No. 875,825. PATENTED JAN. 7, 1908.

J. C. KNOEPPEL.

FURNACE.

APPLICATION FILED JUNE 8, 1907.

2 SHEETS—SHEET 1.

Fig. 1

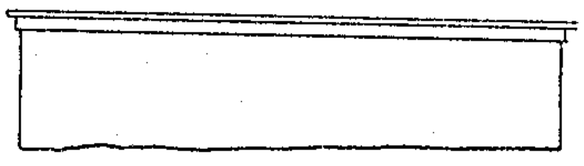


Fig. 2.

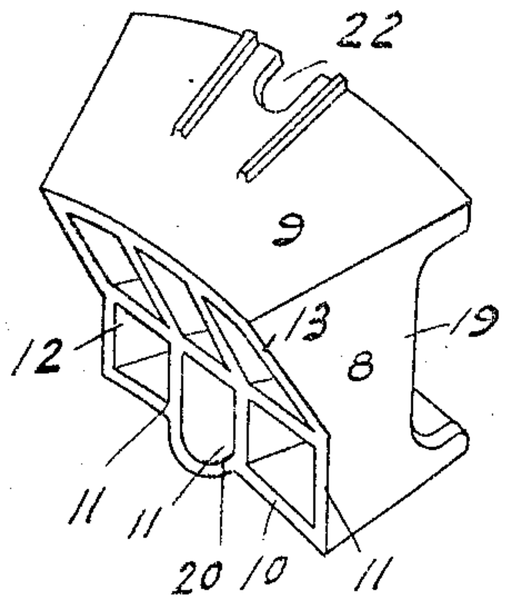
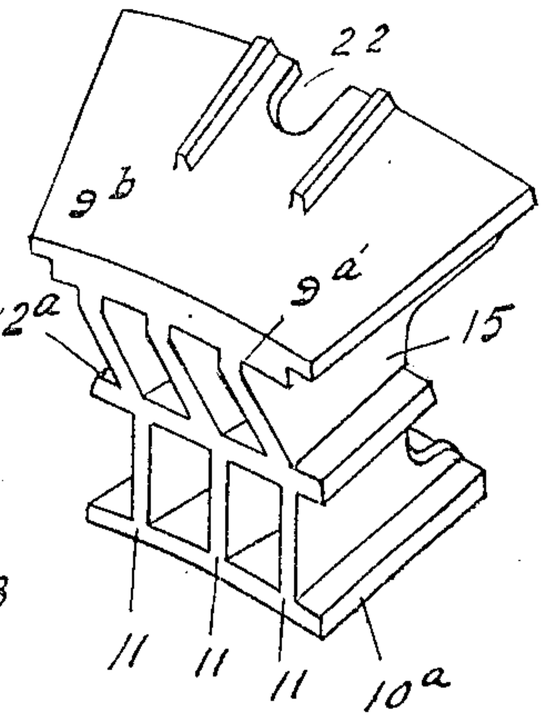


Fig. 4.



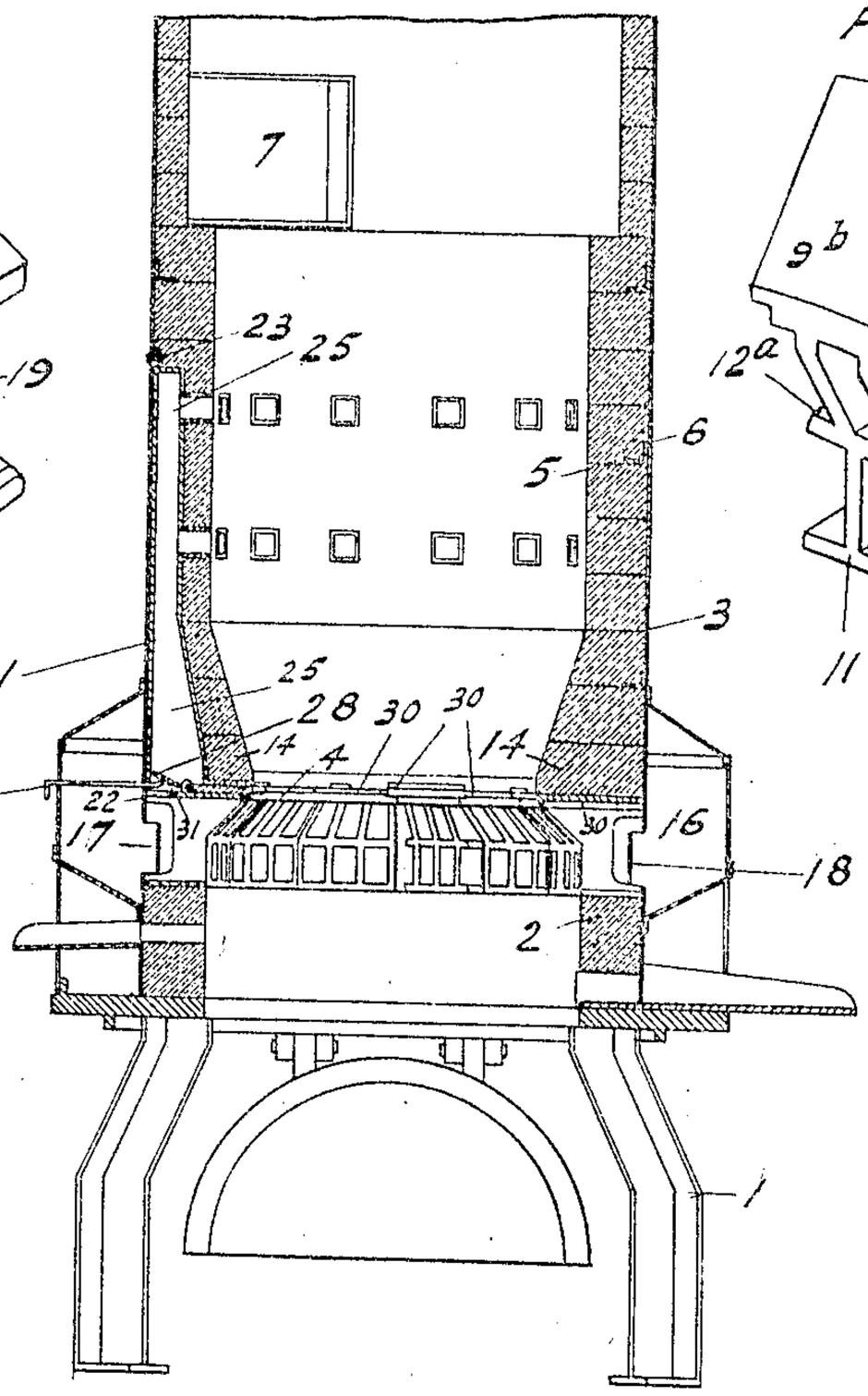
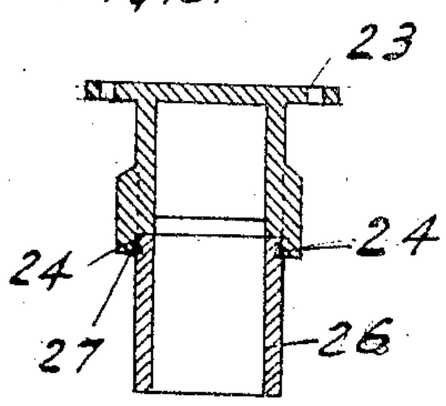


Fig. 3.



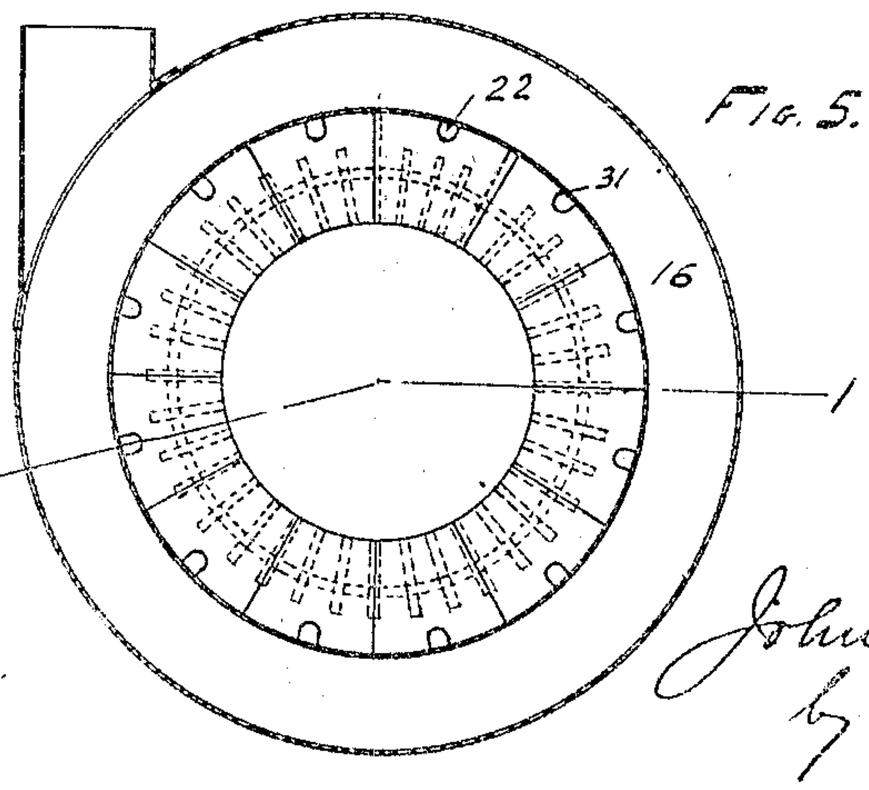


Fig. 5.

Witnesses
G. B. Davis
Adams

Inventor
John C. Knoeppel
by W. E. Lord
Attorney

No. 875,825. PATENTED JAN. 7, 1908.

J. C. KNOEPPEL.

FURNACE.

APPLICATION FILED JUNE 8, 1907.

2 SHEETS—SHEET 2.

Fig. 6.

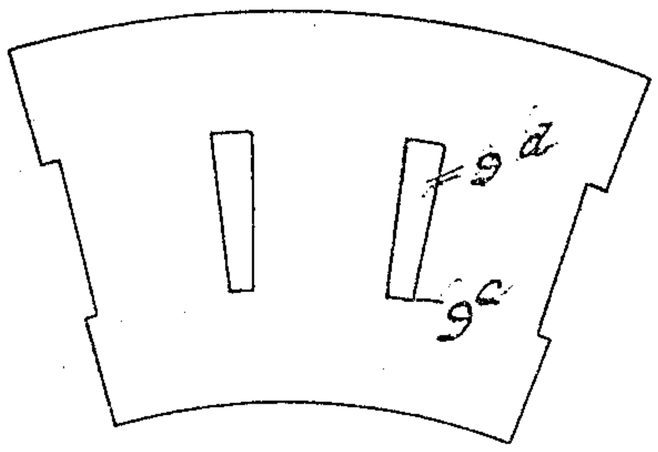


Fig. 7. 11b

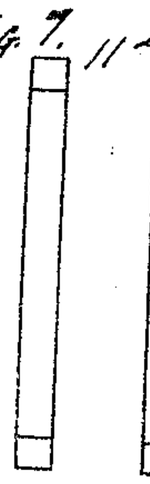


Fig. 8.

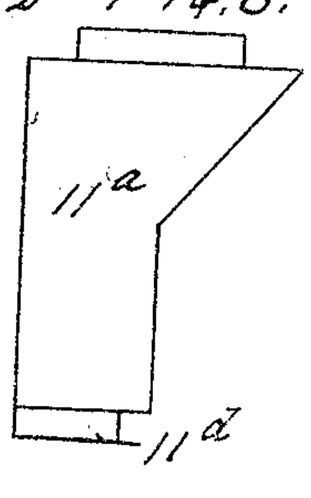


Fig. 10.

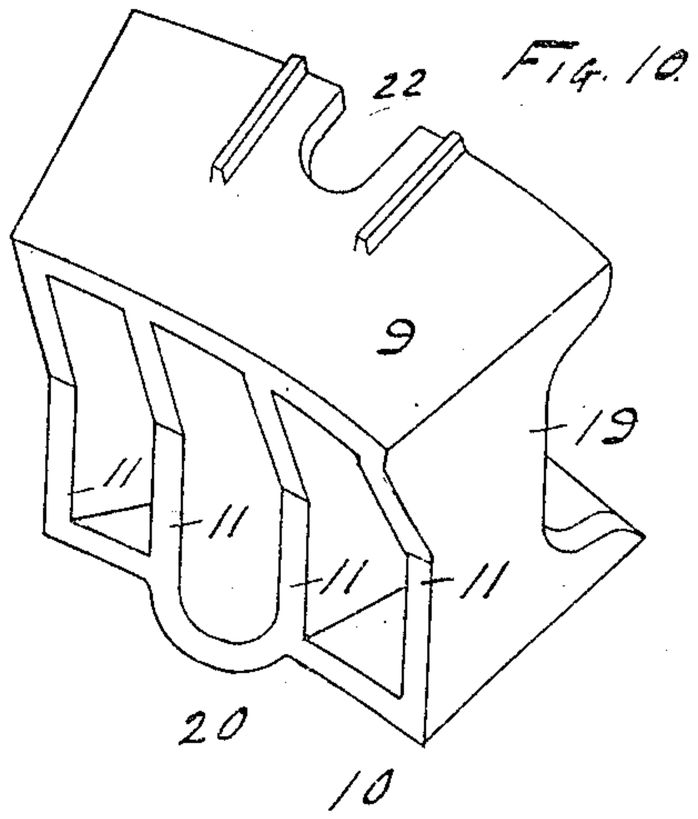


Fig. 9.

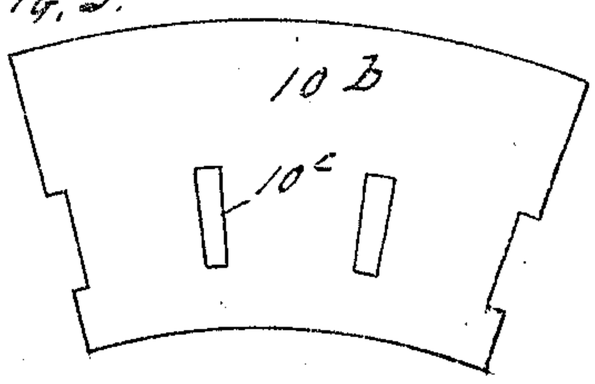


Fig. 12.

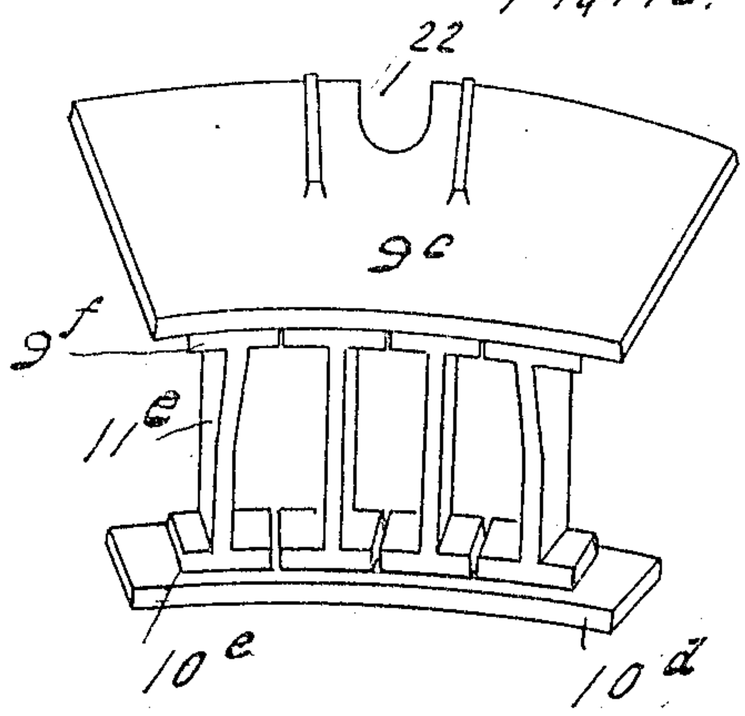
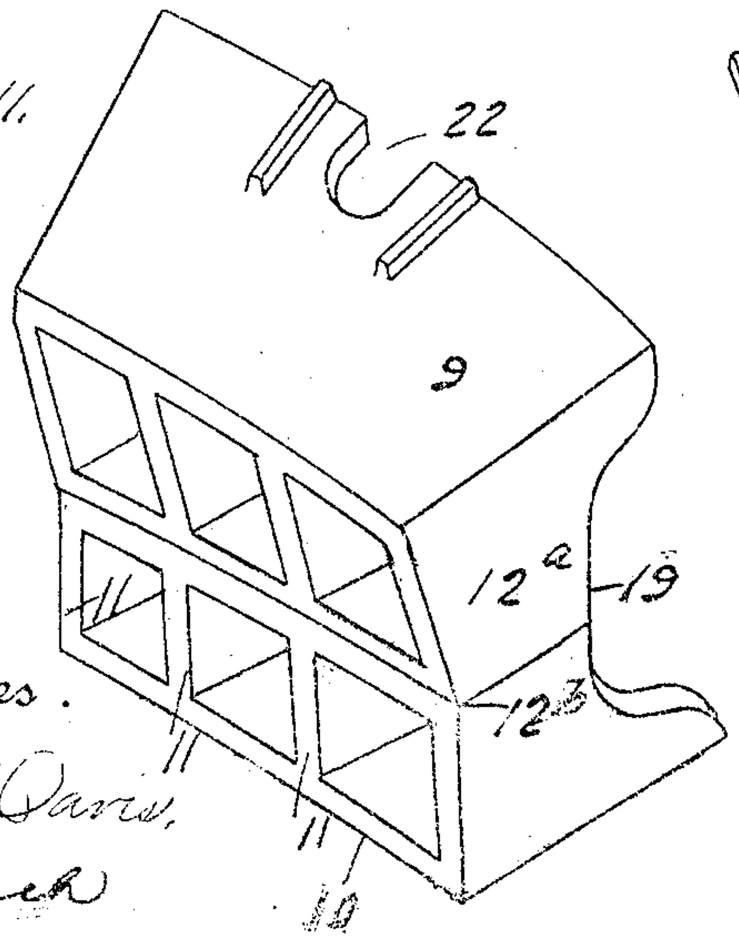


Fig. 11.



Witnesses.

G. B. Ward.

E. A. Rowe

Inventor

John C. Knoeppel

by F. Z. Read

Attorney

UNITED STATES PATENT OFFICE.

JOHN C. KNOEPPEL, OF BELMONT, NEW YORK.

FURNACE.

No. 875,825. Specification of Letters Patent. Patented Jan. 7, 1908.

Application filed June 8, 1907. Serial No. 377,039.

To all whom it may concern:

Be it known that I, JOHN C. KNOEPPEL, a citizen of the United States, residing at Belmont, in the county of Allegany and State of New York, have invented a new and useful Improvement in Furnaces, of which the following is a specification.

This invention relates to furnaces and consists in certain improvements in the construction thereof as will be fully described and pointed out in the claims.

More particularly the invention relates to the twyers or devices for introducing air into the furnaces and is peculiarly adapted to cupola furnaces.

The invention is illustrated in the accompanying drawings as follows:—

Figure 1 is a central vertical section on the line 1—1 in Fig. 5. Fig. 2 is a perspective view of one of the twyer sections. Fig. 3 is a horizontal section of the air passage and upper twyer. Fig. 4 is a perspective view of the key twyer. Fig. 5 is a horizontal section of the furnace immediately above the twyers. Figs. 6, 7, 8 and 9, details in alternative construction of twyer section. Fig. 10 is a perspective view of another alternative construction of twyer section. Fig. 11 is an alternative construction of twyer section. Fig. 12 also shows a perspective view of alternative twyer section.

1 marks the furnace supports, 2 the furnace walls below the twyer, 3 the furnace casing and 4 the twyers. The casing 3 has the usual lining of brick 5, and these are supported to some extent by the angle irons 6, which are secured to the casing. The furnace is provided with the usual charging door 7. The twyers are formed in sections 8, and when the sections are put together form a continuous twyer extending around the furnace. The twyer sections comprise the top plate 9, the bottom plate 10 and the connecting uprights 11. The number of uprights for each section may be varied. In the preferred construction there is a horizontal partition or plate 12 below the upper and lower plates. The uprights 11 have the forwardly extending projections 13, and the top plate 9 preferably extends to the front ends of the projection 13. When the twyers are in place the bricks are arranged immediately above the plate 9 forming the bosh 14.

By projecting the twyers 13 towards the center of the furnace and forming the air passages to the edge of the projection, the air is carried more nearly to the center than with a twyer having the front edges of the uprights parallel with the casing. Not only is there this advantage but the metal, as it melts, is prevented from dripping directly into the twyers, the forward projection protecting the twyers in this respect. The top and bottom plates preferably extend back or outwardly to the casing 3. The wind box 16 is arranged around the casing 3 and openings 17 extend through the casing to the twyers. An air chamber 18 extends entirely around the furnace just inside the casing, this chamber being formed by cutting away the uprights 11 at 19. The inner projection of the twyer also makes a convenient support for the bosh and in connection with the bosh gives sufficient depth to the twyer to readily provide room for the air chamber 18.

In order to prevent the metal rising in the furnace to the level of the bottoms of the twyer passages, I provide some of the twyers with the depressed bottom 20, which is below the general level of the plate 10, and this provides a means by which any metal rising in the furnace may escape. The air passages 21 extend upwardly from the twyer space and are preferably arranged in the walls of the furnace. The plates 9 are provided with the perforations 22 so that the air passages 21 may communicate with the air chamber 18. The air passages 21 are provided with the lugs 23 which extend from the side walls of the passage and at the top, and rivets are passed through these lugs and the shell of the furnace, thus securing the passages in place. The passages have front openings 25, preferably a plurality of them, and immediately adjacent to them are formed the dove-tailed lugs 24. The twyers 26 are secured to the passages by means of the dove-tailed tenons 27 by extending lugs 24. By this construction the twyers 26 may be renewed without renewing the passages, the twyers being removable for this purpose. By making the openings at different levels air may be delivered to the furnace at these points, thus supplying oxygen for the unconsumed gases, and this supplemental combustion taking place at this upper level.

serves to retain the heat incident to the combustion in the lower parts of the furnace, thus adding to the efficiency of the furnace. The air passages being arranged in the walls of the furnace, the air takes up some of the heat from the walls of the furnace so that air is delivered through the twyers 26 in a highly heated condition. It will be noted that the air delivered in the upper passages is above the melting zone in the furnace, the office of these passages being simply to promote the combustion of the unconsumed gases. I prefer to provide the valves 28 in the passages 25, by means of which the flow of air through them may be regulated. The rods 29 extend from these valves to a convenient position to allow for their operation.

I provide a top plate 30 which is arranged above the plate 9 and projects inwardly from said plate. This plate gives flexibility to the inward projection. The plate is provided with the openings 31 which register with the openings 22 and passages 25.

It is desirable to be able to remove the twyers without disturbing much, if any, of the brick above them; for this reason I supply the key twyer shown in Fig. 4. It is similar in construction to the other twyers except that the top plate 9^a and bottom plate 10^a and partition 12^a preferably have parallel edges so that the twyer as a whole may be slipped into place after the other twyers have completed the circle. The overlapping plate 9^b is arranged above the radial plate 9^a and this plate overlaps the adjacent plates 9. I prefer to make the openings between the uprights and partitions of a size which will permit of the insertion of fire brick so that some of the passages may be closed in this way if desired. In the alternative construction shown in Figs. 6, 7, 8, 9 and 10 the parts of the twyer are separable. The top plate 9^c has the openings or slots 9^d, which are so arranged as to receive the tenons or lugs 11^b on their uprights 11^a. The bottom plate 10^b has the slots 10^c, which are arranged to receive the tenons 11^d. It can readily be observed that by placing the uprights between the plates 9^c and 10^b with the tenons 11^b and 11^d in the slots 9^d and 10^c respectively, the twyer of much the same construction as the preferred construction may be formed. The twyer shown in Fig. 10 is similar to the preferred construction except that the horizontal portion 12 is omitted.

The twyer as shown in Fig. 11 is similar to that of the preferred construction except that the plates 12^a and 12^b are substituted for the single plate 12 so that the twyer is separable along the horizontal plane between the plates 12^a and 12^b.

In Fig. 12 the uprights 11^c are separable, but each upright has a top and bottom plate 9^f and 10^e respectively. The plates 9^f and 10^e are segmental shapes so that when a series of them are placed together the uprights 11^c are properly spaced. The plates 9^c and 10^d are preferably arranged above and below the uprights.

What I claim as new is:

1. In a furnace the combination of a series of main twyers of segmental form and filling arcs of the furnace wall, and a key twyer adapted to be moved from within radially into place between and in contact with two main twyers.

2. In a furnace the combination of a series of main twyers of segmental form and filling arcs of the furnace wall, and a key twyer adapted to be moved radially into place between two main twyers, said key twyer having the overlapping top plates 9^b.

3. In a furnace having its furnace walls provided with a bosh, a twyer arranged below the bosh; said twyer comprising top and bottom plates and uprights between said plates, said uprights projecting at their tops inwardly toward the center of the furnace and beneath the bosh.

4. In a furnace having its furnace walls provided with a bosh, a twyer arranged below the bosh, said twyer comprising top and bottom plates and uprights between said plates, said uprights projecting at their tops inwardly toward the center of the furnace and beneath the bosh, said twyer being formed in segments, each segment being removable.

5. A furnace twyer having top and bottom plates and uprights arranged between said plates, said uprights projecting at their tops inwardly toward the center of the furnace, said twyer being provided with a horizontal partition between top and bottom plates.

6. A furnace twyer having top and bottom plates and uprights arranged between said plates, said uprights projecting at their tops inwardly toward the center of the furnace, and said twyer being provided with a horizontal partition between top and bottom plates formed integrally with the uprights.

7. A furnace twyer having top and bottom plates and uprights arranged between said plates, said uprights extending integrally from top to bottom of the twyer, and said twyer being provided with a horizontal partition between top and bottom plates formed integrally with the uprights.

8. In a furnace having its furnace walls provided with a bosh, a twyer arranged below the bosh; said twyer comprising top and bottom plates and uprights between said plates, said uprights projecting at their tops inwardly toward the center of the furnace and beneath the bosh, said twyer being cut away in its rear portion to form an air space communicating with the twyer.

9. In a furnace the combination of the

twyer form of top and bottom plates and uprights between said plates, said uprights projecting at their tops inwardly toward the center of the furnace and plate 30 arranged above the top plate and extending inwardly beyond the edge of the uprights.

10. In a furnace the combination of a twyer form of top and bottom plates, with uprights between the plates, the said uprights being formed integrally with said plates and an overhanging plate 30 arranged on the top plate and extending inwardly toward the center of the furnace beyond the edges of the uprights.

11. A furnace twyer having top and bottom plates and uprights between said plates, said uprights projecting at their tops inwardly towards the center of the furnace and said uprights being cut away at the rear for the purpose described.

12. A furnace twyer having top and bottom plates and uprights between said plates, said uprights being formed integrally with said plates and the outside uprights being cut away at the rear for the purpose described.

13. A furnace twyer having top and bottom plates and uprights between said plates, said uprights projecting at their tops inwardly toward the center of the furnace and being cut away at the rear for the purpose described, said uprights being formed integrally with said plates.

14. In a furnace the combination of a series of segmentally formed twyers having top and bottom plates and uprights between the plates, the uprights projecting at their tops inwardly toward the center of the furnace and the furnace shell, said uprights being placed in front of the said shell, forming an air space between the shell and the uprights for the purpose described.

15. In a furnace the combination of a series of segmentally formed twyers having top and bottom plates and uprights between the plates, the uprights projecting at their tops inwardly toward the center of the furnace and the furnace shell, said uprights being placed in front of the said shell forming an air space between the shell and the uprights for the purpose described, said uprights being formed integrally with said plates.

16. In a furnace the combination with the furnace shell of a series of segmentally formed twyers having top and bottom plates extending to the furnace shell and uprights between the plates, said uprights being placed away from the shell to form an air space between the uprights and the shell.

17. In a furnace the combination with the furnace shell of a series of segmentally formed twyers having top and bottom plates extending to the furnace shell and uprights between the plates, said uprights being placed away from the shell to form an air space between the uprights and the shell and being formed integrally with said plates.

18. In a furnace the combination of a furnace shell of a series of segmentally formed twyers forming a continuous twyer space around the furnace, said twyers having top and bottom plates and uprights between the plates, the uprights projecting at their tops inwardly toward the center of the furnace for the purpose described.

19. In a furnace the combination with the furnace shell of a series of segmentally formed twyers having top and bottom plates extending to the furnace shell and uprights between the plates, said uprights being placed away from the shell to form an air space between the uprights and the shell and being formed integrally with said plates, one of said twyers being adapted to be placed between the twyers of the series by a movement in a radial direction for the purpose described.

20. In a furnace the combination with the walls thereof and the twyers of a series of air passages arranged within the wall and extending upwardly from the twyers and each having a supplemental twyer extending inwardly from said passage to deliver air above the melting point.

21. In a furnace the combination with the walls thereof and the twyers, of a series of air passages arranged within the wall and extending upwardly from the twyers and each having a plurality of supplemental twyers extending inwardly from said passage and adapted to deliver air above the melting point.

22. In a furnace the combination with the furnace walls thereof and the twyers; of a series of air passages extending upwardly from the twyers within the wall, said passages having twyers extending inwardly therefrom, the twyers from different passages extending inwardly at different levels above the melting point.

23. In a furnace the combination with the furnace walls, the twyers formed with the top and bottom plates, and uprights between the plates, said uprights being cut away at the rear forming an air passage, and the upper plates being provided with openings 22, of the air passages 25 extending upwardly within the walls of the furnace and inwardly extending twyers from said air passage.

24. In a furnace the combination with the furnace walls and means for delivering air to the furnace, of a series of upwardlyextending air passages 25 within the walls of the furnace and removable twyers extending from the air passage to the interior of the furnace.

Witness my hand.

JOHN C. KNOEPPEL.

Witnesses:

C. D. HIGBY,

H. C. LORD.