(No Model.) 2 Sheets—Sheet 1.

J. W. CONNERY.

HOT AIR FURNACE.

No. 458,519. Patented Aug. 25, 1891.

Fig. 2.

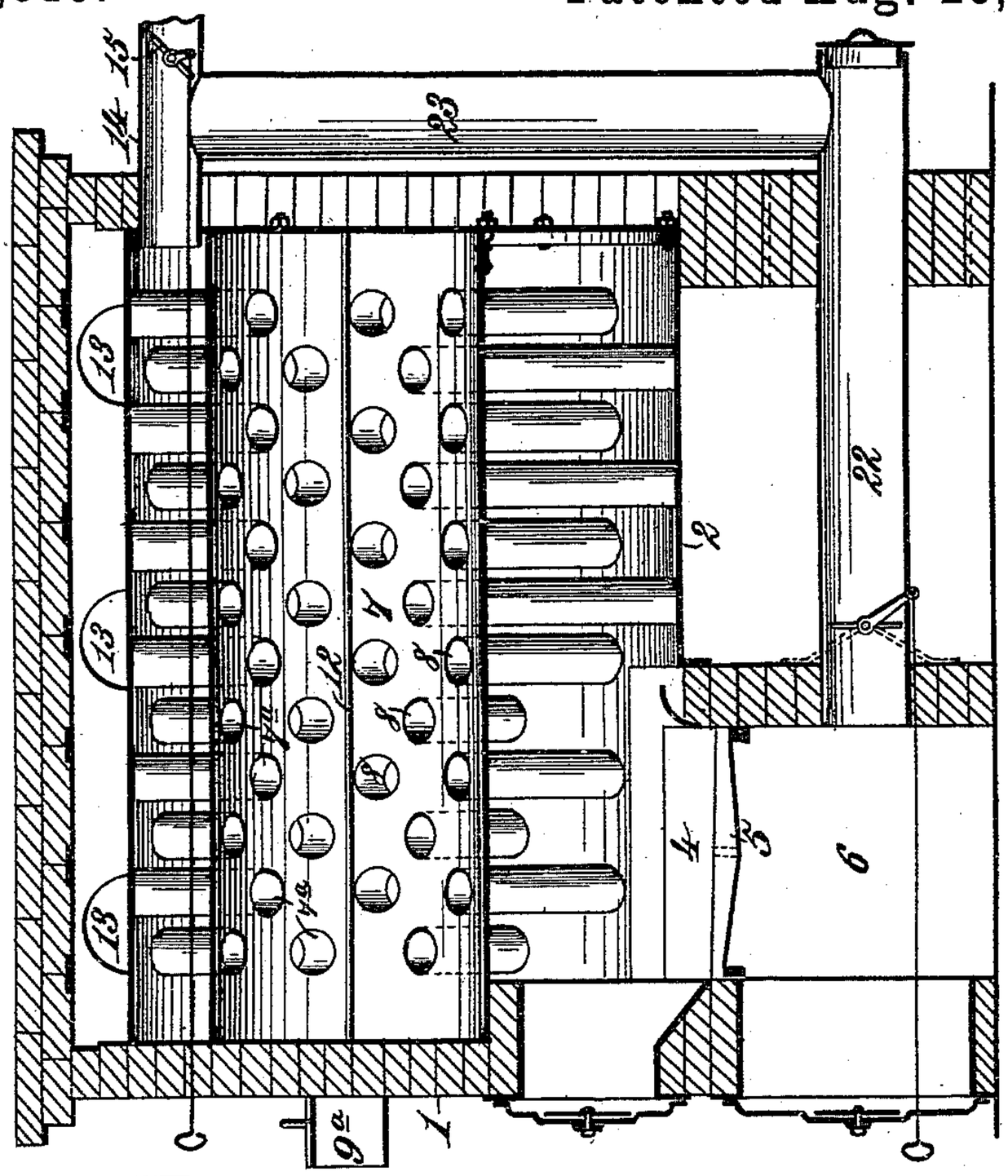
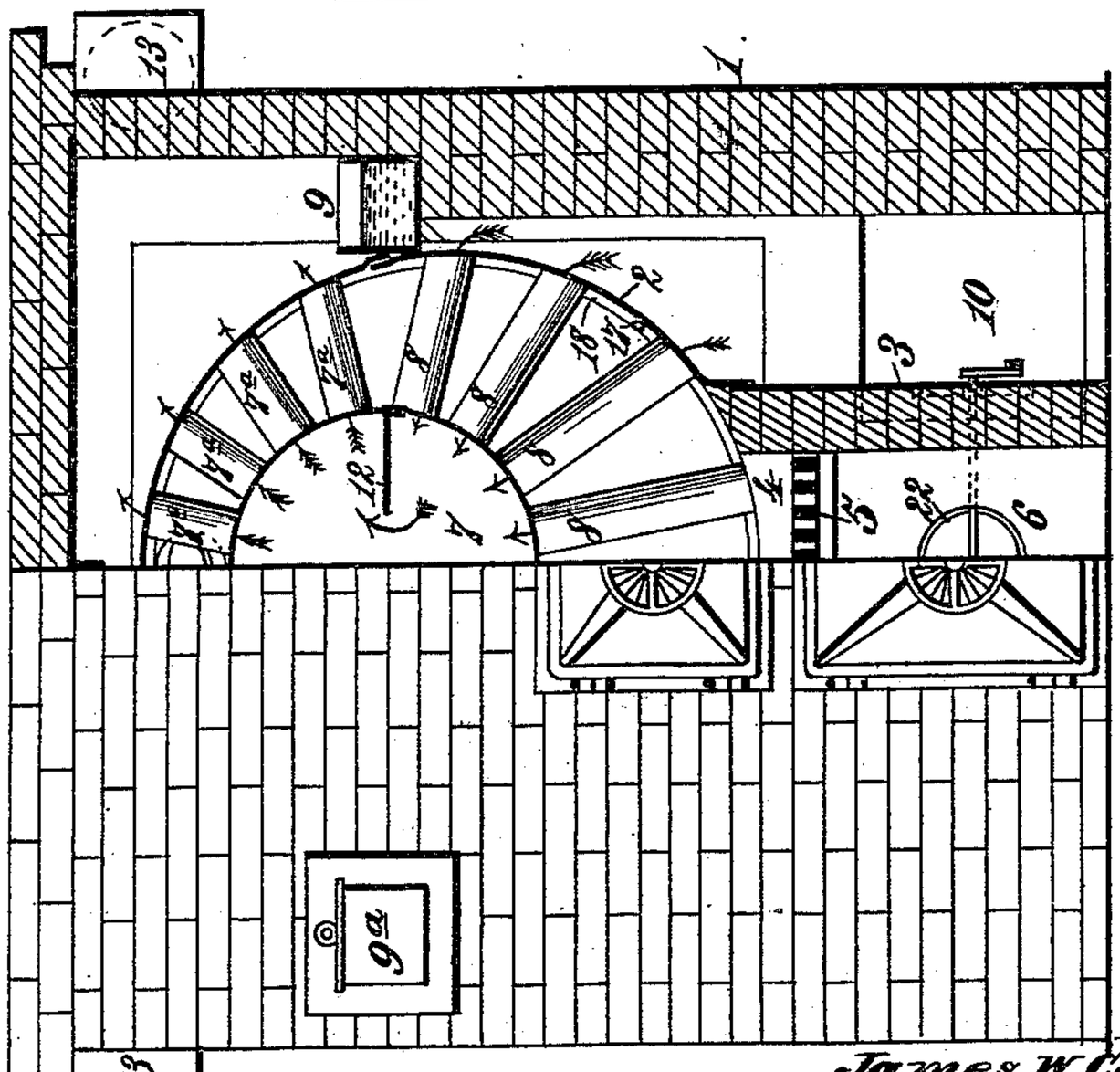


Fig. 1.



Witnesses.
Robt Everett.
J. A. Rutherford.

Inventor.
James W. Connery.
By James L. Norris.
Atty.

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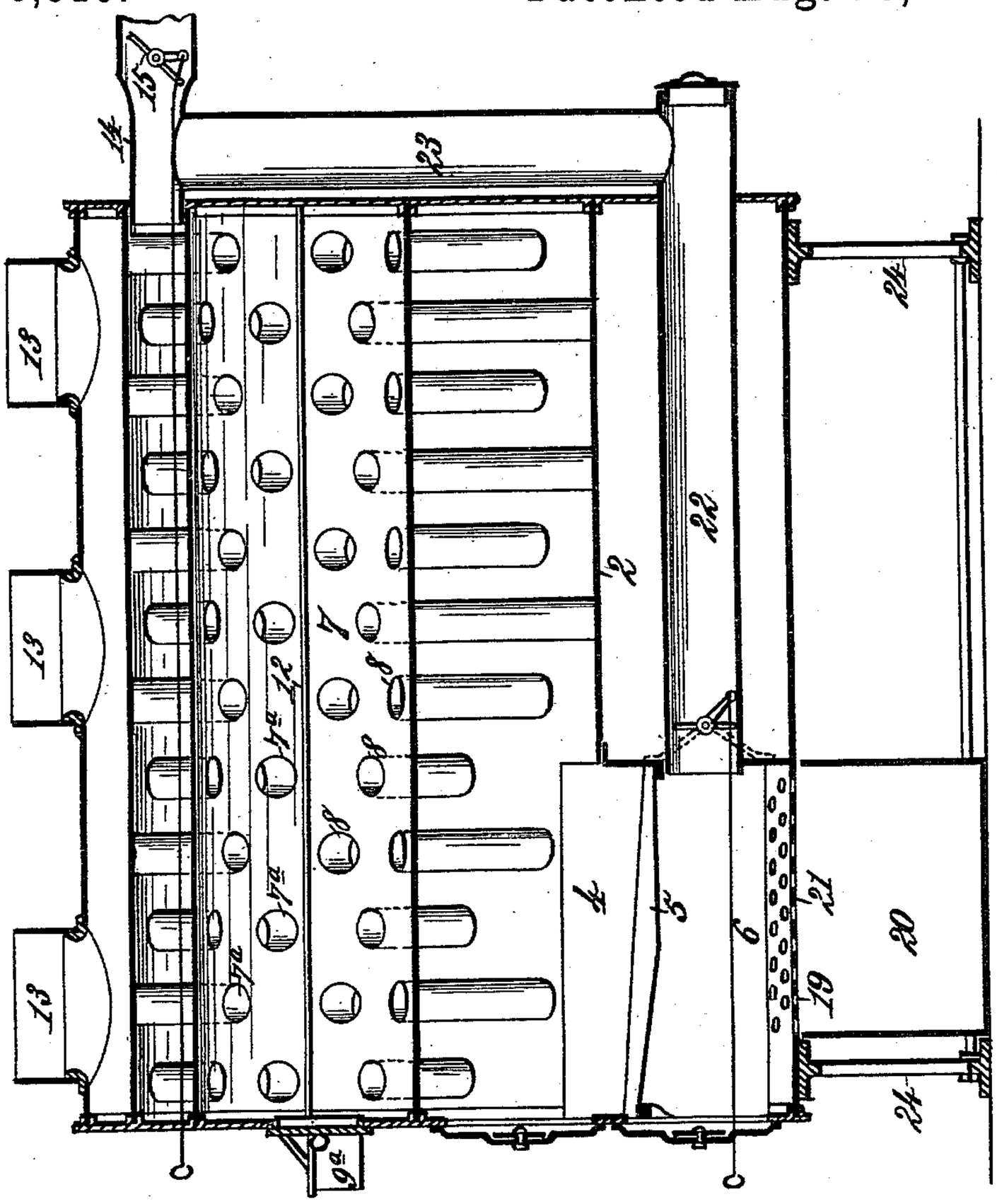
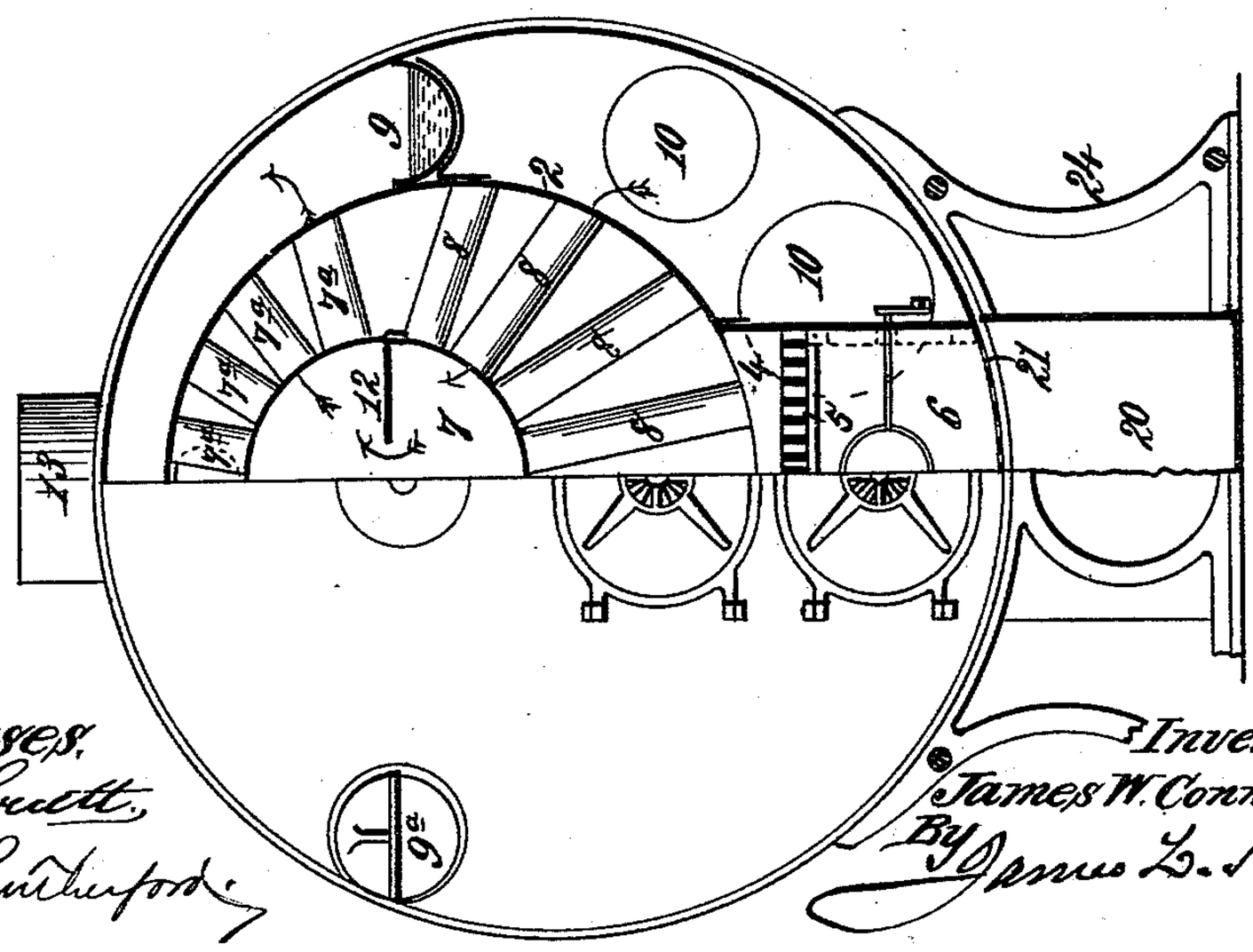


Fig. 3.



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UNITED STATES PATENT OFFICE.

JAMES W. CONNERY, OF PHILADELPHIA, PENNSYLVANIA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 458,519, dated August 25, 1891.

Application filed November 26, 1890. Serial No. 372,719. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. CONNERY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My invention relates to that class of furnaces usually employed for heating air for imparting a suitable temperature to the interior of buildings and apartments in dwelling-houses, and one purpose of said invention is to provide a novel construction and combination of parts, whereby large volumes of pure atmospheric air may be rapidly raised to a high temperature and supplied to the various apartments in any required quantities without contamination by mixture with the gases given off by the furnace. It is my purpose, also, to provide a construction whereby I obtain a largely-increased area for the transmission of the highly-heated products of combustion and a direct action of the latter upon two distinct series of heating-pipes, both arranged within said enlarged area, one series receiving the cold air as it enters the furnace structure and heating it during its passage through said series, from which it is discharged into the hot-air reservoir, where it receives a further increase of temperature, and the second series receiving the hot air from the reservoir, imparting a further temperature thereto, delivering it to a space between the fire-chamber and the furnace structure, where it receives a still further accession of heat, and whence it passes to the hot-air delivery or distributing conveyers or pipes. It is my further purpose to provide an organization of this type, in which a fire-chamber of increased area shall be formed by an outer cylinder and an inner cylinder of much less diameter and arranged eccentrically thereto, the two being connected by staggered air-pipes, open at both ends, whereby the passage of the heated products of combustion through said fire-chamber shall be so far retarded as to cause them to part with the greater portion of their heat before entering the draft-pipe, and whereby, also, each pipe shall be more fully exposed to the heat, the space between the outer cylinder and the furnace structure being divided by longitudinally-arranged water-tanks capable of being supplied from the exterior, whereby the upward flow of cold air in said space is arrested and the air compelled to traverse the pipes lying below said tanks and enter the inner cylinder. It is my purpose, also, to simplify and improve the construction of the furnace in such a manner as to avoid the necessity of sifting the finely-divided ash, and to combine with the furnace and with the perforated floor of the ash-box a dust-flue communicating with the draft-flue.

My invention consists to these ends in the novel features of construction and new combinations of parts hereinafter fully set forth, and then definitely pointed out in the claims following this specification.

To enable others skilled in the art to understand and practice my said invention, I will proceed to describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation, partly in transverse section, showing my invention. Fig. 2 is a longitudinal vertical section upon the line 1 1, Fig. 1. Fig. 3 is an end elevation, half in section, showing a modification in construction. Fig. 4 is a vertical longitudinal section upon the line 3 3, Fig. 3.

In the said drawings the reference-numeral 1 denotes what may be termed the "furnace structure," this term comprising the inclosing wall which surrounds the operative parts. Within this furnace structure is supported by any suitable means an outer cylinder 2, which may rest upon two supporting-walls 3, running from end to end of the structure 1, and between which is placed the furnace or fire-box 4, having a grate 5 and an ash-pit 6 of any suitable construction.

Within the cylinder 2 is placed a cylinder 7, of much less diameter and arranged eccentrically to the outer cylinder, to which it is connected by an intermediate series of pipes 8, having their open ends penetrating each cylinder and rigidly secured therein in any suitable or ordinary way. In that portion of the circular area between the two cylinders which lies directly over the fire-box or furnace-grate these pipes are omitted to prevent the products of combustion from entering the eccentric cylinder 7, which serves as

a hot-air reservoir, and thence passing off through the distributing-pipes. That portion of the outer cylinder which lies directly over the furnace-grate is either provided with openings or is wholly removed to permit the flames and heated products of combustion to enter and traverse the space between said cylinders.

Between the outer cylinder 2 and the furnace structure 1 upon each side thereof, and at or near the line of diameter of said cylinder, I arrange open-water tanks 9, which extend from end to end of the outer or furnace structure and the inner and larger cylinder, with both of which it is in close contact, so that no air can pass above these points, save as it traverses the pipes 8, which open below the bottom of these tanks.

The reference-numeral 10 denotes the openings or inlets for atmospheric air lying between the walls which support the outer cylinder and the outer wall of the furnace structure. It will be seen that air at normal temperatures entering these inlets will pass upward through all the pipes 8, which have their ends opening between the supports and the water-tanks 9. The fire in the furnace 4 being under way, the flames and heated products of combustion are carried by the draft upward between the inner face of the outer cylinder and the outer face of the inner cylinder, and in their passage they are brought into direct contact with the pipes 8, which are staggered to expose each pipe to the full action of the heat, and also for the purpose of retarding the passage of the partly-consumed products of combustion, in order that the highest possible temperature may be obtained with the minimum expenditure of fuel. Those pipes 8 which are in immediate proximity to the furnace and thereby exposed to the fiercest heat are the longer, while the pipes most remote from the furnace and exposed to the lesser heat of the nearly-comsumed products of combustion are much shorter and are confined between the two cylinders at points where the walls thereof most closely approach each other, and where, in consequence, the heat is concentrated upon them. It will be observed, also, that these heated products as they pass between the inner and outer cylinders will impart their heat to the walls of both. The air therefore, as already mentioned, entering the cold-air inlets will flow through the tubes or pipes 8 lying between the supports 3 and the water-tanks 9, and being heated by its passage it will enter the inner and eccentric cylinder at a temperature considerably raised above the normal point. It is caused to flow toward the center of the inner cylinder 7 by means of a horizontal plate 12, projecting from the inner wall of the said inner cylinder toward its center, and while it remains in said cylinder, which is practically a hot-air reservoir, its temperature is constantly rising and approaching that of the reservoir. The air now flows from the cylinder 7 outwardly, passing through those pipes 7^a which lie above the line of union between the water-tanks 9. In traversing these pipes it is again subjected to a high degree of heat and emerges into the space between the outer cylinder and the furnace structure, said spaces lying above the water-tanks. This space being wholly inclosed, save as to the opening to one or more hot-air pipes communicating with the distributers, speedily becomes highly heated, and in traversing the same the air is for the fourth time subjected to an increased temperature, whereby it enters the hot-air pipe 13 in a highly-heated state. The ends 9^a of the water-tanks 9 project through the front of the furnace structure to provide for their being supplied with water at any time. While these tanks serve to separate the cold-air space below from the hot-air space above said tanks, the water in said tanks will always form sufficient vapor to render the air pleasantly moist and also absorb any gases which may by accident have penetrated the outer cylinder.

The numeral 14 indicates the draft-pipe placed at the top of the furnace structure opposite the furnace and provided with a damper 15, operated by a rod 16, which projects from the front of the furnace. The two cylinders are so light that I usually attach the outer one by iron rods 17, passing through an inwardly-turned flange 18 into the ends of the furnace structure.

Below the furnace-grate bars is the ash-pit, having a floor 19, which may, if preferred, form the cover of an ash-box 20. This cover is pierced at short intervals with openings 21, through which the fine ash will readily pass, thereby avoiding the trouble of sifting, while much of the dust and dirt is carried off through a dust-flue 22, having communication with the ash-box and with the draft-pipe by way of a vertical pipe 23.

I may employ various forms of furnace structure, and may also build such of any suitable material, such as brick-work, stone, or metal. As to the form of the furnace structure, I may employ a cylindrical structure, as shown in Fig. 3. The construction and combination of the remaining parts, however, do not differ in any essential point whatsoever from the parts already described. When the form of furnace structure shown in Fig. 3 is adopted, it is usually formed of an iron cylinder, which rests upon a cradle or other support 24 of ornamental form. The sole difference in the arrangement of parts between this form and that shown in Fig. 1 is that in the former the hot-air conveyers connected to the distributing-pipes emerge from the top of the furnace structure instead of the end. By the eccentric arrangement of the inner cylinder the fire has an unobstructed passage entirely around said inner cylinder, said passage narrowing as it recedes from the fire-box, whereby the diminished heat is concentrated, as it were,

upon these shorter pipes. I obtain, also, a greatly-increased area for the fire-chamber, which is the space inclosed between the two cylinders. By dividing the space between the exterior of the outer cylinder and the interior of the furnace structure I not only obtain a heated space above the line of division, but I obtain a rapid circulation of large volumes of air and impart thereto a high temperature with a comparatively small quantity of fuel. By connecting the ash-pit also with the draft-pipe in the manner shown I avoid the entrance of fine dust, which in no time will penetrate the seams and joints of the outer cylinder and pipes to the great injury of furniture, books, carpets, &c. Moreover, I avoid the disagreeable task of sifting the ashes by the use of the perforated bottom of the ash-pit, as already fully described.

What I claim is—

1. In a hot-air furnace, the combination, with a furnace structure, of an outer cylinder resting upon supports between which the furnace-grate is supported, a cold-air inlet being formed between each support and the furnace structure, a cylinder of less diameter arranged eccentrically within the outer cylinder and connected thereto by open pipes having a staggered arrangement, those pipes nearest the furnace being the longest and the remainder diminishing in length as they recede from the furnace, and means for cutting off the upward flow of cold air over the exterior of the outer cylinder at a suitable point, whereby the cold air is compelled to traverse the pipes and enter the inner cylinder and thence flow out therefrom through the pipes above those by which it entered, substantially as described.

2. In a hot-air furnace, the combination, with a furnace structure, of an outer cylinder resting upon supports running longitudinally with said structure, a furnace-grate being arranged between said supports and cold-air inlets upon each side thereof, an inner cylinder of less diameter than the outer and arranged eccentrically therein and united thereto by open pipes having a staggered arrangement, longitudinal water-tanks arranged within said structure and extending the length thereof, said tanks being in contact with the wall of the outer cylinder at or about the ends of its diameter and also engaging the inner face of the furnace structure to cut off the upward flow of cold air, a draft-flue, and a hot-air flue or flues entering the space above the tanks, substantially as described.

3. In a hot-air furnace, the combination, with a furnace structure, of an outer cylinder resting on supports between which is a furnace-grate and on the outside of each of said supports one or more cold-air inlets, a smaller cylinder arranged eccentrically within the outer and united thereto by staggered pipes, water-tanks arranged upon each side of the outer cylinder and having contact therewith and with the furnace structure through the entire length of both, the ends of said cylinders being carried through the forward end of the structure to permit a supply of water, hot-air pipes entering a space above the tanks and between the furnace structure and the outer cylinder, and a draft-pipe, substantially as described.

4. In a hot-air furnace, the combination of a furnace structure having a fire-place and ash-pit at its front end, two horizontally-arranged cylinders located one within the other and connected round their circumference by pipes which gradually decrease in length for the flow of cold air through the pipes into the inner cylinder, cold-air inlets arranged outside the outer cylinder, means for obstructing the ascent of the cold air over the exterior of the outer cylinder, a draft-flue connected with the top portion of the rear end of the outer cylinder, a horizontal valved dust-pipe extending from the ash-pit beneath the outer cylinder to the rear end of the furnace structure, and a vertical pipe connecting the dust-pipe with the draft-flue behind the rear ends of the two cylinders, substantially as described.

5. In a hot-air furnace, the combination, with an ash-pit, of a bottom plate having numerous perforations and arranged above an ash-box, and a dust-flue having a damper and connected to the draft-flue by a vertical pipe, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JAMES W. CONNERY.

Witnesses:
J. R. MASSEY,
AUGUST WEBER.