G. R. HAIGH & J. R. FORTUNE.

FURNACE.

APPLICATION FILED MAR. 18, 1909.

973,652.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 1.

Fig. 1

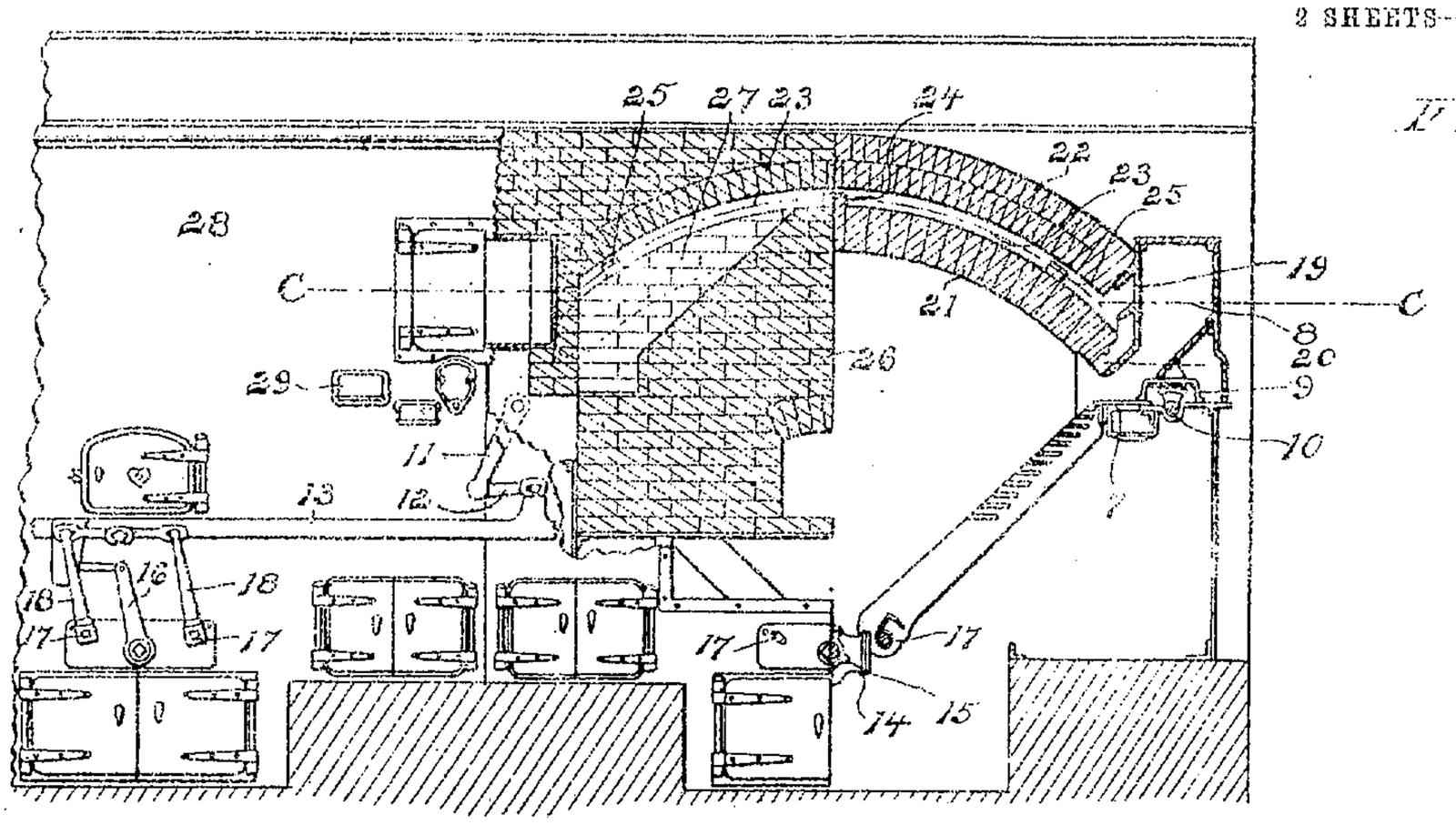
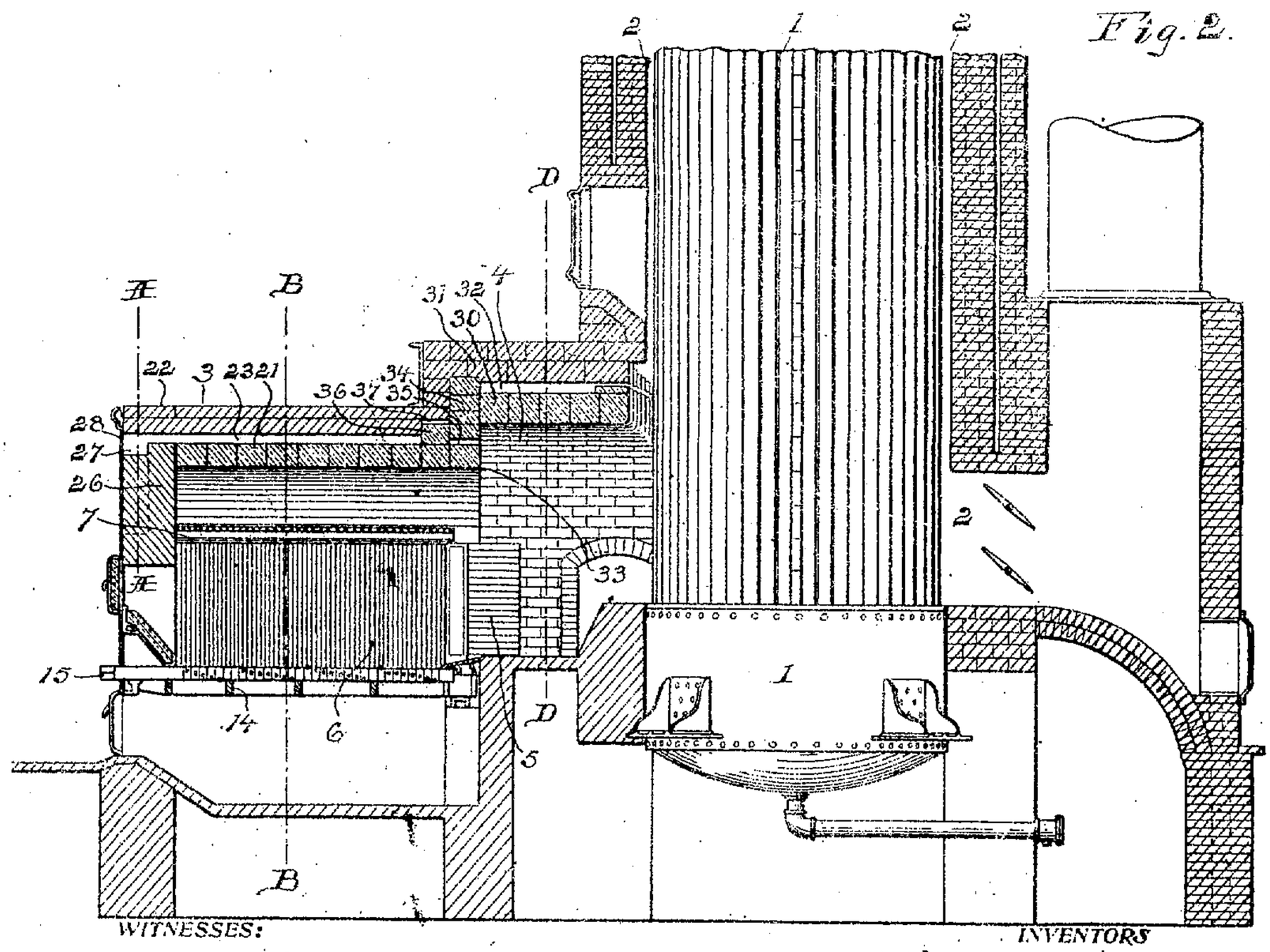


Fig. 2.



WITNESSES:

C. L. Reed Weer.

A. M. Dorr

INVENTORS

Gilbert R. Haigh

John R. Fortune

BY

ATTORNEYS

G. R. HAIGH & J. R. FORTUNE.

FURNACE.

APPLICATION FILED MAR. 18, 1909.

973,652.

Patented Oct. 25, 1910.

2 SHEETS—SHEET 2.

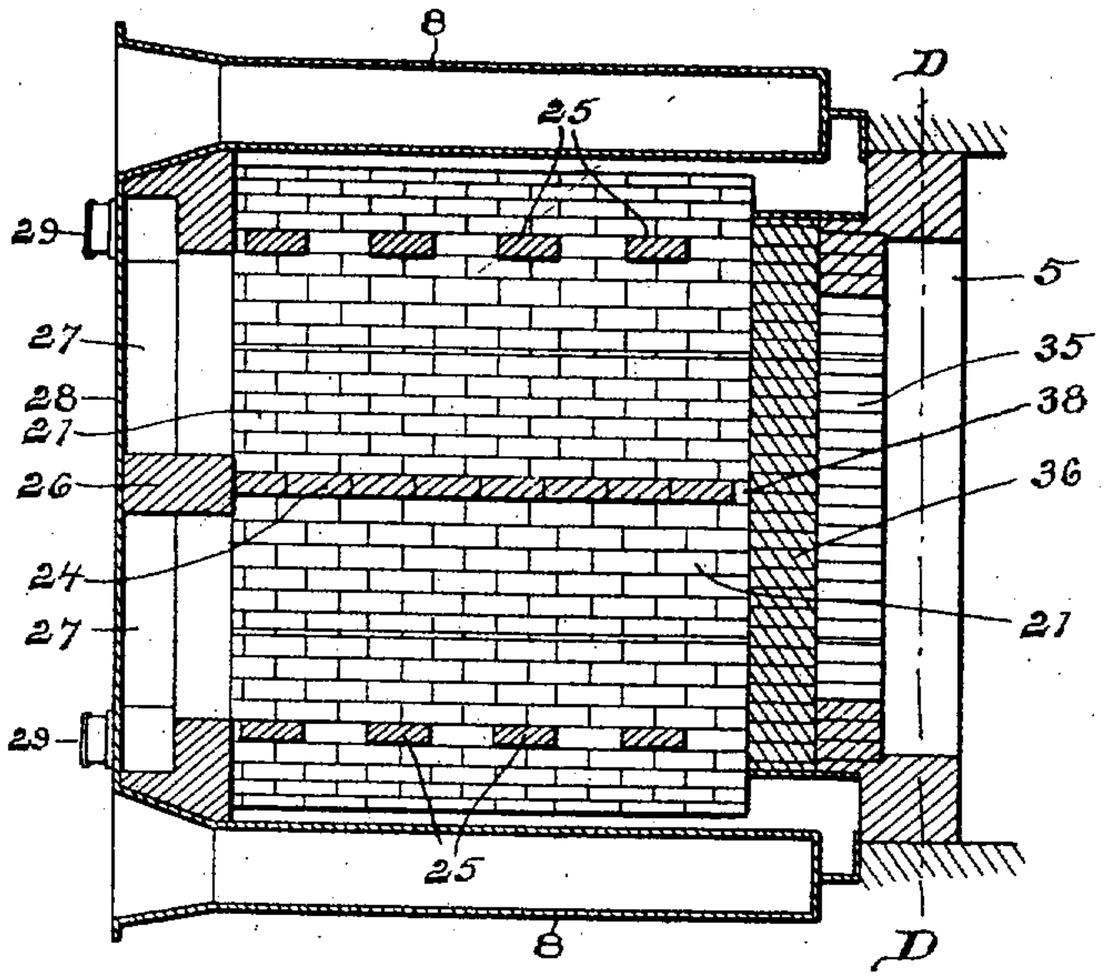


Fig. 3.

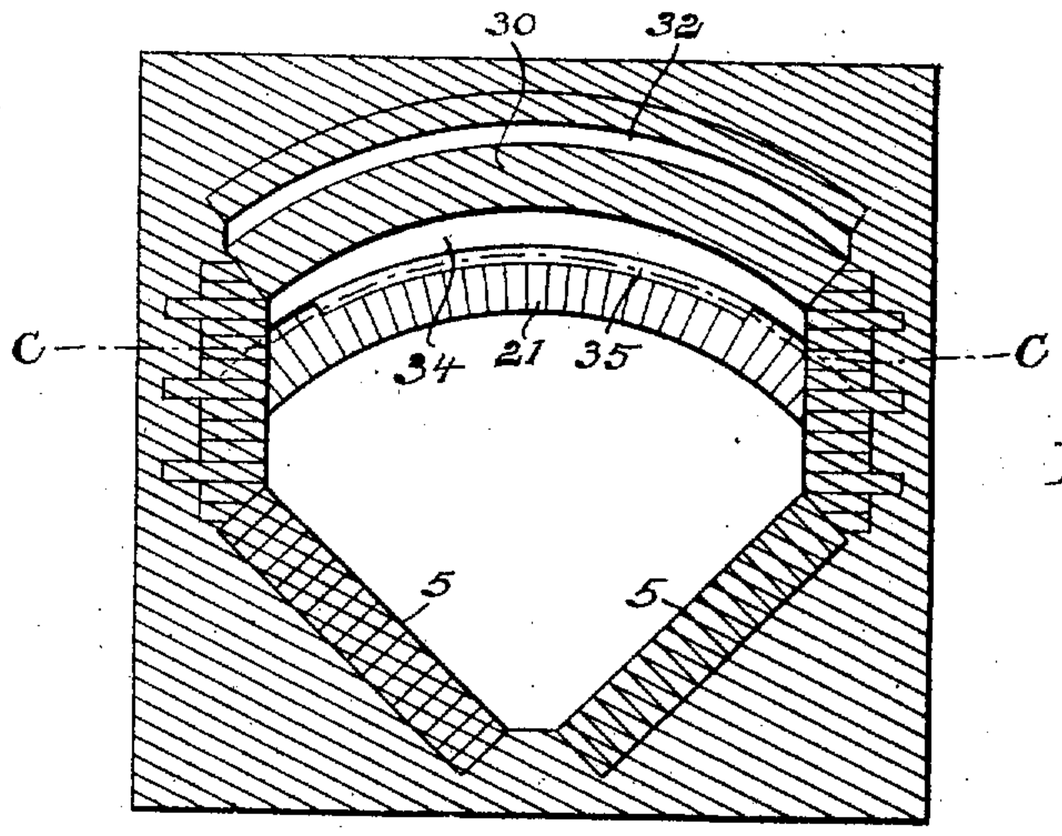


Fig. 4.

WITNESSES:

C. L. ter Veer.

E. M. Dorr.

INVENTORS

Gilbert R. Haigh

John R. Fortune

BY

ATTORNEYS

UNITED STATES PATENT OFFICE.

GILBERT R. HAIGH AND JOHN R. FORTUNE, OF DETROIT, MICHIGAN, ASSIGNORS TO MURPHY IRON WORKS, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

FURNACE.

973,652. Specification of Letters Patent. Patented Oct. 25, 1910.

Application filed March 18, 1909. Serial No. 484,271.

To all whom it may concern:

Be it known that we, GILBERT R. HAIGH and JOHN R. FORTUNE, citizens of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Furnaces, of which the following is a specification, reference being had therein to the accompanying drawings.

In smoke consuming furnaces and especially such furnaces where the fuel is automatically fed onto inclined grates after being subjected to a coking process to liberate its volatile gases, it is found that some of the gases escape into the boiler chamber unburned owing to the lack of proper admixture with air and more or less smoke is therefore emitted from the stack due to this incomplete combustion of the fuel.

The object of this invention is to so construct a furnace of this class as to insure a proper admixture of the air and gases by causing a swirling action thereof in the furnace before they reach the boiler chamber; and further to so construct the furnace as to prevent injury thereto due to the extreme heat, by providing for free expansion of the inner, in relation to the outer arch.

To this end the invention consists in the construction, arrangement and combination of parts as hereinafter more fully described and particularly pointed out in the claims reference being had to the accompanying drawings, in which:—

Figure 1 is a front elevation of a series of furnaces embodying the invention with parts broken away to show transverse sections thereof on the lines A—A and B—B of Fig. 2. Fig. 2 is a central longitudinal vertical section through the furnace and showing the same as applied to a vertical type of water tube boiler. Fig. 3 is a detail of the furnace showing an enlarged sectional plan view thereof substantially on the line C—C of Figs. 1 and 4; and Fig. 4 is a detail showing an enlarged section of the same on the line D—D of Figs. 2 and 3.

As shown in Fig. 2 of the drawings 1 represents a boiler of the vertical water tube type which is supported and inclosed in the usual manner within the boiler chamber 2.

3 is the furnace proper, located at the forward side of the boiler chamber and connected thereto by an intermediate connecting chamber or arch 4 which opens directly into the boiler chamber and in the forward end of which is located the V-shaped or inclined fire wall 5 adjacent to the rear ends of the inclined grates 6 of the furnace. These grates are formed in the usual manner of fixed and movable grate bars which are supported at their upper ends adjacent to the coking plates 7 from which they receive fuel supplied from magazines 8, suitable stoker boxes 9 being provided beneath the magazines 8 to push the coal from the coking plates onto the inclined grate bars. These stoker boxes are automatically operated by means of rock shafts 10 to the outer ends of which are connected crank arms 11 which are in turn connected by links 12 to an actuating bar 13 extending across the front of the furnace and reciprocated by any suitable means. The fixed grate bars are supported at their lower ends upon a grate bearer 14 within which bearer is supported a clinker bar 15 rotatable therein and actuated by an arm 16 on its outer end connected by means of a link to the reciprocating bar 13. The lower ends of the movable grate bars are supported upon rock shafts 17 which are actuated by arms 18 on their outer ends connected by links to the reciprocating bar 13.

The inner side of each magazine 8 is formed by an arch plate 19 having a ribbed seat 20 at its lower end for the inner arch 21 which springs across the furnace, and at its upper end said arch plate is formed with a seat for an outer arch 22, an air space 23 being provided between the two arches. This air space 23 is divided into separate chambers by a wall 24 formed by a row of bricks extending upward across the space 23 near each side of the arch. The front wall 26 of the arch is cut away at 27 at each side of the furnace, and in the plate 28 forming the furnace front are provided air inlet openings 29 to admit air into the space 23 between the inner and outer arches. These air currents entering at 29 after being distributed over the inner arch to cool the same, escape downward between the ribs on the arch seat 20 of the arch plates 19 into the furnace directly over the inner edges of the coking plates.

The construction and arrangement of the

parts of the furnace proper thus far described is old and well known and forms no part of this invention.

The chamber 4 located between the rear end of the furnace and the boiler chamber is provided with an inner arch 30 and an outer arch 31 with an air space 32 between, and these arches are located in a higher plane than the plane of the arches 21 and 22 of the furnace so that what may be termed a "step up arch" is formed. The inner end of the arch 21 forms an abrupt shoulder or angle 33.

It is found that in furnaces of this construction, the gases liberated in the coking process on the coking plates along each side of the furnace will to some extent cling to the surface of the furnace arch and by reason of the swift moving heat and air currents will be carried inward toward the boiler chamber without being properly mixed with the air entering through the openings in the arch seats 20. By forming an abrupt angle in the furnace arch and supplementing the furnace arch with a second arch 30, the inrushing air currents in passing the angle 33 will be retarded and given a swirling motion within the chamber 4 against the arch 30 which is heated to incandescence and thus the air and gases are thoroughly mixed and the combustible mixture ignited by contact with the incandescent arch before passing into the boiler chamber and thus the combustible elements of the fuel are completely burned and no perceptible amount of smoke will be emitted from the stack in the normal running of the furnace.

A vertical wall 34 connects the inner end of the arch 21 with the arch 30, an expansion space 35 being provided in said wall between the brick forming the inner end of the arch 21 and the next tier of brick above so that said arch may expand vertically when highly heated. To close this expansion space a tier of brick 36 is provided which brick extend across the expansion space 35 also the end of the space 23 to close both spaces and at the upper side of this tier 36 of brick is an expansion space 37 so that said tier may rise with the arch 21 when the same expands. The air space 23 is thus effectually closed at its inner end and at the same time the inner arch is left to expand relatively to the outer arch. The partition or wall 24 dividing the air space 23 is so constructed that it does not quite engage the outer arch at its upper end and the bricks 25 are also spaced a slight distance from the outer arch to provide for an expansion of the inner arch. A small space 38 is also left between the end of the wall 24 and the tier of brick 36 to provide for the expansion of the inner arch longitudinally, said arch being free to expand in that direction, owing to the "step-up" in the arch which leaves its end free.

In this construction the effect of a long arch is secured without retarding the free flow of the heat to the boiler chamber as would be the case if a long arch of the same height throughout its length was employed. This construction of arch permits the heat to get away rapidly and at the same time causes a swirling and retardation of the air currents to thoroughly mix the gases and air.

What we claim as our invention is:—

1. A furnace comprising an inner and an outer arch extending over a fire chamber with an air space between said arches, a wall to close one end of said air space with an expansion space between said wall and said inner arch, and means extending across the air space adjacent to said wall to close the expansion space and carried by the inner arch to move therewith upon expansion of said arch.

2. In a furnace of the character described having a fire chamber, a boiler chamber, and an intermediate chamber between said chambers of an inner and an outer arch extending over the fire chamber with an air space between said arches, an arch extending over the intermediate chamber between the fire chamber and the boiler chamber, said intermediate arch extending in a horizontal plane above the plane of the inner fire arch, a vertical wall between the adjacent ends of the inner fire arch and the intermediate arch with an expansion space between it and the said inner arch, and a course of brick carried by the inner arch and extending across the air space between the inner and outer arches, adjacent to said walls to close said expansion space and having an expansion space between the upper side of said course and the outer arch to permit free movement of the said course with the inner arch upon expansion of said arch.

In testimony whereof we affix our signatures in presence of two witnesses.

GILBERT R. HAIGH.
JOHN R. FORTUNE.

Witnesses:
CHESTER M. CULVER,
ROSE M. CONRAD.