

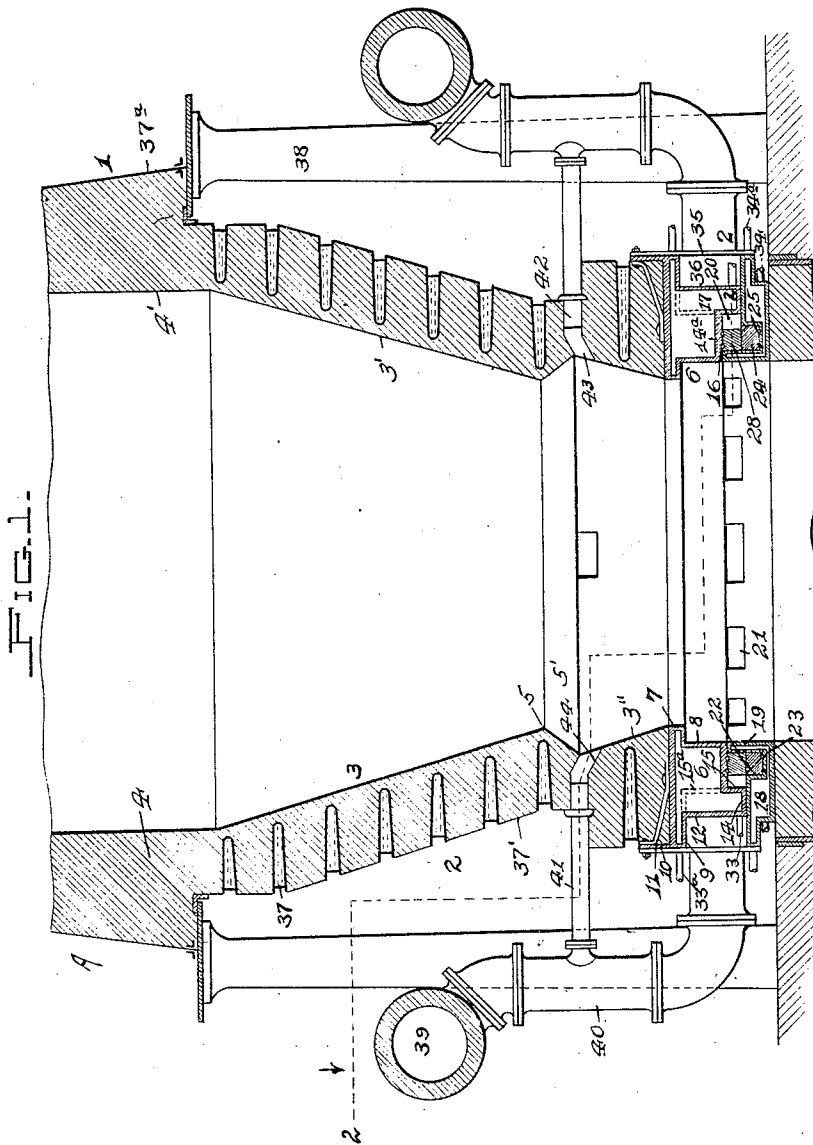
F. J. ZIPPLER.
FURNACE.

APPLICATION FILED MAR. 22, 1912.

Patented Mar. 11, 1913.

3 SHEETS—SHEET 1.

1,055,589.



Witnesses:
M. Humphries.
Frederick L. Kahle

Inventor:
Francis J. Zippler
By J. P. Cook
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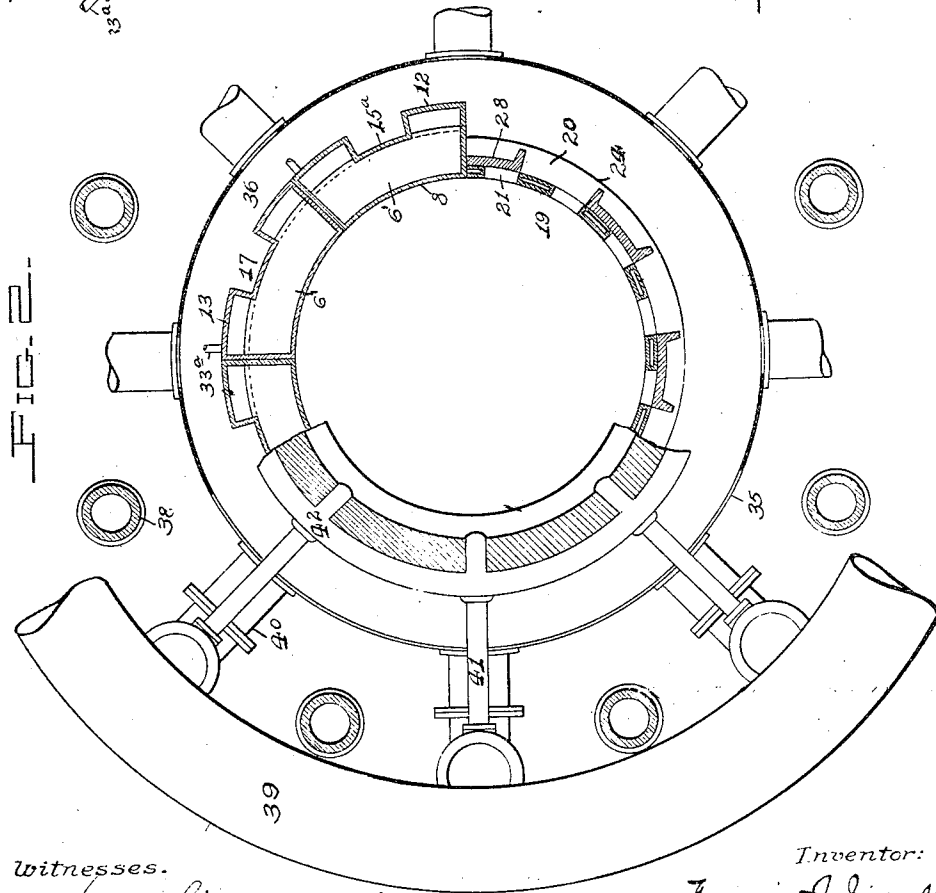
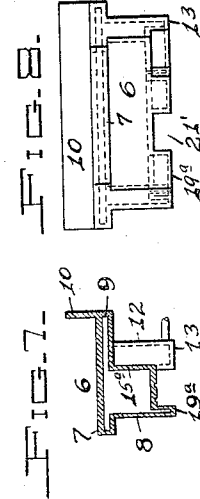
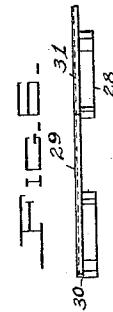
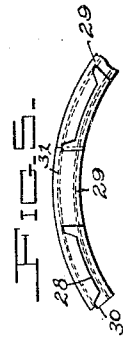
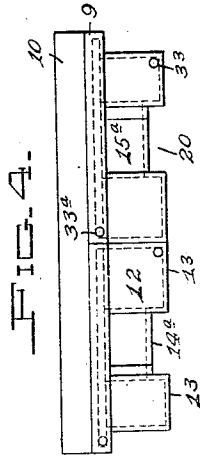
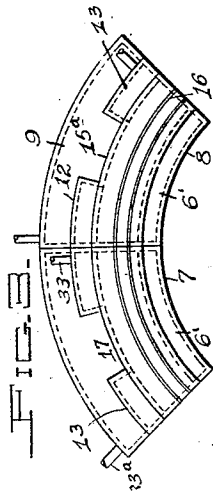
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3 SHEETS-SHEET 2.



Witnesses.
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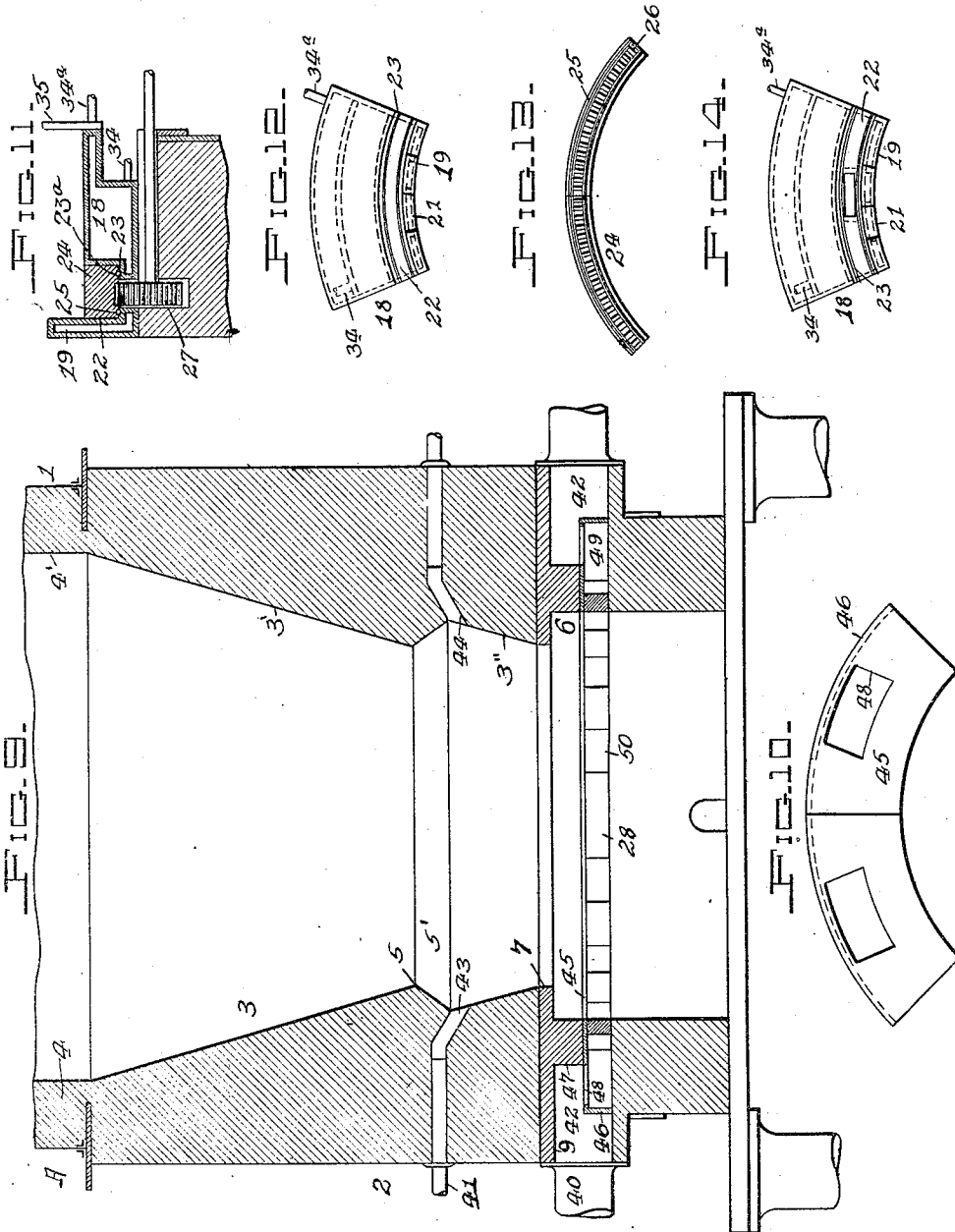
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3 SHEETS—SHEET 3.

1,055,589.



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BEST AVAILABLE COPY
UNITED STATES PATENT OFFICE.

FRANCIS J. ZIPPLER, OF AVALON, PENNSYLVANIA.

FURNACE.

1,055,589.

Specification of Letters Patent.

Patented Mar. 11, 1913.

Application filed March 22, 1912. Serial No. 685,520.

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 furnaces of a like kind.

The object of my invention is to provide a cheap, simple and efficient form of blast or other furnace which will have the "bosh" of the same constructed so that the burning out of the same will be reduced to a minimum, will provide for an increased output by such furnace, will enable a reduction of the fuel consumption therein, and will also 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 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 blast or other furnace having the invention embodied therein I will describe the same more fully, referring to the accompanying drawings, in which—

Figure 1 is a vertical section of the lower part of a blast furnace embodying my invention. Fig. 2 is a cross sectional view 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. Fig. 4 is an outer face view of the same. Fig. 5 is a bottom plan view of the twyer blocks employed. Fig. 6 is a front view of the same. Fig. 7 is a cross sectional view of another form of jacket segment. Fig. 8 is a front view of the same. Fig. 9 is another form of the furnace showing the double blast chamber. Fig. 10 is a plan view of a pair of the plates used in the same. Fig. 11 is a partial cross sectional view of the bosh showing the means for rotating the twyer blocks. Fig. 12 is a top plan view of the blocks employed. Fig. 13 is a bottom plan view of a portion of the revolving segmental ring. Fig. 14 is a top plan view of the segment of jacket used where the driving means is located.

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

As illustrated in the drawing 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 surface 3' extending from the straight vertical portion 4' of the wall 4 in the upper portion 1, and such linings are formed of the usual fire brick construction. The lower end of the downwardly and inwardly inclined surface 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 end of said flared portion connects with the downwardly and inwardly inclined surface 3'' in said wall which extends downwardly from said flared portion 5' and such portions are formed of the usual fire brick construction.

Fitting under the wall portion 3'' is a jacket 6, which in case of blast furnaces will be hollow in order to allow a free circulation of water through the same, while in case of cupolas the jacket will be solid and will have no water circulation therein. The jacket 6 is of circular or ring shape and is formed of segmental sections 6', preferably of cast metal ordinarily used in this class of work. This jacket 6 has an inner flange 7 on the face of the same and such flange corresponds in diameter with the bottom of the downwardly and inwardly inclined surface 3'' while below said flange is a straight vertical wall 8 which is of a greater diameter than the flanged portion 7.

At the rear of the jacket 6 is a flange 9 which extends entirely around the outer wall of the furnace and such flange together with the flange 7 is hollow in order to allow a free circulation of water thereto for the purpose of cooling the same. The outer edge of the flange 9 is provided with an upwardly extending wall 10 which has a strap 11 bolted to the same while the other end of such strap is adapted to be fastened to the upper face of the jacket 6 in order to support the upwardly extending portion and prevent the same from becoming broken. At the rear of the straight vertical wall 8 is an outer vertical wall 12 which is considerably smaller in diameter than the outer edge of the flange 9 of said jacket and such wall extends downward to a point consider-

ably below the bottom of the straight vertical wall 8 at the ends of the same so as to form supporting portions 13 thereon by the base 14 and lower wall 15. This outer vertical wall 12 is cut away at the center of the jacket 6 and a wall 15^a extends inwardly in order to form a prolongation of the lower wall 15 as shown in dotted lines in Fig. 1, and in the detail views in Figs. 3 and 4, while the intermediate base 14^a connecting the bottom of the straight vertical wall 8 and lower wall 15 is provided with a pair of grooves 16 for ball bearings as hereinafter described. The break in the outer vertical wall 12 of the jacket 6 will tend to form a chamber 17 in the center of the jacket and the prolonged lower wall 15 at each side of said chamber will form the support 13 for the block at each end of the same.

Below the jacket 6 is a block 18 which as explained in regard to said jacket will be hollow in construction when used on a blast furnace in order to allow for the free circulation of water through the same, but when used in a cupola such block will be solid in construction and will have no water circulation therein. The front of the block 18 or the inner diameter of the same is provided with an upwardly extending flange 19 which is adapted to extend upward and support the jacket 6 by the intermediate base 14^a resting on the top of such flange. The upwardly extending flange 19 by thus engaging with the jacket 6 forms a chamber 20 between the same and the supports 13 at each end of said jacket, while the said flange is provided with a series of openings 21, which lead from said chamber into the interior of the furnace in order to allow the blast to enter therein as hereinafter described and explained.

Immediately without the upwardly extending flange 19 is a wide slot 22 which is adapted to extend entirely around the furnace and such slot is provided with a pair of grooves 23 for ball bearings as later explained. A segmental ring 24 is adapted to fit into the slot 22 and such ring is made of the ordinary metal used in the construction of the jacket, block, etc., and is provided with a pair of grooves 25, which grooves are adapted to correspond with grooves 23 in the bottom of the slot 22 in the block 18, in order to allow for the insertion of the ball bearings 23^a to said grooves to provide for easy rotation of said ring in said slot. Between the grooves 25 in the bottom of the ring 24 is a toothed rack 26 which is adapted to be engaged at some point in the circumference of the same by a pinion 27, said pinion being rotated either by hand or from any source of mechanical power.

Situated upon the ring 24 in the slot 22 of the block 18 are the twyer blocks 28 and

such blocks are located at equal intervals throughout the circumference of said ring and are adapted to closely engage the outer face of the flange 19 of the block 18 in their travel around the same. The number of twyer blocks 28 will always be half the number of openings 21 in the flange 19 of the block 18 so that as such twyers travel around said openings half of the same will be successively opened and closed. The bottom of the twyer blocks 28 will be securely fastened to the ring 24 while the upper end of each of said blocks is provided with an extending plate 29 at one side of the same and corresponding by its upper surface with the top of said block. The other end of the twyer block 28 has a small shoulder 30 upon the same so that the plate 29 from the preceding block may rest thereagainst and thus form a smooth continuous surface. Each of the twyer blocks 28 and plates 29 are provided with a pair of grooves 31 which correspond with the grooves 16 in the intermediate base 14^a of the jacket 6 and such grooves are filled with ball bearings 32 in order to provide for the easy and efficient rotation of said twyer blocks.

Water is admitted to the jacket 6 by means of pipes 33 entering the same and is drawn away from the same by the pipes 33^a, while the block 18 is also provided with similar pipes 34 and 34^a for the same purposes respectively.

Fitting around the furnace and engaging with the outer flange 9 of the jacket 6 and with the blocks 18 is the steel band 35, which band incloses the annular air chamber 36 and extends above said jacket at which point the upwardly extending wall 10 is bolted to the same to help support the weight of the furnace and help the said jacket from bearing too heavily upon the revolving ring 24 and twyer blocks 28.

The bosh 2 of the furnace A above the jacket 6 has the usual bosh plates 37 within the wall 3' and 3'' of the same, and the usual casing surrounds such portions, while the usual casing 37^a surrounds the upper wall 4, which wall extends beyond said bosh in the ordinary manner and is supported by the columns 38.

The water for the jacket 6 and its flanges 7 and 9 is supplied from any source while the blast is admitted from the main air pipe or bustle 39, which is connected in the usual manner to the usual supply engine, and has the pipes 40 leading therefrom into the annular air chamber 36 at a point in line with the ends of the segments or joints of the jacket 6. Pipes 41 also lead from the pipes 40 into an annular auxiliary air chamber 42 formed in the upper part of the wall 3'', which chamber has the auxiliary twyers 43 leading therefrom into the furnace A below the flared surface 5' and such twyers are

provided with the downwardly inclined portions 44 at the inner ends of the same leading into the furnace through said inclined wall 3''.

5 When it is desired to operate my improved blast furnace A to melt the material therein a portion of the blast of air will pass from the main pipe 39 through the pipes 40 into the annular air chamber 36 formed by the
10 jacket 6 and block 18 and then into the chamber 17 formed by the depressions in the rear of the jacket 6 where it will strike against the wall 15^a and will pass therefrom into the chamber 20. Within the chamber
15 20 are the twyer blocks 28 and the blast will be scattered around within said chamber by the rotation of the same and the successive opening and closing of the openings 21 in the flange 19 of the block 18 by said twyer
20 blocks. At the same time a portion of the blast of air from the main pipe 39 will pass from the pipes 40 into the pipes 41, and thence into the annular air chamber 42 in the wall 3'', so that it can then enter the twyers
25 43 and be projected downward therefrom and into the furnace below the projecting portion 5 at the upper end of the furnace 3''. During this operation of the furnace A the water is circulated in the ordinary manner in the
30 bosh plates 37 in the wall portions 3' and 3'', and water is also circulated in the jacket 6 by means of the pipes 33 and 33^a, as well as in the block 18 by the pipes 34 and 34^a.

It will thus be seen that with the use of
35 my improved blast furnace the blast supplied thereto will be well mixed by entering the annular air chamber 36 and striking against the supporting portions 13 of the jacket 6 at the joints of the segments 6' and such blast of air will thus be compelled
40 to pass along said chamber to enter the chambers 17 in said jacket where it will again strike against a wall viz: the wall 15^a, thus causing it to be again well mixed before entering the chamber 20 from which it
45 passes around the twyer blocks 28 to the interior of the furnace through the openings 21 in the flange 19 of the block 18. The rotation of the twyer blocks in the furnace A
50 will cause the blast to be distributed evenly to every part of the furnace and prevent the same from working on particular parts of the charge. The use of the revolving system will be at the option of the party in
55 charge of the furnace and will be operated or left idle at such party's will, or such revolving may be continuous or periodical and operated either by hand or power, and in either direction. It will
60 be obvious that with the use of the revolving twyer blocks the furnace will work more uniformly and consequently less fuel will be required to successfully operate the same.

If desired the flanges 19 on the block 18
65 may be omitted and the extension 19^a be

placed on the intermediate base 14^a of the jacket 6 as shown in the Figs. 7 and 8, and such extension will have the openings 21' therein to correspond with the openings 21 in the flange 19 of said block.

It is immaterial whether the double air chamber is obtained in the manner shown in Fig. 1, as such may be constructed as in Fig. 9, or in various other ways wherein the blast of air will be mixed thoroughly and will enter the interior of the furnace by a tortuous route and in a compact volume so that it may be properly distributed therein.

When the furnace is constructed as shown in Fig. 9, such furnace will have the usual jacket 6 and below the same and extending to the inner face of said jacket is a ring of annular plates 45 which are adapted to be supported on the rear by the flange 46 of the same and on the front by the twyer blocks 28, which are located at equal intervals around the inner face of the furnace, so that the blast will enter through the usual pipe 40 into the chamber 42 and strike against the surface 47 after which it will pass through the openings 48 in the plates 45 into the chamber 49 and then through the spaces 50 between the twyer blocks 28 into the interior of the furnace.

Various modifications and changes in the design, operation 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 an outer annular blast chamber and blast supply pipes communicating therewith, an inner annular chamber within the walls of said furnace communicating with said first named chamber by short and direct openings between the same, and twyers in the inner wall of said last named chamber leading into said furnace, said blast pipes, openings and twyers being staggered in order to confuse the blast passing through the same.

2. A furnace having an outer annular blast chamber in the wall of the same, blast pipes communicating with said chamber, an inner chamber within the wall of said furnace communicating with said first named chamber through openings between the same, and twyer blocks in said last named chamber adapted to form twyers by the spaces between the same and opening directly from said last named chamber into said furnace, said blocks being so arranged that said openings will be directly opposite said blocks.

3. A furnace having an outer annular blast chamber within the wall of the same, blast pipes communicating with said chamber, an inner chamber within the wall of said furnace communicating with said first

named chamber through openings between the same, and twyer blocks in said last named chamber adapted to form twyers by the spaces between the same opening directly from said last named chamber into said furnace, said blocks being so arranged as to be directly opposite said openings to allow the blast entering the furnace to take a tortuous course from said first named

chamber.

4. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace communicating with said first named chamber, twyers leading from said last named chamber into said furnace, and means for opening and closing said twyers successively.

5. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace below and communicating with said first named chamber, twyers leading from said last named chamber into said furnace, and means for opening and closing said twyers.

6. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace communicating with said first named chamber, twyers leading from said last named chamber into said furnace, and twyer blocks arranged to open and close said twyers successively.

7. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace below and communicating with said first named chamber, twyers leading from said last named chamber into said furnace, and twyer blocks arranged to open and close said twyers successively.

8. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace communicating with said first named chamber, twyers leading from said last named chamber into said furnace, revolving twyer blocks adapted to open and close said twyers successively, and means for revolving said twyer blocks.

9. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace below and com-

municating with said first named chamber, twyers leading from said last named chamber into said furnace, revolving twyer blocks adapted to open and close said twyers successively, and means for revolving said twyer blocks.

10. A furnace having blast supply pipes leading thereto, a chamber in said furnace communicating with said pipes, twyers leading from said chamber into said furnace, and means for opening and closing said twyers successively.

11. A furnace having blast supply pipes leading thereto, a chamber in said furnace communicating with said pipes, twyers leading from said chamber into said furnace, and twyer blocks for opening and closing said twyers successively.

12. A furnace having blast supply pipes leading thereto, a chamber in said furnace communicating with said pipes, twyers leading from said chamber into said furnace, revolving twyer blocks arranged to open and close said twyers successively, and means for revolving said twyer blocks.

13. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace communicating with said first named chamber, and revolving twyer blocks having spaces between the same for directing the blast from said last named chamber into said furnace.

14. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, a chamber in said furnace communicating with said first named chamber, revolving twyer blocks having spaces between the same for directing the blast from said last named chamber into said furnace, and means for revolving said twyer blocks.

15. A furnace having blast supply pipes leading thereto, an annular blast chamber in said furnace communicating with said pipes, and revolving twyer blocks having spaces between the same for directing the blast from said annular blast chamber into said furnace.

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

FRANCIS J. ZIPPLER.

Witnesses:

T. B. HUMPHRIES,

J. N. COOKE.