

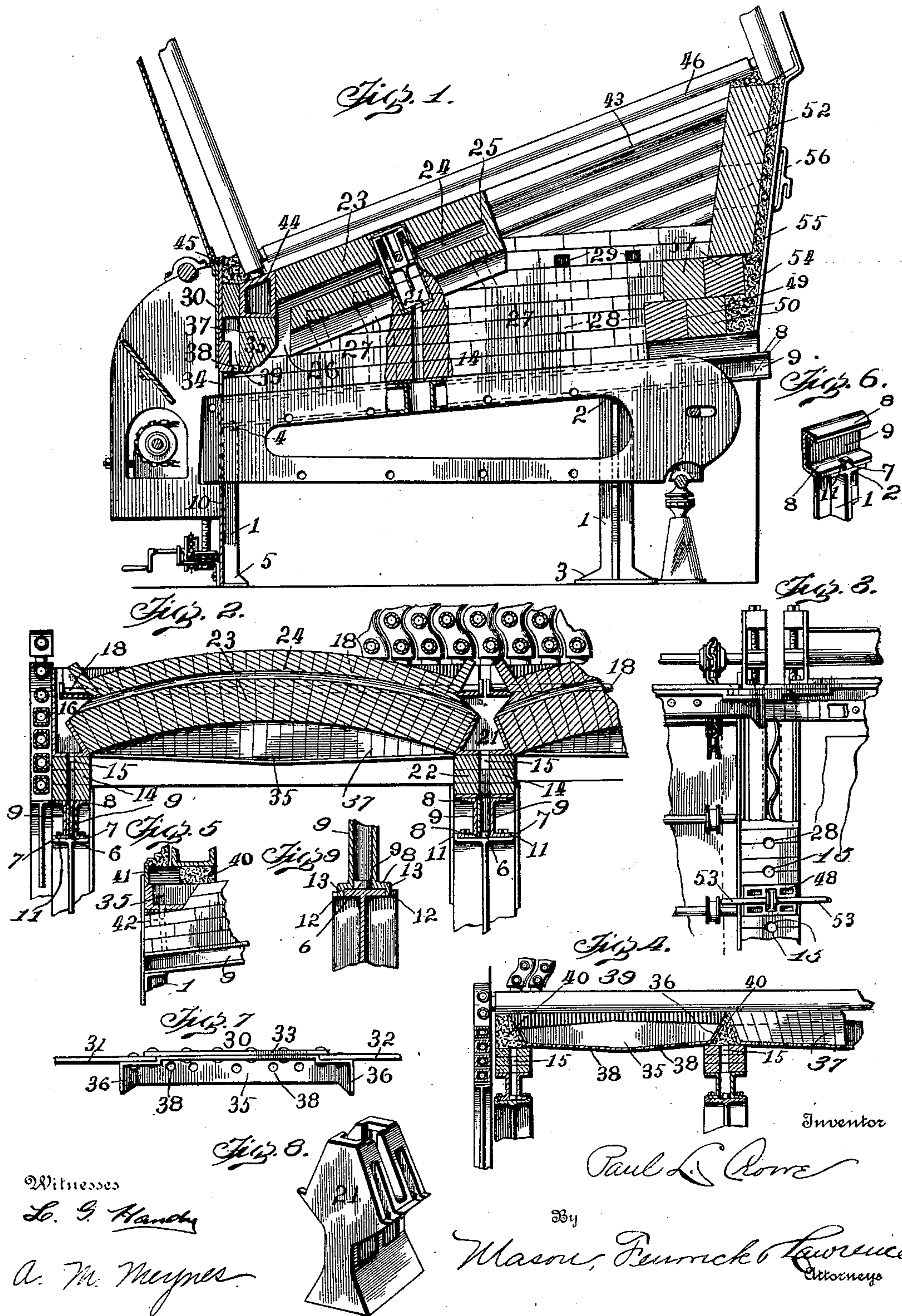
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Patented Nov. 18, 1902.

P. L. CROWE.  
FURNACE WALL CONSTRUCTION.

(Application filed July 8, 1901.)

(No Model.)





# UNITED STATES PATENT OFFICE.

PAUL L. CROWE, OF NEW YORK, N. Y.

## FURNACE-WALL CONSTRUCTION.

SPECIFICATION forming part of Letters Patent No. 713,968, dated November 18, 1902.

Application filed July 8, 1901. Serial No. 67,475. (No model.)

*To all whom it may concern:*

Be it known that I, PAUL L. CROWE, a citizen of the United States, residing at New York, in the borough of Manhattan, county and State of New York, have invented certain new and useful Improvements in Furnace-Wall Constructions; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to furnace-wall constructions and arches built thereon, and has for its object the construction of walls containing air-passages and adapted especially for use in connection with traveling-grate marine furnaces of my own invention and also generally for such other styles of furnaces as it may be practical to use in connection with said walls.

My invention consists of supporting pedestals or posts, channel-beams laid horizontally or at an incline from front to rear thereon, walls erected upon said channel-beams, skewbacks built into said walls as footings for the arches hereinafter described, a vertically-corrugated partition-wall plate, if desired, extending from the floor of foundation to the top surface of the flanges of the central wall channel-beams and between said beams, which plate, however, may be omitted, the said walls having air-passages leading, respectively, into said skewbacks, and other air-passages in said walls leading into the combustion-chamber over the grates, and air-passages from certain of said skewbacks leading into a broad air-passage in the central arch over the grates and thence forward and downward into the combustion-chamber over the fuel.

It also consists of certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter more particularly set forth and described.

In the accompanying drawings, Figure 1 is a vertical central section through a furnace, the walls of which are constructed in accordance with the present invention. Fig. 2 is a vertical transverse section through the side and central walls of such a furnace and through the front arch of the fire-box. Fig. 3 is a fragmentary horizontal sectional view of a portion of the furnace, illustrating the manner

of building up one of the walls of the furnace and showing adjacent parts at the front. Fig. 4 is a vertical transverse sectional view showing the arches over the fuel-ports with the shelf-plates for supporting them. Fig. 5 is a detail sectional view through one of the fuel-ports, showing the air-space just to the rear of the front plate. Fig. 6 is a detail perspective view showing the upper end of one of the wall-supporting posts and a portion of one of the channel-beams resting thereon. Fig. 7 is a top plan view of the fuel-port shelf-plate. Fig. 8 is a perspective view of one of the skewbacks for supporting one of the arches of the furnace. Fig. 9 is a detail sectional view showing the channel-beams of one of the walls resting upon one of the supporting-posts, the channel-beams being secured to a cap-plate on the posts in a slightly-different manner from the way shown in Fig. 6.

I will first describe said walls as constructed for a battery of two furnaces arranged side by side under one boiler.

Upon the floor or foundation I erect supporting pedestals or posts 1 1, of any desired number, but preferably two for each side wall and two for the partition-wall, said posts in each instance being of any suitable design. The rear posts 1 in each wall are preferably substantially + - shaped in horizontal section and respectively provided with suitable integral or affixed caps 2 2 and footings 3 3. The front posts 1 in each wall are approximately T-shaped in horizontal section and respectively provided with suitable caps 4 4 and footings 5 5. I will describe the structure as if it only contained two posts under each wall, though it may sometimes be desirable to use more. The upper surface of said caps forming part of said posts is preferably provided with a central upwardly-extending spacing-lug 6 to space the channel-beams, hereinafter described, and with an upwardly-extending binding-lug 7 near each side edge of said post-cap to engage locking-notches formed in the channel-beam flanges 8 to prevent lateral motion of said beams. The side walls, which are similarly constructed, are erected as follows: Upon the tops of the posts 1 1, already described, are laid channel-beams 9 9, with their flanges 8 8 di-



rected, respectively, to the right and left, which beams extend longitudinally of the furnace from front to rear and are horizontal or at a longitudinal incline, as desired, but parallel  
 5 and on the same plane with each other and with the channel-beams 9 in the opposite wall. The degree of incline, if any, is preferably effected by making the rear posts 1 longer than the front posts 1, or vice versa.  
 10 In my construction I prefer to bolt the front posts 1 to the front wall 10 of the furnace; but that is of course not essential. Said channel-beams 9 9 are further provided with notches 11 11 to engage the upwardly-  
 15 extending binding-lugs 7 7, formed upon the heads or caps of said posts 1 1. I may, however, employ equivalent means for binding said channel-beams by providing apertures or notches 12 12 in said post-caps, as seen in  
 20 Fig. 9, and constructing fingers 13 13 upon said channel-beams to engage said apertures by turning downwardly a small section of the channel-beam flanges. The channel-beams are spaced a short distance apart by  
 25 the upwardly-extending spacing-lug 6, formed upon said post-caps 2 and 4. Upon said channel-beams 9 9 I construct one or more courses of brick or tile 14 14, preferably of the kind manufactured of fire-clay, said brick  
 30 being provided with vertical or inclined or horizontal apertures 15, as the case may be, to form air-passages adapted to connect with similar air-passages in the superimposed or underlying courses, the walls of which apertures may be inclosed within the parallel  
 35 walls of the individual brick or may be constructed by forming a groove in one brick adapted to register with a similar groove in an adjoining brick. Preferably upon the  
 40 third of such courses of brick I erect skewbacks as footings for the central arch and for the bridge-wall arch of a furnace. The skewbacks 16 for the central arch are of any suitable number, preferably five, and are set side  
 45 by side and secured to the skewbacks in the opposite wall by buck stay-rods 18. The said skewbacks 16 16 are substantially hollow and are set over the vertical air-passages in that portion of the wall and are so constructed as  
 50 to conduct the air into the arch 23, for which they form the footings. The forward skewback is set a short distance back from the front wall 30, such distance being substantially equal to the width of a front arch bracket or  
 55 shelf hereinafter described. Springing from said five skewbacks 16 on the one side to five similar but double-faced skewbacks 21 21 in the central or partition wall 22 is a central double arch 23, of brick, containing an air-  
 60 space 24, closed at the rear, as at 25, and open at the front, as at 26, which arch air-space 24 receives air through the skewbacks supporting the arch and transmits it forward and downward in heated condition to the combustion-chamber 27 above the fuel. Said  
 65 arch may follow the same inclination, if any, of the channel-beams 9 9 or may be raised to

a greater inclination by padding the supporting-walls. The faces of said skewbacks 16 and 21 are thus covered by the arch, and the  
 70 wall between the said skewbacks and the bridge-wall skewback is built up of brick to any suitable and desirable height and contains vertical air-passages 28 28, with horizontal upper terminals 29 29, leading into said  
 75 combustion-chamber 27 above the fuel. Secured against the side walls and the central wall by anchor-bolts or any other suitable device (or, if desired, built up of bricks) is the front wall or plate 30, consisting, preferably,  
 80 of an end plate 31, secured to the end of each side wall, and a central plate 32, secured to said central wall, and an arch-plate 33, (preferably a flat arch,) extending from each end  
 85 plate, respectively, to said central plate, which arch-plates 33 form the arches above the fuel-ports 34 of the furnace. In case of single furnaces there is of course no central wall or plate, and the fuel-port arch-plate extends from one end plate to the other end  
 90 plate and is bolted or otherwise secured thereto.

To the rear face of the arch-plate 33, near the lower edge thereof, is bolted or otherwise  
 95 secured a shelf or bracket 35, having box ends 36 flared outwardly to form the footings and support for a front fire-brick arch 37 to protect the front wall from the excessive heat. The lower face of said shelf 35 is preferably  
 100 convex downwardly and extends at the center slightly below the line of the fuel-port arch-plate 33, which, besides affording greater protection to said plate, operates to lessen the volume of coal entering the port at the  
 105 center, while permitting a larger quantity to enter at the sides, where combustion is more rapid. The flared box ends 36 of the shelf, respectively, overhang the adjoining channel-beams, and the shelf proper is provided  
 110 with several vertical apertures 38 38 close to the front wall 30 for the passage of air. Upon said shelf is constructed an arch 37, preferably of fire-brick, which brick are set on edge and project beyond the edge of said shelf toward the front of the central brick arch, but  
 115 so as to leave the passage 26 between the rear face of said front arch and the front face of said central arch 23. Between the front wall 30 and the brick upon said shelf 35 is left an air-passage 39, extending from end to  
 120 end of said shelf. The front arch terminates upon the outwardly-placed ends 36 of said shelf 35, and the space between said shelf end and the side wall of the furnace or the side boiler-tubes, as the case may be, is filled with  
 125 brick or asbestos, or both, as at 40, except that an air-space 41 is left between said filling and the front wall of the furnace, thus permitting circulation of air through a vertical passage 42 in said side wall into said  
 130 space and over the end of said shelf into the space 39 between said front arch and said front wall and down through the apertures 38 in said shelf to the combustion-chamber,



the upper faces of said channel-beams 9 9 being preferably covered with brick clear to the front wall 30, and said vertical passage 42 passing through said brick and registering with the space between said channel-beams 9 9. The space between the adjoining shelves 35 35 at the central partition-wall is partly filled substantially as above described for said side wall. When using the type of boiler partly shown in the accompanying drawings at 43, the lower horizontal front header 44 of the boiler is preferably placed immediately above and in contact with said front arch 37 and a filling of brick interposed between said header 44 and said front plate 30, above which brick filling is preferably inserted a broken brick and asbestos filling, as at 45, to choke all passages and crevices to the height of lower overhead tubes 46. In using other types of boilers it might be preferable to superimpose a second front arch above said first one in place of said horizontal header, the rest of the front construction remaining the same.

The central wall in battery-furnaces is constructed substantially the same as the side wall, except that said central wall contains double-faced skewbacks 21 instead of single-faced skewbacks, as at 16. Upon said side and central walls, a suitable distance in rear of said central arch, are placed skewbacks 21, and upon a predetermined course of brick, (preferably the third,) forming part of said wall, I place or build bridge-wall skewbacks 48 48, preferably hollow, from which is sprung the bridge-wall 49, consisting of two double arches, the lower two arches 50 50 (which may, however, be integral) on one plane and the other two arches 51 51 (which may, if desired, be integral) superimposed upon the lower arches, but so constructed, preferably, as to break joints with the lower arches—that is to say, the upper arches are begun a short distance in rear of the front edge of the lower arches and extended a short distance in rear of the rear edge of the lower arches. Upon said upper arches 51 is built up a brick wall 52 to the height of the lower overhead water-tubes 46. The faces of the bridge-wall skewbacks 48 are covered by the side and center wall bricks and by the brick of said bridge-wall arches 50 51, and the bridge-wall skewbacks 48 in the center wall are tied to the skewbacks in the side walls by buckstay-rods 53, traversing said arches. In the rear of said bridge-wall 49 and bridge-wall arches is preferably a filling of broken brick and asbestos, as at 54, to make a flush face for the rear casing-plate 55 and to further prevent the radiation of the heat from the rear wall. The rear of said bridge-wall is supported in place in any desirable and suitable manner. The rear end of said furnace inclosure is preferably entirely open beneath the lower line of the bridge-wall arch 49; but, if desired, said rear end may be entirely closed by one or more plates or by a wall. A suitable manhole 56 penetrates said

bridge-wall and casing 55 immediately above the arch and is covered by a suitable removable closure.

It will be obvious that my said invention is capable of and would require many minor modifications to adapt it for use with different types of boilers, all of which modifications would be well within the scope of my invention. For example, in the accompanying drawings my wall construction is shown in connection with a type of boiler known as the "Babcock & Wilcox tubular boiler," in which side tubes are shown outside of the furnace-walls proper. It will be obvious that in using a type of boiler in which said side tubes or their equivalent are not used I might without departing from the spirit of my invention substitute in their stead an exterior brick wall to prevent an abnormal radiation of heat from the sides. If desired, also the metallic skewbacks may be omitted and any other desirable footings in the walls substituted, and the buckstay-rods might then, if desired, penetrate the walls and engage exterior buckstays.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A furnace-wall, comprising supporting-posts, channel-beams resting upon the same with their webs vertical, and means for spacing them apart, so that air may pass between them, bricks mounted upon the upper edges of said channel-beams and having air-passages formed within the same arranged above the space between said beams, the said passages extending upwardly and delivering air into the combustion-chamber of a furnace, substantially as described.

2. A furnace-wall, comprising front and rear posts, cap-plates secured to their upper ends, channel-beams extending from the front to the rear posts, means for spacing the channel-beams apart to form air-passages between them, bricks formed with air-passages mounted upon the channel-beams so that the air-passages in them will register with spaces between the channel-beams, the said bricks having lateral passages in the upper part of the brickwork for delivering the air into the combustion-chamber of a furnace, substantially as described.

3. In a furnace the combination with a combustion-chamber of walls therefor, comprising front and rear posts formed of angular material, foot-plates secured to their lower ends, and cap-plates upon their upper ends, the said rear posts being made higher than the front posts, channel-beams resting upon the said front and rear posts and inclining from the rear toward the front, spacing-lugs upon the cap-plates adapted to project between the channel-beams for spacing them apart and thereby forming air-passages between them, bricks mounted upon the said channel-beams provided with vertical passages formed in and between them, part of



said bricks being provided with lateral passages connecting the vertical air-passages with the combustion-chamber, substantially as described.

5 4. In a furnace the combination of side walls provided with air-passages, hollow means supporting said walls so that air may pass upwardly to said passages, hollow skewbacks mounted upon the said walls, the hollow portion of said backs receiving air from the passages in the wall, means for directing the air which passes through the wall-passages, and the skewbacks into the furnace, arches springing from and resting upon the said skewbacks, and means for supporting a boiler above the said arches, substantially as described.

5. In a furnace, the combination of side and middle walls having air-passages passing upwardly through the same, hollow supporting means below the walls for admitting air to the said passages, hollow skewbacks mounted upon the walls having their central passages coinciding with the air-passages of the wall, tie-bolts engaging said skewbacks for holding them in position, the said skewbacks having inner beveled faces, arches mounted upon said passages connecting the hollow skewbacks with the combustion-chamber of the furnace, and means for supporting a boiler above said arches, substantially as described.

6. In a furnace the combination of side walls having vertical passages formed therein, a series of skewbacks mounted upon said walls and having passages registering with the passages in the walls for forming a part of these passage-ways, a double brick arch springing from and connecting the said skewbacks of adjoining walls, the said arch having an air-passage formed therein and connected with the combustion-chamber of the furnace, the said air-passage in the arch being also connected with the air-passages in the supporting-walls, the structure being such that heated air may be delivered from the walls and arch to the combustion-chamber, substantially as described.

7. A furnace-closure, comprising walls having air-passages formed therein, extending around a suitable grate, a furnace-front, comprising end plates and a connecting-plate, an arch-supporting shelf secured to said front, a boiler-header, a brick arch mounted upon said shelf and adapted to protect the said header, the lower face of said brick arch and of said arch plate or shelf extending slightly below the lower line of the front plate, about the center or mid-section, and operating to lessen the volume of fuel about the center of the fuel-port, and an air-space formed between the arch and the front plate for protecting it from excessive heat, substantially as described.

8. A furnace-closure, comprising side walls

for partially inclosing a grate and a combustion-chamber, a double arch formed between its forward ends having an air-passage closed at the rear and open at the front of the combustion-chamber, a furnace-front, comprising side and central plates, a supporting-shelf secured to the front and having vertical air-passages formed therein, the lower face of shelf over the center of the fuel-port and grate extending slightly below the lower line of front plate, thereby diminishing the supply of fuel about the lateral center of the grate-surface, a boiler-header, an arch for protecting the said header mounted upon said shelf, air-spaces left between the arch and the front for introducing air through the passages formed in the shelf to the combustion-chamber, and a brick filling interposed between the boiler-header and the furnace-front, substantially as described.

9. A boiler-support, comprising side walls provided with air-passages and a front, the said front comprising plates and a supporting-shelf, end bearing-pieces formed upon the said shelf and adapted to rest upon the walls of the furnace, a space being left around the ends of the said shelf and connected with air-passages in the walls, an arch supported by the said shelf and arranged so as to leave an air-space between it and the front plates, apertures in the shelf communicating with the combustion-chamber of the furnace, the whole structure being such that air may pass upwardly through the furnace-walls, pass the ends of the shelf into the space between the front arch and the front plates, and thence downwardly through the passages in the shelf to the combustion-chamber, substantially as described.

10. In a furnace the combination of side walls and a front arch, skewbacks mounted upon the said walls, bridge-wall arches mounted upon the said skewbacks, one of said bridge-wall arches being superimposed above the other, and means for supporting a boiler above the bridge-wall, substantially as described.

11. In a furnace the combination of side walls, skewbacks mounted thereon having upper and lower beveled faces, lower arches engaging the lower beveled faces and upper arches resting upon the lower arches and engaging the upper beveled faces of the skewbacks, the said double arches forming a bridge-wall for the furnace, brickwork mounted upon the said arches for protecting the rear casing-plate outside the arches and brickwork, a rear casing-plate back of said arches, and a filling of asbestos and brick filling the space between the rear plate and the bridge-wall, substantially as described.

12. In a furnace the combination of side walls, skewbacks mounted thereon, double upper and lower bridge-wall arches mounted on the said skewbacks and forming a bridge-wall for the furnace, a rear face-plate, and a



brick and asbestos filling interposed between the rear plate and the bridge-wall, substantially as described.

13. In a furnace the combination of side  
5 walls, skewbacks mounted thereon having  
upper and lower beveled faces, arches resting upon the upper and lower faces of the said skewbacks, and means for supporting a boiler above the said arches, substantially as  
10 described.

14. In a furnace the combination of side walls and a furnace-front, the said front being made up of front plates and a supporting-shelf secured thereto, an arch mounted

on the said shelf so as to leave an air-passage 15  
between it and the front plate, fire-brick arranged between the arch and the front plate above the said air-space, a boiler-header resting above the said arch, and a filling of asbestos and broken material arranged above 20  
the brickwork to seal all apertures at the top of the front arch, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

PAUL L. CROWE.

Witnesses:

EUGENE F. CROWE,  
G. H. WILDE.