F. J. ZIPPLER.

FURNACE.

APPLICATION FILED JUNE 29, 1910.

998,940.

Patented July 25, 1911.

2 SHEETS—SHEET 1.

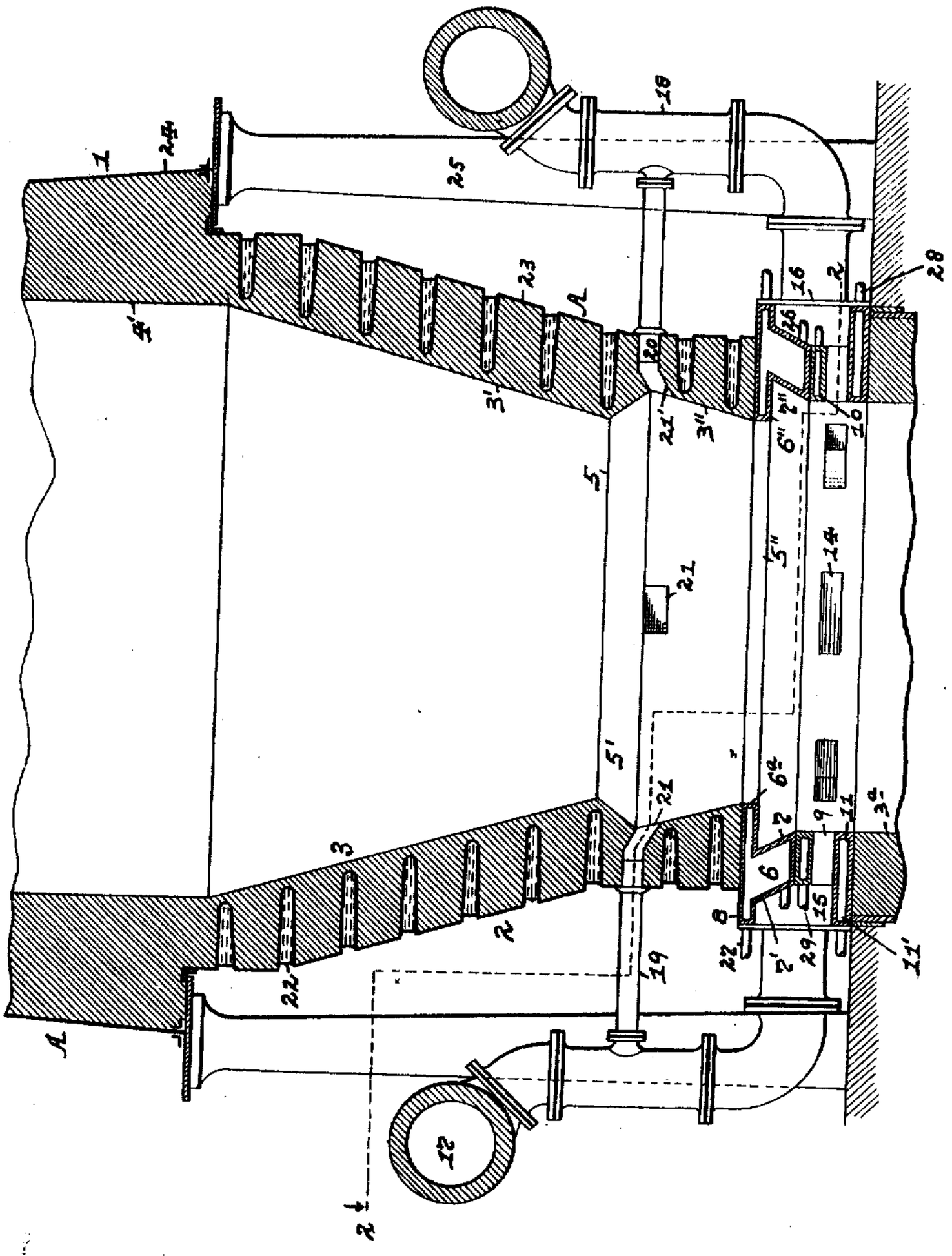

FIG. 1.

Witnesses:
C. B. Hunt Obries
O. L. Thompson.

Inventor:
Francis J. Zippler
By J. P. Cooke
Attorney.

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2 SHEETS—SHEET 2.

Fig. 3.

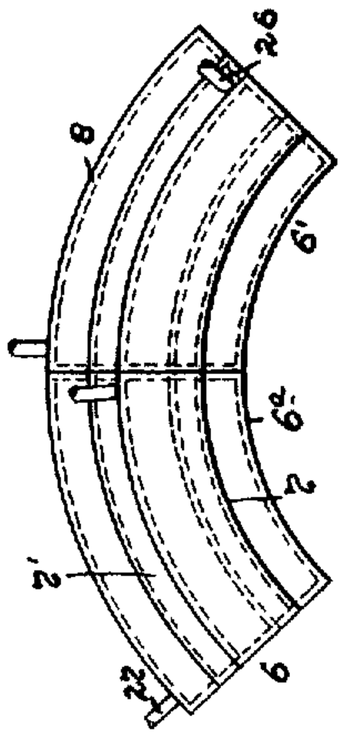


Fig. 4.

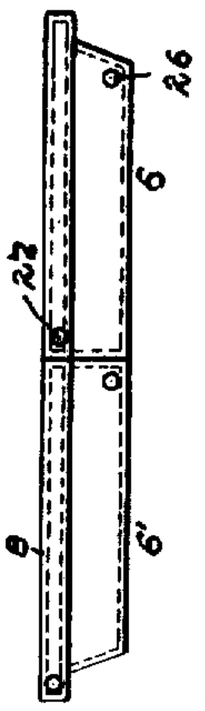


Fig. 5.

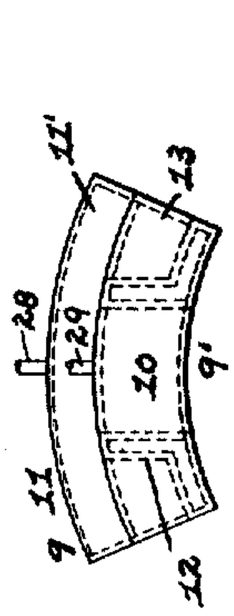


Fig. 6.

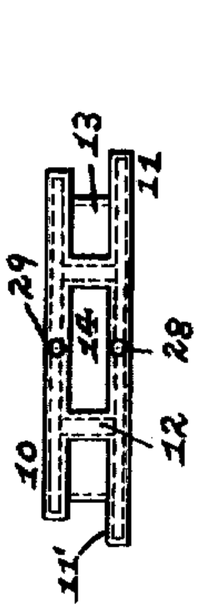
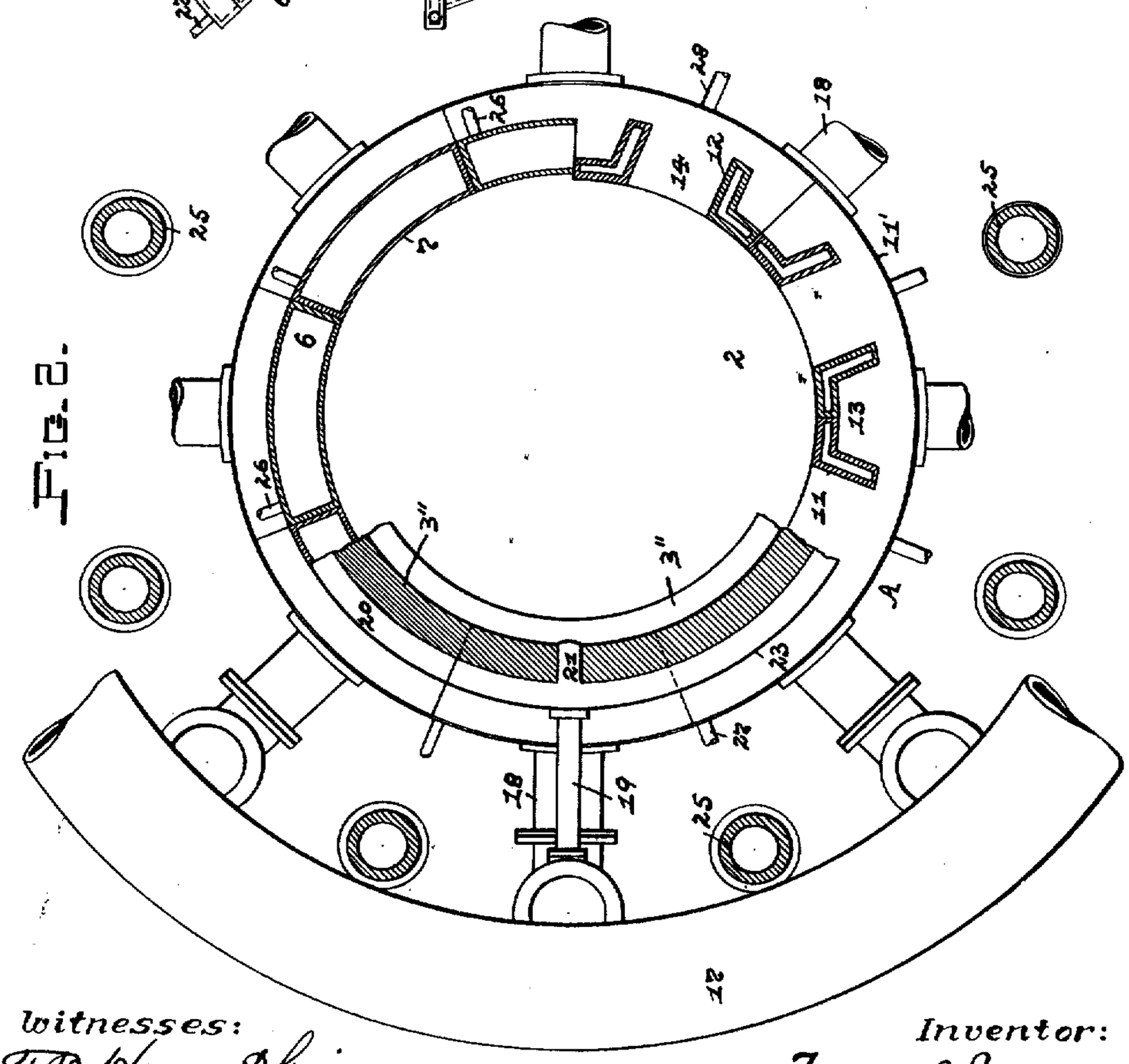


Fig. 2.



Witnesses:

T. B. Humphreis.

O. L. Thompson.

Inventor:

Francis J. Zippler,

By F. P. Cooke,

attorney.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FRANCIS J. ZIPPLER, OF AVALON, PENNSYLVANIA.

FURNACE.

998,940. Specification of Letters Patent. Patented July 25, 1911.

Application filed June 29, 1910. Serial No. 569,571.

To all whom it may concern:

Be it known that I, FRANCIS J. ZIPPLER, a resident of Avalon, 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 the "bosh" of blast and other similar furnaces.

The object of my invention is to provide a cheap, simple and efficient form of a bosh for a blast or other similar furnaces in which the burning out of the same is reduced to a minimum, will provide for an increased output by such furnace, will enable a reduction of the fuel consumption therein, and one which will prevent the sticking of the melted metal therein.

To these ends my invention consists, generally stated, in the novel arrangement, construction and combination of parts, as hereinafter more particularly 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 blast furnace, I will describe the same more fully, referring to the accompanying drawing, in which—

Figure 1 is a vertical section of the lower part of a blast furnace embodying my invention. Fig. 2 is a cross-section of the same on the line 2—2, Fig. 1 looking in the direction of the arrow. Fig. 3 is a top plan view of one of the segments employed in forming the inwardly extending water-jacket. Fig. 4 is an outer face view of the same. Fig. 5 is a top plan view of one of the segments employed in forming the twyer boxes. Fig. 6 is an outer face view of the same.

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

As illustrated in the drawings, 1 represents the upper portion and 2 the bosh of the blast-furnace A, which bosh is provided with the lining or wall 3 having the downwardly and inwardly inclined portion 3′ extending from the straight vertical portion 4′ of the wall 4 in said upper portion, and such linings are formed of the usual fire-brick construction. The lower end of the downwardly and inwardly inclined wall portion 3′ of the bosh-wall 3 is flared outwardly on its inner face, as at 5′, in order to form the upper projecting portion 5 in said wall, while the lower portion of said flared portion connects with the downwardly and inwardly inclined wall portion 3″ in said wall which extends downwardly from said flared portion 5′ and such inclined portions are formed of the usual fire-brick construction.

Fitting under the inclined wall portion 3″ is the hollow water jacket 6, which is of ring shape and formed of segmental sections 6′ preferably of cast metal, such as steel. This jacket 6 has the inner faces 7 on its sections inclined inwardly and downwardly from the outer end of the hollow inner flange portion 6″ on the upper end of said jacket, which extends from said inclined face 7 under the tapered wall portion 3″ to form the space 7″ and the lower projecting portion 5″ by said wall and straight vertical end portion 6ª on said flange. The jacket 6 is provided with the hollow flange portion 8 extending outwardly from the outer faces 7′ on said jacket and at the upper ends of such jacket, which faces are similar to the faces 7, and such flange portion extends beyond the outer face of the inclined wall portion 3″.

Fitting under the jacket 6 is the main twyer belt or jacket portion 9 which rests on the lower vertical wall portion 3ª and is formed of the segmental sections 9′, preferably of cast metal, such as steel. The sections of the twyer portion 9 have the upper and lower sides of the same formed hollow, as at 10 and 11, and between such sides and at the ends of such sections are the vertical L-shaped hollow walls 12. These walls 12 are adapted to abut against each other on each end of the twyer section 9′, so as to form the pockets 13 between such ends, and the main twyers 14 between such walls on each of said sections. The inner faces of the sides 10 and 11 and walls 12 on the twyer sections 9 extend outward and away from the projecting wall portion 5″ and are in line with the lower side of the inwardly inclined face 7 on the jacket 6, and the inner face of the wall portion 3ª below and on which said twyers rest. The outer faces of the side 10 and the walls 12 are in line with the outer flared face 7′ on the jacket 6, while the outer

portion of the side 11 extends beyond the side 10 and walls 11, so as to form the flange or projecting hollow portion 11′ thereon, and the annular air chamber 15 between the portion 11′ and the flange portion 8 on the jacket 6 by the casing 16 fitting against said portions.

Extending exteriorly around the bosh 2 of the furnace A is the bustle or main air pipe 17, which is connected in the usual manner to the usual supply engine, and has the pipes 18 leading therefrom into the twyer chamber 15 at a point in line with the pockets 13 between the twyers 14. Pipes 19 also lead from the pipes 18 into an annular auxiliary air chamber 20 formed in the upper part of the wall portion 3″, which chamber has the auxiliary twyers 21 leading therefrom into the furnace A below the flared portion 5′, and are provided with the downwardly inclined portions 21′ at the inner ends of the same leading into the furnace through said inclined wall 3″.

The bosh 2 of the furnace A above the water jacket 6 has the usual bosh-plates 22 within the wall portions 3′ and 3″ of the same, and the usual casing 23 surrounds such portions,, while the usual casing 24 surrounds portion 4′ of the upper wall 4, which wall extends beyond said bosh in the ordinary manner and is supported by the columns 25.

The water for the jacket 6 and its flanges 6″ and 8 enters at one end of the sections 6′ by the inlet pipe 26 from any source of supply into the flared body 6ª of said jacket sections and passes out through the outlet pipe 27 at the other end of such sections and from the flange 8 thereon. The water for the twyer portion 9 enters centrally of the lower side 11 on the sections 9′ and through the projecting portion 11′ thereon from the inlet pipe 28 connected to a source of supply and passes out from said twyer portion through the outlet pipe 29 leading centrally from the upper side 10 on said sections.

When it is desired to operate my improved blast furnace A to melt the materials therein a portion of the blast of air will pass from the main pipe 17 through the pipes 18 into the annular air chamber 15 formed by the jackets 6 and 9, and thence into the pockets 13 formed by the walls 12, where such air will be deflected by such walls, so that it will pass around the same and then pass through the twyers 14 into the furnace, and below the projecting portion therein formed by the faces 7 on said jacket 6. At the same time a portion of the blast of air from the main pipe 17 will pass from the pipes 18 into the pipes 19, and thence into the annular air chamber 20 in the wall portion 3″, so that it can then enter the twyers 21 and be projected downward therefrom, and into the furnace below the projecting portion 5 formed by the wall 5′ on the wall 3′ by the inclined portions 21 on said twyers. During this operation of the furnace A the water is circulated in the ordinary manner in the bosh-plates 22 in the wall portions 3′ and 3″, and water is also circulated around the sides 10 and 11 and walls 12 of the twyer jacket 9 by the pipes 28 and 29, as well as around the jacket 6 and flange 8 thereon by the pipes 26 and 27.

It will thus be seen that by my improved blast furnace the large air chamber for the lower or main twyers will provide for a large twyer area, so that a large volume of air can be placed in said chamber, which will equalize the blast, and thereby form an even pressure of the blast as it passes through each and every one of such twyers into the furnace, while the upper or auxiliary twyers will also be provided with such a chamber to provide for such twyers working along the same lines and with the same result. By the use of the upper twyers in connection with the lower twyers the furnace will be prevented from scaffolding, and will also enable such furnace to economize in fuel and make an increased output therefrom. The construction of the bosh will also enable the walls of the same to be completely and thoroughly protected, which will prevent the burning out of said walls and the twyers within the same.

It will be evident that the metal within the furnace A as it is melted will be permitted to slide along the inclined wall 3″ and be dropped into the lower part of the furnace from the projecting portion 5″, so that it will not come in contact with the jacket 6 or twyers 9, and thereby saves these parts from rapidly burning out and the metal from sticking in the bosh or the other lining below the wall 3″. It will also be evident that much thinner walls can be used in the bosh of the furnace, which will thereby cheapen the cost of materials and maintenance of such bosh, and will thus enable them to be easier and more quickly repaired or renewed, when necessary. It will further be obvious that my improved construction can be applied to cupola and other forms of furnaces, while various other modifications and changes in the design and construction of my improved furnace may be resorted to, without departing from the spirit of the invention, or sacrificing any of its advantages.

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

1. A furnace having its lining provided with main twyers opening into the furnace, a water jacket above said twyers, an inwardly projecting portion on the inner face

of said lining above said jacket, and a downwardly and inwardly inclined portion below said projecting portion and extending inwardly from said jacket to form an overhanging portion.

2. A furnace having its lining provided with main twyers opening into the furnace, a water jacket above said twyers, an inwardly projecting portion on the inner face of said lining and above said jacket and formed by outwardly inclined portions above and below the same, and a downwardly and inwardly inclined portion on said lining below said last outwardly inclined portion and extending inwardly from said jacket to form an overhanging portion.

3. A furnace having its lining provided with main twyers opening into the furnace, a water jacket above said twyers, an inwardly projecting portion on the inner face of said lining above said jacket, a downwardly and inwardly inclined portion below said projecting portion and extending inwardly from said jacket to form an overhanging portion, and auxiliary air twyers in said lining above said main twyers and opening into the furnace below said projecting portion.

4. A furnace having its lining provided with main twyers opening into the furnace, a water jacket above said twyers, an inwardly projecting portion on the inner face of said lining and above said jacket and formed by outwardly inclined portions above and below the same, a downwardly and inwardly inclined portion on said lining below said last outwardly inclined portion and extending inwardly from said jacket to form an overhanging portion, and auxiliary air twyers in said lining above said main twyers and opening into said furnace below said projecting portion and lower outwardly inclined portion.

5. A furnace having its lining provided with main twyers opening into the furnace, an inwardly projecting portion on the inner face of said lining above said twyers, an inwardly inclined surface below said projecting portion, and a water jacket in said lining above said twyers and having an inwardly projecting portion under said inwardly inclined surface and adapted to form an overhanging portion in said lining above said twyers.

6. A furnace having its lining provided with main twyers opening into the furnace, an inwardly projecting portion on the inner face of said lining and above said twyers and formed by outwardly flared surfaces above and below the same, a downwardly and inwardly inclined surface on said lining face below said lower outwardly inclined surface, and a water jacket in said lining above said twyers and having an inwardly projecting portion under said inwardly inclined surface and adapted to form an overhanging portion in said lining above said twyers.

7. A furnace having its lining provided with main twyers opening into the furnace, an inwardly projecting portion on the inner face of said lining above said twyers, a downwardly and inwardly inclined surface below said projecting portion, auxiliary air twyers in said lining above said main twyers and opening into the furnace below said projecting portion, and a water jacket in said lining above said twyers and having an inwardly projecting portion under said inwardly inclined surface and adapted to form an overhanging portion in said lining above said twyers.

8. A furnace having its lining provided with main twyers opening into the furnace, an inwardly projecting portion on the inner face of said lining and above said twyers and formed by outwardly flared surfaces above and below the same, a downwardly and inwardly inclined surface on said lining face below said lower outwardly inclined surface, auxiliary air twyers in said lining above said main twyers and opening into said furnace below said projecting portion and lower outwardly inclined surface, and a water jacket in said lining above said twyers and having an inwardly projecting portion under said inwardly inclined surface and adapted to form an overhanging portion in said lining above said twyers.

9. A furnace having a bustle pipe and air supply pipes leading therefrom to the furnace, and a twyer belt composed of a series of metallic members providing pockets opposite each of said supply pipes.

10. A furnace provided with twyers, and a ring above said twyers comprising a series of metallic sections having an overhanging portion extending beyond the inner face of said twyers and sections.

11. A furnace provided with twyers, and a ring above said twyers comprising a series of metallic sections having the lower part of their inner faces upwardly and outwardly inclined and the remainder of such faces composed of an overhanging portion extending beyond the inner face of said twyers.

12. A furnace having its lining provided with main twyers opening into the furnace, and an inwardly projecting portion on the inner face of said lining above said main twyers having a downwardly extending portion below said projecting portion and terminating at an upwardly and outwardly inclined portion from said main twyers.

13. A furnace having its lining provided with main twyers opening into the furnace through a vertical portion on said lining, and an inwardly projecting portion on the inner face of said lining above said main twyers having a downwardly extending por-

tion below the same and terminating at an upwardly and outwardly inclined portion from said vertical portion.

14. A furnace having its lining provided with main twyers opening into the furnace, an inwardly projecting portion on the inner face of said lining having a downwardly and outwardly inclined portion below the same, and a downwardly extending portion on said face below said inclined portion and terminating at an upwardly and outwardly inclined portion at its lower end from said main twyers.

15. A furnace having its lining provided with main twyers opening into the furnace through a vertical portion on said lining, an inwardly projecting portion on the inner face of said lining having a downwardly and outwardly inclined portion below the same, a downwardly extending portion on said face below said inclined portion, and an upwardly and outwardly inclined portion below the last named inclined portion and connected at its lower end to said vertical portion.

16. A furnace having its lining provided with main twyers opening into the furnace, auxiliary air twyers in said lining above said main twyers and opening into the furnace, an inwardly projecting portion on the inner face of said lining above said auxiliary twyers, and a downwardly extending portion below said last named twyers and terminating in an upwardly and outwardly inclined portion from said main twyers.

17. A furnace having its lining provided with main twyers opening into the furnace, auxiliary air twyers in said lining above said main twyers and opening into the furnace, an inwardly projecting portion on the inner face of said lining above said auxiliary twyers, and a downwardly extending portion below said last named twyers and terminating in an upwardly and outwardly inclined portion from a lower vertical portion extending along said main twyers.

18. A furnace having its lining provided with main twyers opening into the furnace, auxiliary air twyers in said lining above said main twyers and opening into the furnace, an inwardly projecting portion on the inner face of said lining having a downwardly and outwardly inclined portion below the same and above said auxiliary twyers, a downwardly extending portion on said face below said inclined portion, and an upwardly and outwardly inclined portion below the last named inclined portion extending from said main twyers.

19. A furnace having its lining provided with main twyers opening into the furnace, auxiliary air twyers in said lining above said main twyers and opening into the furnace, an inwardly projecting portion on the inner face of said lining above said auxiliary twyers having a downwardly and outwardly inclined portion above said last named twyers, and a downwardly extending portion below the projecting portion and terminating at its lower end in an upwardly and outwardly inclined portion above said main twyers.

20. A furnace having its lining provided with main twyers opening into the furnace, auxiliary air twyers in said lining above said main twyers and opening into the furnace, an inwardly projecting portion on the inner face of said lining above said auxiliary twyers having a downwardly and outwardly inclined portion above said last named twyers, and a downwardly extending portion below the projecting portion and terminating at its lower end in an upwardly and outwardly inclined portion from a lower vertical portion extending along said main twyers.

In testimony whereof, the said FRANCIS J. ZIPPLER, have hereunto set my hand.

FRANCIS J. ZIPPLER.

Witnesses:

T. B. HUMPHRIES,

J. L. TREFALLER, Jr.