

No. 713,811.

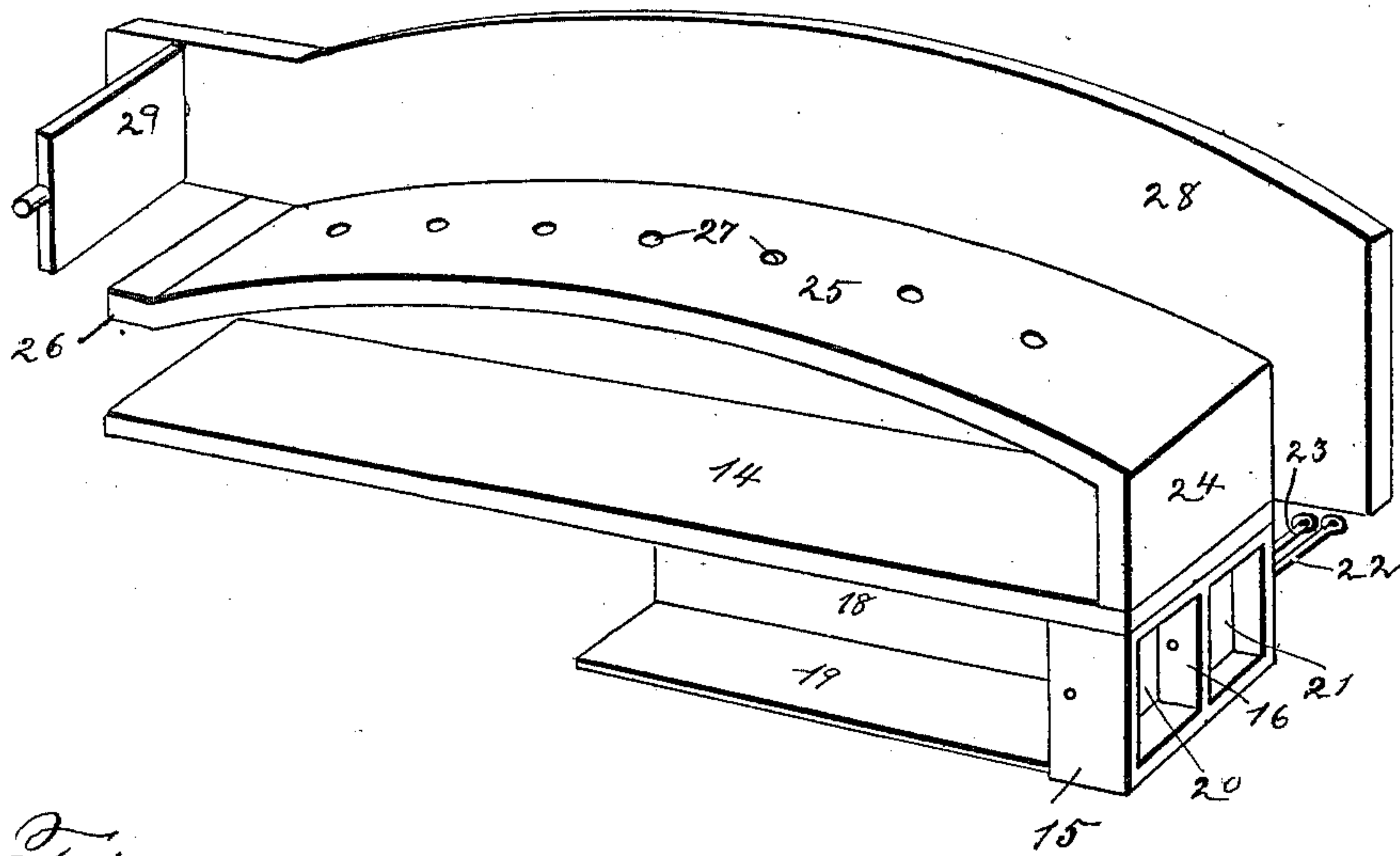
Patented Nov. 18, 1902.

L. G. SMITH.  
BOILER FURNACE.

(Application filed Mar. 1, 1902.)

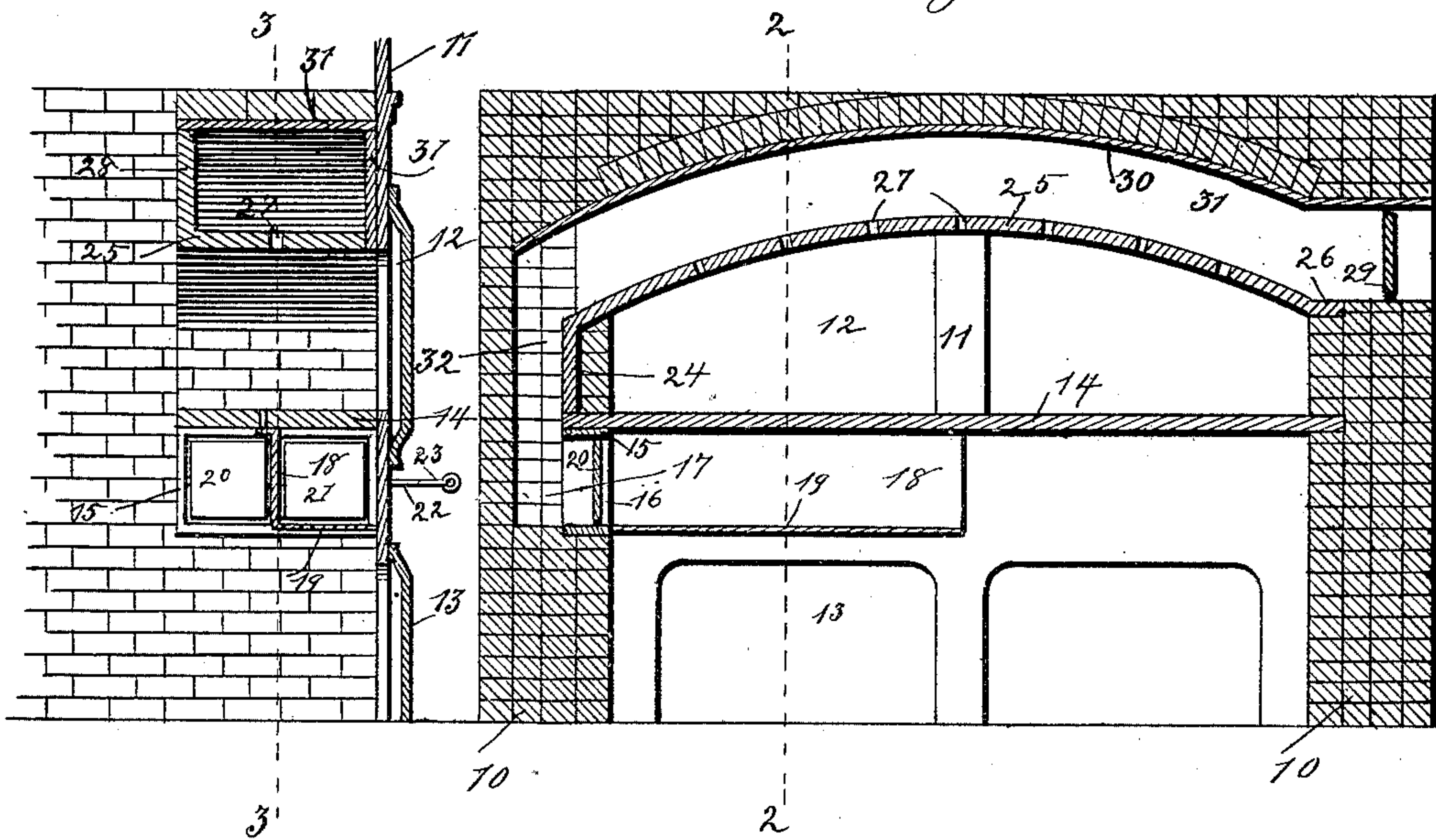
(No Model.)

*Fig. 1.*



*Fig. 2.*

*Fig. 3.*



Witnesses:  
*Charles F. Wilcox.*  
*L. H. Orwig*

Inventor:  
*Lincoln G. Smith*  
*By Orwig Lane Atty's.*



# UNITED STATES PATENT OFFICE.

LINCOLN G. SMITH, OF DES MOINES, IOWA.

## BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 713,811, dated November 18, 1902.

Application filed March 1, 1902. Serial No. 96,272. (No model.)

*To all whom it may concern:*

Be it known that I, LINCOLN G. SMITH, a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a specification.

Heretofore in boiler-furnaces it has been found that the arch over the fire-doors when made of fire-brick is quickly broken and destroyed by reason of the excessive contraction and expansion thereof and also by being struck with lumps of coal and with the fireman's shovel, poker, &c., and when such arches are made of metal to protect the brick the metal frequently burns out and the arch is thus destroyed.

My object is to provide an improved construction of furnace-front whereby a strong and durable arch over the fuel-openings is provided and at the same time a current of warmed air is provided to discharge upwardly through the grates and aid the combustion of fuel on the grates.

A further object in this connection is to provide means whereby this air may be discharged on either side or on both sides of the grate-surface.

A further object is to provide for the circulation of a current of cold air through the arch to thereby prevent it from burning out.

My invention consists, essentially, in the construction, arrangement, and combination of the various parts of the device and their arrangement and combination within a furnace whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 shows in perspective the metal portions of my furnace attachment as they would appear with the cast-metal furnace-front removed and also with the top and front portions of the hollow metal arch removed.

Fig. 2 shows a vertical sectional view of a portion of a furnace having my improvements applied thereto and taken on the indicated line 2 2 of Fig. 3. Fig. 3 shows a vertical transverse section of the same, taken on the indicated line 3 3 of Fig. 2.

In connection with the following descrip-

tion it is to be understood that my improvements are applied to the ordinary boiler-furnace setting having the cast-metal front, and my improvements may be applied to a furnace after it is constructed as well as before, so that when repairing the arch of a furnace my improvements may be substituted for the ordinary brick or cast-metal arch.

The reference-numeral 10 is used to indicate the brick side walls of a furnace.

11 indicates a cast-metal furnace-front of ordinary construction, having the door 12 to cover the firing-opening and the door 13 to cover the ash-pit opening.

The numeral 14 indicates a flat cast-metal plate extended transversely of the furnace in line with the bottom of the fire-opening, and the grates (not illustrated) are arranged with their top surface flush with the top of this plate. One end of the plate is supported in the side wall 10. The other end rests upon a rectangular metal frame 15, having a vertical central partition 16. This frame is mounted in one of the side walls 10, and a chamber 17 is formed in the side wall at the side of the frame 15. On the under surface of the plate 14 is a vertical sheet-metal partition 18 to extend from the partition 16 to a point near the center of the plate 14, and at the bottom of the partition 18 is a horizontal partition 19 to extend forwardly to the furnace-front 11.

In the frame 15 on each side of the partition 16 are the dampers 20 and 21, connected with the rods 22 and 23, which are designed to project through the furnace-front. On top of the plate 14, directly above the frame 15, is one end of the cast-metal arch. This end is extended vertically and rests upon the plate 14 and is indicated by the reference-numeral 24.

Connected with the said part 24 is the integral arch 25 to project across the furnace-front and having a straight surface 26, designed to enter and rest upon the opposite side wall 10. The part 25 is provided with the perforations 27. Cast integral with the parts 24, 25, and 26 is the back piece 28. This back piece projects some distance beyond the end 24 and downwardly as far as said end 24 for purposes hereinafter made clear, and at the other end the back 28 projects horizontally some distance beyond the end 26, and a damper 29 is



mounted in said end. A top plate 30 is fixed to the arched back 28 and extends parallel with the arch 25, both ends projecting into the side walls, and said arch is provided with  
 5 an integral downwardly-projecting front piece 31. A chamber 32 is formed in one of the side walls to communicate with the hollow arch and with the rectangular frame 15, below the plate 14 the said projecting end of the  
 10 back 28 opposite from the end having the damper 29, which serves to form part of this chamber 32 and the opposite end of the chamber by the arches 25 and 30. The front 31 and the back 28 are open to the outside atmos-  
 15 phere, and the air is admitted to the chamber thus formed through said opening, which is controlled by the damper 29.

In practical use and assuming that the parts were assembled as shown and described  
 20 and assuming further that all the dampers were open it is obvious that the heat of the fire upon the grates will cause a strong suction, and this suction will tend to draw a current of air through the passage-way above the  
 25 arch 25, then downwardly through the chamber 32, and then through both sides of the rectangular frame 15, the partition 18 and 19 causing a portion of the air to discharge under the grates at the opposite side of the  
 30 furnace, while another portion of the air-current discharges under the grate through the opening in the frame 15. Obviously the damper 29 may be adjusted to regulate the amount of current passing through the arch, and the  
 35 dampers 20 and 21 may be adjusted to regulate the amount of air passing to either side of the furnace. At all times it is obvious that the arch 25 will be kept comparatively cool by reason of the cool air passing over the  
 40 top of it and entering through the holes 27. This causes sufficient draft to keep the blaze and intense heat away from the arch 25 and yet does not in any way interfere with the ordinary use of the furnace. It is obvious  
 45 that by this construction a strong and durable arch is provided which cannot readily be burned out and which also provides a current of heated air that may be applied to any desirable portion of the grate-surface to aid in  
 50 combustion.

Having thus described my invention, what

I claim, and desire to secure by Letters Patent of the United States therefor, is—

1. The combination with a furnace-front and side walls and a fire-door on the furnace-front, of a plate 14 arranged horizontally in the rear of the furnace-front supported by the side walls, its top surface being substantially in line with the bottom of the fire-door, a frame in the side wall beneath one end of the  
 60 plate 14, said frame having openings therein, a hollow metallic arch having perforations in its under surface extending across the furnace in the rear of the furnace-front and above the fire-door, one end of the arch ex-  
 65 tending through the side wall of the furnace, a damper therein, the opposite side wall being provided with a passage-way communicating between the opposite end of the arch, and the openings in the frame, for the pur-  
 70 poses stated.

2. The combination, with a furnace having a chamber 32 in one of its side walls, of a furnace-front, a frame 15 in one of the side walls at the lower end of the said chamber 32, a ver-  
 75 tical, central partition 16 in said frame, dampers 20 and 21 in the opposite sides of said frame, a partition 18 and 19 extending from the partition toward the longitudinal center of the furnace, and the part 19 extending to  
 80 the furnace-front, a flat plate 14 having one end in the furnace-wall and the other resting on top of the frame 15, an arch preferably made of cast metal having one end resting upon the top of the plate 14 and the other  
 85 end resting in the opposite furnace-wall and also having a series of openings 27, a back piece cast integral with the plate 25 to project above it laterally on both sides, a metal arch 30 having one edge resting upon the back  
 90 piece and a front piece connected with the said arch 30, whereby an inclosed passage-way is provided above the plate 25, said passage-way communicating at one end with the exterior of the furnace and at its other end  
 95 with the said chamber 32, and a damper 29 in the entrance of said passage-way, substantially as and for the purposes stated.

LINCOLN G. SMITH.

Witnesses:

JOSHUA STRUTHERS,  
 W. R. LANE.