

Nov. 7, 1933.

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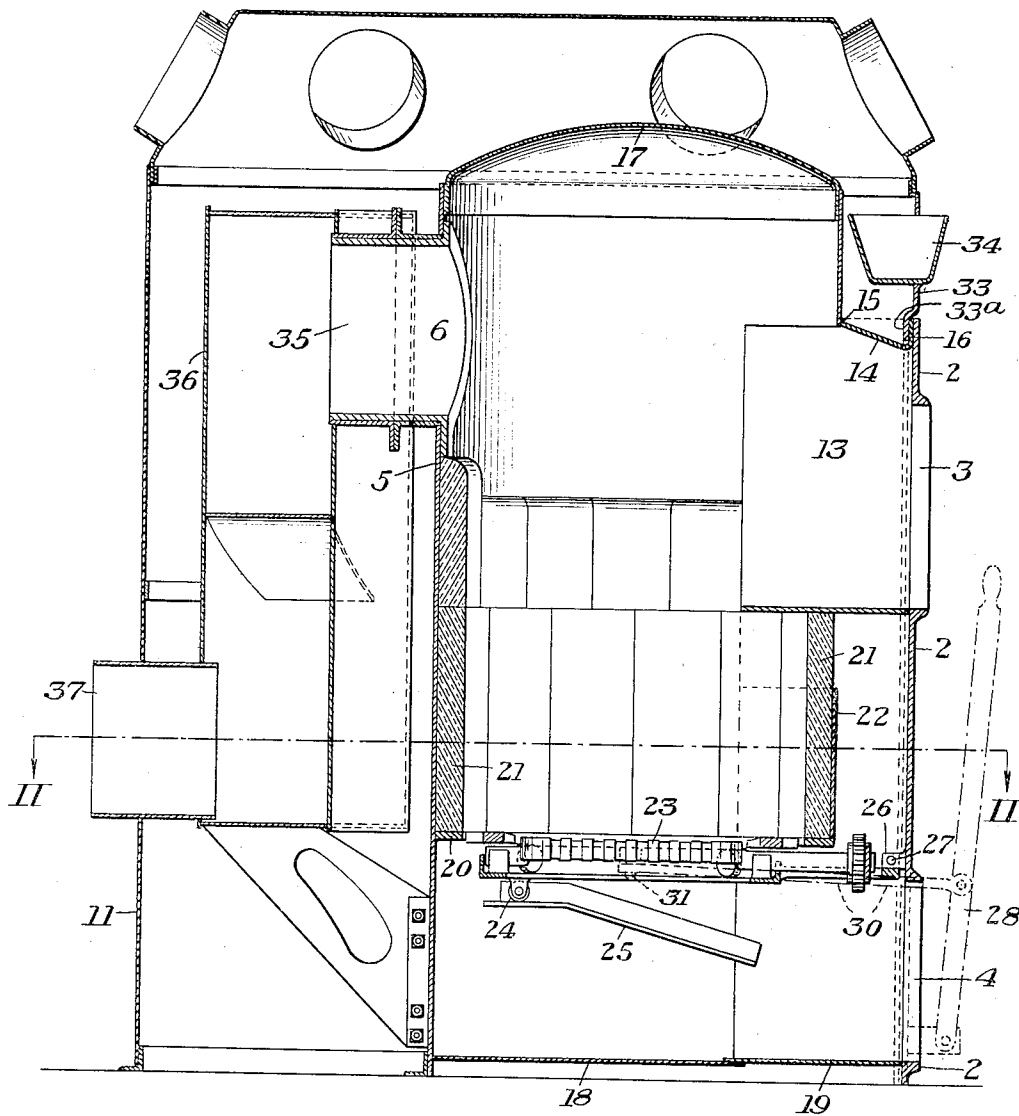
1,933,743

HEATING FURNACE AND METHOD OF FORMING THE SAME

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4 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

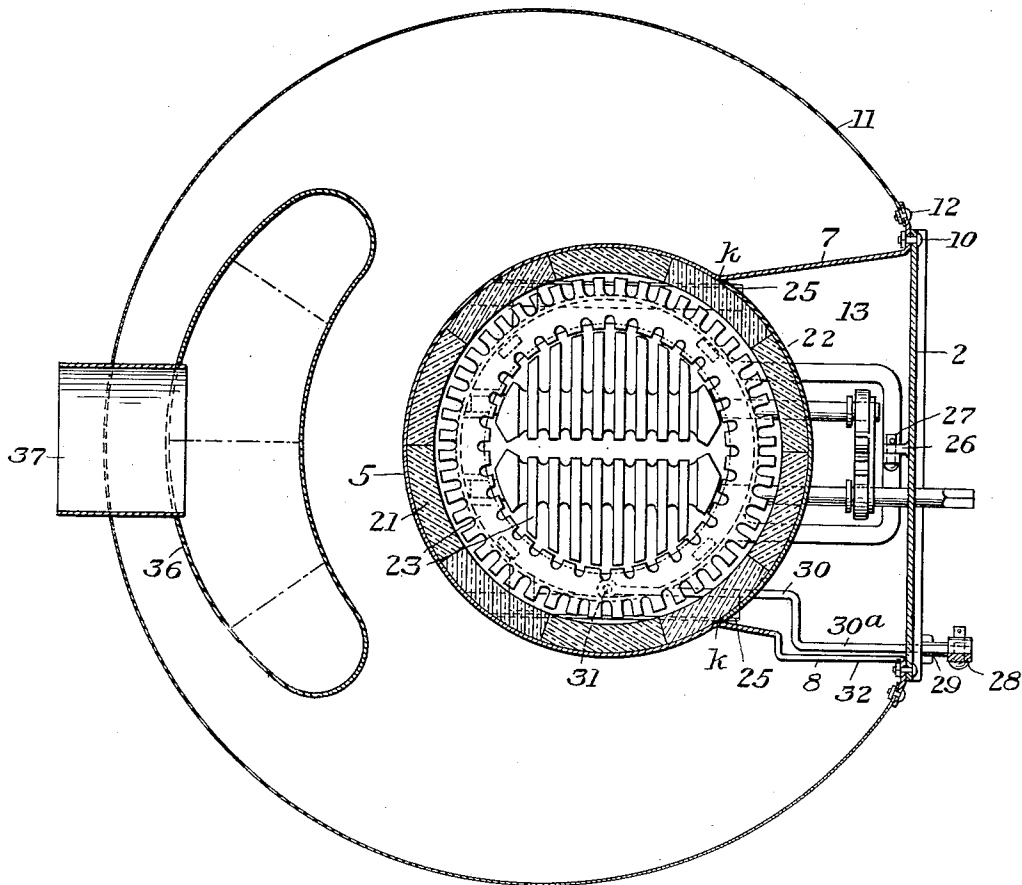
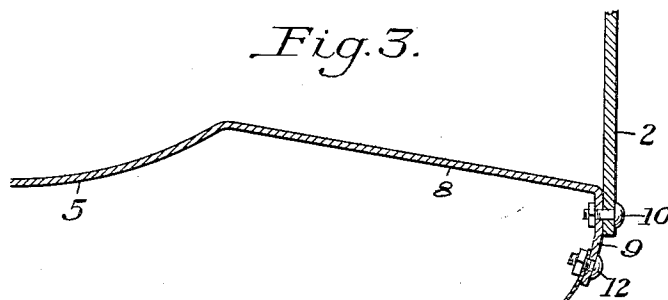


Fig.3.



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Fig. 4.

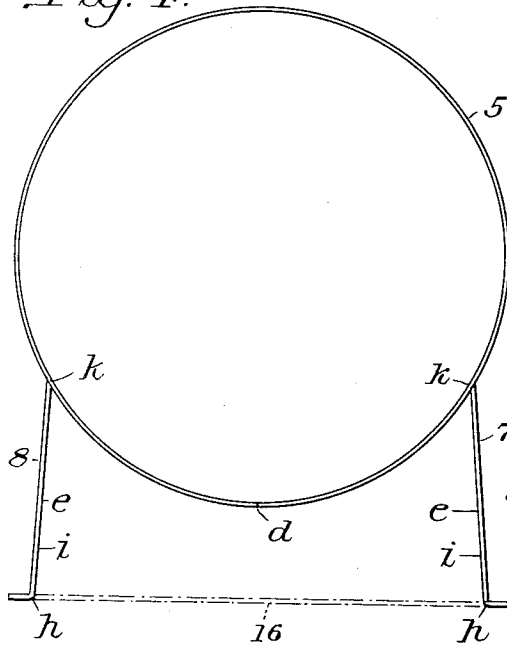


Fig. 5.

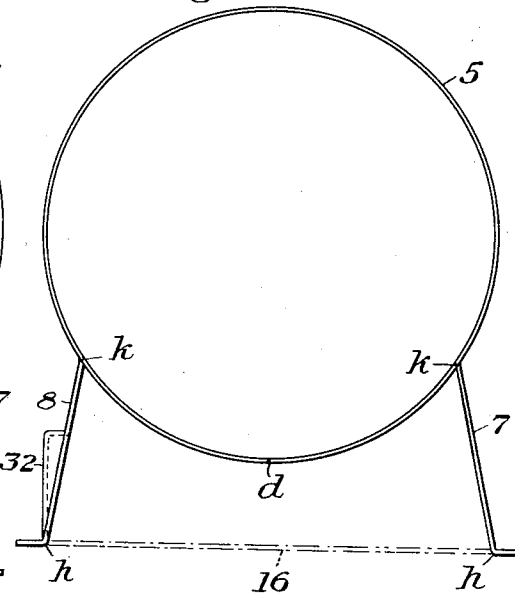
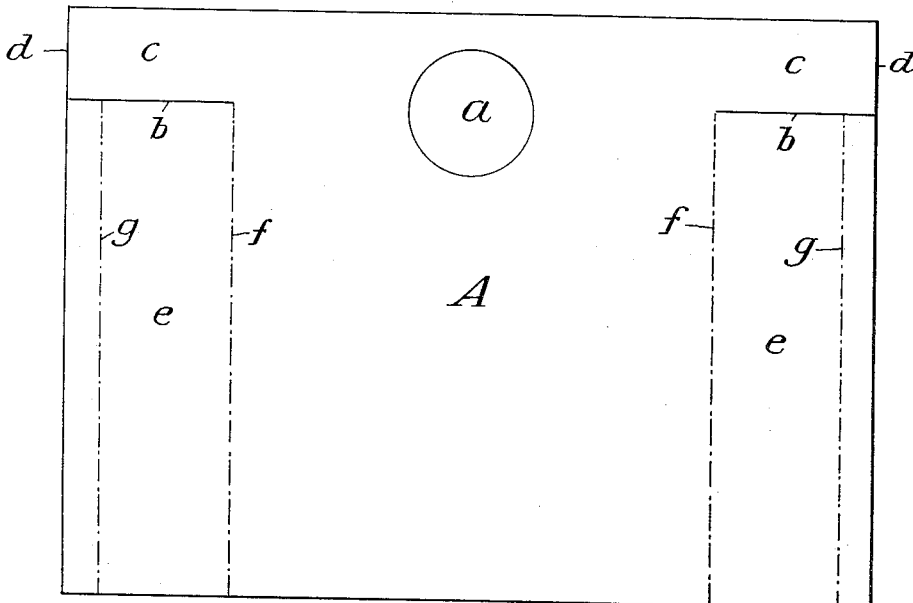


Fig. 6.



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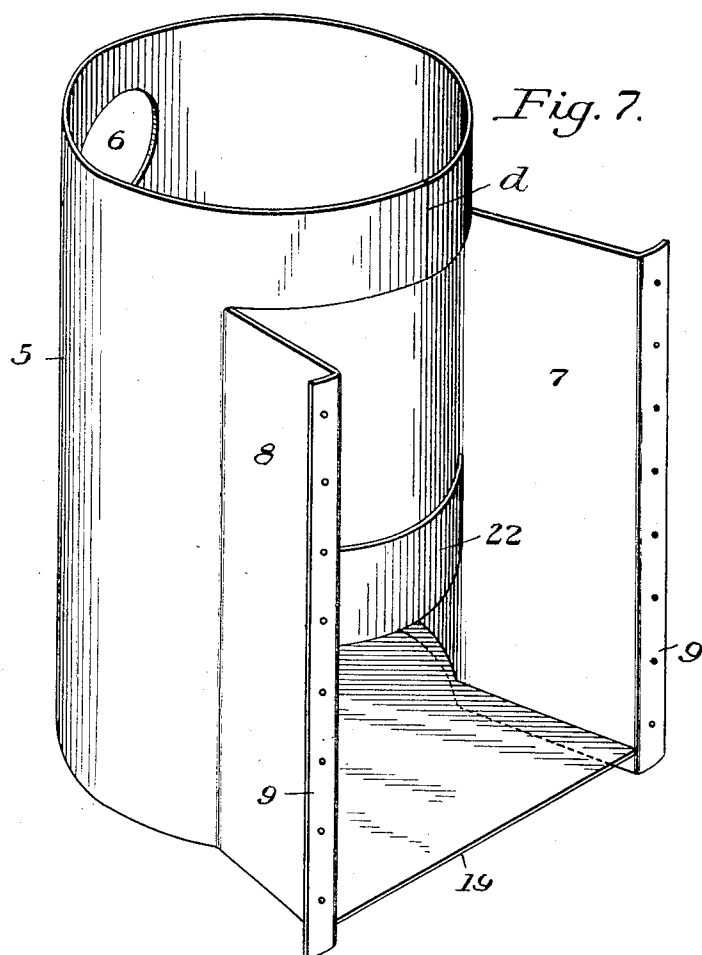
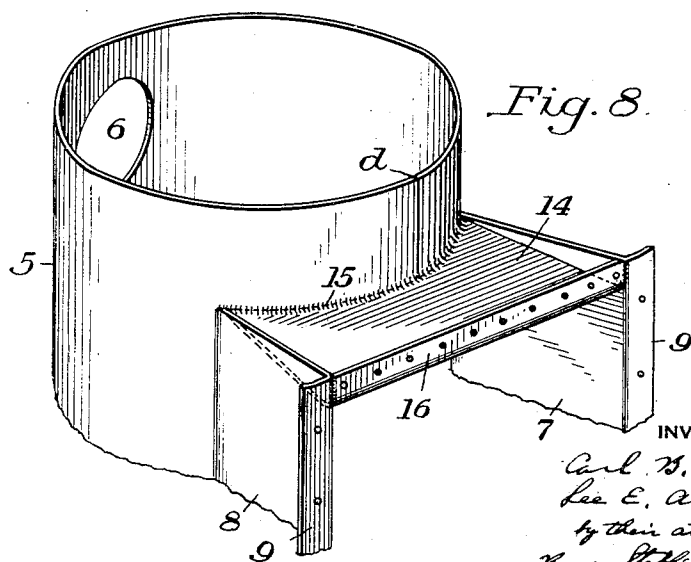
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HEATING FURNACE AND METHOD OF FORMING THE SAME

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4 Sheets-Sheet 4

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UNITED STATES PATENT OFFICE

1,933,743

HEATING FURNACE AND METHOD OF FORMING THE SAME

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Application January 10, 1931. Serial No. 507,866

9 Claims. (Cl. 126—99)

This invention relates to hot air heating furnaces of the type commonly employed for domestic use, and is for an improved furnace structure and an improved method of making the same.

Furnaces of this type generally comprise an inner furnace structure within which the fuel is burned. Surrounding this structure and in spaced relation thereto is a sheet metal shell. This shell has air outlets near the top thereof and an air intake near the bottom. The air, circulated around the outside of the inner structure, is heated so as to flow out the outlet pipes at the top of the shell.

It is quite common in the art to form the inner furnace structure of cast metal sections, but such structures are somewhat objectionable because of the weight of the sections, and the cost of replacing them, and the difficulty of preventing furnace gases from leaking through the joints between adjacent sections into the air space around the outside thereof.

It has also been proposed to form the inner structure or fire box of a steel plate, and the present invention relates to such a steel plate construction.

According to the present invention, there is provided a furnace of steel plate construction so arranged as to eliminate many of the disadvantages present in steel plate constructions as heretofore used, and provide a furnace in which there is less likelihood of the leakage of furnace gases from the furnace into the surrounding air space.

Moreover, hot air furnaces are usually made in various sizes, according to the size of the building in which they are to be employed. Even where the furnace itself is made of steel plate construction it is very desirable to have a cast metal front for the furnace, this front carrying the various doors required for introducing fuel into the fire box and removing ashes from the ash pit. Furnace structures as heretofore made have required that each size of furnace have its own special size of cast metal front plate. According to the present invention the construction is such that one front plate of a single size may be used for a series of furnace sizes. This is of considerable commercial advantage because it materially decreases the number of sizes of cast iron front sections which the manufacturer must carry in stock.

The invention may be readily understood by reference to the accompanying drawings in which

Figure 1 represents a vertical section through a furnace made in accordance with our invention;

Figure 2 is a horizontal section in substantially the plane of line II—II of Figure 1;

Figure 3 is a detail view showing the connection between the furnace proper, the front casting and the sheet metal shell;

Figure 4 is a somewhat schematic view showing the steel plate construction of the furnace for one of the larger sizes;

Figure 5 is a view similar to Figure 4 for one of the smaller sizes of furnaces;

Figure 6 is a plan view illustrating the development of the body of the furnace from a flat sheet of metal;

Figure 7 is a perspective view of the shell of the furnace apart from the other structure of the furnace; and

Figure 8 is a fragmentary view of the upper portion of the shell shown in Figure 7, showing the plate which closes the space between the wings in place.

In the drawings, 2 designates the front casting of the furnace, this cast metal plate having a fuel door opening 3 and an ash door opening 4. The furnace proper comprises a cylindrical shell 5 made of a single piece of steel plate having a flue opening 6 at the back thereof and having outwardly flared wings 7 and 8 on the front portion thereof forming a pouch. The wings 7 and 8 are turned outwardly, as shown in Figs. 2 and 3, to provide flanges 9. The cast metal front 2 is bolted directly to the flanges 9 by means of bolts 10.

Surrounding the inner shell is an outer shell 11 formed of relatively thin sheet metal. At the front of the furnace the sheet metal outer shell is secured to the flange 9 by means of bolts 12.

The pouch, designated 13, formed between the wings 7 and 8, is of less height than the height of the cylinder 5. A piece of steel plate 14 has its ends welded to the top of the wings 7 and 8 and has its inner edge welded to the front of the cylindrical body 5 at 15.

The inner cylindrical shell 5 is developed from a single piece of steel plate of rectangular form, this plate being shown as a solid rectangle in Figure 6. It is designated A. The opening which forms the flue opening 6 is formed in the middle of this plate near the top thereof, as shown at *a*. Next the plate is cut inwardly from each of the side edges along the lines *b*. When the plate A is bent up into cylindrical form, portions *c*, lying between the cut *b* and the upper edge of the plate, are brought into abutting relation and welded at *d* in Figures 4 and 5, to form the completely circular upper part of the cylindrical fire box. The portions *e* below the cuts *b*, are bent outwardly along the dot-and-dash lines *f* to provide the wing portions 7 and 8. The outer edge portions of these wings are again bent along the dotted line *g* to form the flanges 9 of the finished structure.

When the cylindrical body is finished, the top view of the same resembles Figures 4 and 5. By

comparing Figures 4 and 5 it will be seen that the diameter of one of the cylinders is larger than the diameter of the other. This is because of the fact that initially larger plates are used. However, the opening between points *h* at the front of the wings is the same in both cases due to the fact that on the smaller cylinder the wings are flared outwardly, whereas in the larger one as shown in Figure 4, they are substantially parallel. By reason of this fact it is possible to use the same cast iron front 2 for the large diameter shell of Figure 4 as for the small diameter shell of Figure 5.

In assembling the furnace, the weld is formed at *d*, as previously described, and the wing portions *e* are bent outwardly as shown. The plate 14 is set down between the wings at a slight angle, as shown in Figure 1, and welded in place, the plate 14 not only being welded to the shell along the line 15, but being welded to the wings at each of their ends along the lines *i*. The forward edge of the plate 14 has an upwardly turned flange 16 thereon at the front thereof.

The top of the cylinder 5 is closed by a dome-shaped head 17 which fits into the cylindrical upper portion of the shell 5 and is welded into the shell, the joint of course being a gas-tight joint, the lower end of the cylindrical casing disclosed by the plate 18 forming the bottom of the ash pit. The plate 18 has a forwardly extending portion 19 extending between the wings 7 and 8 and resting on the front casting 2 at the bottom of the ash door. Welded to the interior of the shell is a ring or flange 20 on which is supported a refractory lining 21 for the fire box. At the front of the furnace, between the wings 7 and 8, the refractory is retained in position by a plate 22 spanning the distance between the wings and curved to conform to the curvature of the fire box.

At 23 is a rotary grate construction of the usual type. The rear end of this grate is supported on casters 24 riding on an inclined track 25, while the front end thereof is supported on a lug 26 on the inside of the casting 2, a removable pin 27 establishing the connection between the lug on the plate 2 and a part of the grate assembly, the arrangement being such that by removal of the pin 27 the front end of the grate unit may be dropped down and the whole unit then pulled out through the ash door.

According to the present invention the distance between the inner ends of the wings, i. e., the distance between points *k* and *k*, as viewed in Figures 2, 4 and 5, is always slightly greater than the diameter of the grate unit to permit the removal of the grate unit through the ash door.

The shaking of the grates is accomplished by means of a vertical lever 28 pivotally supported on a lug 29 at the bottom of the casting 2. A link 30 extends from a midpoint on the lever to a pin 31 on one side of the rotary grate ring.

Since the diameter of the grate ring is always less than the minimum distance between the wings 7 and 8, and since a standard size of casting 2 is used for several different sizes of furnaces, whereby the lever 28 is always in the same relative position with reference to the front of the furnace, it is obvious that a link 30, which is satisfactory for a large furnace, would not line up properly for a furnace of smaller diameter.

To overcome this difficulty the link 30 as shown in Figure 2 is provided with a lateral offset as shown at 30^a on the smaller sizes of furnaces. To accommodate this offset the wing 8 has an outwardly pressed pocket 32 therein as shown

in Figs 2 and 5. On the larger size of furnace with the same size front plate 2, the link 30 may be straight and a pocket of this kind is not required. The length of the pocket from the flange back toward the fire box is only slightly greater than the distance through which the link 30 reciprocates.

Set above the plate 14 and located on the inside of the flange 16 is a second cast metal plate 33 in which is the water trough 34 for humidifying the air. Welded into the flue port 6 is a flue passage 35 leading into a radiator 36 and from the bottom of the radiator 36 is a flue passage 37, this arrangement being similar to that generally employed in hot air furnaces.

The advantages of the construction as herein described reside in the fact that the steel shell 5 with its wings 7 and 8 and the plate 14 provides a tight structure through which gases and smoke from the fire box cannot escape into the air chamber surrounding the furnace. If any leakage occurs between the plate 14 and the front casting 2, the gases which escape escape into the atmosphere and not into the air space. The downwardly extending flange 33^a on the casting 33 assures this. If any gases escape between the flange 9 and the front plate 2, such gases again escape into the surrounding atmosphere and not into the air space inside the outer shell 11. By the use of the integral wings 7 and 8 the arrangement is such that a single size of front plate 2 is satisfactory for several different diameters of furnaces. Because the minimum distance between the wings is never less than the maximum diameter of the grate, the grate can always be easily removed for repairs. The provisions of the offset portion in the grate operating link 30 in combination with the pocket 32 on the smaller diameters of furnaces also provides for the use of a standard front plate 2 with furnaces of different diameters, assuring always a proper clearance for the operating link.

We have shown and described a preferred embodiment of our invention, but it will be apparent that various changes and modifications may be made therein within the contemplation of our invention and under the scope of the following claims.

We claim:

1. The method of forming a sheet steel furnace structure which comprises forming a metal sheet of a width and length sufficient to produce the furnace structure, cutting the sheet from each of the vertical edges back toward the center of the sheet for a predetermined distance, circling the sheet into a substantially cylindrical form, joining the meeting edges of the sheet above the cut to provide a permanent seam, and bending the portions of the sheet below the cut outwardly to provide spaced apart wings, the wings being spread to conform to the width of the metal front plate with which the structure is adapted to be used, then securing a curved plate across the gap between the wings and intermediate the top and the bottom of the wings and substantially flush with the interior of the cylindrical walls to form a partition defining a fire door and an ash door.

2. The method of forming a sheet steel furnace structure which comprises forming a metal sheet of a width and length sufficient to produce the furnace structure, cutting the sheet from each of the vertical edges back toward the center of the sheet for a predetermined dis-

tance, circling the sheet into a substantially cylindrical form, joining the meeting edges of the sheet above the cut to provide a permanent seam, and bending the portions of the sheet below the cut outwardly to provide spaced apart wings, the wings being spread to conform to the width of the metal front plate with which the structure is adapted to be used, the wings being flared outwardly to this width, then securing a curved plate across the gap between the wings and intermediate the top and the bottom of the wings and substantially flush with the interior of the cylindrical walls to form a partition defining a fire door and an ash door.

3. A furnace shell of the class described comprising an integral body having a completely cylindrical upper portion formed from sheet metal, said body having integral forwardly extending wings below such cylindrical upper portion, and a plate having an upwardly turned flange at the outer edge thereof spanning the distance between the wings at the upper ends of said wings and having its ends welded to the wings and its inner edge welded to the lower portion of said completely cylindrical upper portion of the body, said wings being flared outwardly, and a front plate bolted to the wings, one of said wings having a laterally offset pocket therein, and a grate operating rod extending through the front plate into the shell, said rod having a laterally offset portion received within said pocket.

4. A furnace structure comprising a front plate, an integral sheet metal casing of greater height than the front plate having a continuously cylindrical upper part, a generally cylindrical lower part with outwardly turned wings which extend substantially the full height of the front plate, the outer ends of the wings being joined to the upper plate and being separated a distance at least as great as the distance between the wings at their inner ends where they join the cylindrical lower part of the body, the distance between the wings at the inner ends being approximately the same as the maximum width of the grate which the cylindrical lower part of the body will accommodate.

5. A furnace structure comprising a front plate, an integral sheet metal casing of greater height than the front plate having a continuously cylindrical upper part, a generally cylindrical lower part with outwardly turned wings which extend substantially the full height of the front plate, the outer ends of the wings being joined to the upper plate, the wings diverging outwardly from the cylindrical body to the front plate, the separation between the wings at their point of juncture with the cylindrical body being substantially the same as the diameter of the grate which the cylindrical lower part of the casing will accommodate and less than the maximum diameter of such lower part of the body.

6. A furnace structure comprising a front plate, an integral sheet metal casing of greater height than the front plate having a continuously cylindrical upper part, a generally cylindrical lower part with outwardly turned wings which extend substantially the full height of the front plate, the outer ends of the wings being joined to the upper plate and being separated a distance at least as great as the distance between the wings at their inner ends where they join the cylindrical lower part of the body, the distance between

the wings at the inner ends being approximately the same as the maximum width of the grate which the cylindrical lower part of the body will accommodate, said wings having outwardly turned flanges at their outer ends, the furnace having a sheet metal casing which laps behind said flanges, and means for securing the sheet metal casing to the flanges.

7. A heating furnace of the type having a fire box with a fire door and an ash door, comprising a front plate having a door opening near the top thereof and a door opening near the bottom thereof, a fire box comprising a sheet metal cylinder having a continuous upper portion and having a pocket structure below such upper portion, said pocket comprising integral wings projecting outwardly from the metal cylinder at opposite sides of the center line of the cylinder and of a height substantially coextensive with the front plate, the outer edges of the wings being connected to the front plate, the separation of the wings at their point of juncture with the cylindrical body being slightly less than the width of the front plate and the internal diameter of the cylinder, and a grate within the cylinder the diameter of which is substantially the same as the distance between said wings at their point of juncture with the cylindrical body.

8. A heating furnace of the type having a fire box with a fire door and an ash door, comprising a front plate having a door opening near the top thereof and a door opening near the bottom thereof, a fire box comprising a sheet metal cylinder having a continuous upper portion and having a pocket structure below such upper portion, said pocket comprising integral wings projecting outwardly from the metal cylinder at opposite sides of the center line of the cylinder and of a height substantially coextensive with the front plate, the outer edges of the wings being connected to the front plate, the separation of the wings at their point of juncture with the cylindrical body being slightly less than the width of the front plate and the internal diameter of the cylinder, a grate within the cylinder the diameter of which is substantially the same as the distance between said wings at their point of juncture with the cylindrical body, and a partition comprising a curved plate extending around between the wings intermediate the top and bottom thereof and forming an opening through the casing which registers with the fire door and the ash door of the front plate.

9. The method of making furnaces of a range of sizes, which comprises forming front plates of uniform dimension for furnaces of a number of different sizes, forming a plurality of cylindrical fire boxes of different diameters and providing outwardly projecting spaced apart wings on such cylindrical fire boxes with the minimum separation between the wings of any one size as great as the diameter of the grate which the fire box will hold and less than the internal diameter of the cylindrical casing, and bending the wings to make the spacing between the outer edges thereof correspond to the width of the front plate and securing the outer edges of the wings to the marginal portions of the front plate.

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