C. ST. JOHN.

HOT AIR HEATING APPARATUS.

APPLICATION FILED JULY 31, 1908.

970,117.

Patented Sept. 13, 1910.

2 SHEETS—SHEET 1.

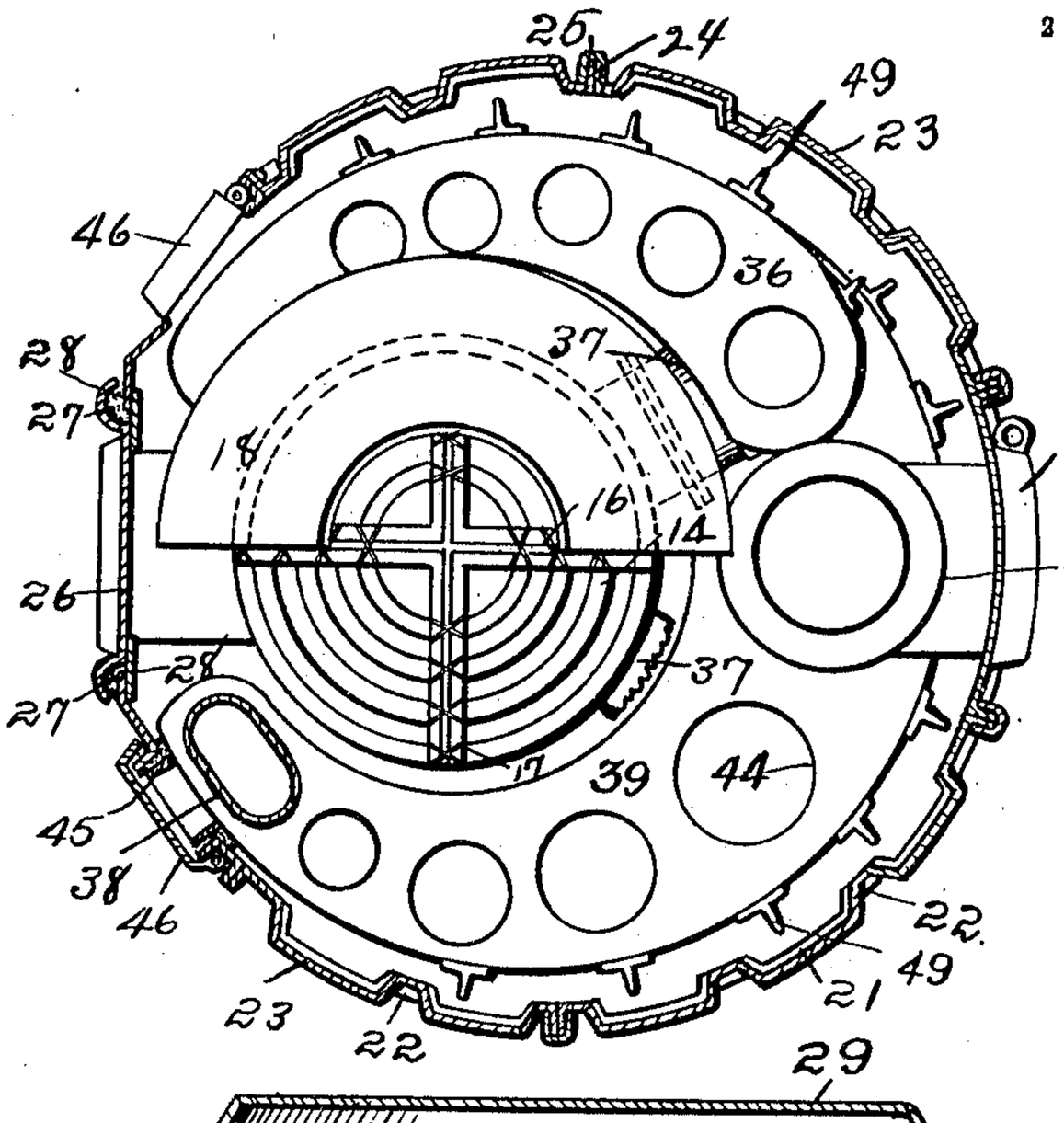
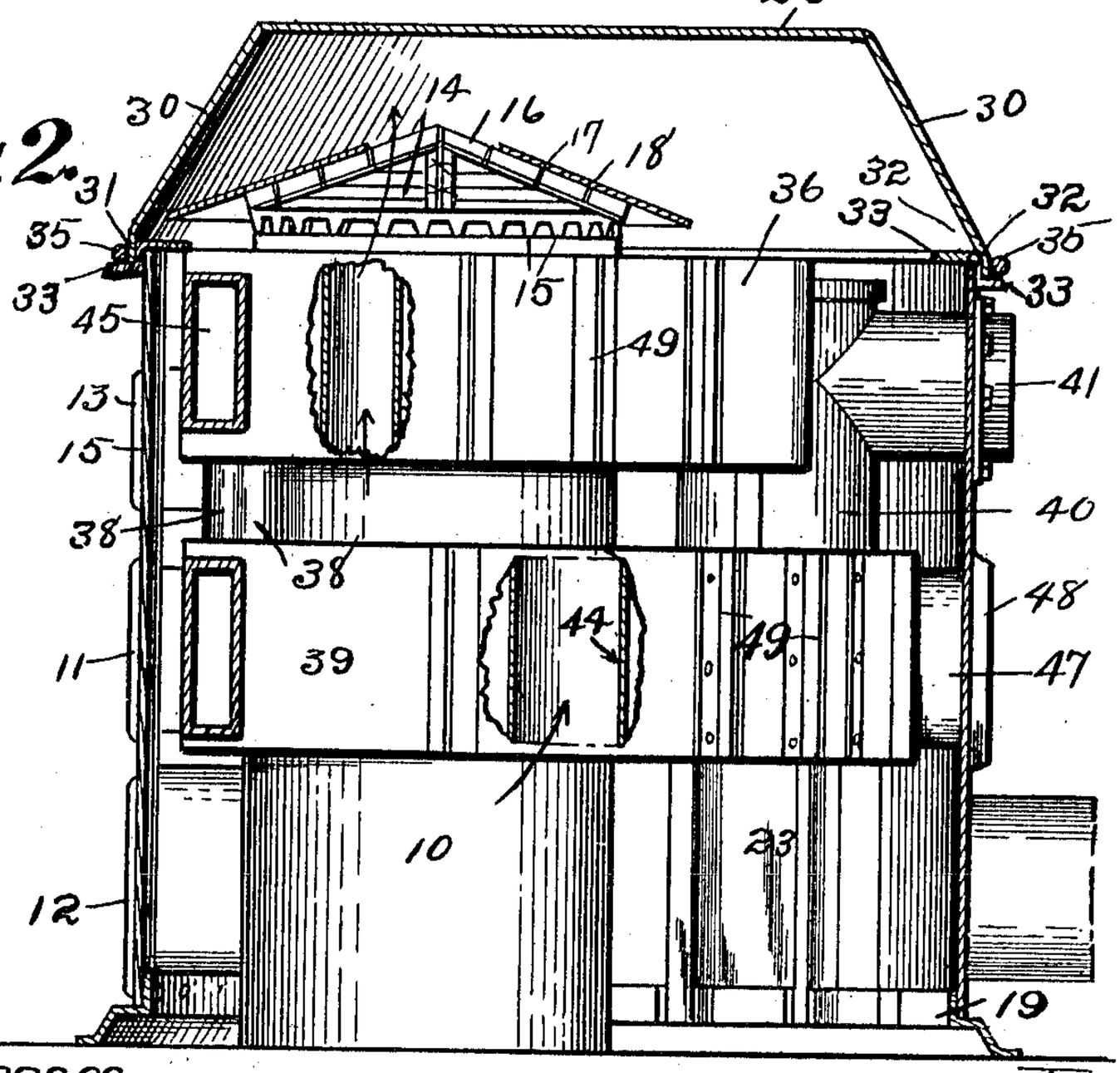


Fig. 1.

Fig. 2.



Witnesses

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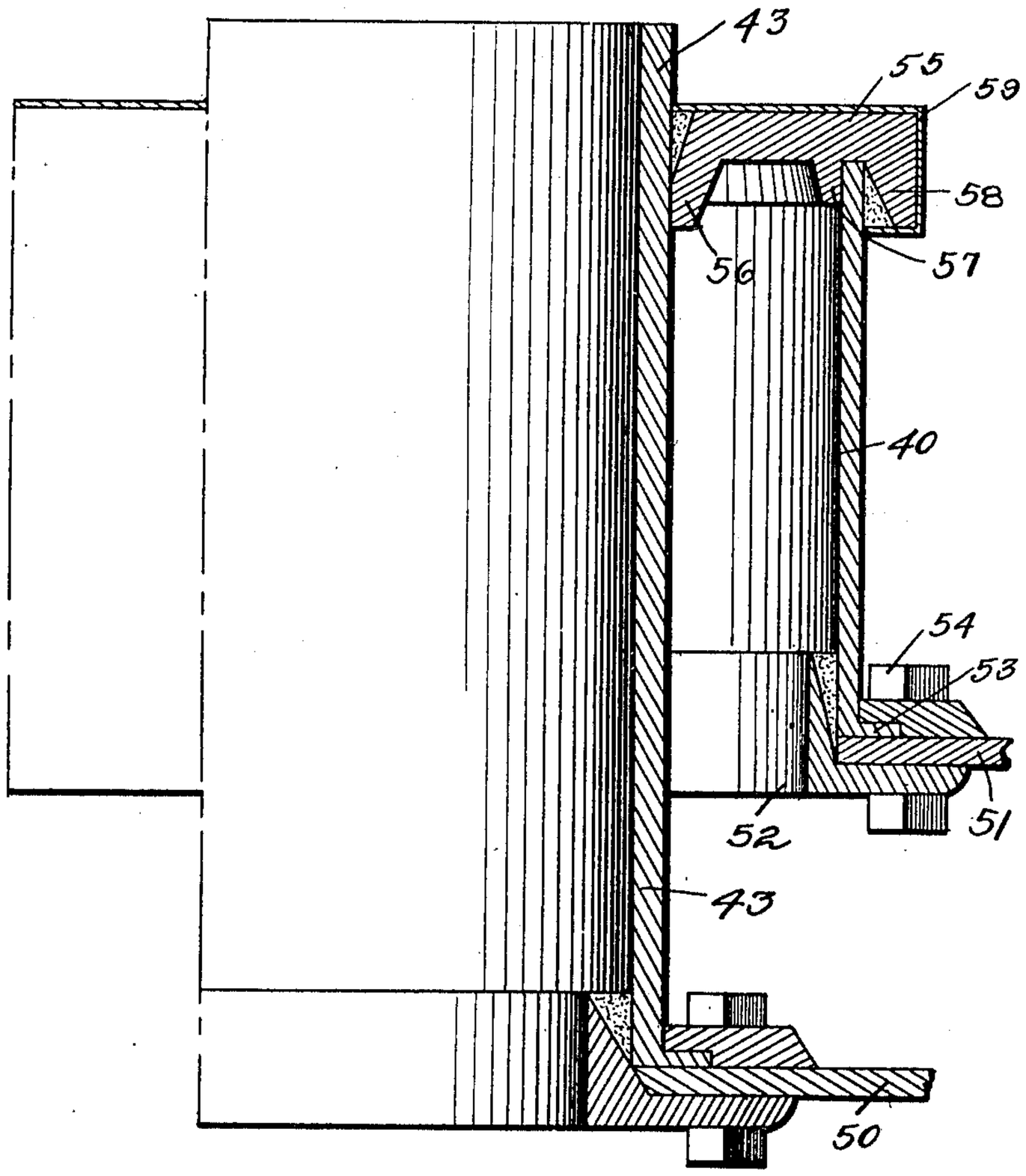
2 SHEETS—SHEET 2.

Fig. 3



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UNITED STATES PATENT OFFICE.

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HOT-AIR HEATING APPARATUS.

970,117. Specification of Letters Patent. **Patented Sept. 13, 1910.**

Application filed July 31, 1908. Serial No. 446,286.

To all whom it may concern:

Be it known that I, CARLISLE ST. JOHN, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented a certain new and useful Hot-Air Heating Apparatus, of which the following is a specification.

The objects of my invention are to provide a hot air furnace of simple and durable construction, so arranged that a maximum amount of the heat generated by the fire will be utilized in heating air, to thereby effect an economy in fuel; to provide a furnace of this kind in which the draft passageways are readily accessible, so that they may be quickly and easily cleaned out; to provide a furnace of this kind in which the side walls of the furnace, or portions thereof, may be quickly and easily removed for the purpose of providing access to the interior of the furnace, at any point, in making repairs or replacing parts; to provide a furnace of this kind in which the joints are arranged so as to be packed with a suitable packing, thus allowing for the expansion and contraction of the metal parts; also to provide a furnace of this kind arranged with sheet metal parts for retaining the packing at the joints, and preventing any leakage of gases at said joints.

My invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows a horizontal, sectional view through the central portion of a furnace embodying my invention, part of said view being taken on a line above the upper hot air drum, and part of the view being taken on a line below the upper hot air drum. Fig. 2 shows a side elevation of a furnace embodying my invention with the outer casing on one side cut away and portions of both heating drums being broken away to show the interior construction, the flanges on both of the clean-out door openings in the heating drums being in section and the cover of the radiating device on top of the combustion chamber also being shown in section. Fig. 3 shows an enlarged, detail sectional view through a portion of the lower radiating drum and the pipe that connects it with the flue and also the hot air pipe which leads upwardly through the pipe that connects the lower radiator with the flue.

Referring to the accompanying drawings, I have used the reference numeral 10 to indicate the combustion chamber of the furnace. At the furnace front is a door 11, leading to the combustion chamber above the grate, a door 12 leading to the ash pit below the grate, and a draft door 13 above the door 11. This portion of the device is of the ordinary construction and is designed to be operated in the ordinary manner.

The furnace base comprises an annular rim 19 having on its upper surface a series of flanges. Each flange comprises an upright central portion 20 and two upright inwardly inclined end portions 21. These flanges are spaced apart and between each pair of flanges is a stationary lug 22 adjacent to the outer edge of the base 19. At certain intervals throughout the base 19, the lugs 22 are omitted. This is done for the following reason: The furnace wall is made of sheet metal in segmental sections, each of which sections extend from the base to the top of the furnace. Each section is so shaped that its lower edge will rest on top of the base 19, the parts thereof that are adjacent to the flanges 20 and 21 being designed to stand on the outer sides of said flanges, and the parts adjacent to the lugs 22 being designed to stand on the inner sides of said lugs, as shown in Fig. 1.

The sheet metal walls are indicated by the numeral 23, and the side edges thereof are provided with outwardly projecting flanges 24. In order to connect the adjacent flanges of two sections, I provide a sheet metal connecting piece 25, substantially U-shaped in cross section, designed to overlap the edge portions 24 of two adjacent furnace wall sections.

The furnace front is made of a cast metal portion 26 having its side edges formed with two flanges 27 and 28, spaced apart and designed to receive between them, the adjacent edges of the furnace wall and also to receive a packing material to thereby provide for contraction and expansion in the furnace wall and at the same time maintain air tight joints.

The dome or top of the furnace casing is indicated by the reference numeral 29 and fixed thereto and projecting downwardly therefrom is a flange 30 having its lower

edge extended downwardly at 31. The flange 30 rests upon a cast metal flange 32. This flange is provided with a downwardly and outwardly projecting portion 33 upon which the flange 30 of the dome rests. It is obvious that by this means, the upper end of the furnace wall may be quickly, easily and conveniently attached to the furnace top and that it may also be readily removed when desired.

The fire box 10 is arranged eccentrically relative to the furnace wall as shown in Fig. 1 of the drawings. In such an arrangement there is a considerable space between the fire box and the interior of the furnace wall and this space is utilized for the purpose of containing the radiating drums. There are two upper radiating drums exactly alike, but entirely independent of each other, and a lower radiating drum. Both the upper drums and the lower drum comprise a hollow body portion 36 and 39, as shown in Fig. 1 of the drawings, so formed that the inner edges conform with the fire box, and the outer edges conform with the furnace wall. The products of combustion from the fire box pass through the pipes 37 into the rear of the radiating drums 36 down through the pipes 38 at the forward ends of said drums into the forward ends of the lower radiating drum 39, back to the rear of said drum 39, and out through the upright, and horizontal flue pipes 40 and 41. On the interior of the flue 40 is a hot air pipe 43, as clearly shown in Fig. 3, open at both ends and intended only for the purpose of providing additional radiating surface, so that the products of combustion in passing through the flue, will come in contact with the outer surface of the pipe 43 and warm it. In both of the radiator drums, 36 and 39, I provide a number of upright hot air pipes 44, open at both ends for the purpose of conducting air through said drums to be heated by the products of combustion passing around them.

In order to provide for cleaning out the hot air drums, I form an opening at the forward end of each drum, surrounded by a flange 45, and said flanges are covered by the hinged doors 46. At the back of the lower drum 39 is a pipe 47 extended through the furnace wall, said wall being provided with a door 48, the construction being similar to the parts 45 and 46, as shown in Fig. 1, whereby the outer end of the pipe may be closed. In this way, the operator may have access to the interior of the lower drum at the rear for the purpose of cleaning out the same. On the outer face of each of the radiating drums is a series of ribs 49 for the purpose of increasing the radiation from the drum.

The means for connecting the lower radiating drum with the flue pipe 40 is clearly shown in Fig. 3. In said view, the reference numeral 50 indicates the bottom of the radiating drum and 51 the top thereof. The outer side of the drum is not shown in said figure. At the bottom of the flue pipe 40 is an annular flange 52, I-shaped in cross section, having its upright portion adjacent to the inner surface of the flue pipe 40 and its horizontal portion under the part 51 of the radiating drum. At the bottom of the flue pipe 40 is a flange 53 resting on top of the part 51, and said parts, 51, 52, and 53, are connected by the bolts 54, and in order to form an air tight joint between the top of the flue pipe 40 and the outer surface of the air pipe 43, I provide a cast metal head 55 designed to fit around the pipe 43 and having a downwardly projecting flange 56 adjacent to the pipe and so arranged that packing material may be inserted between the flange 56 and the pipe 43. At the outer portion of the head 55 are two downwardly projecting flanges 57 and 58 designed to receive the top of the pipe 40 between them and also provided with a space to receive packing material. In order to hold the packing material in position, I provide a sheet metal veneering 59 designed to cover the space between the flange 56 and the pipe 43, and also to extend under the space between the flange 58 and the pipe 40, as shown in Fig. 3. Thus said packing material is firmly held in position and an air tight joint provided. Another one of the very important functions of the sheet metal veneering 59 is to provide for the durability of the furnace. It is well known that cast metal, when subjected to great variation of temperatures, is liable to crack, and smoke and gases may leak through the cracks thus formed. Sheet metal of itself is not sufficient to form certain parts of the furnace which require great strength. By combining the sheet metal veneering 59 with the rigid and strong cast metal member to which it is attached, I provide means whereby, in the event that the cast metal should crack, the sheet metal veneering would then cover the crack sufficiently to prevent the leakage of gas or smoke, and at the same time the sheet metal veneering does not need to be heavy or strong as required to withstand strain, and the cast metal will protect the sheet metal veneering from the action of the fire even if small cracks are developed in the cast metal. The lower end of the air pipe 43 is connected with the bottom of the lower radiating drum in the same way as the pipe 40 is connected with the top of the lower radiating drum, as shown in Fig. 3. In practical use with this portion of the apparatus, it is obvious that all of the products of combustion arising from the furnace will pass first through the upper radiating drums, and then downwardly through the lower ones, and then out

through the flue. The heat arising from the top of the combustion chamber will be materially increased by the radiating device set forth and the products of combustion throughout their entire course will surround the air pipes in the drum and in the pipe 40, so that a maximum amount of the heat arising from the furnace will be utilized in heating the air within the furnace walls.

I claim as my invention:

1. In a device of the class described, the combination of a combustion chamber, a furnace wall surrounding the combustion chamber and arranged concentrically relative thereto, the front of the furnace wall being closer to the combustion chamber than the other parts, two radiating drums at the upper portion of the space between the combustion chamber and the furnace wall, each of said upper radiating drums having its rear end spaced apart from a rear central line, and being extended to a point spaced apart from the front central line, and also being tapered from a maximum width at its rear end to a minimum at its front end, means for providing communication direct from the upper portion of the combustion chamber to the rear end of each radiating drum, a radiating drum below the upper drums extended from points spaced apart from a front central line all around the space between the combustion chamber and the furnace wall, pipes communicating between the front ends of the upper drums and the front ends of the lower drum to convey the products of combustion from the upper drums to the lower one, and a discharge pipe communicating with the rear central portion of the lower drum and leading to a point of discharge.

2. In a device of the class described, the combination of a combustion chamber, a furnace wall surrounding the combustion chamber and arranged eccentrically relative thereto, the front of the furnace wall being closer to the combustion chamber than the other parts, two radiating drums at the upper portion of the space between the combustion chamber and the furnace wall, each of said upper radiating drums having its rear end spaced apart from a rear central line, and being extended to a point spaced apart from the front central line, and also being tapered from a maximum width at its rear end to a minimum at its front end, means for providing communication direct from the upper portion of the combustion chamber to the rear end of each radiating drum, a radiating drum below the upper drums extended from points spaced apart from a front central line all around the space between the combustion chamber and the furnace wall, pipes communicating between the front ends of the upper drums and the front ends of the lower drum to convey the products of combustion from the upper drums to the lower one, and a discharge pipe communicating with the rear central portion of the lower drum and leading to a point of discharge, said pipe being extended upwardly between the rear ends of the upper drums and then rearwardly through the furnace wall.

3. In a device of the class described, the combination of a combustion chamber, a furnace wall surrounding the combustion chamber and arranged eccentrically relative thereto, the front of the furnace wall being closer to the combustion chamber than the other parts, two radiating drums at the upper portion of the space between the combustion chamber and the furnace wall, each of said upper radiating drums having its rear end spaced apart from a rear central line, and being extended to a point spaced apart from the front central line, and also being tapered from a maximum width at its rear end to a minimum at its front end, means for providing communication direct from the upper portion of the combustion chamber to the rear end of each radiating drum, a radiating drum below the upper radiating drums, extending from points spaced apart from a front central line all around the space between the combustion chamber and the furnace wall, pipes communicating between the front ends of the upper drums and the front ends of the lower drum to convey the products of combustion from the upper drums to the lower one, a discharge pipe communicating with the rear central portion of the lower drum and leading to a point of discharge, said pipe being extended upwardly between the rear ends of the upper drums and then rearwardly through the furnace wall, and an open-ended pipe in the center of said discharge pipe so arranged that the products of combustion passing through the discharge pipe will surround the open-ended pipe and heat the air passing upwardly through said open-ended pipe.

4. In a device of the class described, the combination of a combustion chamber, a furnace wall surrounding the combustion chamber and arranged eccentrically relative thereto, the front of the furnace wall being closer to the combustion chamber than the other parts, two radiating drums at the upper portion of the space between the combustion chamber and the furnace wall, each of said upper radiating drums having its rear end spaced apart from a rear central line, and being extended to a point spaced apart from the front central line, and also being tapered from a maximum width at its rear end to a minimum at its front end, means for providing communication direct from the upper portion of the combustion chamber to the rear end of each radiating drum, a radiating drum below the upper radiating drums ex-

tended from points spaced apart from a front central line all around the space between the combustion chamber and the furnace wall, pipes communicating between the front ends of the upper drums and the front ends of the lower drum to convey the products of combustion from the upper drums to the lower one, a discharge pipe communicating with the rear central portion of the lower drum and leading to a point of discharge, said pipe being extended upwardly between the rear ends of the upper drums and then rearwardly through the furnace wall, and an open-ended pipe in the center of said discharge pipe so arranged that the products of combustion passing through the discharge pipe will surround the open-ended pipe and heat the air passing upwardly through said open-ended pipe, all of said radiating drums being provided near their forward portions with clean-out openings.

Des Moines, Iowa, July 17, 1908.

CARLISLE ST. JOHN.

Witnesses:
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