

June 30, 1925.

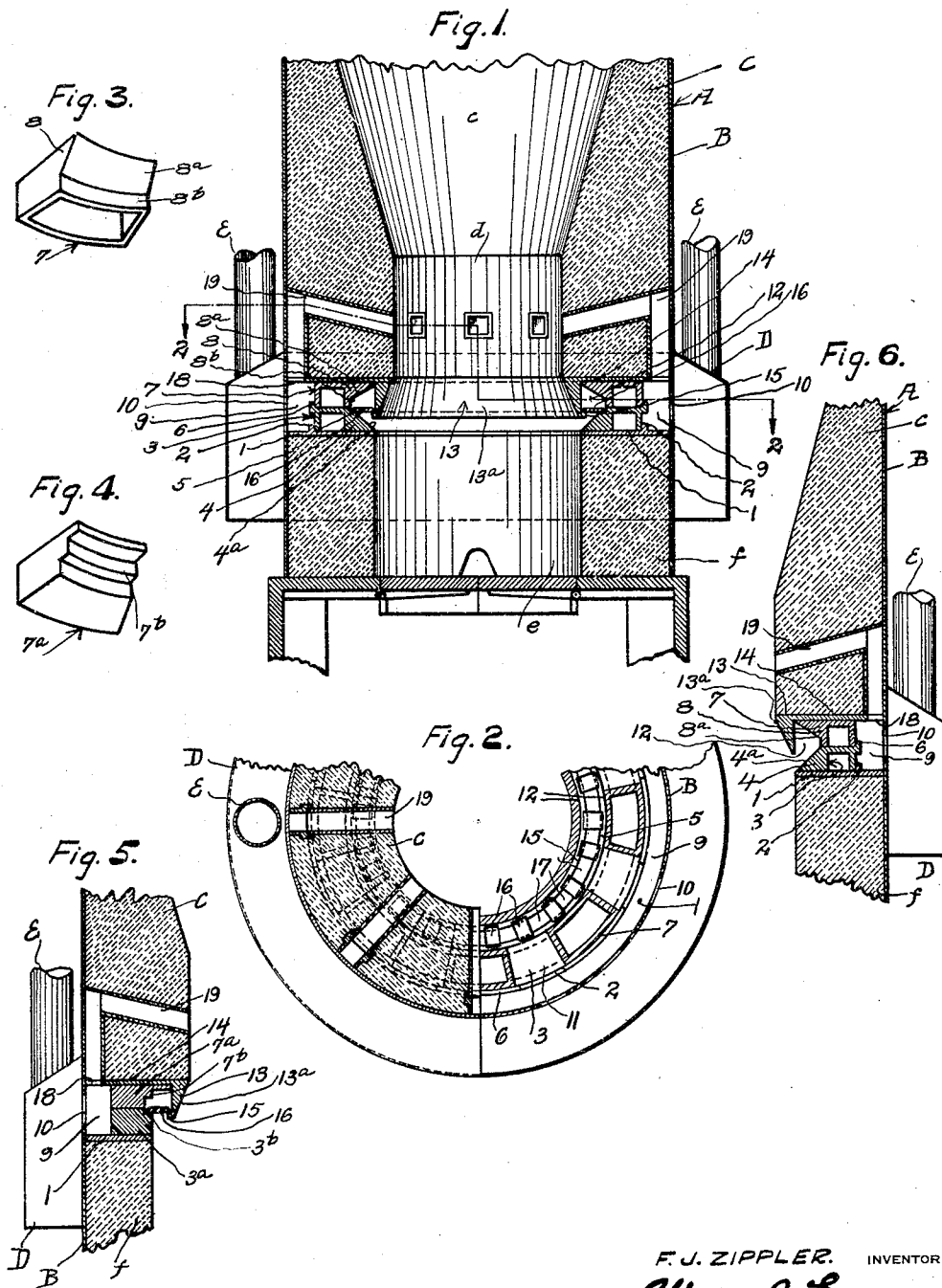
1,543,970

F. J. ZIPPLER

FURNACE CONSTRUCTION

Filed June 27, 1924

2 Sheets-Sheet 1



F. J. ZIPPLER.

INVENTOR

BY *Victor J. Evans*

ATTORNEY

June 30, 1925.

1,543,970

F. J. ZIPPLER

FURNACE CONSTRUCTION

Filed June 27, 1924

2 Sheets-Sheet 2

Fig. 7.

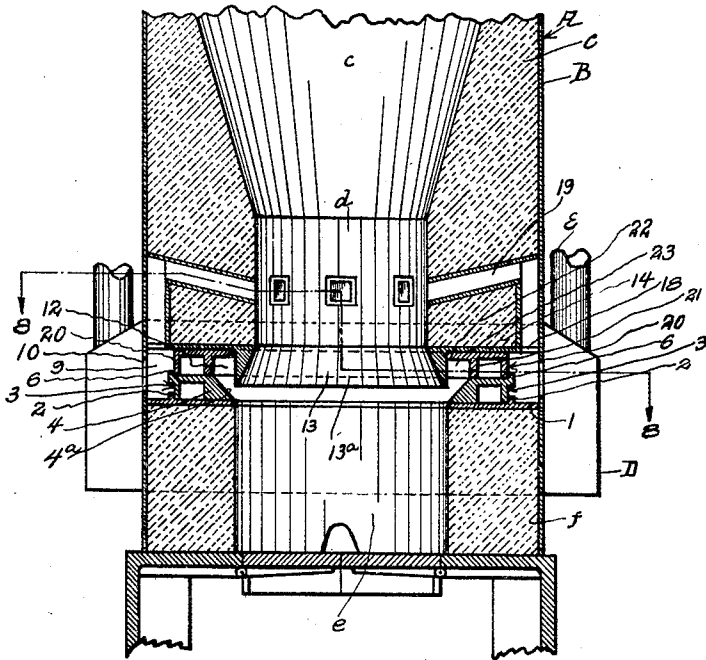


Fig. 8.

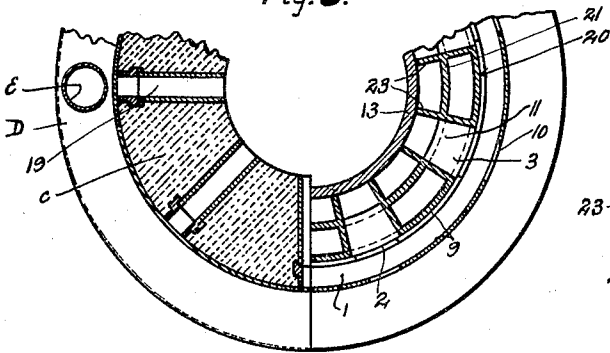
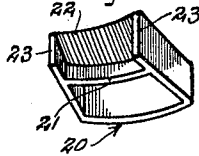


Fig. 9.



F. J. ZIPPLER, INVENTOR
BY *Victor J. Evans*
ATTORNEY

UNITED STATES PATENT OFFICE.

FRANCIS J. ZIPPLER, OF AVALON, PENNSYLVANIA.

FURNACE CONSTRUCTION.

Application filed June 27, 1924. Serial No. 722,766.

To all whom it may concern:

Be it known that I, FRANCIS J. ZIPPLER, a citizen of the United States, residing at Avalon, in the county of Allegheny and State of Pennsylvania, have invented new and useful Improvements in Furnace Constructions, of which the following is a specification.

This invention relates to furnaces, and more particularly to cupola furnaces.

This invention is intended more particularly as an improvement over the furnace construction disclosed in my U. S. Patent 1,055,589 for furnace issued March 11, 1913; and one of the main objects of the present invention is to provide an improved twyer construction whereby the twyer openings into the furnace may be varied in size and in their relative disposition to suit circumstances and obtain maximum efficiency in operation. A further object is to provide a furnace construction in which the air as it enters the furnace is so distributed and controlled as to be uniformly distributed throughout the cross-area of the furnace. Another object is to provide means whereby all possibility of currents or streams of air which have not been preheated being projected into the molten metal in the furnace, is eliminated, thus avoiding "freezing" of the metal in the furnace and consequent stoppage thereof such as not infrequently occurs in furnaces of this general type in which the air is projected into the furnace radially thereof and without sufficient preheating. Further objects will appear from the detail description.

In the drawings:—

Fig. 1 is a vertical sectional view through the lower portion of a furnace constructed in accordance with my invention;

Fig. 2 is a horizontal section substantially on line 2—2 of Fig. 1;

Fig. 3 is a perspective detail of one of the upper twyer blocks;

Fig. 4 is a perspective detail of a modified form of upper twyer block;

Fig. 5 is a fragmentary section through the furnace showing a modified form of construction;

Fig. 6 is a fragmentary section showing a slight modification of the form illustrated in Fig. 1;

Fig. 7 is a vertical section through the lower portion of the furnace showing another modified form of construction;

Fig. 8 is a section taken substantially on line 8—8 of Fig. 7;

Fig. 9 is a detail perspective view of one of the twyer blocks used in the construction shown in Figs. 7 and 8.

The furnace A is of known construction and includes a sheathing or casing B which surrounds the refractory material C of the interior of the furnace. The furnace is provided with a downwardly tapering neck portion *c* with which communicates a reduced throat *d* the lower end of which opens into an enlarged metal receiving chamber *e* provided in the lower portion *f* of the furnace structure. The construction of cupola furnaces of this type is well known in this art and it is not thought necessary to further describe in detail the construction of the furnace itself.

A cast iron ring 1 which may be formed in one piece or of one or more segments, as desired, is mounted upon the top of lower portion *f* of the furnace structure. This ring is provided, a short distance from its outer edge, with an upwardly projecting rib 2 which acts as a stop element for a series of lower twyer blocks 3 of cast iron or other suitable material, these blocks being of hollow construction and of segmental shape, the open sides of the blocks being directed downwardly and seating upon ring 1. Each block is provided with a thickened inner portion 4 the inner upper face 4^a of which is inclined downwardly and inwardly of the furnace. A horizontally disposed shoulder 5 is provided at the upper end of surface 4^a. The block is further provided, at its outer upper edge, with an upwardly projecting flange 6. This flange acts as a stop element for an upper twyer block 7 which is also of hollow construction and is seated upon block 3 with its open side directed downwardly. Block 7 is provided with an inner upper thickened portion 8 the inner surface 8^a of which is inclined upwardly and inwardly of the furnace, from the lower end of which extends a short vertical portion 8^b. The twyer blocks 3 and 7 are held in superposed relation and are spaced away from the periphery of lower portion *f* of the furnace so as to leave an annular air space 9 extending about the furnace between the twyer blocks and the casing B. An air manifold or chest D extends about the furnace and air under pressure is supplied to this chest through conduits E in any

suitable or preferred manner, this air flowing from the chest into air space 9 by means of openings 10 provided through casing B for this purpose.

As will be noted from Fig. 2, upper twyer blocks 7 are spaced apart so as to provide openings 11 between these blocks, these openings communicating with an annular air passage 12 formed between the elements 8 of blocks 7 and an inner flange or wall 13 which depends from an annular cast iron plate 14 which seats upon blocks 7. The inner surface 13^a of wall 13 is inclined downwardly and outwardly of the furnace from the lower end of throat *d* and this wall is provided at its lower edge with an outwardly projecting shoulder 15 which is disposed in alignment with shoulders 5 of blocks 3. Wall 13 co-acts with the inclined surfaces 4^a of elements 4 of blocks 3 to provide an outlet opening at the lower portion of the passage 12 which acts to direct the air from this passage into the furnace downwardly and inwardly thereof. The inclined surface 13^a of the wall 13 acts to deflect the air which tends to flow upwardly along this surface upwardly and inwardly of the furnace, the air being thus uniformly distributed throughout the cross-area of the furnace and all tendency to project the air into the furnace radially thereof in streams and at high velocity is eliminated thus effectually preventing sudden cooling and consequent freezing of the molten metal passing into the lower portion of the furnace, such as occurs in furnaces of this type where relatively cold air is projected into the furnace radially thereof.

A plurality of closure members or bricks 16 of refractory material are supported upon shoulders 5 and 15 of blocks 3 and wall 13, respectively, these bricks extending across the lower portion of air passage 12. By spacing these bricks apart I provide a plurality of outlet twyer openings 17 through which the air is discharged into the furnace in the manner described. The bricks 16 are free from each other and from the flanges so that these bricks may be moved toward or away from each other thus varying the sizes of the openings 17 as well as the relative disposition of these openings. This feature is of particular importance as it permits ready adjustment of the twyer openings so as to obtain the best possible results while properly regulating the entry of air into the furnace. This provides very simple and highly efficient means whereby the admission of air to the furnace may be readily controlled and adjusted so as to obtain maximum efficiency. Ring 14 is provided with a plurality of openings 18 which are disposed in alignment with air space 9. A plurality of air flues 19 of approxi-

mately L-shape are mounted in body C of the furnace, the lower ends of these flues registering with openings 18 and the upper ends of these flues communicating with throat *d* at the approximate center thereof. For convenience in handling these flues are preferably constructed of sections of cast iron, one of these sections being provided with offset elements or lugs for reception of the other section, as illustrated in Fig. 2. This construction of flue is fully illustrated and described in the U. S. Patent 874,476 for cupola furnace issued December 24, 1907, to Michael Zippler, and need not be further described in detail here. It is to be noted, however, that I do not in any way limit myself to this particular construction of flue as any suitable or preferred construction may be employed and, if desired, the flues may be replaced by suitable passage ways or ducts formed in the wall of the furnace, as will be readily understood. A portion of the air which enters into air space 9 is discharged into the annular air passage 12 from which it is discharged into the furnace below throat *d* in the manner previously described. This air is caused to assume a tortuous path of travel so as to be preheated before it enters into the furnace itself. The remaining portion of the air which enters space 9 flows upwardly through flues 19 and is discharged into throat *d* centrally thereof, this air being also preheated and having its direction of travel reversed during passage through the flues. In this manner I assure that a maximum amount of air is supplied to the molten metal flowing through throat *d* into the lower portion of the chamber, this air being preheated and so directed and distributed as to effectually prevent cooling and consequent freezing of the metal.

In the modified form illustrated in Fig. 5 I have shown a solid lower twyer block 3^a having a vertical inner face 3^b and a solid upper twyer block 7^a having a stepped inner face 7^b. Ordinarily, however, I prefer to use the hollow blocks illustrated and above described though the solid blocks can be employed where great strength is desired. In the form illustrated in Fig. 5 I have also omitted the rib 2 of plate 1 as the solid blocks are sufficiently heavy to remain in proper position under ordinary conditions though, as will be understood, these blocks and the ring 1 can, if desired, be provided with co-acting flanges and a rib for holding the blocks against movement.

In the form illustrated in Fig. 6 the shoulder 15 of the depending wall 13 of plate 14 is omitted, as well as the shoulder 5 of block 3 and the bricks 16. In all other respects the construction in this form is similar to that illustrated in Figs. 1 and 2.

In Figs. 7 and 8 I have shown a different type of upper twyer block 20 of hollow construction which is provided, adjacent to its inner end, with an inner wall 21 from which extend top and side walls 22 and 23, respectively. This provides a block of light construction which possesses great strength and is well adapted for use in constructing unusually large or heavy furnaces. In all other respects the construction of the form illustrated in Figs. 7 and 8 is similar to that illustrated in Fig. 6.

As above indicated, and as will be understood, changes in details of construction and arrangement of parts of the invention may be resorted to without departing from the field and scope of the same, and I intend to include all such variations, as fall within the scope of the appended claims, in this application in which the preferred forms only of my invention are disclosed.

What I claim is:—

1. A furnace provided with an annular air passage, means for supplying air under pressure to said passage, the air passage having an inner wall extending from the top of the passage, the lower edge of said inner wall being spaced above the bottom of the passage, and a plurality of closure members supported between the inner and outer walls of the passage and extending across said passage, said members being arranged in spaced relation and forming twyer openings establishing communication between the air passage and the interior of the furnace.

2. A furnace provided with an annular air passage, means for supplying air under pressure to said passage, the air passage having an inner wall extending from the top of the passage, said wall being provided adjacent to its lower edge with a shoulder projecting inwardly of the air passage and the outer wall of the air passage being provided with a shoulder projecting inwardly of the passage, and a plurality of closure members extending across said passage and seating upon said shoulders, said members being free from each other and the walls of the air passage whereby the closure members may be arranged to provide twyer openings establishing communication between the interior of the furnace and the air passage and the relative sizes and disposition of such openings may be varied at will.

3. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, twyer blocks supported above said bottom portion and disposed in spaced relation, means for supplying air under pressure to the spaces between said blocks, and a ring member seated upon said blocks and provided with a depending peripheral flange spaced away from the inner faces of said twyer blocks for admitting air into the furnace.

4. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, twyer blocks supported above said bottom portion and disposed in spaced relation, means for supplying air under pressure to the spaces between said blocks, a ring member mounted upon said blocks and provided with a depending peripheral flange spaced away from the inner faces of said twyer blocks, and means for deflecting the air from the space between said flange and the blocks into the furnace.

5. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, twyer blocks supported above said bottom portion and disposed in spaced relation, means for supplying air under pressure to the spaces between the blocks, a ring member seated upon said blocks and provided with a depending peripheral flange spaced away from the inner faces of said twyer blocks, and means for deflecting the air from the space between said flange and the blocks into the furnace downwardly and inwardly thereof.

6. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, twyer blocks supported above said bottom portion and disposed in spaced relation, means for supplying air under pressure to the spaces between said blocks, a ring member seated upon said blocks and provided with a depending peripheral flange spaced away from the inner faces of said twyer blocks, and a plurality of members supported between the blocks and the flange and disposed in spaced relation to form twyer openings for admitting air into the furnace.

7. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, blocks supported above the ring member and spaced apart, means for supplying air under pressure to the spaces between the blocks, and an upper ring member seated on the blocks and provided with a depending peripheral wall spaced away from the inner faces of the blocks, the lower edge of the wall being spaced away from the furnace structure to provide an opening for admitting air to the furnace.

8. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, lower twyer blocks mounted on the ring, upper twyer blocks mounted on said lower blocks and disposed in spaced relation, means for supplying air under pressure to the spaces between the upper blocks, and an upper ring seated upon said upper blocks and provided with a depending peripheral wall spaced away from the inner faces of the blocks, the lower edge of said wall being positioned above the lower faces of said lower blocks.

9. In a furnace construction, a bottom

portion, a ring member mounted on the bottom portion, lower twyer blocks mounted on the ring and having their inner faces inclined downwardly and inwardly of the furnace, upper twyer blocks mounted on said lower blocks and disposed in spaced relation, means for supplying air under pressure to the spaces between the upper blocks, an upper ring seated upon said upper blocks and provided with a depending peripheral wall spaced away from the inner faces of the blocks, the lower edge of said wall being spaced above the lower edges of the inner faces of said lower blocks.

10. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, lower twyer blocks mounted on the ring and having their inner faces inclined downwardly and inwardly of the furnace, upper twyer blocks mounted on said lower blocks and disposed in spaced relation, means for supplying air under pres-

sure to the spaces between the upper blocks, an upper ring seated upon said upper blocks and provided with a depending peripheral wall spaced away from the inner faces of the blocks, the lower edge of said wall being spaced above the lower edges of the inner faces of said lower blocks and the inner face of said wall being inclined upwardly and inwardly of the furnace.

11. In a furnace construction, a bottom portion, a ring member mounted on the bottom portion, twyer blocks supported above said bottom portion and disposed in spaced relation, means for supplying air under pressure to the spaces between said blocks, and a ring seated upon said blocks and provided with a depending peripheral wall spaced away from the inner faces of the blocks and extending below the spaces between said blocks.

In testimony whereof I affix my signature.
FRANCIS J. ZIPPLER.