Sept. 8, 1925. 1,553,004

E. A. PACKARD

FURNACE WALL STRUCTURE

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Fig. 1.

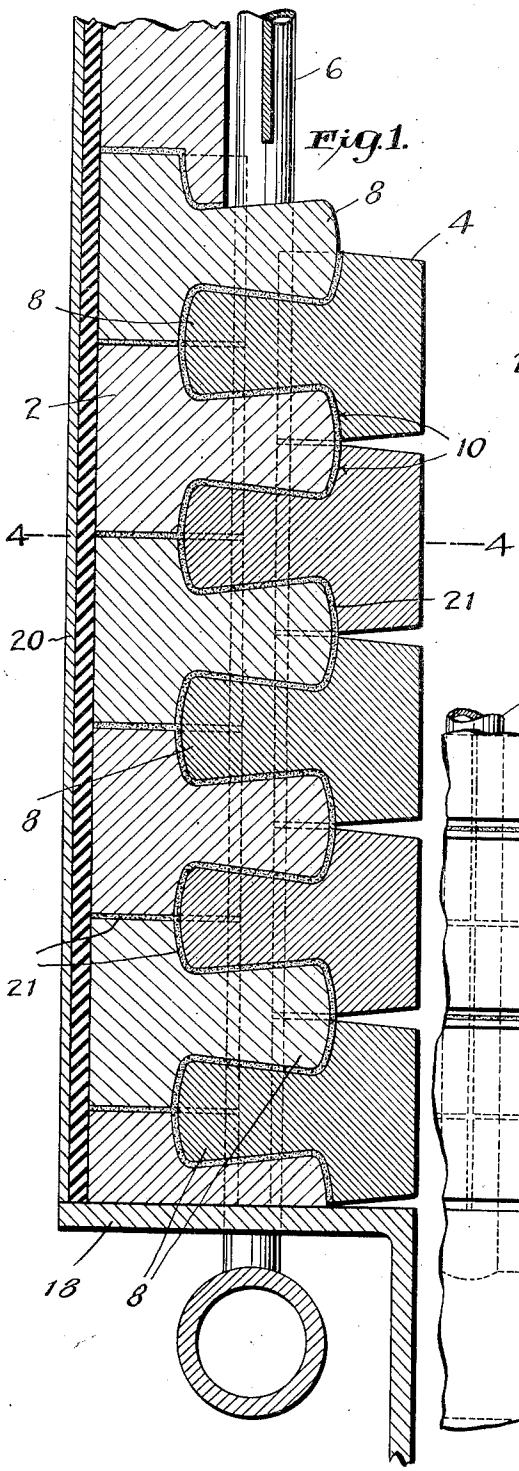


Fig. 2.

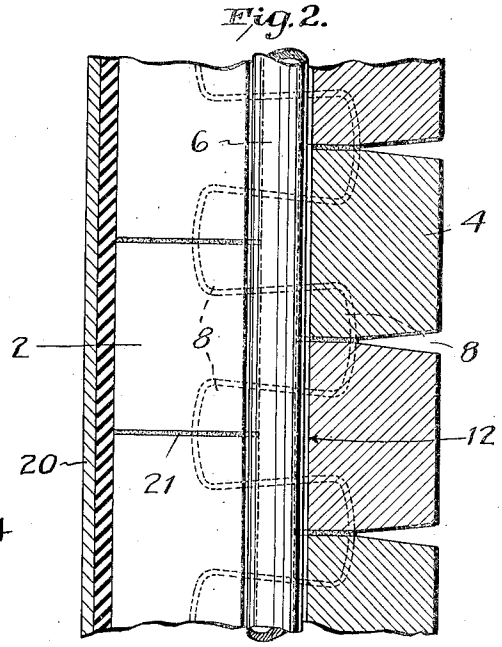
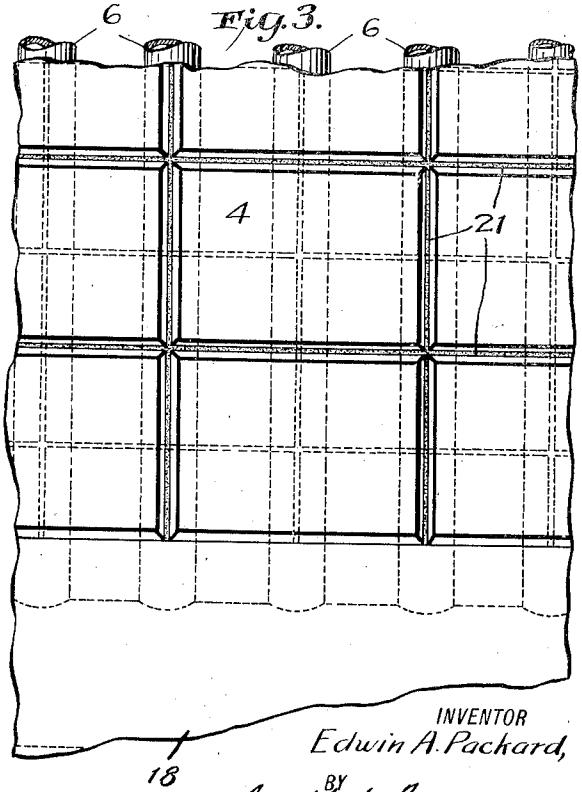


Fig. 3.



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Fig. 4.

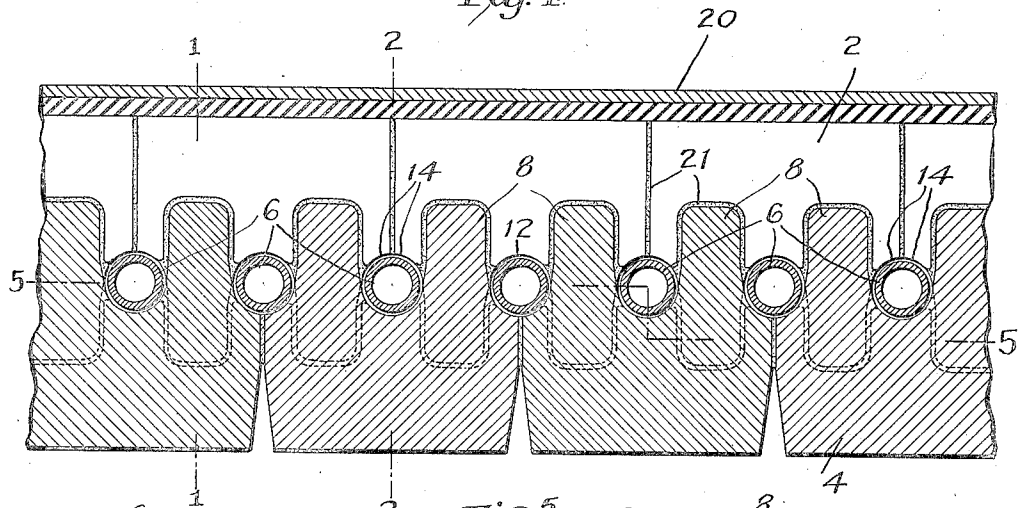


Fig. 5.

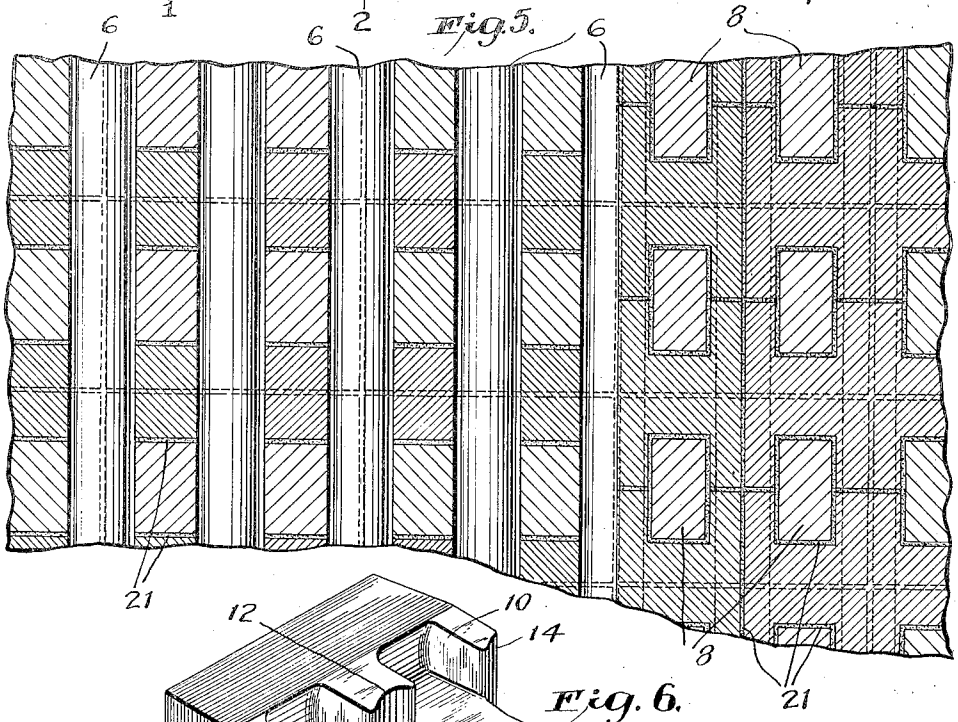
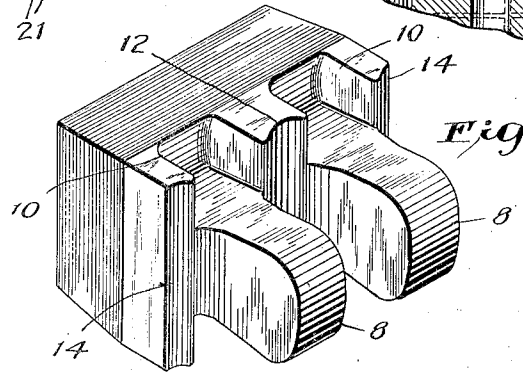


Fig. 6.



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Fig. 7.

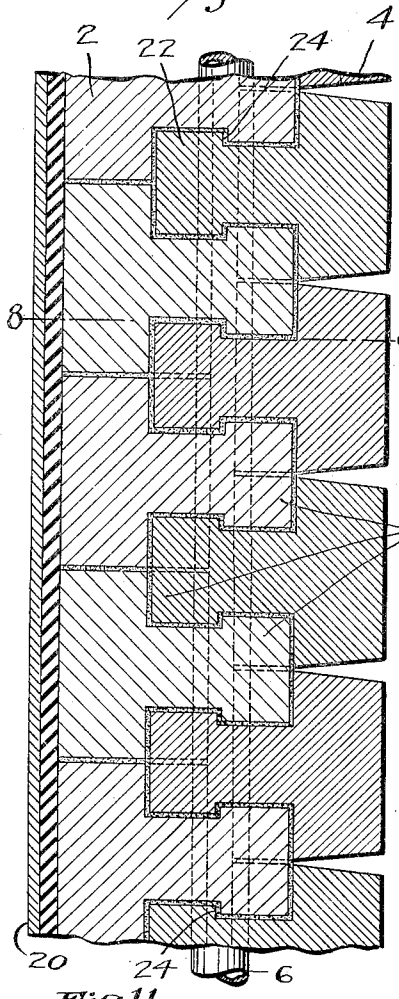


Fig. 8.

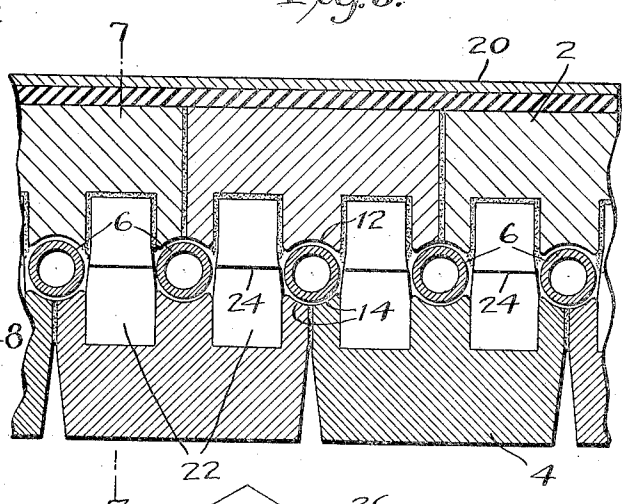


Fig. 9.

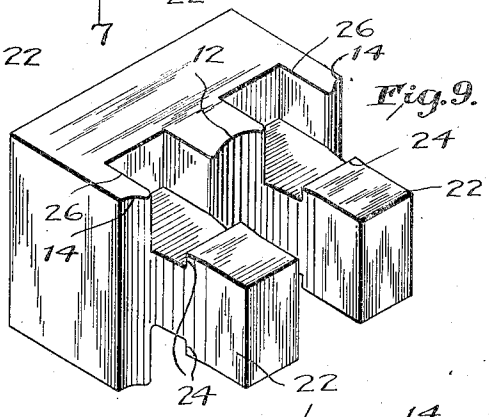


Fig. 10.

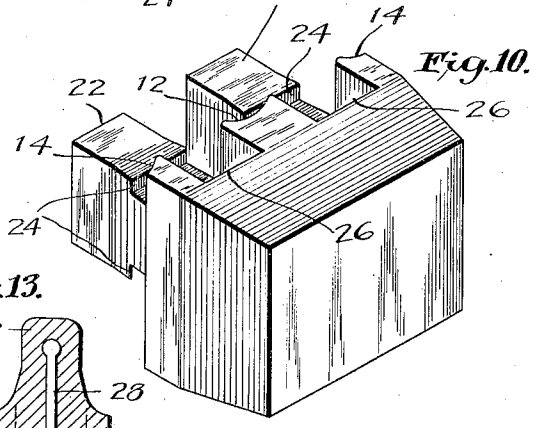


Fig. 11.

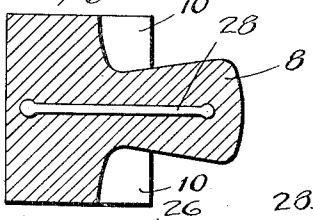


Fig. 13.

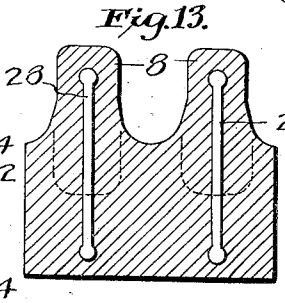
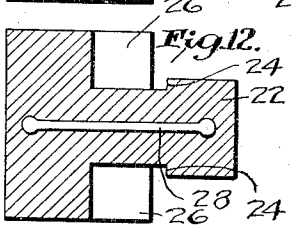


Fig. 12.



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UNITED STATES PATENT OFFICE.

EDWIN A. PACKARD, OF YONKERS, NEW YORK, ASSIGNOR TO INTERNATIONAL COMBUSTION ENGINEERING CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE.

FURNACE-WALL STRUCTURE.

Application filed October 1, 1924. Serial No. 740,918.

To all whom it may concern:

Be it known that I, EDWIN A. PACKARD, a citizen of the United States, residing at Yonkers, county of Westchester, State of New York, have invented a certain new and useful Improvement in Furnace-Wall Structures, of which the following is a full, clear, and exact description.

My invention relates to furnace wall structures, and has special reference to structures of this character that are particularly adapted for use in furnaces of the radiant boiler tube type in which a part of the boiler tubes are arranged vertically adjacent the vertical side walls of the furnace, the lower portions of the tubes being enclosed by the side walls so as to protect them from the direct heat of the burning fuel.

An object of the invention is to provide a furnace wall structure of this character which is simple, strong and durable in construction and highly efficient.

Another object of the invention is to provide a novel and improved furnace wall structure.

With these and other objects in view, the features of the invention consists in certain constructions, arrangements and combinations of parts hereinafter described and claimed, the advantages of which will be obvious to those skilled in the art.

The several features of the invention will be clearly understood from the following description and accompanying drawings, in which:

Figure 1 is a vertical sectional view of a furnace wall structure embodying the features of the invention in their preferred form, the section being taken substantially on line 1—1 of Fig. 4;

Fig. 2 is a similar sectional view taken on the line 2—2 of Fig. 4;

Fig. 3 is an inner face view of a portion of the structure illustrated in Fig. 1;

Fig. 4 is a horizontal sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a longitudinal sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a view in perspective of a block of refractory material forming a component part of the furnace wall structure;

Fig. 7 is a view corresponding to Fig. 1 of a modified form, the section being taken on the line 7—7 of Fig. 8;

Fig. 8 is a horizontal sectional view taken on the line 8—8 of Fig. 7;

Figs. 9 and 10 are views in perspective of blocks of refractory material forming component parts of the wall structure illustrated in Figs. 7 and 8;

Fig. 11 is a vertical sectional view of a block of refractory material of modified form; and

Figs. 12 and 13 are vertical and horizontal sectional views, respectively, of another modified form of block.

The furnace wall structure illustrated in the drawings is particularly adapted for a furnace of the radiant boiler tube type in which a part of the boiler tubes are arranged vertically over the inside of the walls of the furnace with the lower portions of the tubes enclosed by the walls so as to protect them from the direct heat and flame of the burning fuel. As shown the lower portion of the furnace wall structure is provided with an outer wall section 2, and an inner wall section 4 having opposed grooved portions forming openings which extend vertically therethrough and through which the vertical tubes 6 of the boiler extend, the portions of the tubes extending above said inner and outer wall sections being spaced a slight distance from the furnace wall so as to be exposed to the radiant heat of the burning fuel. Each of the wall sections 2 and 4 is made up of a plurality of rows of blocks of refractory material arranged vertically side by side, the rows of the two sections being arranged in staggered relation. Each of the blocks of each section is provided with two laterally projecting tongues 8 that are spaced a distance apart and spaced from the vertical sides thereof. The tongues 8 are spaced midway between the top and bottom sides of the block, and the portions of the block between the tongues 8 and the top and bottom sides are recessed at 10 so as to form continuations of the longitudinal sides of the tongues. The inner or tongue side of each block is provided with a grooved portion 12 extending between the top and bottom sides of the block and through the space between the tongues,

and are further provided with correspondingly grooved portions 14 adjacent the outer sides of the tongue, each of the grooved portions 14 being substantially one-half of the width of the centrally grooved portion 12. The top and bottom longitudinal sides of each tongue are inclined outwardly from each other and the end surface of each tongue is curved convexedly in an arc struck from a horizontal center. As the blocks of the outer wall section are not subjected to the direct heat of the burning fuel as is the case with the blocks of the inner wall section, the former may be made of inferior material. The blocks of the two sections are preferably of the same construction except that the portion of the sides of the blocks of the inner section extending from substantially the plane of the ends of the tongues of the blocks of the outer section to their exposed faces, are inclined inwardly toward each other so that the adjacent sides of the adjacent blocks of the inner section are inclined away from each other.

In assembling the blocks to form the wall sections, the lowermost blocks of the outer wall section, which as shown correspond to the upper half portion of the other blocks of said section, are laid side by side upon the wall supporting ledge 18 of the furnace casing with their outer sides laid against the vertical wall 20 of the casing. Upon this layer of blocks are laid the lowermost blocks of the inner wall section, the blocks of the two layers being arranged in staggered relation so as to position the tongues of each block of the upper layer over the adjacent tongues of adjacent blocks of the lower layer, with the tongues of the blocks of one layer entering the corresponding recesses or sockets 10 of the other layer. The next layer of blocks of the outer wall section is laid upon the first thereof with their tongues extending over the tongues of the layer of blocks of the inner wall section and the ends of the tongues entering the recesses thereof. The remaining layers of blocks of the two sections may be correspondingly laid, the blocks of the several layers of each section being laid one directly above the other, so as to form vertical rows, and the rows of blocks of the two sections being arranged in staggered relation.

With the blocks of the two sections thus laid, the centrally grooved portions 12 of the several blocks of each vertical row of each wall section are arranged in vertical alinement with each other and opposite to and spaced from the adjacent end grooved portions 14 of the several blocks of adjacent rows of the other section, so as to provide the openings through which the boiler tubes extend. In laying the blocks a suitable fire clay 21 is employed upon which the blocks are laid.

From the foregoing it will be apparent that a simple, strong and durable furnace wall structure is provided which is particularly adapted for a furnace of the radiant boiler tube type. The arrangement of the blocks of each section in vertical rows arranged side by side with the rows of the two sections arranged in staggered relation, and the double tongue and socket construction of each block of each section which interlock with the tongues of two adjacent blocks of the other section insures the blocks being securely and firmly held together in a compact unitary structure that well protects the enclosed portions of the boiler tubes from the direct heat of the burning fuel. The inclination of the adjacent sides of the inwardly projecting portions of the blocks of the inner wall section which is exposed to the direct heat of the burning fuel, permit the requisite degree of expansion and contraction without danger of injury to the blocks.

In the construction shown in Figs. 7 to 10, inclusive, instead of the top and bottom sides of the tongues of the blocks being inclined as in the construction above described, the tongues are provided with enlarged squared ends 22 forming abrupt shoulders 24, and the blocks are further provided with correspondingly squared cut-away portions or sockets 26. With this construction, when the blocks are assembled to form the sections, the shoulders 24 of the tongues of each block of one section interlocks with the shoulders of the tongues of the blocks of the other section.

In the construction shown in Fig. 11 and in Figs. 12 and 13, re-enforcing bars 28 are shown embedded in the blocks and extending into the tongues, so as to re-enforce them; the block shown in Fig. 11 corresponding to the blocks shown in Figs. 1 to 6, and the blocks shown in Figs. 12 and 13 corresponding to the blocks shown in Figs. 7 to 10, inclusive.

As will be evident to those skilled in the art, my invention permits various modifications without departing from the spirit thereof or the scope of the appended claims.

What I claim is:

1. A furnace wall structure having outer and inner wall sections, each made up of a plurality of blocks of refractory material, the adjacent sides of the blocks of the two sections having interlocking portions integral therewith, respectively, and having opposed portions forming openings, said interlocking and said opposed portions being constructed and arranged so that the ends of the interlocking portions of the blocks of each wall section project a distance beyond said opposed portions of the other wall section, and boiler tubes extending through said openings.

2. A furnace wall structure having outer

and inner wall sections, each made up of a plurality of blocks of refractory material, the adjacent sides of the blocks of the two sections having projecting interlocking portions, and opposed grooved portions forming openings, and boiler tubes extending through said openings, each of said blocks having a plurality of said projecting portions, and having said grooved portion thereof arranged between two of said projecting portions, said interlocking portions of the blocks of the two sections being of the same construction.

3. A furnace wall structure having outer and inner wall sections, each made up of a plurality of rows of blocks arranged vertically side by side, the rows of blocks of the two sections being arranged in staggered relation, and the adjacent sides of the blocks of the two sections having interlocking portions arranged one upon the other and having opposed portions forming vertical openings, and boiler tubes extending through said openings.

4. A furnace wall structure having outer and inner wall sections, each made up of a plurality of blocks, each block having an inwardly projecting tongue having an enlarged end, said tongue of each block of one section being in interlocking engagement with said tongues of two adjacent blocks of the other section, and the adjacent sides of the blocks of the two sections having opposed portions forming openings, and boiler tubes extending through said openings.

5. A furnace wall structure having outer and inner wall sections, each made up of a plurality of blocks, each block having two inwardly projecting tongues arranged side by side and spaced apart, each tongue of each block of one section being in interlocking engagement with adjacent tongues of two adjacent blocks of the other section.

6. A furnace wall structure having outer and inner wall sections, at least one of which is made up of a plurality of blocks of refractory material, each of said blocks having two inwardly projecting tongues arranged side by side and spaced apart, and arranged in interlocking engagement with the walls of recesses in the other section, the adjacent faces of said sections having opposed portions forming openings, each opening extending between the tongues of one of the blocks, and boiler tubes extending through said openings.

7. A furnace wall structure having outer and inner wall sections, each made up of a plurality of rows of blocks arranged vertically side by side, the rows of blocks of the two sections being arranged in staggered relation, each of the blocks having two projecting tongues with each tongue of each block of one section arranged in interlocking engagement with adjacent tongues of two adjacent blocks of the other section, and the adjacent sides of the blocks of the two sections having opposed portions forming openings, each opening extending between the tongues of a row of blocks of one section, and boiler tubes extending through said openings.

8. A furnace wall structure having outer and inner wall sections, each made up of a plurality of blocks the adjacent sides of the blocks of the two sections having interlocking portions and opposed portions forming openings, and the adjacent sides of the blocks of the inner wall section being inclined inwardly away from each other, and boiler tubes extending through said openings.

9. A block of refractory material for a furnace wall structure having two horizontally projecting tongues having enlarged ends arranged side by side and spaced apart and spaced from the vertical sides of the block, and having cut away portions adjacent the inner ends of the top and bottom longitudinal sides of the tongues and forming continuations thereof.

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