

L. H. HOSBEIN.
FURNACE ARCH CONSTRUCTION.
APPLICATION FILED APR. 4, 1917.

1,309,435.

Patented July 8, 1919.

3 SHEETS—SHEET 1.

Fig. 1^a

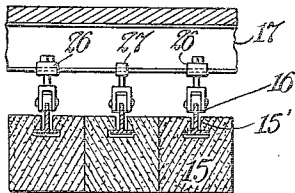


Fig. 1.

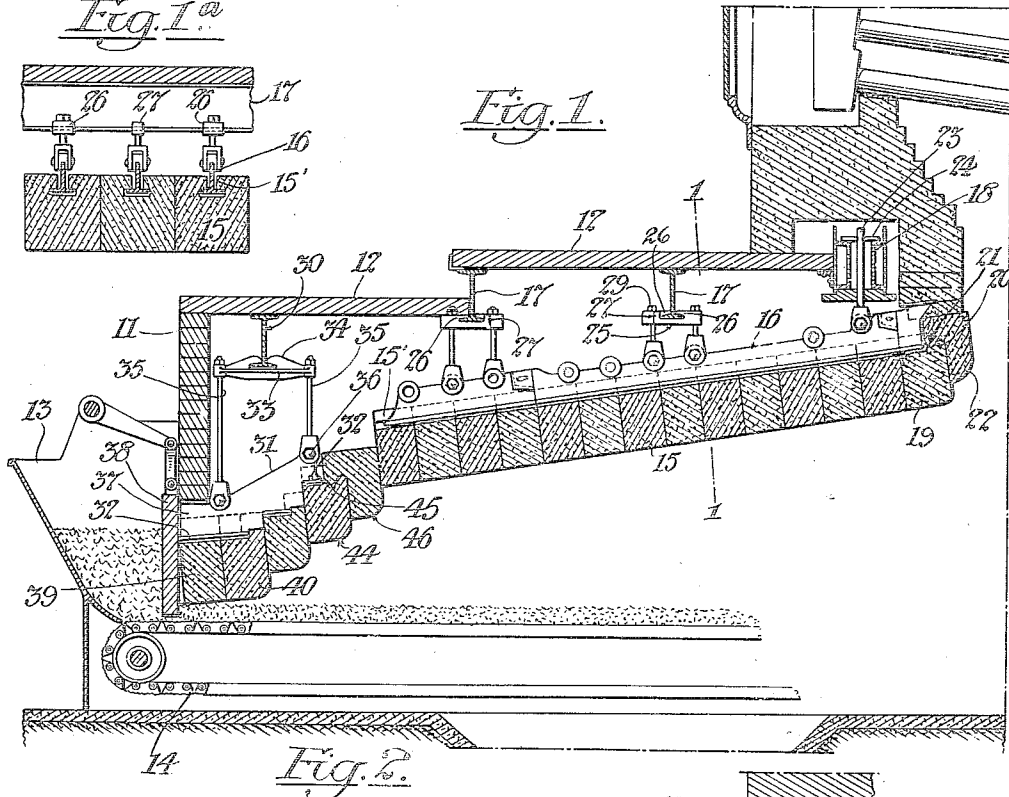
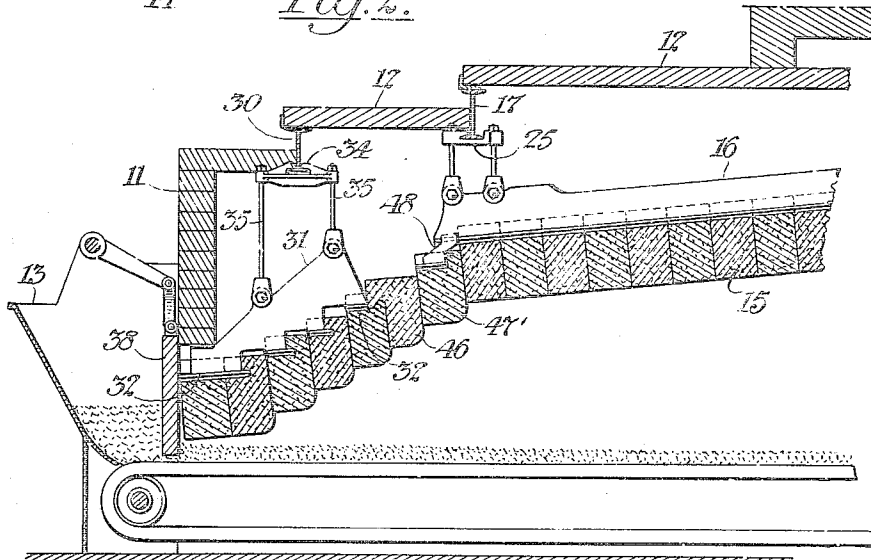


Fig. 2.



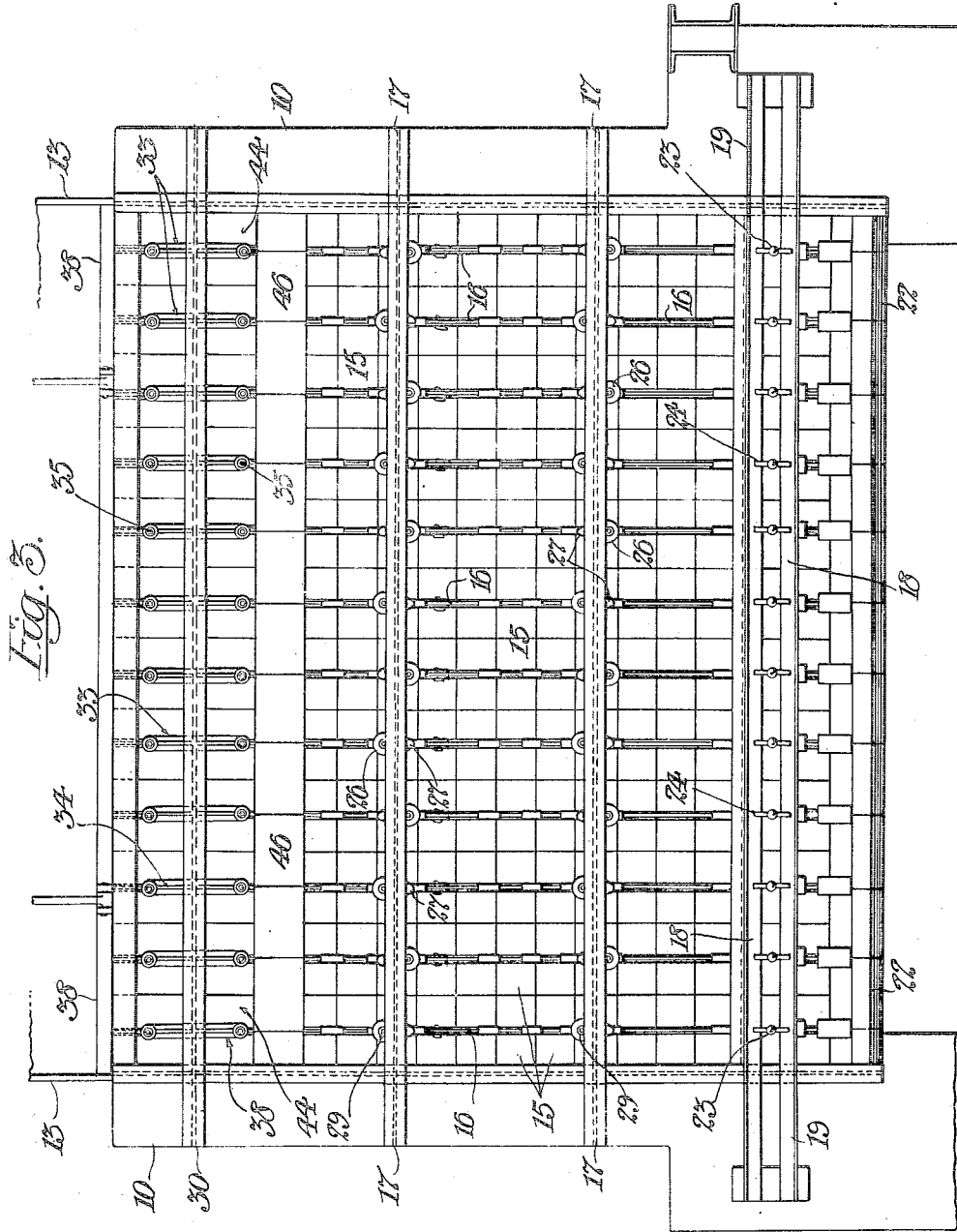
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3 SHEETS—SHEET 2.



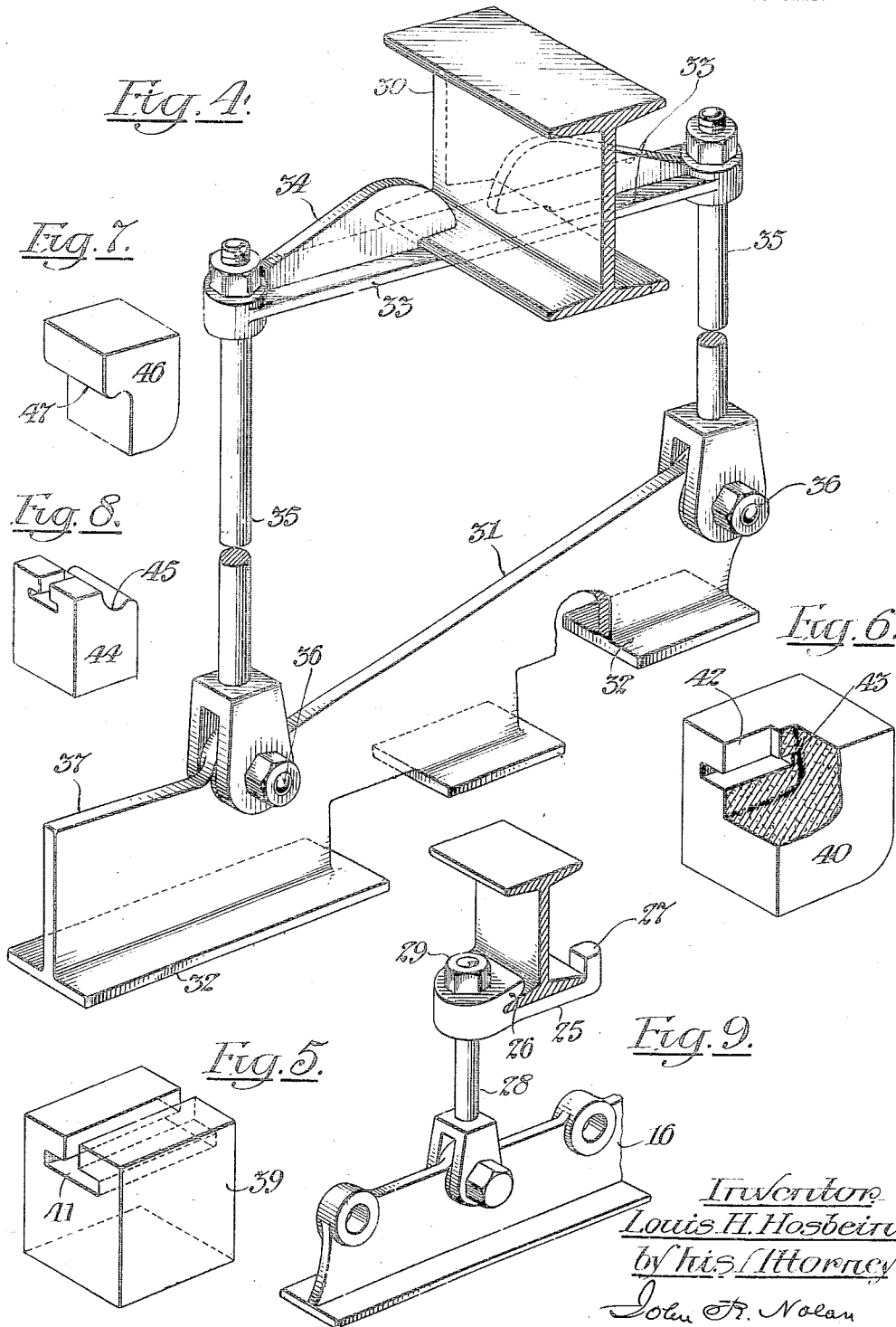
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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FURNACE-ARCH CONSTRUCTION.

1,309,435.

Specification of Letters Patent.

Patented July 8, 1919.

Application filed April 4, 1917. Serial No. 159,610.

To all whom it may concern:

Be it known that I, LOUIS H. HOSBEIN, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Furnace-Arch Constructions, of which the following is a specification.

This invention relates to arch constructions for furnaces equipped with traveling grate stokers, having reference, more particularly, to ignition arches which overhang the grate throughout the width of the combustion chamber and forwardly of the main or furnace arch. Such ignition arches being adjacent the fuel delivery end of the furnace absorb a large amount of heat both by contact with the products of combustion from the fresh fuel and by radiation from the fuel bed, and, therefore, the fire bricks of an ignition arch burn out more quickly than the bricks of the rearward or furnace arch.

An object of my invention is to provide, in a furnace of the character mentioned, an ignition arch of such construction that the fire bricks or blocks thereof present a series of radiating surfaces whereof those at the forward portion of the arch are protected to a large extent from the destructive action of the intense heat, and that such bricks, or any of them, can be readily removed and replaced by others, as occasion may require.

Another object of my invention is to provide an arch of such construction that an intimate mixture of the gases arising from the burning fuel is effected, thereby insuring better combustion.

A further object of my invention is the provision of an arch of such construction that a relatively narrow delivery throat from the fuel hopper to the combustion chamber is provided, and that the use of protecting tile on the stoker gate is avoided.

A still further object of my invention is to provide arch-work of such character that arches or arch sections on different levels can be effectually connected.

With these and other objects in view my invention comprises, in a traveling grate stoker furnace, an ignition arch whereof the bricks are arranged in step formation as-

cending from a point adjacent the front of the grate in such a manner that a series of angular heat-radiating surfaces are exposed to the direct action of the heat from the burning fuel.

The invention also comprises an arch embodying step-like suspension members by means of which the fire bricks are so arranged and supported independently of each other that a brick or series of bricks can be readily removed and another brick or bricks as readily substituted therefor.

The invention also comprises features of construction and combinations of parts in both main and ignition arches whereby practical advantages are secured, all as will be hereinafter described and claimed.

In the drawings—

Figure 1 is a longitudinal vertical section through a portion of a traveling grate stoker furnace embodying the preferred form of my invention.

Fig. 1^a is a partial transverse section, as on the line 1—1 of Fig. 1.

Fig. 2 is a section similar to Fig. 1 showing a modification of the ignition arch.

Fig. 3 is a partial plan of the structure illustrated in Fig. 1, the covering and other parts of the furnace above the supporting beams being omitted in order to expose the arches and their suspension elements.

Fig. 4 is a perspective view showing the step suspension structure for the bricks of the ignition arch, a part of the supporting beam being shown.

Figs. 5, 6, 7 and 8 are similar views of various styles of fire brick employed in the construction of the ignition arch.

Fig. 9 is a perspective view of a form of hanger for the arch-bars of the rear or furnace arch, showing a portion of an arch bar and also a portion of the beam from which said bar is suspended.

Referring to the drawings, 10 designates the side walls of a furnace; 11 the front wall, and 12 the top.

13 designates the fuel hopper located exteriorly of the front wall; and 14 an endless traveling chain grate to which the fuel is supplied from the hopper and thus carried by the grate into the combustion chamber in the usual manner,

The main or furnace arch, which is located above the chain grate, is of the general flat type. In the present instance said main or furnace arch comprises rows of fire bricks 15 carried by a series of spaced parallel arch bars 16 which extend longitudinally of the furnace, said bars being suspended by hangers from spaced girders 17 and 18 which extend transversely of the furnace from side to side thereof. Each of the arch bars includes a vertical web having lateral flanges along its lower edge. The bricks 15 are provided in their upper surfaces with undercut grooves 15' whereby such bricks may be individually slid upon the lateral flanges of an arch bar 16 and thus be detachably supported side by side throughout the length of the bar. The brick 19 at the rearward end of each of the arch bars is provided with a rearward extension having a recessed top portion 20 with which engages the overhanging nose 21 of an end brick 22. The latter brick is thus supported in close contact with the outer end of the arch bar so as to cover and protect such end. This end brick arrangement is substantially the same as that described in Letters Patent of the United States No. 1,259,215, dated March 12, 1918. The arch bars 16 are slightly inclined upwardly from the front to the rear of the combustion chamber, and hence the brick-work carried by the bars is correspondingly inclined.

The rear girder in its preferred construction includes a pair of spaced parallel channel bars extending from side to side of the furnace. Depending between these bars is a hanger comprising a rod 23 having at its upper end a cross-piece 24 which rests upon the tops of the bars; the lower end of the rod being pivotally connected to the web of the adjacent arch bar. This girder and suspension construction is substantially such as described in Letters Patent of the United States No. 1,284,066, dated November 5, 1918.

The forward and intermediate girders 17 comprise single I-beams extending from side to side of the furnace. The preferred form of arch bar hanger which I employ in connection with the beams 17 includes a clip-like structure comprising a body 25 having at one end an inwardly overhanging lip 26 and at the other end an upstanding lug 27, whereby the body may be readily applied to the underside of a beam in such manner that the lip overhangs one of the beam flanges and the lug 27 extends against or adjacent the outer edge of the other flange. (See Fig. 9.) That end of the body having the overhanging lip is vertically perforated for the upward passage of a hanger rod 28 to the projecting upper end of which a nut 29 is conveniently applied. The lower end of the rod is pivotally connected to the web of the adjacent arch bar, the weight of

which binds the lip and body portion of the clip oppositely against the contiguous flanges of the I-beam and thus maintains the body securely in place. The hooked or lipped ends of the successive hanger clips are alternately disposed on the respective flanges of the beam, as seen in Fig. 3, so as to insure a uniform distribution of the load throughout the beam.

By the construction just described, the hanger clips, or any of them, can be readily applied to or removed from the beam at any point in the length of the latter; thus facilitating the operation of installing or repairing the arch section.

The space between the front end of the main or furnace arch and the front wall of the furnace is occupied by the ignition arch. In the preferred form of embodiment of this feature of my invention, rows of fire brick are supported in step-like order by structures which are suspended in spaced relation to each other throughout the width of the combustion chamber. These structures are suspended by suitable hangers depending from an I-beam 30 which is supported at its ends on the side walls of the furnace. The bricks are so disposed as to incline upward to and merge with the main or furnace arch from a level beneath the front wall of the furnace and adjacent the front of the grate. Each structure comprises a web 31 having along its lower edge a series of laterally projecting flanges 32 which are spaced apart and arranged in ascending step formation from the forward to the rearward end of the web. In the construction illustrated in Figs. 1 and 4, three step flanges are arranged on each side of the web, such flanges being adapted to engage the grooved portions of appropriately-formed fire bricks and thus support the succeeding bricks in close relation to each other, as will be presently described. The preferred form of hanger for each of the step structures comprises a body 33 having on its upper surface spaced under-cut webs 34 which provide hook portions adapted to be slid upon the lower flanges of the I-beam 30 as best seen in Fig. 4, whereby the said body can be readily movable and adjustable longitudinally of the beam. Depending from the outer ends of the body 33 are two rods 35 of different lengths to the lower ends of which the web of the step-structure is pivotally connected, as indicated at 36. The lower end of the inclined web 31 comprises a horizontal portion 37 which extends into the usual fuel opening in the front wall of the furnace, so as to lie in close relation to the stoker gate 38, while the upper end of the web terminates short of the forward end of the main or furnace arch. (See Fig. 1.) The flanges 32 at the lower end of the web are of sufficient length to receive and support two

bricks side by side, the outer brick being indicated at 39 and the inner brick at 40. The top of the brick 39 is provided throughout its width with an undercut groove 41 of appropriate form to permit the brick to be bodily slid upon and lengthwise of the flanges. The groove 42 in the top of the brick 40 extends only partially through the latter, the inner end of the bottom of such groove being undercut as at 43 so that when the brick 40 is applied to the inner end portion of the flanges 32 it incases and protects such portion, and also takes against and lies under the adjacent angular edges of the web so as to cover and protect such edges, as seen in Fig. 1. The brick on the second pair of step flanges 32 is similar in construction to the brick 40 just described, and it likewise protects the flanges and the adjacent edges of the web from the direct action of the heat from the burning fuel. The brick 44 which is supported on the uppermost flanges 32 is provided with a recess or depression 45 in its upper surface just beyond the supporting member, and a brick 46 provided with an overhanging nose 47 (similarly to the brick 22) is entered in the recess and thereby suspended snugly in the space between the brick 44 and the front end brick 15 of the main or furnace arch. The brick 46 serves as a key to keep in place the adjacent rows of bricks of the two arches. This key brick, as it may be termed, is preferably arranged in step relation to the adjacent brick 44, as seen in Fig. 1. The key brick can be readily applied to or removed from the brick 44 so as to close or open the space between the adjacent end bricks of the two arches. When the key brick is removed the resulting space permits the ready removal of the bricks from the step-member and the substitution of others therefor. Such space also permits a similar removal of bricks from the arch bar 16 and their replacement by others, as occasion may require.

By the construction described it is to be noted that a succession of stepped heat-radiating surfaces is provided in the ignition arch in such relation to the fresh bed of fuel that a whirling and a thorough mixture of the ascending gases are effected, thus promoting their combustion; that a relatively small portion of the rearward surface of each brick is subjected to the destructive action of the heat, thus conserving the life of the arch; that the front row or rows of bricks extend adjacent to and parallel with the grate so as to afford a relatively narrow fuel inlet throat and thus insure the delivery of a uniform depth of fuel from the hopper to the grate; that the close relation of the front row of bricks to the stoker obviates the use of fire tile on the stoker gate, and that an efficient ignition arch extending from

side to side of the furnace and from the lower row of bricks to the elevated furnace arch is provided. Furthermore that the ignition arch is structurally independent of the furnace arch, and therefore either arch may be installed, removed, or repaired without disturbing or impairing the other.

In the modification illustrated in Fig. 2 the stepped supporting structure is represented as provided on each side with four ascending step flanges 32 having fire-brick mounted thereon, and the key-brick 46 is represented as bearing against a brick 47' at the forward end of the furnace arch; such latter brick being supported in step relation to the brick 46 by a flanged bracket 48 which is applied to the corresponding end of the suspended arch bar 16. Thus when the key-brick is removed, the brick 47' and its bracket, together with the remaining bricks on the arch bar, may be detached and replaced if desired. So also the bricks on the step-member of the ignition arch may be removed and replaced if required.

I do not limit myself to the structural details herein set forth, as the construction may be changed in various respects without departing from my invention as defined in the appended claims.

I claim—

1. A furnace having a traveling grate and an arch construction overhanging the grate and extending from side to side of the furnace, said construction comprising a main arch and an ignition arch, the main arch including longitudinally flanged members extending lengthwise of the furnace and fire bricks slidably mounted upon the flanges of said members, and the ignition arch including longitudinally flanged suspension members extending lengthwise of the furnace and fire bricks slidably mounted upon the flanges of the latter members and positioned to present heat-radiating surfaces ascending in step-like formation toward but short of the main arch, and removable key-bricks located between the adjacent spaced ends of the main and ignition arches and locking the fire bricks on the flanged members of the respective arches.

2. A furnace having a traveling grate and an arch construction overhanging the grate and extending from side to side of the furnace, said construction comprising a main arch and an ignition arch, the main arch including longitudinally flanged members extending lengthwise of the furnace and fire bricks slidably mounted upon the flanges of said members, and the ignition arch including longitudinally flanged suspension members extending lengthwise of the furnace and fire bricks slidably mounted upon the flanges of the latter members and positioned to present heat-radiating surfaces ascending in step-like formation toward but short of

the main arch, and removable key-bricks located between the adjacent spaced ends of the main and ignition arches and locking the fire bricks on the flanged members of the respective arches, said key-bricks being in step relation to the adjacent bricks of the ignition arch.

3. A furnace having a traveling grate and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the forward arch includes a series of members having spaced flanges thereon ascending in step-like formation toward the rearward arch from a level adjacent the front or fuel receiving portion of the grate, and fire bricks carried by said flanges.

4. A furnace having a traveling grate and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the forward arch comprises a series of members having spaced flanges thereon ascending in step-like formation toward the rearward arch from a level adjacent the front or fuel receiving portion of the grate, a beam overhanging said members, means suspending said members from the beam, and fire-bricks carried by said flanges.

5. A furnace having a front wall with a fuel opening therein, a traveling grate extending from said opening into the combustion chamber, and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the forward arch includes a series of members having spaced flanges thereon ascending in step-like formation toward the rearward arch from a level within the fuel opening and adjacent the grate, and fire bricks carried by said flanges.

6. A furnace having a traveling grate and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the forward arch includes a series of members having spaced flanges thereon ascending in step-like formation toward the rearward arch from a level adjacent the front or fuel receiving portion of the grate, and fire bricks having recessed upper portions which embrace the flanges and protect the same and the parts of the members between successive flanges.

7. A furnace having a front wall with a fuel opening therein, a traveling grate extending from said opening into the combustion chamber, and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the forward arch includes a series of members having spaced flanges thereon ascending in step-like formation from a level within the fuel opening and adjacent the grate, a row of fire bricks recessed to embrace the lowermost flanges within the

opening, and other fire bricks having upper portions recessed to embrace the flanges and protect the same and the parts of the members between successive flanges.

8. A furnace having a traveling grate and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the forward arch includes a series of members having spaced flanges thereon ascending in step-like formation from a level adjacent the grate toward but short of the forward end of said rearward arch, fire-bricks having their upper portions longitudinally recessed and slidably mounted on said flanges, and removable key-bricks in the space between the said members and the rearward arch.

9. A furnace having a traveling grate and arch construction overhanging the grate, said construction comprising forward and rearward arches, whereof the rearward arch includes a series of longitudinally flanged arch bars extending lengthwise of the furnace and a row of recessed fire bricks slidably mounted upon the flanges of each of said bars, and whereof the forward arch includes a series of suspension members having brick-supporting portions ascending from a level adjacent the grate toward but short of the forward end of said rearward arch, fire bricks carried by said members, and removable key-bricks in the space between the said members and the rearward arch.

10. A furnace having a traveling grate and arch construction overhanging the grate, said construction comprising forward and rearward arches whereof the rearward arch includes a series of longitudinally flanged arch bars extending lengthwise of the furnace and a row of recessed fire bricks slidably mounted upon the flanges of each of said bars, and whereof the forward arch includes a series of members having spaced flanges thereon ascending in step-like formation from a level adjacent the grate toward but terminating short of the forward end of said rearward arch, recessed fire bricks slidably mounted on said flanges, and removable key-bricks in the space between the said members and the rearward arch.

11. An arch brick support including a member having laterally-projecting flanges arranged in ascending step-like formation.

12. An arch brick support including a member having laterally-projecting flanges arranged in ascending step-like formation, and suspension means for said member.

13. An arch brick support including a member having laterally-projecting flanges arranged in ascending step-like formation, a clip element having a beam-engaging portion and means depending from said element connected to said member.

14. In a furnace, an arch comprising a

series of counterpart brick supporting members, means suspending said members in spaced parallel relation to each other, and rows of fire-bricks carried by the respective
5 members, each of said members consisting of a web having a series of laterally-projecting flanges in ascending step-like formation,

said bricks having undercut recesses with which the said flanges are engaged.

Signed at Chicago in the county of Cook 10
and State of Illinois this 20th day of March
A. D. 1917.

LOUIS H. HOSBEIN.