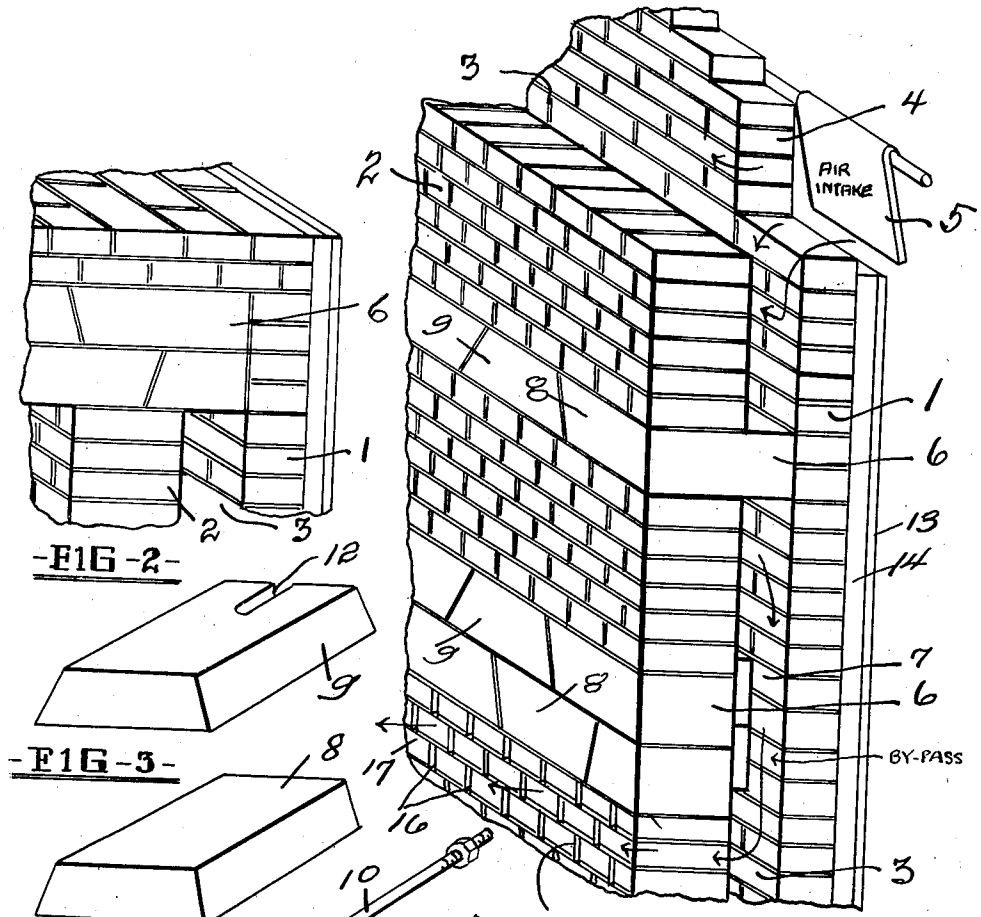
Oct. 21, 1941. R. W. BELL 2,260,242

FURNACE BLOCK, ARCH, AND WALL

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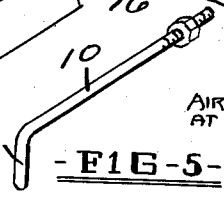


-FIG-1-

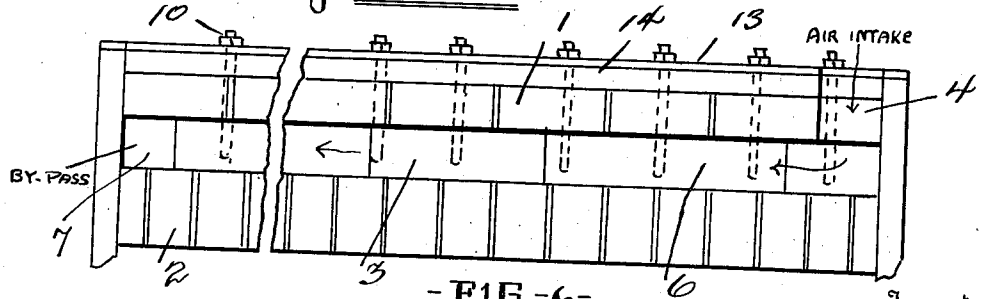
-FIG-2-

-FIG-3-

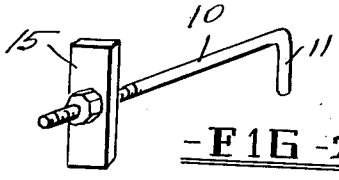
-FIG-4-



-FIG-5-



-FIG-6-



-FIG-7-

Inventor

RAY W. BELL.,

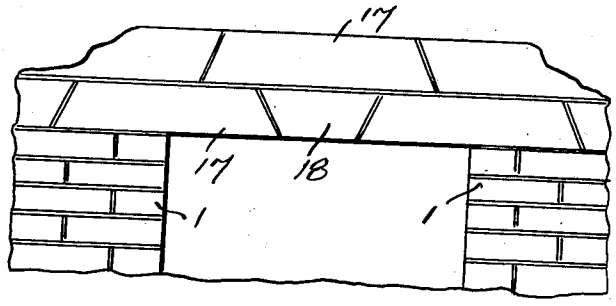
By Wm. L. Cathey

Attorney

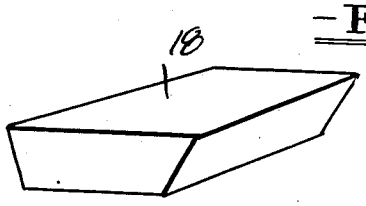
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FURNACE BLOCK, ARCH, AND WALL

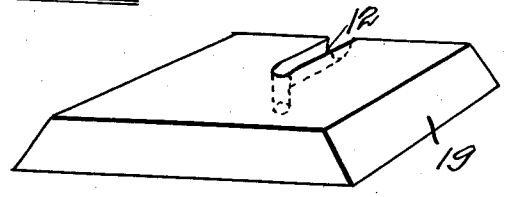
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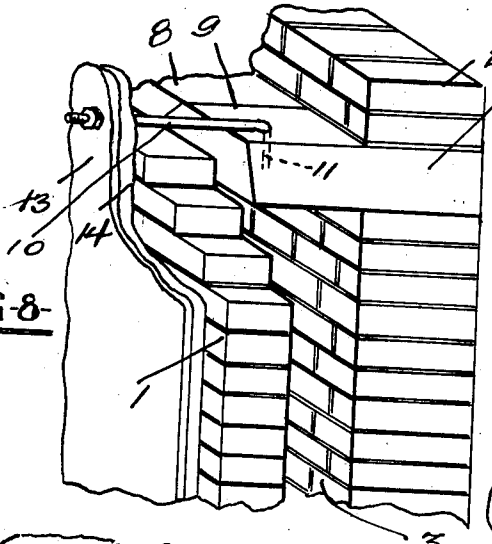
-FIG-11-



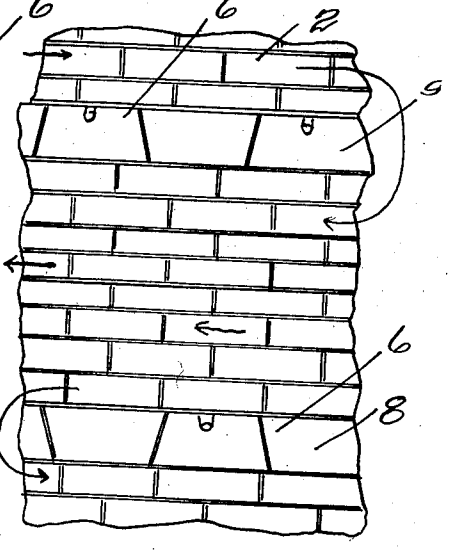
-FIG-12-



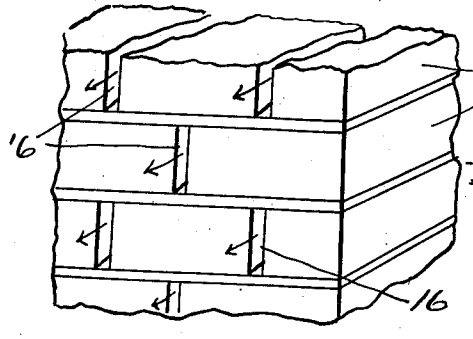
-FIG-13-



-FIG-8-



-FIG-9-



-FIG-10-

Inventor

RAY W. BELL,

By

Attorney

Patented Oct. 21, 1941

2,260,242

UNITED STATES PATENT OFFICE

2,260,242

FURNACE BLOCK, ARCH, AND WALL

Ray W. Bell, Hot Springs, Ark., assignor to Bel-Ray, Incorporated, a company of Illinois

Application December 30, 1937, Serial No. 182,623

1 Claim. (Cl. 110—75)

My present invention, in its broad aspect, has to do with improvements in drafts regulation and air circulation devices for furnaces and more particularly its purpose is to provide means whereby pre-heated air is let into the fire box of a furnace at or above the fire line to attain more complete combustion. Furthermore and of equal advantage is my construction of a furnace wall whereby the inner firebrick construction or wall is spaced from the outer or ordinary brick wall and the hollow chamber formed between the two walls used to provide a space for preheating air drawn into said space and discharging same in a preheated condition at or above the fire line in the fire box; also said hollow chamber is zoned so that the air drawn into the space is caused to follow a circuitous path thereby to be properly heated before being discharged into the fire box. My inner furnace wall is constructed of fire brick, and that portion or zone of the wall at and somewhat above the fire line is laid up with bricks which have spaces between each other or interstices through which air from the chamber is discharged into the fire box. The remaining portion of the inner wall is of solid fire brick construction with the bricks laid up in fire resistant or high temperature cement. The outer wall is formed of common brick. The space between the two walls may be of any desired size, and the draft control or regulators are preferably at the top or near the top of the outer wall so that the natural draft of the furnace by suction will draw the heated air from the air chamber into the fire box and its place will be taken by outside air entering through the draft regulator or regulators, the quantity being controlled thereby.

One of the principal features of my invention is the use of blocks of fire resistant material or fire brick construction, but much larger than an ordinary fire brick, which are laid up in single, double or plural block zones in the inner wall and extend into the air chamber, cutting the same up into zones so that the air will follow a circuitous route. These blocks have their outer ends against the inner face of the outer common brick wall and are anchored therein so that in effect the construction of the inner or fire brick wall is supported in zones on the series of block layers which in turn are anchored in the outer wall. This permits not only of zoning, but also of making repairs readily since the separate portions of the inner or fire brick wall are supported on the blocks and accordingly various portions of the inner wall may be repaired or renewed without disturbing the rest of the wall.

Another advantage of my invention is that the anchoring means of the blocks are adjustable and are wholly concealed either in the blocks or in the construction of the outer wall so that they will not burn out. This block and anchor construction permits of lining up the inner wall so that the inner or refractory wall is always maintained in its original position. In practice the bolts or anchors are slightly tapered and are loosely fitted for expansion and contraction of the inner wall without cracking or causing leaks of air into the fire box where not desired. In setting up the wall or for repairs the bolts are tightened after the inner wall has cooled, and they cannot burn out since the heated air is wholly carried by the air zones of the chamber. The present construction is adapted for use with gas or oil burners since preheated air can be released directly to the intake of the furnace thereby increasing its efficiency, and the peculiar shape of the blocks permits of repairs to lower sections or zones of the refractory wall without disturbing the upper sections. The use of preheated air at or above the fire line largely eliminates smoke and the like since complete combustion of gases and products of combustion is attained. Each wall—sides, front are built separately so that draft control may be independent for each and may also extend to the bridge wall; air entering at the top must pass the length of each zone before entering the next lower zone so that it is thoroughly preheated before being discharged into the fire box. As an arch construction my blocks are particularly adaptable since by a keystone arrangement of the same an arch is made self-supporting.

Other and equally important objects and advantages of my invention will be apparent as the detailed description of the same proceeds, but attention is directed to the fact that changes in construction, arrangement, size and position of parts may be made to meet varying conditions of practice, and that interpretation of the scope of my invention should only be conclusive when made in the light of the subjoined claim.

In the drawings wherein is illustrated the preferred form of my invention:

Figure 1 is a fragmentary perspective view of a wall construction made after the dictates of my invention;

Figure 2 is a fragmentary perspective view of a top of a wall and part of the bridge wall;

Figure 3 is a view of one of my blocks—i. e. the block in which the anchor bolt is fastened;

Figure 4 is a view of another of my blocks, i. e. the one designed to be supported between anchored blocks;

Figure 5 is a view of one of my anchor bolts;

Figure 6 is a top plan view of my wall and shows the air spaces, the inner and outer walls and the by-pass;

Figure 7 is a modified form of my anchor bolt construction used with an anchor plate when the outer sheet metal and asbestos liner are not used, but the bolts anchored directly in the common brick outer wall;

Figure 8 is a perspective view partly broken away showing the construction of my wall and especially illustrative of the manner of arranging my blocks;

Figure 9 is a fragmentary view taken with the outer wall removed and looking toward the inner face of the refractory wall and shows the air zones and path of air circulation;

Figure 10 is a view of the method of laying up the firebricks with spaces therebetween to discharge pre-heated air into the fire box through the refractory wall;

Figure 11 is a view of the top or arch construction using my blocks to form the same;

Figure 12 is a view of one of my arch blocks, and;

Figure 13 is a view of another of my arch blocks, i. e. the type of block in which the anchor bolt is engaged.

In the drawings wherein like characters of reference are used to designate like or similar parts throughout the several views:

The numeral 1 designates the outer or common brick wall, and 2 the inner, or fire brick, or refractory wall; the air space between the two walls is designated 3. Near the top of the outer wall 1, as shown in Figure 1, is an opening 4 with draft control means 5 so that air drawn into the space 3 between the walls may be properly controlled, and since the air circulation means for the two sides, front, and other parts of the furnace are preferably independently controlled more or less air may be admitted through any one draft or intake opening. The space between the walls 1 and 2 is divided by a series of layers of blocks 6 which are spaced apart to divide the space or chamber 3 into zones so that air admitted to the upper zone will travel the entire length of each zone to its point of discharge, there being provided by-passes 7 at the ends of the layers of blocks as shown in Figures 1 and 6.

The outer wall is laid up with common brick and the series of block layers 6 are carried thereby. The blocks forming the layers 6 are of two types, shown in Figures 3 and 4. They have beveled or sloping edges and are mortised together as shown in Figures 1 and 2; that is intermediate blocks 8 are supported on the sides of anchored blocks 9 and the layers may be single, double, or plural as desired. Anchor bolts 10 are provided which engaged in the blocks 9 and hold the same in abutment with the common brick or outer wall. The anchor bolts have end portions 11 which are at right angles to the body and extend in openings 12 in blocks 9 with the bodies or shanks of the bolts lying in the grooved portions of the blocks; the fit is subject to adjustment, and each bolt is screwthreaded and provided with a nut. In practice the anchors hold the blocks firmly attached to the outer wall and the blocks themselves divide the space between the walls into zones and are imbedded in the inner or refractory wall 2. Outside of the outer wall 1 is a metal shell 13 and a liner of asbestos or insulating material 14, but these may be dispensed with if desired and the anchor bolts used with a plate 15 as shown in Figure 7. In practice the bolts are preferably slightly tapered.

The inner or fire brick or refractory wall 2 is laid up in fire-resistant or high temperature cement except at the zone at or above the fire line, in which case the bricks are laid up with interstices or spaces 16 between each brick 17; these spaces, as shown in Figures 1 and 10 provide air discharge means to the fire box. In laying up the inner wall 2 the various sections between the layers of blocks 6 are laid up so that in effect the sections are supported on the layers of blocks to the end that lower portions of the inner wall may be repaired or replaced without removing the upper portions or disturbing the same since the layers of blocks serve two purposes; i. e. to reinforce and divide the inner wall into relatively independent zones or sections, and to support those sections. The bridge wall or arch is preferably formed as shown in Figure 2, with layers of blocks 6 forming the supporting surface of the bridge. In Figures 11, 12 and 13, I have shown an arch construction in which the type of block designated 18 is smaller than the block 19 and serves in the nature of a keystone; the block 19 being formed with an opening and groove to receive the anchor bolt.

It will be seen that the natural draft of the furnace will draw air through the interstices 16 between the bricks in the section of the refractory or inner wall 2 at or above the fire line; this in turn creates a draft in the air chamber 3 between the walls drawing air into the intakes controlled by the draft regulating means 5; the outside air therefore passes in a circuitous route indicated by the arrows in Figures 1 and 9 and becomes thoroughly preheated before passing to the fire box so that products of combustion and gases are thoroughly consumed and the furnace rendered more efficient and largely smokeless. Furthermore the anchor bolts are shielded from heat, and the wall may be readily repaired, replaced in sections, and the inner wall kept in alignment and in its original position by adjustment of the bolts. My blocks are much larger than an ordinary brick and are of unique form and arrangement, and the entire wall construction is designed to provide the greatest efficiency with the least construction and material cost.

While I have described my invention in detail in the foregoing it is emphasized that latitude in matters of change of constructon, operation and arrangement of parts is permissible provided the same fall within the broad inventive concept and what is hereinafter claimed; for instance, where stokers are used for burning coal the hot air outlet is preferably above the grate line since most stokers have a forced draft from under the grate line. Furthermore in the elimination of smoke caused by smoldering of fuel on top of the coal bank and incomplete combustion of gases, the hot air projected into the fire box at this point causes complete combustion and the elimination of smoke. It is believed that the operation of my invention and the manner of laying up my wall and its operation are apparent from the foregoing to anyone skilled in the art. It is again emphasized that the scope

of my invention is to be determined from the claim appended hereunto and forming a part of this specification.

I claim:

A wall construction for a furnace combustion chamber of the character described comprising an inner wall of refractory material and an outer wall with a substantial space therebetween, end, top and bottom walls closing said space, an intake opening into the upper portion of said space from the exterior of the furnace, an opening in the lower portion of the inner wall directly into the combustion chamber whereby suction from the combustion chamber will draw air downwardly from said intake opening into the combustion chamber, and means for yieldably anchoring said inner wall to the outer wall at intervals throughout their height to permit relative expansion and contraction therebetween, said anchoring means comprising substantially horizontal layers of blocks of refractory material forming portions of the inner wall and extending across said space, each block having beveled edges, each block being larger than the units of refractory material forming the inner wall and each layer of blocks contacting the end wall opposite to the end wall contacted by the next adjacent layer above and below so as to form a circuitous passageway for air from said intake opening to said combustion chamber, each horizontal layer of blocks supporting a section of the inner wall to provide for independent repair or replacement thereof, and anchors in the outer wall yieldably holding said layers of blocks, said last named anchors being exteriorly accessible from the outer wall and adjustable to maintain the walls in alignment.

RAY W. BELL.