(No Model.)

3 Sheets—Sheet 1.

J. E. & J. L. SPENCER.

HOT AIR FURNACE.

No. 486,134. Patented Nov. 15, 1892.

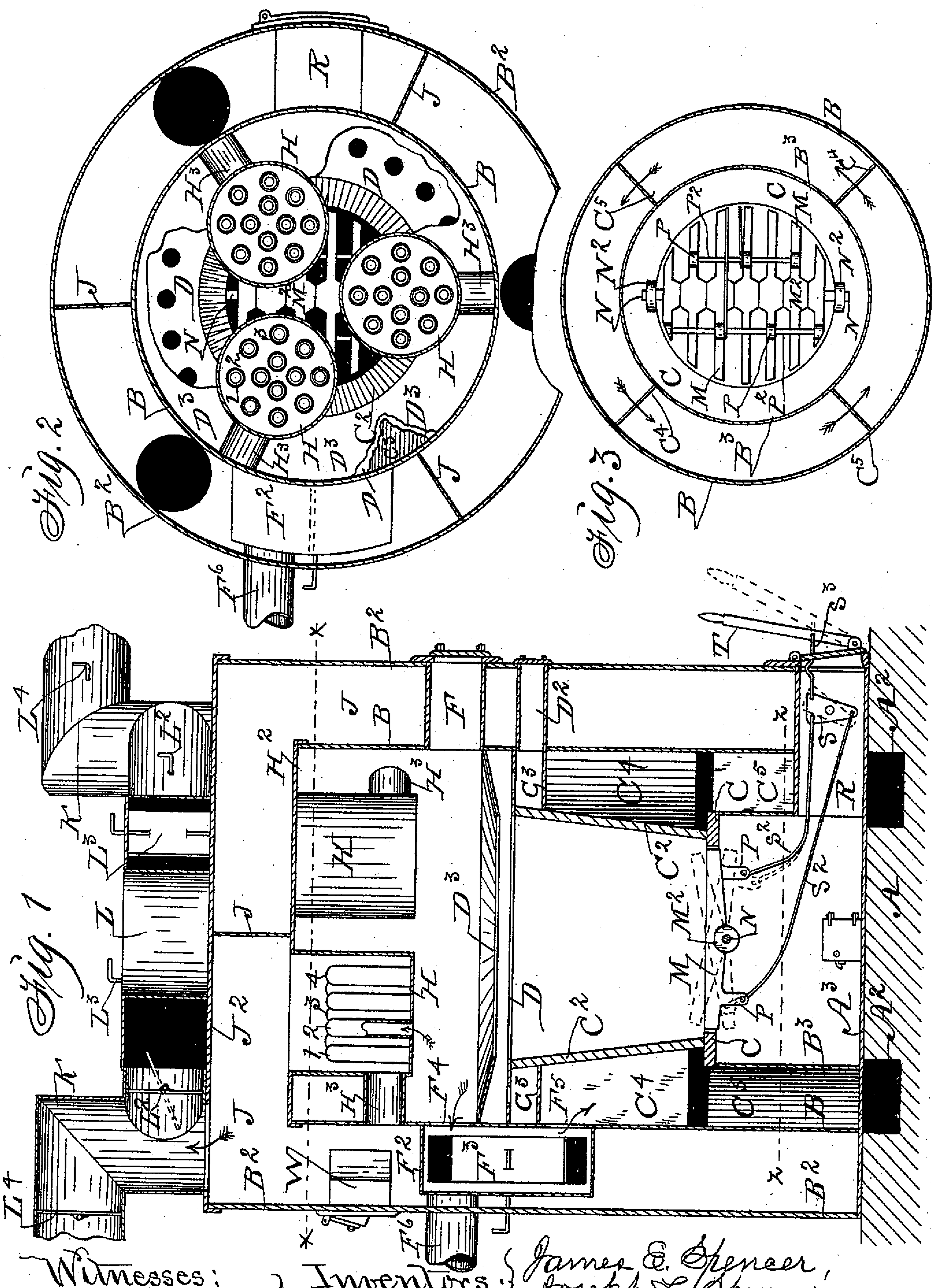

Fig. 2

Fig. 3

Fig. 1

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

3 Sheets—Sheet 2.

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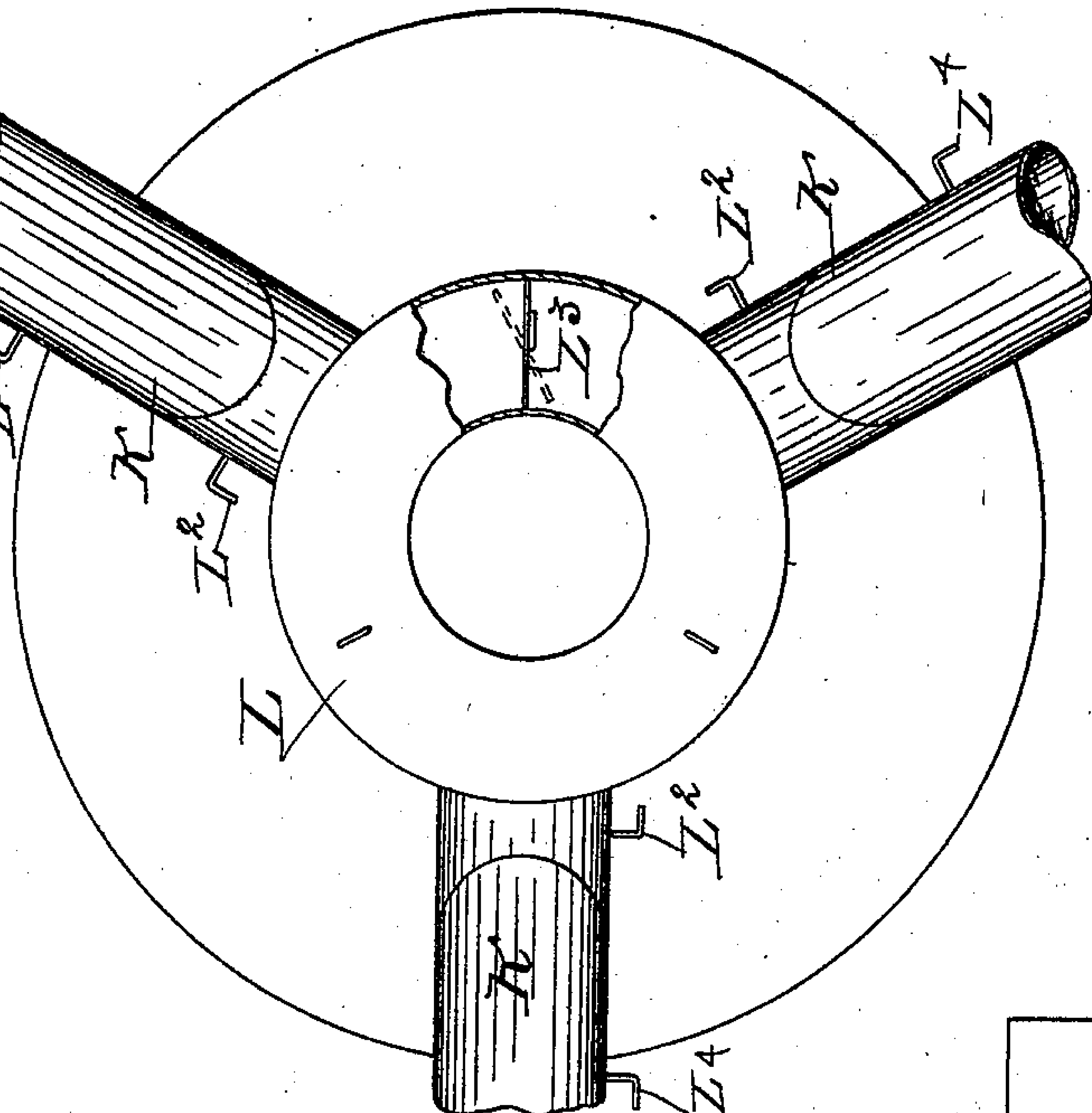

Fig. 5

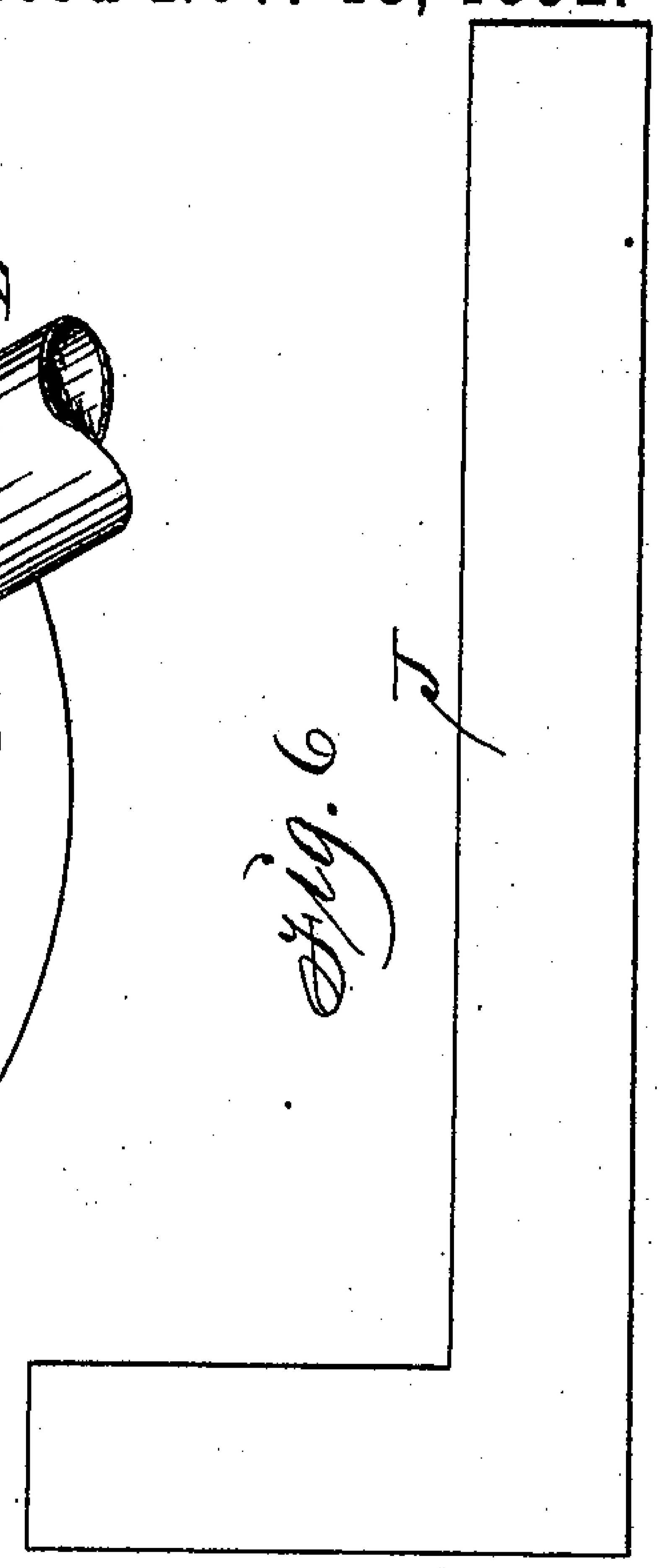

Fig. 6

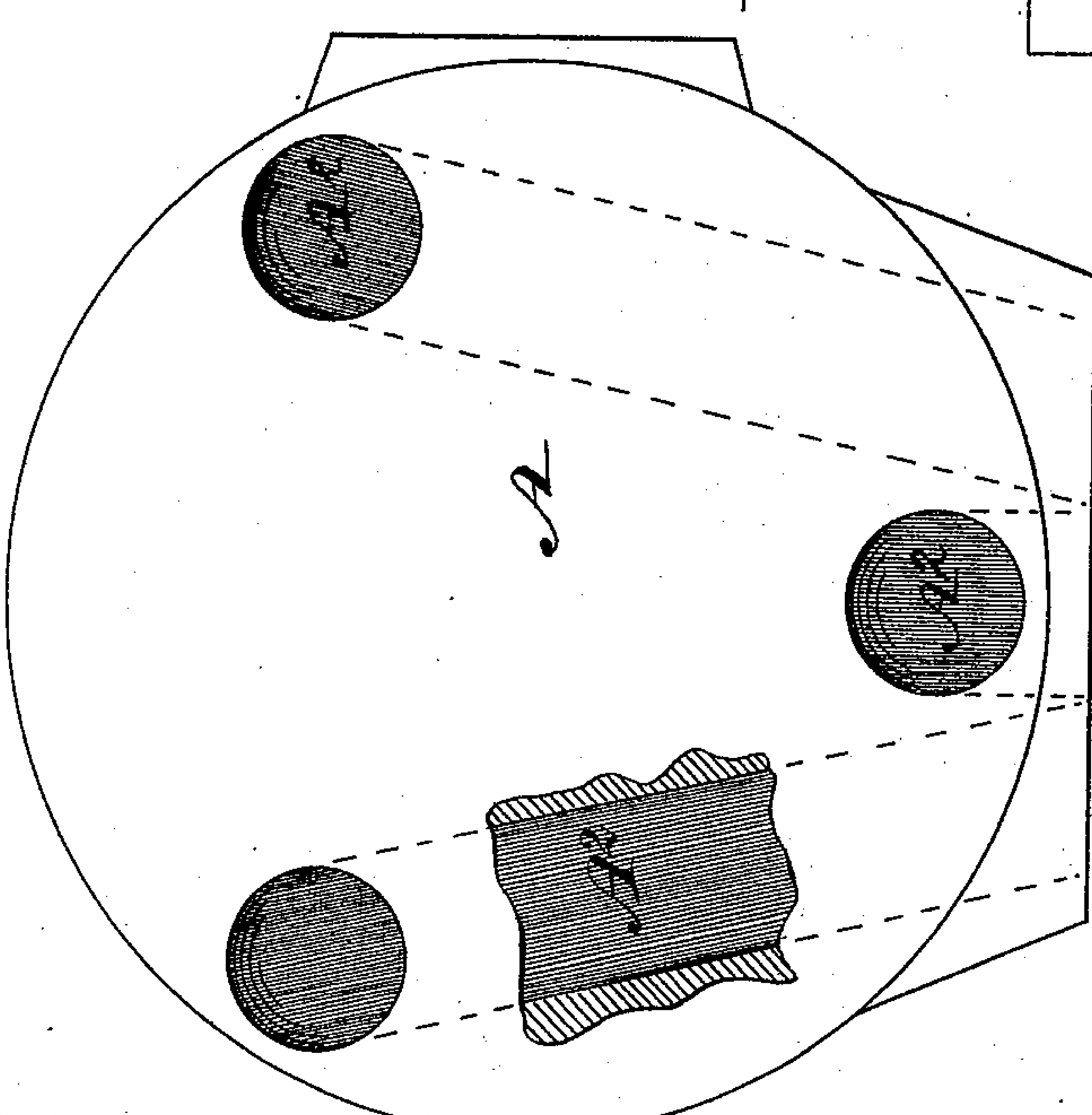

Fig. 4

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 7

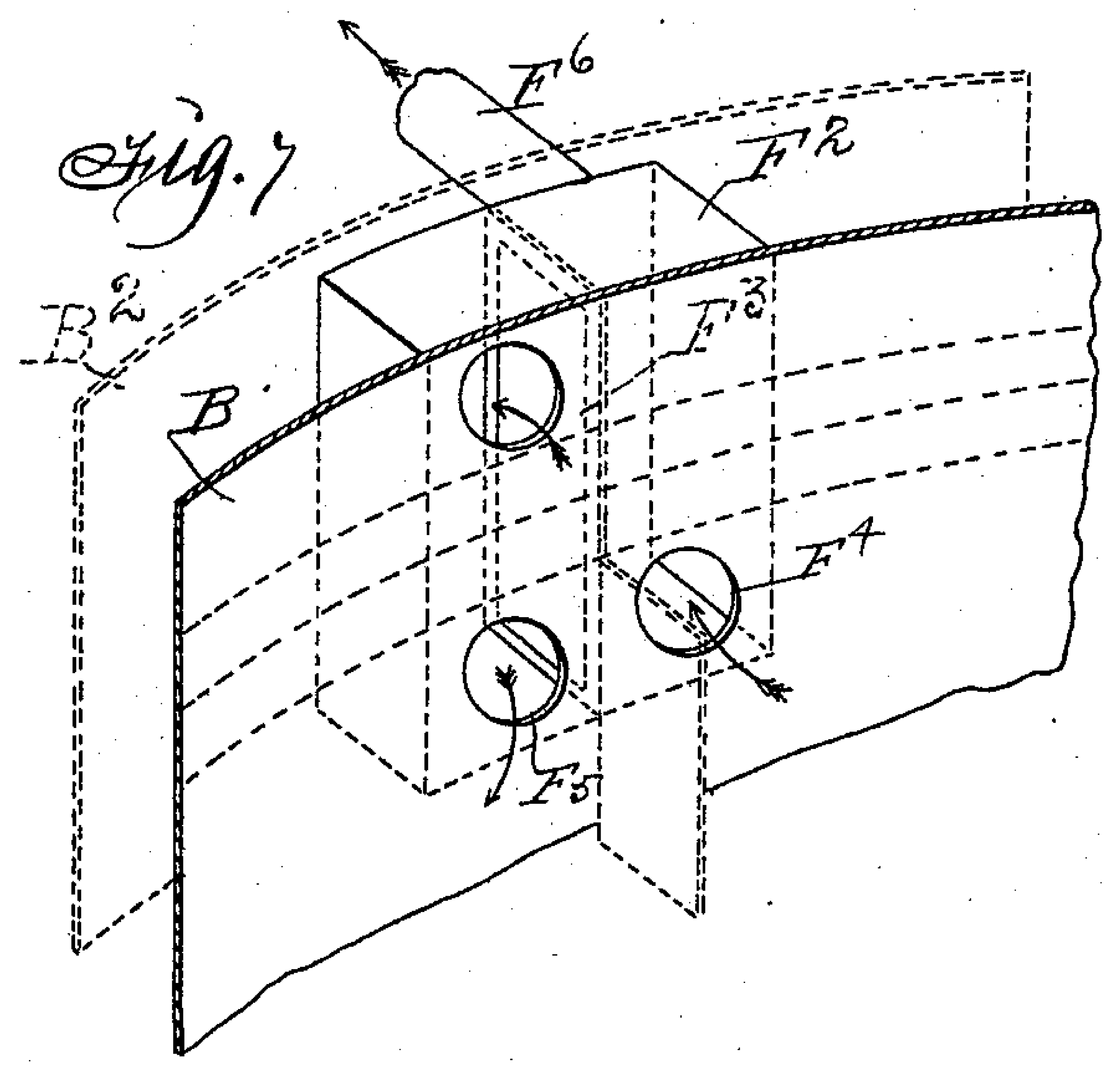
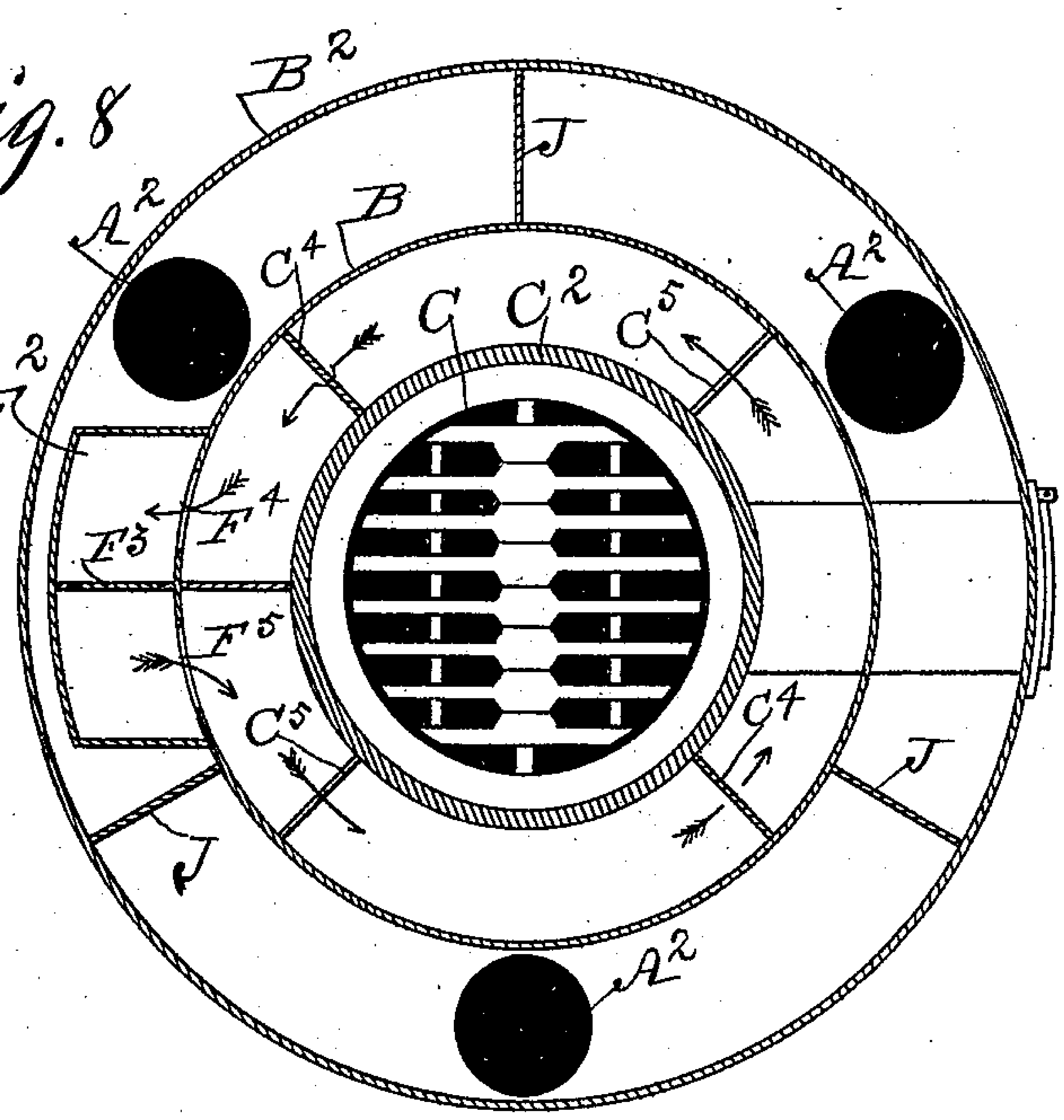


Fig. 8



Witnesses:
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UNITED STATES PATENT OFFICE.

JAMES E. SPENCER AND JOSEPH L. SPENCER, OF DES MOINES, IOWA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 486,134, dated November 15, 1892.

Application filed July 27, 1891. Serial No. 400,835. (No model.)

To all whom it may concern:

Be it known that we, JAMES E. SPENCER and JOSEPH L. SPENCER, citizens of the United States of America, and residents of Des Moines, in the county of Polk and State of Iowa, have invented a new and useful Hot-Air Furnace, of which the following is a specification.

Our object is to provide a metal furnace adapted for generating heat in an economic manner and distributing the heat through any number of apartments, as required, to maintain a uniform temperature in the various rooms or parts of a building, and also specially adapted for concentrating the heat and directing it to any room or portion of a building whenever desired.

Our invention consists in the arrangement and combination of concentric walls, partitions, cold and hot air chambers and flues, radiators, a fire-pot, a fuel-deflector, and grate, as hereinafter set forth, pointed out in the claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional view of the furnace, showing the relative positions of all the parts. Fig. 2 is a transverse sectional view looking downward from the line $x\ x$ in Fig. 1. Parts of the fuel-deflector are broken away to disclose the openings in a circular plate connected with the top of the fire-pot. Fig. 3 is a bottom view of the grate, looking upward from the line $z\ z$ in Fig. 1, to show the partitions in the annular chamber surrounding the fire-pot and their positions relative to the grate and fire-pot. Fig. 4 is a top view of the base of the furnace, showing the passage-ways for cold air. Fig. 5 is a top view of the furnace, showing the annular chamber and hot-air tubes and dampers connected therewith for concentrating or distributing hot air at pleasure. Fig. 6 shows the form of the partitions used to divide the hot-air chamber. Fig. 7 is a perspective view of a chamber through which the products of combustion circulate. Fig. 8 is a horizontal sectional view of Fig. 1, looking downward from a line through the fire-pot and the chamber into which the products of combustion pass before descending and circulating around the fire-pot and chamber below the fire-pot.

A represents the base of the furnace, which may be permanently-fixed mason-work or portable metal castings.

A^2 are cold-air passages adapted to convey air from the outside inward and upward and over heat-radiating surfaces.

B is the inner circular metal wall, and B^2 the outer wall, in concentric position with each other and the base A. B^3 is the wall of the ash-chamber, in concentric position within the inner wall B. These three concentric walls rest upon and are fixed to an auxiliary bottom or base A^3, or they may be placed direct upon the flat top surface of the base A and fastened thereto in any suitable way.

C is a circular frame on the top of the wall B^3 and adapted to support a grate and the fire-pot C^2.

C^3 is a circular plate and air-tight partition between the top portion of the fire-pot and the wall B, and in combination therewith, and the wall B^3, produces a chamber through which the products of combustion can be passed to heat the wall B and by radiation through said wall heat cold air as it ascends between the walls B and B^2.

C^4 are radial partitions between the fire-pot and the wall B, and C^5 are radial partitions between the wall B^3 and the wall B. These partitions cause products of combustion to move up and down in a serpentine course as they pass through the annular chamber that surrounds the fire-box and ash-chamber. The radial partitions C^4 extend upward from the lower portion of the fire-pot at points equidistant from each other and midway between the tops of the radial partitions C^5, that extend downward from the fire-pot. The products of combustion that enter the space between two of the radial partitions C^4, as indicated by an arrow in Fig. 1, pass downward under one of said partitions C^4 and enter the space between two of the radial partitions C^5 and from thence over the top of one of said partitions C^5 into the space between two partitions C^4, and thus continue in a zigzag course around the fire-pot and ash-chamber and then re-enter a chamber, as hereinafter set forth.

D is a perforated circular plate filling the space between the top of the fire-box and the wall B, and, in combination with the fire-box and the wall, produces a cold-air chamber around the top of the fire-box. An open-ended tube D^2, fitted in corresponding openings in the walls B and B^2, conveys air from the outside into the chamber to become heated therein and to escape therefrom through the perforations in the plate D to mingle with the products of combustion at the top of the fire-pot. A door or slide on the outer end of the tube D^2 for opening and closing this cold-air passage serves as a means of regulating the admission of cold air in such quantities as will best promote combustion and prevent the formation of soot and the escape of valuable particles of carbon liberated from fuel in the fire-pot.

D^3 is an annular plate fixed to the inside of the wall B to incline inward over the fire-pot and to serve as a deflector to direct fuel into the fire-pot and also to produce an air-space immediately over the perforated plate D, into which space the heated air will pass from the annular chamber under the plate D and there mingle with the gases rising from the fire-pot to aid in promoting combustion and generating heat.

F is a doorway fixed in openings in the walls B and B^2, through which fuel is passed into the fire-pot.

F^2 is a chamber fixed to the outside of the wall B, and F^3 is a damper in said chamber.

F^4 is an opening in the wall B, through which the products of combustion pass from the chamber above the deflecting-plate D^3 into the chamber F^2.

F^5 is an opening in the plate B, below the plate C^3, through which the products of combustion can pass from the chamber F^2 into the annular chamber surrounding the fire-pot and ash-chamber. When the damper is closed and in a vertical position, as required to divide the chamber F^2 into two parallel compartments, the products of combustion will enter the one compartment at its top and pass out at its bottom and circulate through the annular chamber around the fire-pot and ash-chamber and from thence pass back into the chamber F^2 again through the opening F^4 in the wall B on the other side of the damper and from the chamber F^2 out through the flue F^6. When the damper is open, the products of combustion will pass direct from the combustion-chamber above the plate D^3 through the chamber F^2 and into the escape-flue F^6.

H are radiators suspended from a circular plate H^2 on top of the wall B. Each radiator has a series of tubes 1 2 3, that are open at their bottoms and closed at their tops, fixed in openings in the bottoms of the radiators in such a manner that the heat rising from the fire-pot will enter the tubes and radiate therefrom to heat air admitted into the radiators through open-ended tubes H^3, extending from the wall B. The open tops of the radiators H allow the heated air to ascend into the tops of the hot-air chambers produced by fitting and fixing partitions J between the walls B and B^2 and the plate H^2 and a plate J^2 on the top of the outer wall B^2. At the top of each hot-air chamber is an opening through the wall J^2, communicating with a pipe or hot-air flue K, leading to a room or apartment in a building.

L is an annular chamber on top of the plate J^2 and connected with each one of the flues K in such a manner that communication can be closed between each flue and the chamber by means of a damper L^2, located at the junction of the flue with the chamber. Dampers L^3 in the chamber at points between the flues K can be closed to divide the annular chamber into different compartments for the purpose of concentrating and directing the heat. Dampers L^4 in the flues K aid in concentrating and directing the heat.

W represents a water-reservoir, from which water is evaporated to moisten the air.

When the furnace is in operation and all the dampers L^2, L^3, and L^4 open, the heat will ascend from the different compartments into the annular chamber L and from thence into the flues K, as required, to be uniformly distributed to different parts of a building. By closing all of the dampers excepting the dampers L^2 and L^4, connected with one of the flues K, the heat will be concentrated and directed through that flue to the room or compartment to which it extends. By closing any one of the dampers L^4 and opening the damper L^2, connected with the same flue K, the heat will be prevented from passing through the flue K and allowed to pass through the annular chamber to one or more of the other flues, as may be desired and required, to regulate the distribution of the heated air through the different parts of a building.

We claim as our invention—

1. In a furnace, a hot-air chamber extending vertically between two concentric walls and extending horizontally between a plate on the top of the inner wall, and fixed elbow-shaped partitions extending vertically between the inner and outer wall and horizontally between the plates at the tops of the two walls, said partitions serving to divide the said chamber into a number of compartments, and a hot-air flue connected direct with the top of each compartment, a chamber between said flues having openings communicating therewith, and a damper for each opening for the purpose of conveying an equal quantity of heat through each flue to an equal number of separate rooms in a building or directing the heat to any one of the rooms in the manner set forth, for the purposes stated.

2. An annular chamber on the top of a hot-air furnace, a plurality of flues connected with the said chamber, dampers whereby communication between the flues and chamber may be cut off, dampers located in the said annular chamber at points between the flues, so that heated air may be directed to any one or all of the said flues, and dampers in each

of the said flues to aid in concentrating and directing the heated air, substantially as set forth.

3. A radiator consisting of an open-topped chamber having a series of tubes that are closed at their tops and open at their bottoms fixed in the closed bottom of the chamber to project vertically and open-ended tubes extending outwardly from said open-topped chamber, in combination with the combustion-chamber and hot-air chamber that extends around and over the combustion-chamber in the manner set forth, for the purposes stated.

4. In a hot-air furnace, the combination of the chamber F^2, an opening leading from above the fire-pot into the top of the said chamber, an annular chamber surrounding the fire-pot, an opening leading from the bottom of the chamber F^2 to the said annular chamber and an opening leading from the annular chamber to the chamber F, an escape-flue connected with the chamber F, and a damper within the said chamber whereby the products of combustion may be directed through the said annular chamber or directly to the flue, substantially as set forth.

5. An improved hot-air furnace adapted to concentrate and direct heat to a single room or compartment in a building or divide and direct a uniform quantity to each one of a number of rooms or compartments, comprising three concentric walls B, B^2, and B^3, a base having a number of air-passages A^2, a fire-pot supported at the top of the inner wall B^3, plates D and C^3 at the top portion of the fire-pot to produce an annular air-chamber, a deflector D^3 above the fire-pot, a chamber F^2, having a damper F^3, having communication with the combustion-chamber at a point above the fire-pot and also at a point below the plate C^3, radiators H, suspended in the top of the combination-chamber, partitions J between the walls B and B^2, flues K at the top of the furnace, and an annular chamber L and dampers L^2, L^3, and L^4, arranged and combined to operate in the manner set forth.

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