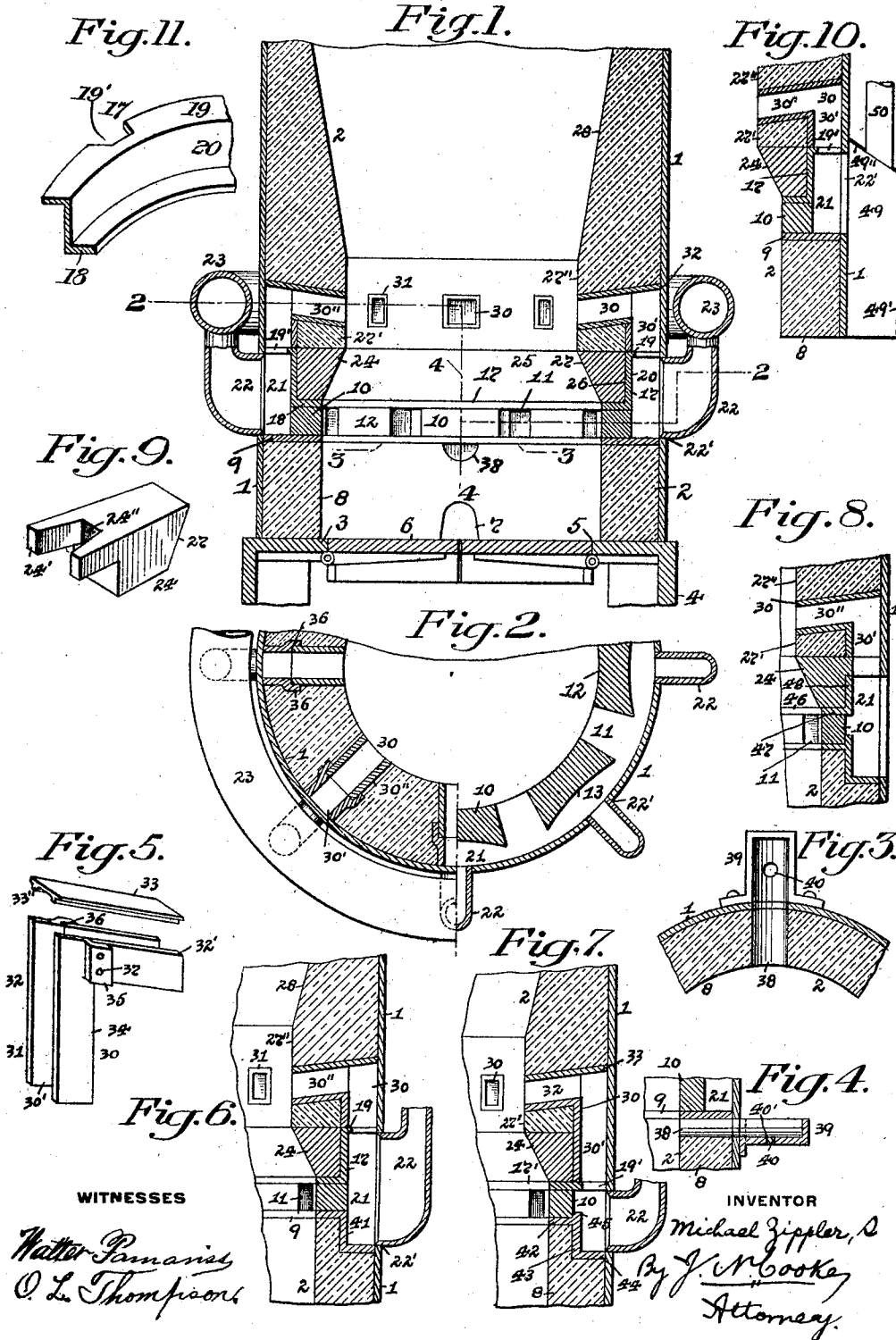


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FURNACE.
APPLICATION FILED MAR. 12. 1909.

942,872.

Patented Dec. 7, 1909.



UNITED STATES PATENT OFFICE.

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FURNACE.

942,872.

Specification of Letters Patent.

Patented, Dec. 7, 1909.

Application filed March 12, 1909. Serial No. 483,042.

To all whom it may concern:

Be it known that I, MICHAEL ZIPPLER, SR., a resident of Pittsburg, (North Side,) in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to furnaces and has special reference to what are known as "cupola furnaces".

The object of my invention is to provide a cheap, simple and efficient form of a lining for such furnaces in which a larger amount of air storage space can be formed therein than is ordinarily provided, and without weakening the furnace or said lining, as well as enabling the furnace to run continuously and give more blast area.

My invention consists, generally stated, in the novel arrangement, construction and combination of parts, as hereinafter more specifically set forth and described and particularly pointed out in the claims.

To enable others skilled in the art to which my invention appertains to construct and use my improved furnace, I will describe the same more fully, referring to the accompanying drawing, in which—

Figure 1 is a vertical central section of the base portion of a cupola furnace showing my invention applied thereto. Fig. 2 is a cross-section on the line 2—2 Fig. 1 with one side of the same removed. Fig. 3 is a detail cross-section on the line 3—3 Fig. 1. Fig. 4 is a section on the line 4—4 Fig. 1. Fig. 5 is a perspective view of one of the air boxes employed. Figs. 6, 7 and 8 are sectional views showing other forms of my invention. Fig. 9 is a perspective view of one of the bricks for forming the metal lining shown in Fig. 8. Fig. 10 is a sectional view showing another form of furnace. Fig. 11 is a perspective view of a portion of the Z-shaped ring or plate employed.

Like symbols of reference herein indicate like parts in each of the figures of the drawing.

As illustrated in the drawing the general arrangement and form of the furnace is similar to that shown and described in my United States Letters Patent No. 874,476, granted on December 24, 1907, in which the casing 1 incloses the lining 2, and such lining in the ordinary furnaces is generally

formed of fire bricks and of the same general thickness of walls throughout the length or height of the furnace. In such furnaces the casing 1 and lining 2 are built up from the bottom plate 3, which rests upon columns 4 extending down to the ground or floor of the foundry or mill for supporting said furnace. The bottom plate 3 has the usual opening 5 therein for being closed by the doors 6 hinged at the side of the plate and which form the bottom or base of the furnace for supporting the material within the same and for permitting the withdrawal of said material after the heat, or when desired. Adjacent to the plate 3 is the usual tap-hole 7 extending through the casing 1 and lining 2 and is used to draw off the molten metal from the furnace.

In the present construction the lining 2 is built up from the plate 3 for a short distance and of uniform thickness to form the lower wall portion 8 of said lining and upon the same and extending from its inner face to the casing 1 is secured the lower metal ring 9 of segmental plates or sections, as shown in Fig. 1. Resting upon the ring 9 are a series of metal blocks 10, which are placed around the same and at the inner edge thereof to form the main horizontal flues or twyers 11 between them. These blocks 10 are provided with the curved inner faces 12 to correspond with the like face on the ring 9, and are also provided with the recesses 13 on the rear of the same for more properly distributing the air from the chamber hereinafter described through the twyers 11 to the furnace.

Laid on or secured upon the blocks 10 is the metal ring 17 which is formed of segmental plates or sections and preferably Z-shape in cross-section, as shown in Fig. 11, so that the lower horizontal flange 18 of the same rests upon said blocks and the upper horizontal flange 19 thereof extends outward and against the casing 1, thereby forming the large vertical air chamber 21 between said flange and casing, the vertical flange or body 20 of said ring, the said blocks and the ring 9. The air supply pipes 22 lead into the lower end of the chamber 21 through openings 22' in the casing 1 and opposite the twyers 11, and they connect on the exterior of the furnace with the main blast pipe 23 leading from the usual source of blast supply. The openings 22' connect

with the chamber 21 and they are preferably of the same height as said chamber.

Resting by their bottom faces on the flange 18 of the ring 17 are the metal bricks or plates 24, which are tapered on their sides to form a brick or plate of keystone or wedge shape for insertion to form a circular metal lining 25 at this point. The rear or outer faces 26 of these bricks 24 rest against the body 20 of the ring 17, and the front or inner faces 27 of the same are inclined upwardly and inwardly toward the center of the furnace.

Extending above and from the upper faces of the bricks 24 and flange 19 of the ring 17 is the wall portion 27' of the lining 2 which is preferably of the ordinary fire brick and extends from the upper inner edge of said bricks to form said wall portion inwardly projecting, as at 27'. Above the projecting portion 27' the lining 2 extends upward and backward at an incline, as at 28, and joins the upper wall of the said lining at its upper end, such portion and said wall being preferably formed of fire-brick and said wall being of the usual thickness of four and one half inches from said portion up to the top of the furnace.

Extending up from the air chamber 21 are the auxiliary flues or twyers 30 which pass through the lining 2 and lead into the furnace through the projecting portion 27' of said lining. These twyers 30 connect with the chamber 21 through openings 19' in the flange 19 of the ring 17 and are formed of metal boxes 31 built within the lining 2 and against the casing 1, such boxes being preferably formed in two sections to form the vertical and the substantially horizontal and downwardly inclined portions 30' and 30'' of said twyers. The boxes 27 are provided with the open side 32 for fitting against the casing 1 to form the twyer portion 30' and the twyer portion 30'' is also provided with the open top 32' for being closed by a cover or top plate 33 fitting over the same and held within said portion 30'' by the strips or flanges 33' on said plate. The vertical section 34 of the boxes 31 for the twyer portion 30' is preferably provided with the projection 35 at the upper end of the same to form a seat 36, within which the end of the inclined twyer portion 30'' of said boxes are adapted to fit and be held in place by pins 37 passing through the same.

In the operation of my improved furnace the material for melting the metal is placed upon the doors 6 in the ordinary manner and such material extends up to the top of the lining 28 where the metal to be melted is placed. After the fire has been started in the furnace and the air blast turned on, such air will pass from the blast pipe 23 through the pipes 22 and opening 22' into

the chamber 21 and thence from said chamber into the furnace through the twyers 11 and 30, which will cause the metal to melt and run down the lining 28 through the material to the bottom of the furnace and away from the flues 11 and 30 where it can be drawn off through the tap hole 7. After the metal has been drawn off through the tap hole 7, the doors 6 can be opened and the material left within the furnace will be free from the lining 2, so that it can be dropped to the ground or floor.

If desired, the lining 2 below the metal ring 9 can be provided with a trough or recessed portion 38 within the same and extending down into the wall 8 of said lining which leads from the furnace to a box 39 secured on the outside of the casing 1, and such portions act to prevent any overflow of the melted metal within the furnace from entering the twyers 11 and conduct the same to said box, where it will burn out the plug 40 in a hole 40' in the bottom of said box and pass through said hole to the floor or ground, so that when the bosh is full of molten metal or slag it can also escape in this manner.

In Figs. 6 and 7 the metal ring 9 in forming the bottom of the vertical air chamber 21 can be made in the form of Z-shaped segmental plates or sections, as shown at 41, in which case the upper horizontal flange 42 can be placed between the blocks 10 and wall 8, and the vertical body 43 and lower horizontal flange 44 extend down into said wall, so that the end of said lower flange will come against the casing 1 to form the bottom of said chamber and thereby form a larger air chamber 21 for use with low down pipes or twyers, as in Fig. 6. In Fig. 7 such plate 41 can be provided with a lug 45 extending up from the upper flange 42 in order to form an abutment for the blocks 10 and keep them in place, and in case it is desired to form a smaller air chamber 21 a flat metal ring 17' can be used in place of the Z-shaped ring 17, as shown in said figure, so that the vertical portions 30' of the twyer boxes 30 can be lengthened to rest upon said ring and communicate with the said chamber through the openings 19' therein.

In Figs. 8 and 9 the metal bricks or plates 24 can be provided with flanges or lugs 24' extending out from the rear faces of the same and at the upper ends thereof for fitting by their ends against the casing 1 to form the upper wall of the chamber 21, so that in this case the vertical portions 30' of the twyer boxes 30 can rest upon said lugs and communicate with said chamber through the openings 24'' between said lugs. In this form the ring 17 can be formed of angular shaped segmental plates or sections, as at 46, so that one flange 47 of said ring can be placed between the bricks or plates 24 and

the blocks 10 and the other flange 48 placed in a vertical upward line against the rear faces of said bricks. The bricks 24 in this arrangement will support and form a connection with the chamber 21 in place of and the same as the plate or rings, while at the same time they will still form a bosh to the furnace.

In Fig. 10, the air blast is shown as supplied to the chamber 21 from a large air chamber 49 surrounding the lower end of the furnace, which communicates with the chamber 21 through the openings 22', and the chamber 49 is formed of a casing 49' having an inclined top 49'' leading upwardly against the casing 1, and through said top an air blast pipe 50 leads into said chamber from the usual source of supply.

Various other modifications and changes in the design and construction of the various parts of my improved furnace may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

It will thus be seen that my improved furnace will enable a continuous air chamber of a large blast area to be formed on the inside of the furnace shell or casing and of a greater vertical depth than the main twyers, so that the reduced twyers will feed the air therefrom to the furnace, thereby permitting said air to be compressed as it is fed to the entire furnace, which will make the melting of the metal more uniform and prolong the life of the furnace lining. This arrangement of air chamber and twyers will also prevent what is known as "center melting" of the metal and forms a continuous flow of the air, which enables a more uniform and steady blast pressure to supply all the twyers with a sufficient amount of air to melt the metal freely and without the clogging of the twyers, while at the same time getting the blast more evenly distributed and spreading the same over the entire furnace. It will also be seen that my improved furnace will overcome the changing of the different parts of the lining and connections to the furnace, so that the arrangement of air chamber and twyers can be applied to the ordinary approved form of these furnaces, while the construction of the combination plate for such chamber can be made in different shapes and styles, and forms a solid and substantial rest for the overhanging bricks or plates. The plate for the chamber can be used for the raising or lowering of the auxiliary twyers without interfering with the furnace shell or casing and will enable the supplying of air to said twyers through the same, so that such air enters the furnace through the projecting portion thereof, and as many of such twyers can be used as desired to get the best results. The plate can be made to any size

necessary to deliver air to the furnace through the main twyers and can be made in one piece or in segments or sections to suit each and every furnace, while at the same time it can be cut in the center and at both ends to meet any requirements necessary, or can be made in blank without casting for the upright twyer boxes. The connections for forming the air chamber are strong and durable, are easily set and secured in place and will add very little to the cost of forming the linings in these furnaces.

What I claim as my invention and desire to secure by Letters Patent is—

1. In a furnace, the combination of the wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said chamber being of greater vertical depth than said twyers, and a plate extending from the interior of said lining and forming the wall of said chamber.

2. In a furnace, the combination of the wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said chamber being of greater vertical depth than said twyers, and an angular-shaped plate extending from the interior of said lining and forming the wall of said chamber.

3. In a furnace, the combination of the wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said chamber being of greater vertical depth than said twyers, and a Z-shaped plate extending from the interior portion of said lining and forming the walls of said chamber.

4. In a furnace, the combination of the wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said chamber being of greater vertical depth than said twyers, auxiliary twyers leading up from said chamber and into the furnace through said lining, and a Z-shaped plate extending from the interior portion of said lining for forming the walls of said chamber and for supporting said auxiliary twyers.

5. In a furnace, the combination of the wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said chamber being of greater vertical depth than said twyers, and a sectional Z-shaped plate extending from the interior portion of said lining and forming the walls of said chamber.

6. In a furnace, the combination of a wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said chamber being of greater vertical depth than said twyers, auxiliary twyers leading up from said chamber and into the furnace through

said lining, and a sectional Z-shaped plate extending from the interior portion of said lining for forming the walls of said chamber and for supporting said auxiliary
5 twyers.

7. In a furnace, the combination of the wall or lining having main twyers within the same, an air chamber within said lining and connected to said twyers, said air chamber being of greater vertical depth than said
10 twyers, auxiliary twyers leading up from said chamber and into the furnace through said lining, and a Z-shaped plate extending from the interior portion of said lining for
15 forming the walls of said chamber and for supporting said auxiliary twyers, said plate having openings within the same for communicating with said auxiliary twyers.

8. In a furnace, the combination of the

wall or lining having main twyers within 20 the same, an air chamber within said lining and connected to said twyers, said air chamber being of greater vertical depth than said twyers, auxiliary twyers leading up from
25 said chamber and into the furnace through said lining, and a sectional Z-shaped plate extending from the interior portion of said lining for forming the walls of said chamber and for supporting said auxiliary twyers,
30 said plate having openings within the same for communicating with said auxiliary twyers.

In testimony whereof, I, the said MICHAEL ZIPPLER, Sr., have hereunto set my hand.

MICHAEL ZIPPLER, Sr.

Witnesses:

JAMES L. WEHN,
J. N. COOKE.