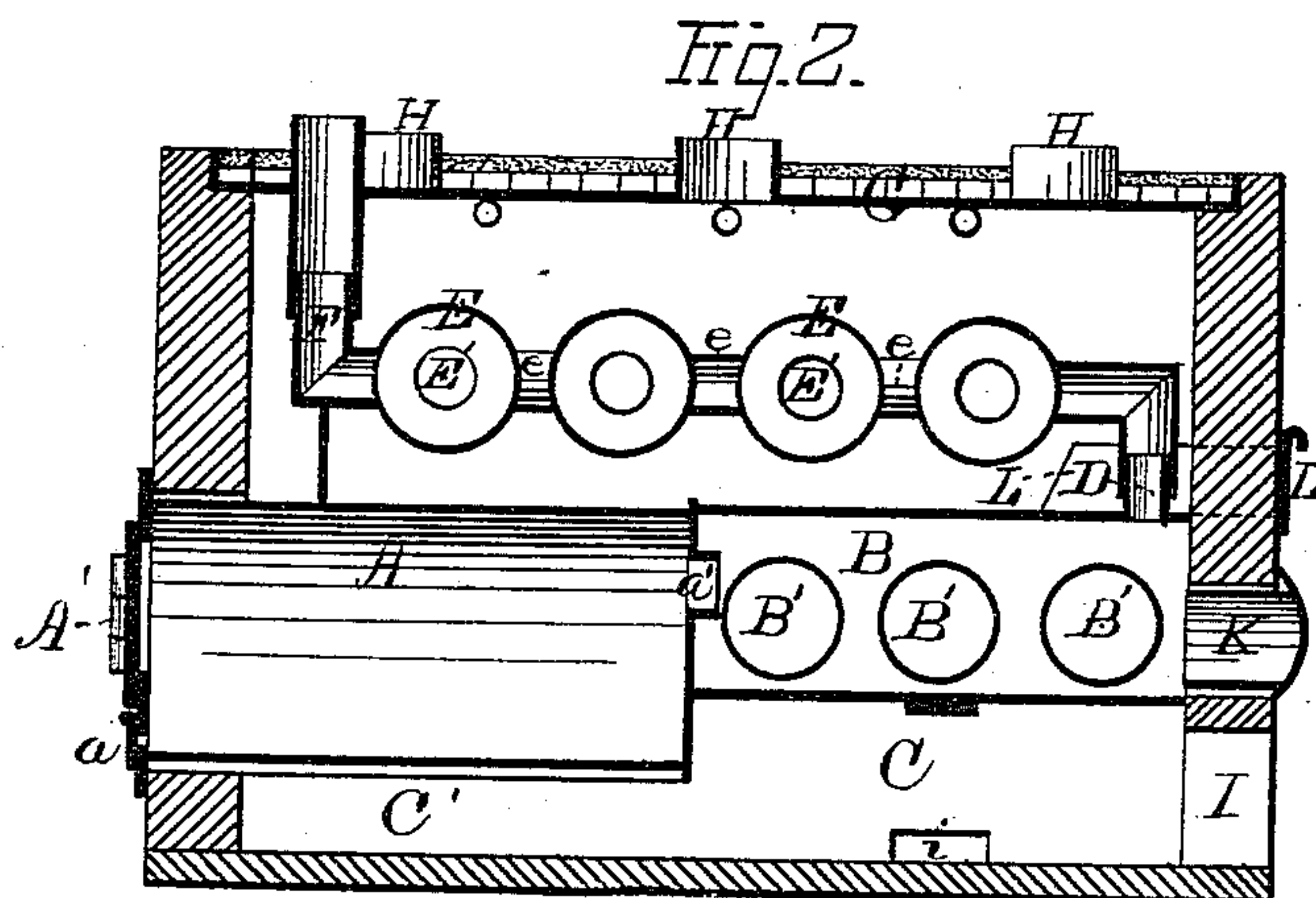
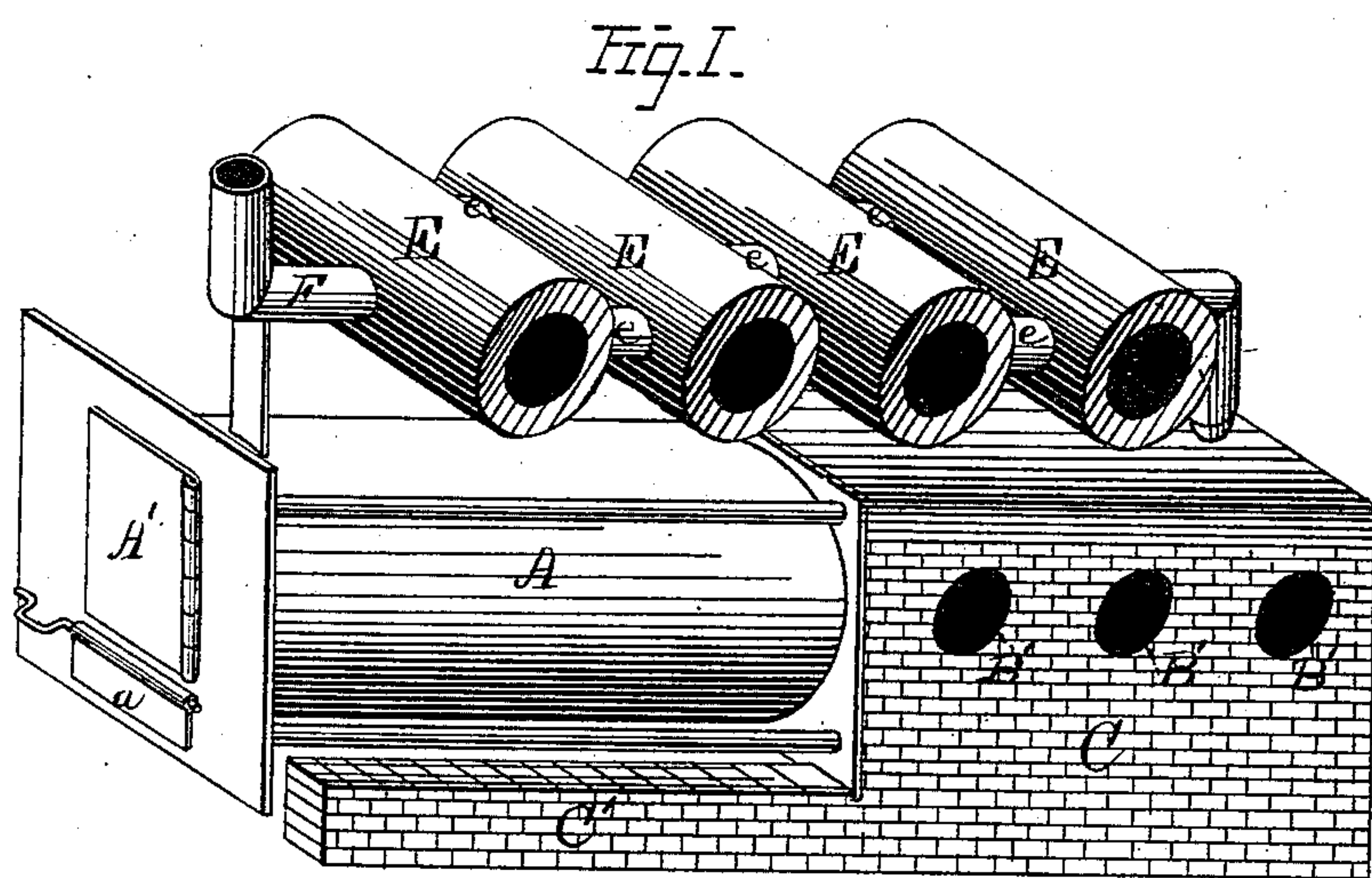


M. GATES.
Hot-Air Furnaces.

No. 148,690.

Patented March 17, 1874.



WITNESSES=

Jas. C. Hutchinson
 H. L. Hazard.

INVENTOR.

Marshall Gates, by
 Orindle and Beane, his Attys.

UNITED STATES PATENT OFFICE.

MARSHALL GATES, OF OWATONNA, MINNESOTA.

IMPROVEMENT IN HOT-AIR FURNACES.

Specification forming part of Letters Patent No. 148,696, dated March 17, 1874; application filed February 9, 1874.

To all whom it may concern:

Be it known that I, MARSHALL GATES, of Owatonna, in the county of Steele and in the State of Minnesota, have invented certain new and useful Improvements in Hot-Air Furnaces; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my apparatus with the casing removed, and Fig. 2 is a vertical central section on a line extending from front to rear.

Letters of like name and kind refer to like parts in each figure.

The present invention has for its object the construction and arrangement of a hot-air furnace in such a manner that the largest per cent. of heat from the products of combustion shall be utilized for warming the apartments of the house in which the furnace is used; and it consists in combining with the fire-chamber a supplementary chamber of combustion and drums, in and through which are passages for the radiation and circulation of heat and air, and all so arranged that the products of combustion shall be compelled to traverse the length of the furnace at least twice before it escapes into the chimney; and in so constructing the furnace that an air chamber or space is provided under nearly the entire lower parts thereof, whereby the heat is radiated freely from these parts of the furnace, and, by means of suitable passages in and from said chamber, caused to circulate and escape readily into the main hot-air chamber of the furnace.

In the drawing, A designates the fire-chamber. This is usually made of boiler-iron, and has cast-iron heads, the front one of which is fixed to and upon the outer front wall by suitable flanges, and the rear one is set firmly against the walls of the supplemental combustion-chamber B. A' is the furnace-door; a, the draft-openings; a', the smoke-exit into the supplemental chamber of combustion B. This chamber is usually inclosed at its sides by brick walls. These are built up from the bottom of the furnace, and the space C beneath the said supplemental chamber constitutes an air-chamber, the purpose of which will be hereinafter more fully described. The rear

wall of the furnace and the rear end of the fire-chamber close this air-chamber at the two ends. Transversely through these walls, and through said chamber, are air-pipes B'. In the top of said chamber, which is usually made of sheet-iron, and at the part of the chamber nearly the remotest from the point at which the products of combustion enter it, is the exit-pipe D. This has an elbow, which connects said chamber with the drum E at a point about equidistant from its ends. Said drum is an annulus, and the opening E' constitutes an opening or aperture for the radiation of heat from the inner periphery of the annulus, and for the circulation of air. On the side of this drum opposite to that in which the pipe D enters, and near the ends, are two pipes, e e. These enter the second drum, E', which is constructed in like manner as the drum E, and connected with the next by a single pipe, e'. In the drawing, I have shown four of these drums thus made and arranged and connected; but it is evident that I can use as few or as many of them as I choose, the object being to make the longest possible passage for the flow of the products of combustion, and afford the greatest surface for the radiation of heat. These drums are arranged horizontally, and usually fill the distance between the rear and front wall of the furnace-casing, extending entirely over the supplemental chamber of combustion and the fire-chamber, but placed so far above them as to allow a circulation of air and a free radiation of heat from the outer surface of all these parts. Ordinarily, I so arrange these drums that the pipe F, issuing from the last, comes from a point near the center, like as the pipe D entered the first drum. This pipe has suitable provision, by elbows or connections, to lead it through the top G of the furnace. This top I usually construct of sheet metal, and fit it at its edges upon rabbets in the top of the furnace-walls, so that it is sufficiently below the upper edges of these walls to allow a layer of bricks to be placed upon it. These bricks cover the entire surface, excepting in the places where apertures or thimbles H are provided for the reception of the pipes which convey the hot air to the various apartments to be heated. These bricks serve to prevent, in a

good measure, the radiation of heat from this top, and to insure, in a greater degree, this non-radiation of heat, I sometimes strew sand freely over the top of the bricks. I can also use rods or bars, extending them from side to side, as further supports for this sheet-metal top.

For the purpose of cleaning out the furnace or admitting air into the heating-chamber, I have provided a door in one of the walls. There may also be another door over the aperture I in the rear wall. This aperture serves to admit air into the chamber C beneath the supplemental chamber of combustion, and the space C' beneath the fire-chamber. This latter space is merely a continuation and contraction of chamber C. The air becomes considerably heated here, and then escapes into the main heating-chamber through apertures i, which are placed at convenient points on each side near the floor. By means of these chambers and this circulation of air, I am able to insure a better and more complete radiation of heat from the under parts of the furnace proper, and to utilize a portion of the heating power which is ordinarily wasted. K is a clean-out aperture in the rear of the supplemental chamber of combustion. L is a water-pan, which is designed to be pushed in or pulled out through a suitable aperture in the wall of the furnace, and, when thus set in place, rests upon the top of the supplemental chamber of combustion. This water-pan may have a handle, or be provided with any suitable means for moving it back and forth.

In the drawing, I have made no special provision for dampers, but I design to have them placed at such points in the pipes a', D, and F as may best answer the purposes of checking the draft, according to the particular needs of the location in which the furnace is placed. In some instances the draft may be so great as to render more dampers necessary than in others. I wish to put them in or leave them out, as may be best, according to the condition of the individual use of the furnace. The device, as thus made and arranged, is chiefly used for burning wood.

By the peculiar arrangement of the parts of my device, the smoke and escaping products of combustion are caused to make a long and most circuitous passage after leaving the fire-chamber before they finally go off at the outlet-pipe; and, in their course, they pass over so great an extent of radiating-surface—to wit, in the first instance, in the chamber B, and then in the drums E E', &c., with all their connecting-pipes—that they give out a very large proportion of their heat.

The construction of this furnace is such that it can be forced to its maximum heating capacity in the shortest time, since the material of which it is chiefly constructed is thin metal, and this high state of combustion can be maintained without the least inconvenience; and, on the other hand, the furnace can be run or combustion maintained at a very low degree of temperature. Thus, in the extreme cold weather of our more northern states, this device is admirably adapted for use during the entire period when a heater is needed. It can be used with the minimum of fuel in the cool days of fall and spring, or with the maximum when the rigors of the winter set in.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. In a hot-air furnace, substantially as described, the fire-chamber A, supplemental combustion-chamber B, air-pipes B', and drums E E', &c., the several parts being arranged and combined in the manner and by the means set forth.

2. The combination of air-chambers C and C', having air inlet and exit openings, as described, with the fire-chamber A, supplemental combustion-chamber B, air-pipes B', and drums E E', &c., in a hot-air furnace, substantially in the manner and for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 5th day of February, 1874.

MARSHALL GATES.

Witnesses:

GEORGE W. PAYNE,
T. G. PATCH.