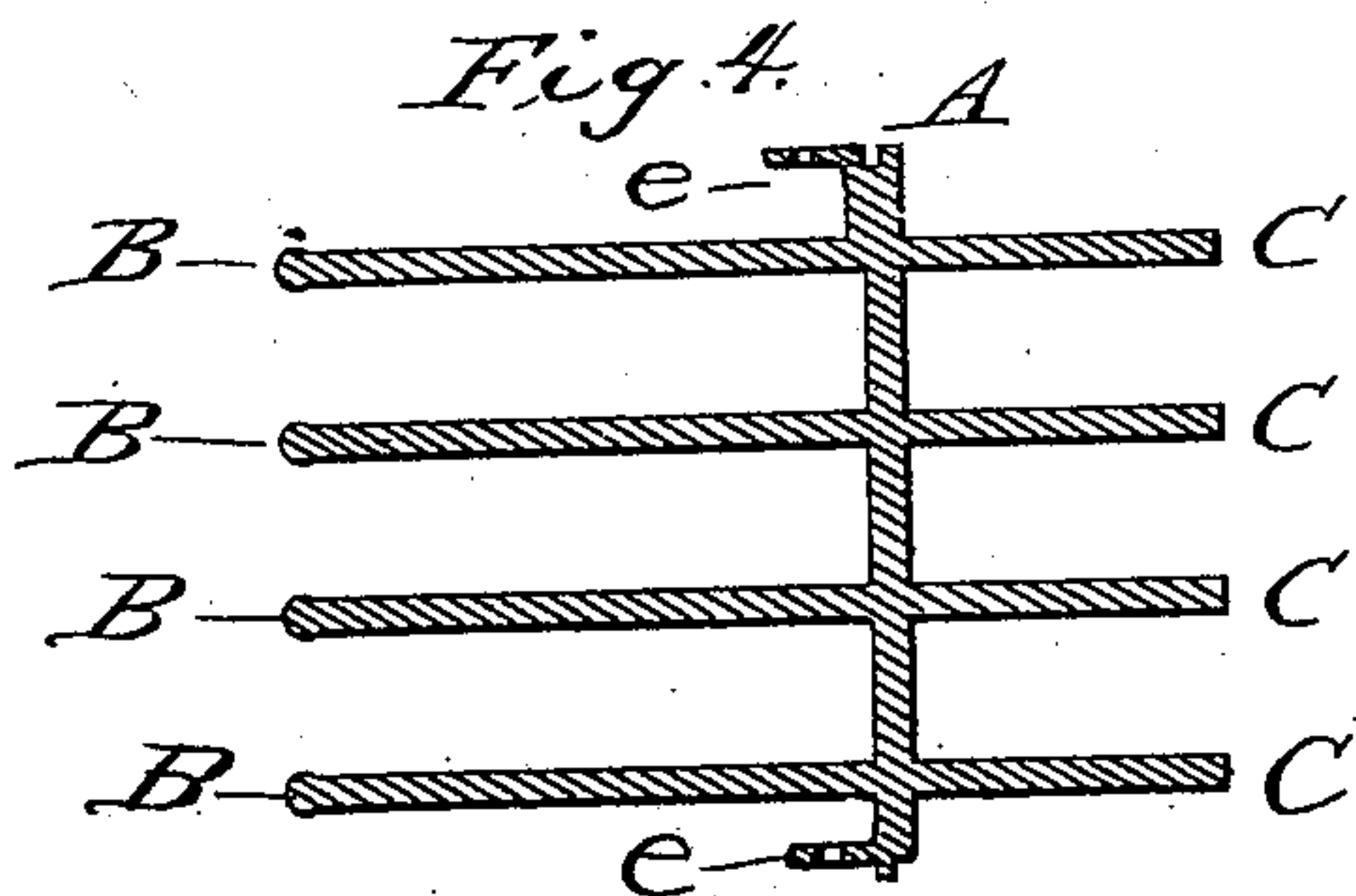
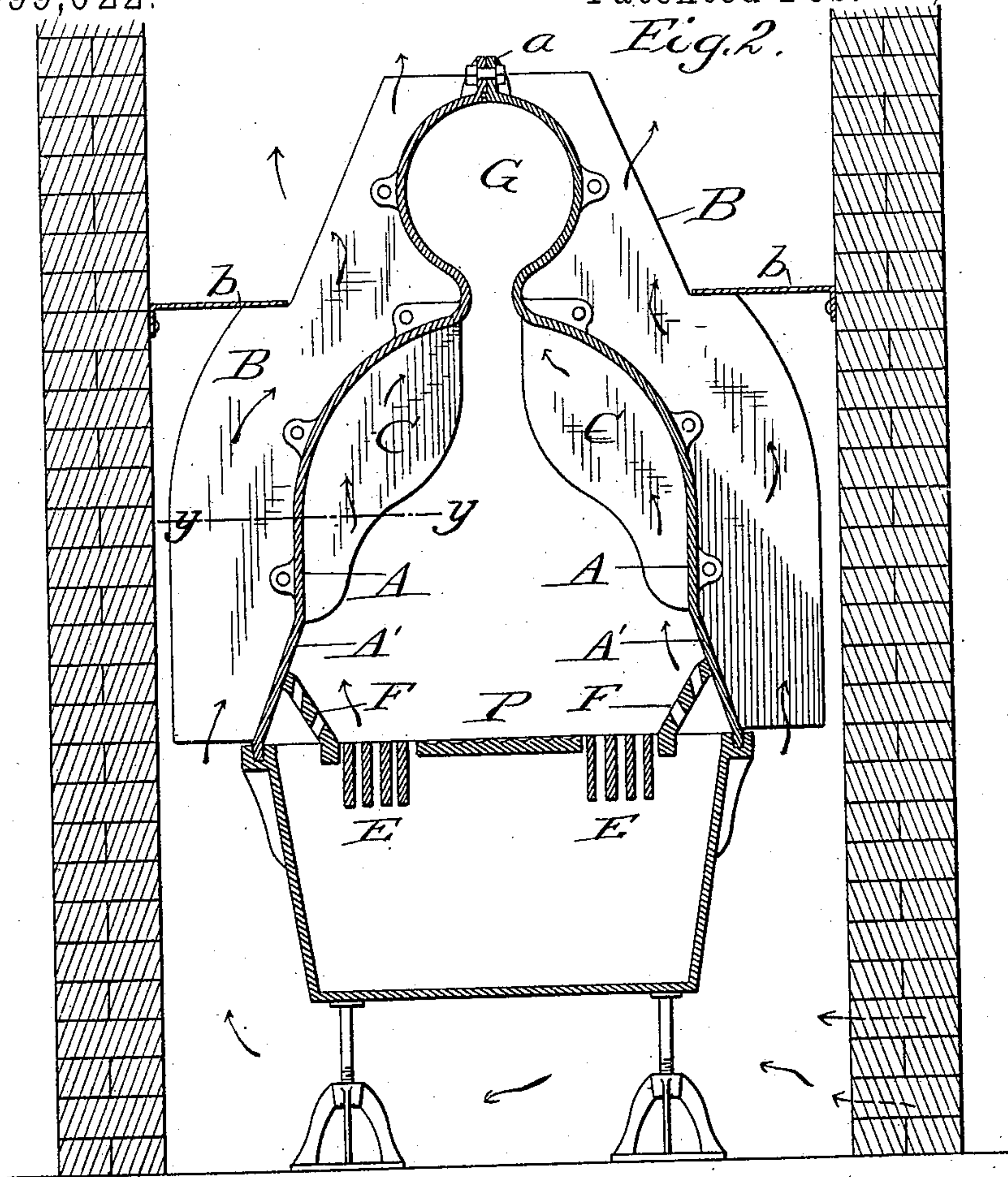
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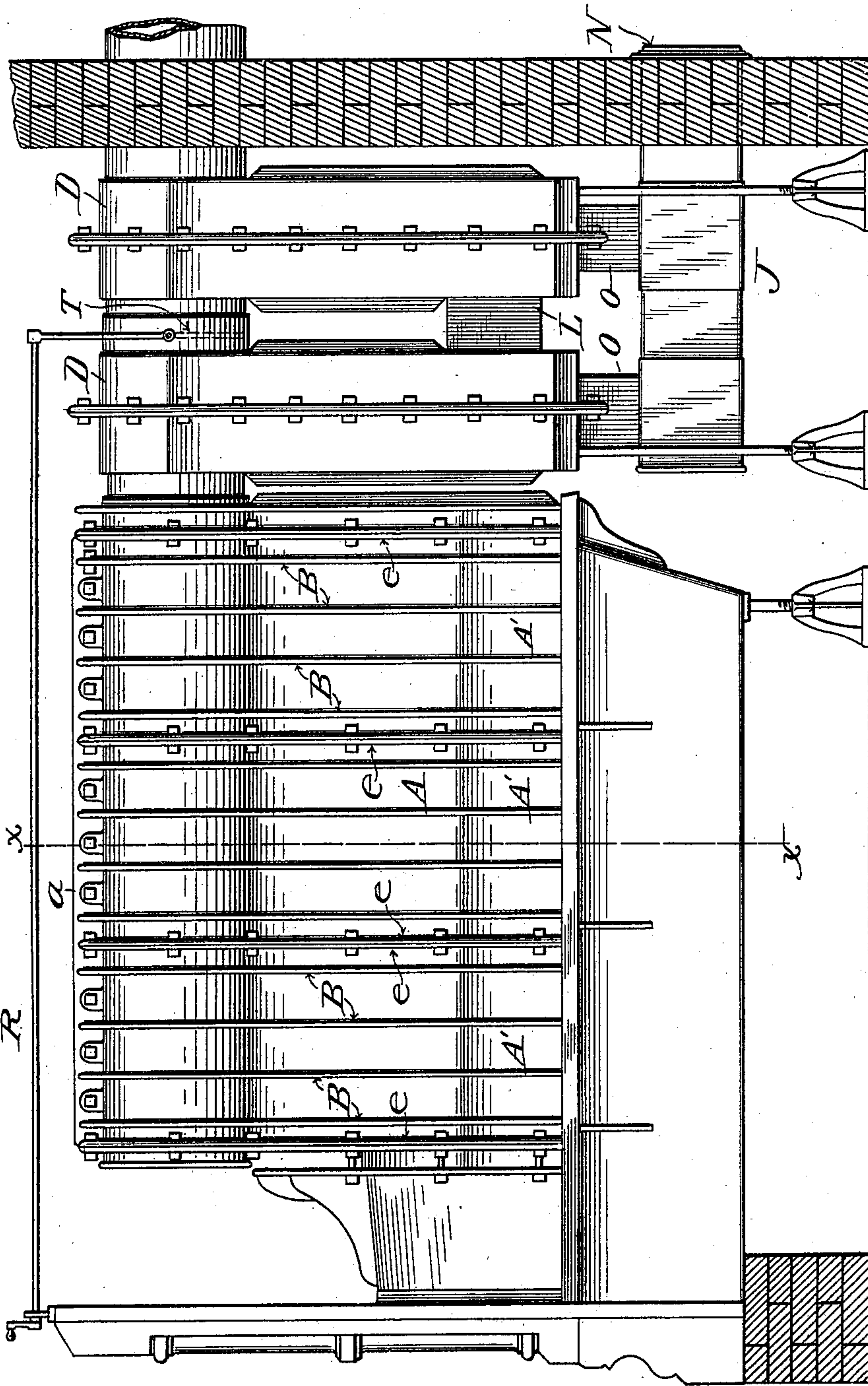
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Fig. 3.



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UNITED STATES PATENT OFFICE.

ISAAC D. SMEAD, OF TOLEDO, OHIO, ASSIGNOR TO THE SMEAD FURNACE AND FOUNDRY COMPANY, OF SAME PLACE.

WARM-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 599,022, dated February 15, 1898.

Application filed June 28, 1897. Serial No. 642,706. (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
5 invented certain new and useful Improvements in Warm-Air Furnaces, of which the following is a specification.

My invention relates to furnaces of that class used for heating large buildings—such
10 as school-houses, churches, court-houses, and the like; and the invention consists in constructing the body of the furnace of plates having both interior and exterior heat-conducting flanges, in so constructing and ar-
15 ranging the interior flanges as to form a series of vertical flues for the heat and smoke, in providing a smoke-flue along the top of the body and connecting the same with the vertical flues and the fire-chamber by a nar-
20 row opening or throat, and in a peculiar construction of the grate whereby the fire is made to burn at the sides of the fire-box, and in certain other details, all as hereinafter set forth.

Figure 1 is a perspective view of the fur-
25 nace, looking from the rear and having one side broken away to show the interior. Fig. 2 is a transverse vertical section on the line $x x$ of Fig. 3. Fig. 3 is a side elevation, and Fig. 4 a transverse section on the line $y y$ of
30 Fig. 2.

The object of this invention is to produce a furnace which shall more effectually convey the heat produced by the consumption of the fuel to the exterior and thereby more ef-
35 fectually utilize the fuel consumed.

To construct a furnace on my plan, I form the body of a series of plates A of the form shown in Fig. 2, and which plates have very wide flanges B projecting from their exterior
40 faces at right angles, and also a corresponding series of flanges C projecting at right angles from their interior faces, as shown in Figs. 2 and 4.

As shown in Fig. 4, the exterior and inte-
45 rior flanges are directly opposite each other, thus making them, as it were, continuous, whereby the heat taken up by the interior flanges is more effectually conveyed to the exterior.

50 The exterior flanges B preferably extend from the top of the smoke-flue G down to the

bottom of the walls of the fire-box, while the interior flanges C extend from the throat of the smoke-flue down about two-thirds or three-fourths of the way to a point where the
55 side walls A' begin to incline outward, as shown in Fig. 2.

The side plates A are curved inward to form an arched top to the fire-box, but instead of meeting at the center of the top they are so
60 formed as to leave a narrow space or throat I at that point, and above which they are curved in a semicircular form, so that when the plates forming the walls of the two sides of the fire-box are placed in position and
65 united the two semicircular portions at the top form a continuous circular smoke-flue G, which is connected to the chamber of the fire-box by a continuous narrow opening or throat I, as shown in Figs. 1 and 2.
70

The plates A are provided with narrower flanges e at their edges, by which they are bolted together, as shown in Figs. 3 and 4, and they are also provided with a longitudinal flange a at the top for the same purpose,
75 as shown in Figs. 1, 2, and 3.

The plates A, which form the side walls of the furnace, are inclined outward from a point some distance above the point where
80 the side grates rest against them to the termination of said plates below the grate, as shown in Fig. 2. The result of this construction is that the ashes tend to fall away from the sides instead of banking up against the
85 side walls, as is usually the case, and a free open space is left below the side grates, through which the ashes fall and through which the air passes at the sides, where the combustion takes place. By this construction and the use of the inclined side grates the
90 latter are rendered practically self-cleaning, thereby affording greater facility for the entrance of the air close to the side walls, where it is desired to produce the greatest heat.

At the rear of the furnace-body proper I
95 locate two radiating drums D, each composed of two cast-iron sections united at their center externally by flanges and bolts, as shown clearly in Figs. 1 and 3. The bottom wall of these drums is provided with a large central
100 opening R, toward which the bottom wall inclines at the sides, as shown in Fig. 1, so that

the soot and ashes which enter these drums will find a ready exit at the bottom. Underneath these drums and connected thereto by collars or tubes O, I locate a longitudinal receptacle J, the rear end of which is extended far enough to project through the wall of the furnace, as shown in Fig. 3, from which the accumulation of soot and ashes can be removed whenever desired, it being provided with a door N at its outer end for closing the same. At the top these drums are connected to the smoke-flue G by a suitable collar and to each other by collars and a short section of pipe, while near their bottom they are connected by two short pipes L, as shown in Fig. 1.

In the pipe which connects the drums at the top is secured a valve or damper T to be operated by a rod R, extending to the front of the furnace, so that when the damper is turned to a horizontal position it opens the direct draft through the top of the drums, but when closed the current passes downward in the first drum and from thence upward through the second drum and thence out through the smoke-pipe at the rear.

In order to cause the fuel to burn at the sides only, I make the grate in two separate sections with a dead-plate P between them, as shown in Figs. 1 and 2. Each section of the grate is composed of two parts, the one part E consisting of a series of bars which are arranged in a horizontal plane with their upper surface on a level with the dead-plate P, as clearly shown in Fig. 2, while the other section F is set inclined at an angle of about forty-five degrees, more or less, as is also shown in Fig. 2. These grate-bars and the dead-plate extend from front to rear of the fire-box or body of the furnace, as shown in Fig. 1, though it is not absolutely necessary that they extend the entire length, but I prefer to so make them.

While I prefer to use the inclined side grates F, as they tend to throw the ashes away from the side walls and admit air at a higher point at the sides, it is obvious that the flat grates may be extended outward to the side walls and the inclined grates be thereby dispensed with and still keep the fire at the sides in close contact with the side walls, the operation being similar in principle or effect and differing only in degree. I, however, consider the use of the inclined grates as preferable for the reasons stated.

For the purpose of admitting more air at or near the rear end to mingle with and more effectually consume the gases I prefer to make the dead-plate P with perforations in its rear portion, as represented in Fig. 1, though it may be made imperforate, if preferred. Whether the perforated or imperforate dead-plate be used will depend upon the kind of coal or fuel that is to be used in the furnace. The result of this construction is that the fire is produced in two sheets, one along each side, and the flame and smoke arising therefrom instead of passing backward along the center of the

fire-chamber, as in ordinary box-furnaces, passes upward in the flues formed by the interior flanges C to the throat I at the top, as indicated by the arrows in Fig. 2, and thence into and through the smoke-flue G to the drums at the rear.

By the arrangement of the wide dead-plate at the center and the narrow grates at the sides it will be seen that the air to support combustion is delivered at each side in the form of a sheet extending from front to rear and that consequently the combustion of the fuel occurs at the sides and at the base of the vertical flues formed by the inwardly-projecting flanges, the products of combustion passing directly upward in these flues, through the throat I, and into the smoke-pipe G and thence backward through the drums D D. The fuel on the dead-plate at the center does not burn, but is coked by the heat of the burning fuel at the sides, the gases given off by the coking of the same mingling with the heat and air at the sides and being thereby thoroughly consumed. When it becomes necessary to replenish the fuel, the mass of coked fuel on the dead-plate is broken up and shoved over onto the grates at the sides, after which fresh coal is again piled up on the dead-plate to go through the coking process, and thus there is a continuous process of first coking the fresh coal and then burning the fuel that has been coked, and which gives far better results than the ordinary method of burning the fresh fuel on a grate extending across the entire chamber. By this means the heat is brought more effectually into contact with the side walls and the interior flanges C, which conduct it directly to the outer flanges B. It will be seen, therefore, that not only are the side walls more effectually heated, and consequently radiate more heat, but that the outer flanges B are also more effectually heated, and these flanges, being of unusual extent and width, add immensely to the extent of the heat-radiating surface.

In setting these furnaces they are inclosed with brick walls, as represented in Fig. 2, and by placing a plate b at each side near the top, as there shown, it will be seen that the air which enters at any suitable or convenient point at the bottom (usually through a series of openings in the brick wall along the whole length of one side) is compelled to pass upward between the flanges B, as indicated by the arrows in Fig. 2, and is thus distributed equally the entire length of the furnace and on both sides.

As the body is composed of a series of plates of uniform shape and size, it will be seen that the fire-box may be made longer or shorter, and thus the size of the furnace be varied at will to suit different-sized buildings. They are composed wholly of cast-iron, and as the largest size weighs about seven thousand pounds it will be seen that with this peculiar construction their heating capacity is very great. Experiment has demonstrated that

they are far superior in that respect to the furnaces heretofore patented and used by me.

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

5 1. A furnace-body provided with a longitudinal heat and smoke flue along its top, said flue communicating with the fire box or chamber by a narrow opening or slot, substantially as shown and described.

10 2. The combination in a furnace, of the side walls provided with inwardly-projecting vertical flanges C and the longitudinal flue G at the top communicating with the fire box or chamber by a narrow opening or slot, all arranged to operate substantially as and for the purpose set forth.

20 3. A furnace-body composed of a series of sections, each provided with one or more internal vertical flanges C, one or more external vertical flanges B, and terminating at the top in a semicircular plate of the full width of the segment, substantially as shown and described.

25 4. The combination in a furnace, of a central dead-plate, and a grate at each side thereof, with a fire-box having the lower portion of its walls adjoining the grates inclined outward and downward substantially as shown and described, whereby the ashes are caused
30 to fall away from the inclined side walls, and

an unobstructed space for the passage of the air is left at the sides, as set forth.

5. The combination in a furnace, of a fire-box provided at its sides with a series of vertical flues formed by inwardly-projecting
35 flanges, said flues communicating at their upper end with a horizontal heat and smoke flue G, and a separate narrow grate along each side below said internal flues with a dead-plate between said grates substantially as shown,
40 whereby the fire is confined to the sides and the products of combustion are caused to pass directly upward through said flues and into the horizontal flue at the top, as set forth.

6. In combination, the elongated furnace-
45 body provided at its top with a heat and smoke flue G communicating with said body, the vertical drums D, D, connected to said body by an extension of the flue G and to each other by pipes L, and a horizontal dust-receptacle
50 J beneath said drums and communicating therewith, with a door at its outer end, all constructed and arranged substantially as shown and described.

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

ISAAC D. SMEAD.

Witnesses:

L. A. WILLOUGHBY,
ANTHONY KUEFER.