

June 19, 1928.

G. ALLEN, JR., ET AL

1,674,422

AIR COOLED WALL

Filed May 20, 1927

5 Sheets-Sheet 1

Fig. 1.

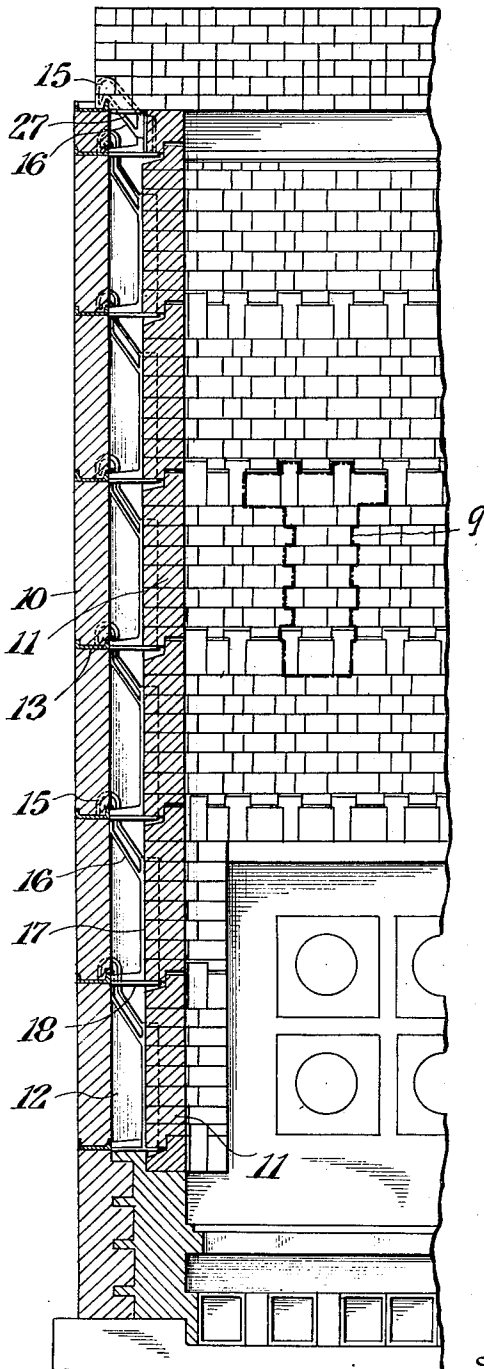
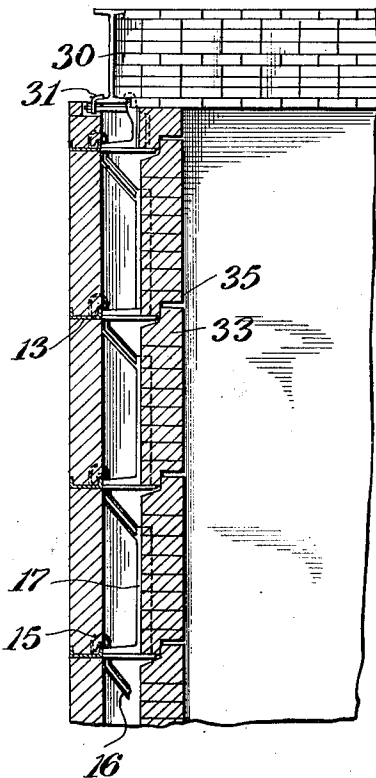


Fig. 2.



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Fig. 5.

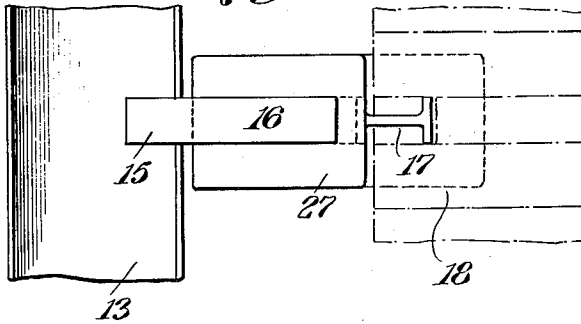


Fig. 7.

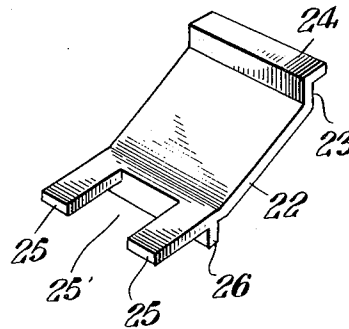


Fig. 6.

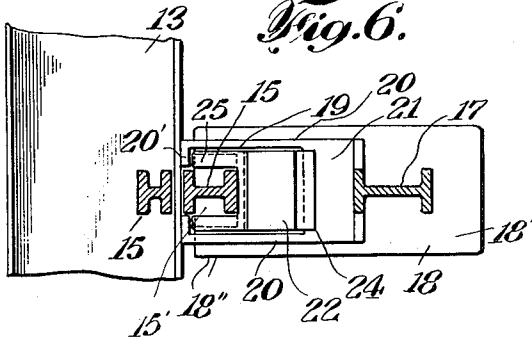
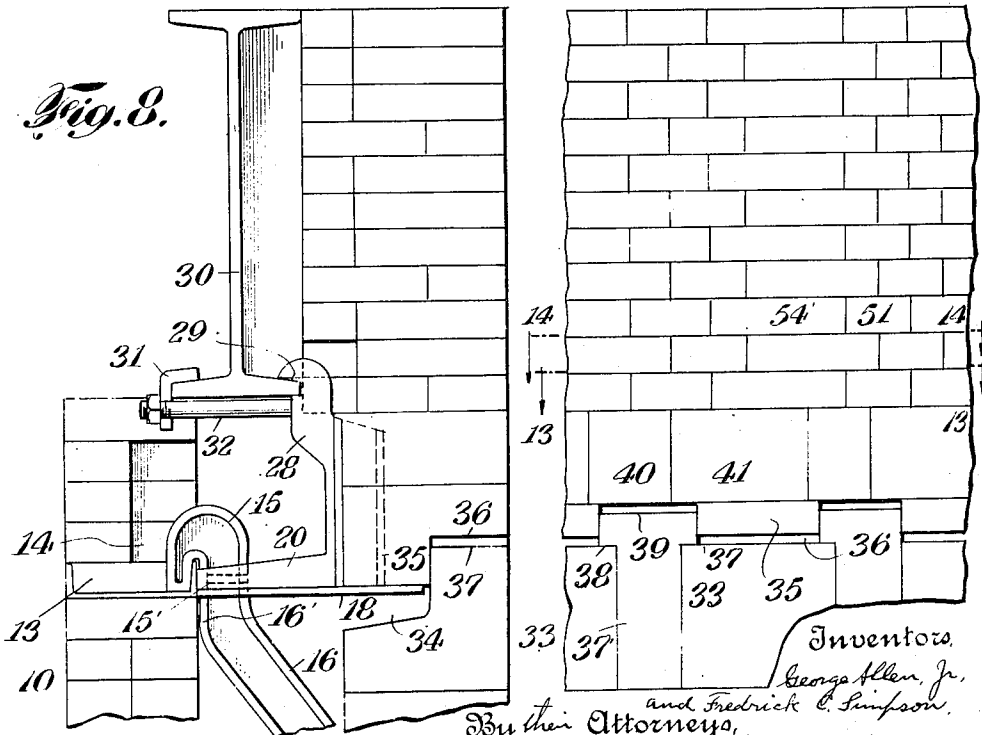


Fig. 9.

Fig. 8.



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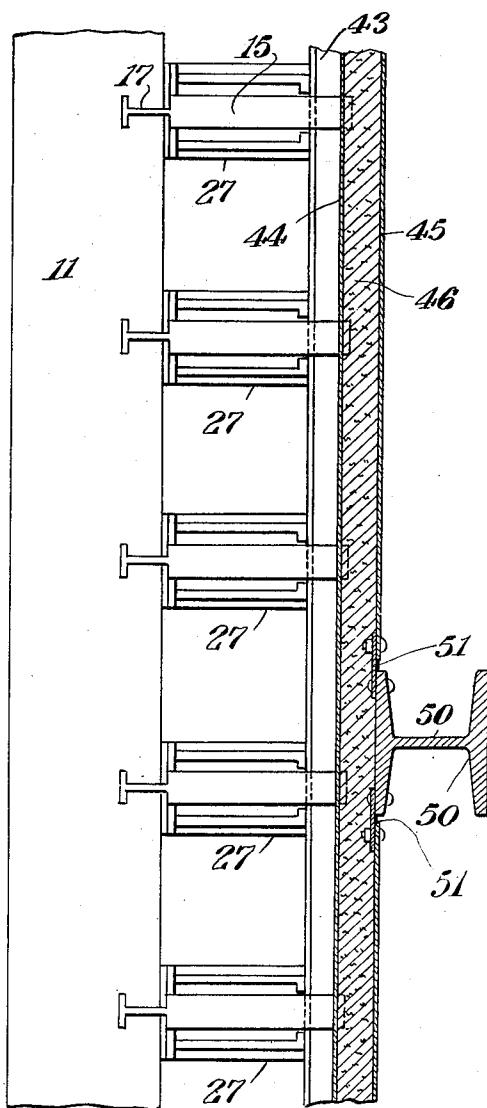
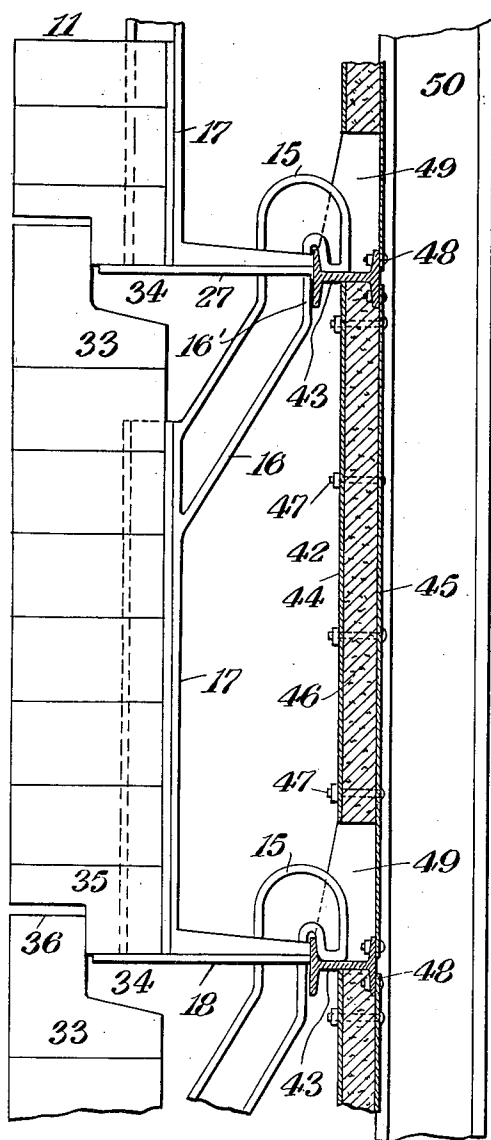
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Fig. 10.

Fig. 11.



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5 Sheets-Sheet 5

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UNITED STATES PATENT OFFICE

GEORGE ALLEN, JR., OF NEW YORK, N. Y., AND FREDRICK C. SIMPSON, OF WEST SOMERVILLE, MASSACHUSETTS, ASSIGNORS TO GEORGE ALLEN & SON, A FIRM CONSISTING OF JANE ALLEN, WILLIAM ALLEN, AND GEORGE ALLEN, JR., ALL OF NEW YORK, N. Y.

AIR-COOLED WALL.

Application filed May 20, 1927. Serial No. 193,021.

Our invention relates to improvements in air cooled walls and in accessories necessary to the construction of the improved wall. The invention comprises a wall having two parts spaced apart to leave an air space between them, and certain devices, accessories and parts which are used in making the wall. The objects of the invention are generally to produce a wall of this character which can be rapidly, economically and accurately built, in which the horizontal sections of one wall part are supported from the other part, and in which hangers are arranged so as to be supported on one part of the wall and carry sections of the opposed part of the wall, while at the same time acting as a gage to enable the second part of the wall to be rapidly and accurately made. This arrangement also is carried out in such a way that the several wall sections provide for free vertical expansion of the castings which support them.

The wall is also intended and it is a principal object of the invention to produce a construction which will have a longer life and higher efficiency from the refractories due to:—

(a) The inner wall being supported in small sections practically all superimposed weight is removed. This will permit of refractories withstanding higher temperatures without deforming.

(b) Higher temperature can be obtained as inner wall is air cooled. This means higher furnace efficiency as refractories will remain at lower temperatures than the moulton ash, therefore, will not erode.

(c) Furnace radiation losses are eliminated as outer wall is kept cool with the circulating air between the two walls. As the heated circulating air is used for combustion this means higher over-all efficiency.

The invention is further intended to arrange the hangers and supports for one of the wall parts so that they will support this part of the wall in sections as hereinafter referred to, and in connection with the hanging elements to arrange and construct the tile and brick so that any particular section of the wall can be easily repaired without taking down any large part of the wall.

The invention is further intended to pro-

duce the hanging elements referred to in such a way that one hanger will interlock with one above it so as to make a rigid connection between the two, and between the hanging elements and the wall parts, and further to produce a hanging element which will facilitate the wall building, will also make it easy to divide the wall space into cells, and have means for locking the wall parts and the hanging elements together, and at the same time making a tight closure between the air cells.

In practice we use our improved wall in boiler settings to great advantage, and in the drawings we have shown this application of the structure, but the wall can be built to advantage for any other purpose where an air cooled wall is desirable. These and other advantages will appear more clearly from the description which follows.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar reference characters indicate corresponding parts in all the views.

Figure 1 is a broken vertical section of a wall embodying our invention shown as a boiler setting.

Figure 2 is a view similar to Figure 1 but showing a modified construction at the top of the wall.

Figure 3 is a broken enlarged detail cross section of the wall partly diagrammatic, showing the hanging elements and their connections.

Figure 4 is a vertical section on the line 4—4 of Figure 3.

Figure 5 is a broken detail plan of one of the hanging elements and the support therefor.

Figure 6 is a cross section on the line 6—6 of Figure 3.

Figure 7 is a detail perspective view of a cover plate used in connection with the hanging elements.

Figure 8 is an enlarged detail of the top wall construction shown in Figure 2.

Figure 9 is a broken face view of a section of the wall.

Figure 10 is a vertical broken section of a slightly modified wall construction.

Figure 11 is a sectional plan of the structure shown in Figure 10.

Figure 12 is a broken detail perspective view partly diagrammatic, showing two of the hanging elements and the baffles supported by them.

Figure 13 is a section on the line 13—13 of Figure 9, and

Figure 14 is a section on the line 14—14 of Figure 9.

The wall embodying our invention comprises two parts 10 and 11 which may be made of any suitable material, usually brick, tile, or the like, these parts being spaced apart to leave an air space 12 between them at necessary intervals. On one wall member, in the present instance the outer wall member 10, are arranged horizontal supports 13 which can conveniently be channel iron, and at intervals on the inner surface of the wall 10 and just above the supports 13, notches or spaces 14 are left to accommodate the hooks 15 at the upper end of the hanging elements which are used to bind the two wall parts together, and to carry sections of the second wall part, that is the part 11. These hooks 15 and their connected parts 16 and 17 are preferably of I beam cross section as shown, as this makes them light and strong, but this particular cross sectional shape can be departed from.

Each hook 15 is preferably shaped so as to fit on over the inner flange of a support 13, and the surface of the shank 16 below where it merges with the hook 15 and on the side next the wall 10, is left parallel with the wall as shown at 16' so that when the hook is in place as in Figure 3, this surface 16' abutting with the wall will cause the remainder of the hanging element to assume a correct and stable position.

The shank 16 extends obliquely downward from the hook 15 and merges in a vertical member 17 which at its lower end has a shelf 18 horizontally arranged, and it will be noticed that the parts 16' and 17 are parallel, and the transverse distance between the planes of these parts corresponds to the wall space between the wall parts 10 and 11. It will be seen that when the hook 15 is in the position shown in Figure 3, the member 17 will hang in parallel relation to the wall 10 and enable the sections of the wall 11 to be laid with reference to the member 17, and thus the work can be rapidly and accurately done. The shelf 18 has a projecting portion 18' which is adapted to abut with the inner surface of the wall 10. Thus it will be seen that when the hanging element is in place with its hook engaged as shown, and the surface 16' abutting with the inner surface of the wall part 10, and the shelf 18 also abutting but at a lower level with the wall 10, the part 17 will form a very accurate gage for building the sections of a wall. It will be noticed further that by having the member 17 hung at a lower level

than the hook 15 and suspended by the oblique member or shank 16, the hanging element as a whole will by gravity at once assume its correct position.

Each shelf 18 has an opening 19 vertically therethrough, around the edge of which is a strengthening flange 20, the flange at opposite sides being intumed as at 20', leaving a slot through one edge of the shelf 18. At the back of the flange 20 and extending across the shelf is a ledge 21 which facilitates the application of a plate 22 to the hole or opening 19, this also serving to assist in locking the parts together as will presently appear. Each hook 15 has also at a point where the hook extends through the shelf 18 of an adjacent hook, and on each side, a ledge or flange 15' (see Figures 6 and 12). When the hook of one hanging element is extended through the hole 19 of another element, the parts 15' will lock behind the flanges 20 and serve the double purpose of closing the air opening through the shelf 18 and the channels of the hook 15, and of locking the hook of one hanger to the shelf of another, this making a firm bond between them.

The cover plate 22 is arranged to extend between the flanges 20, and it has at one end offset flanges 23 and 24, so that the latter will lie on the ledge 21 with the part 23 abutting the edge of the ledge (see Figure 3), and at its opposite end the cover is slotted as at 25', and has tongues 25 to straddle the hook 15 of an adjacent hanger (see Figure 6), and abut the flange 20'. The cover 22 also has at the base of the tongues 25, and on the under side, a flange 26 which likewise abuts the ledges or flanges 15'. Thus it will be seen that where a cover plate is applied to a shelf 18 of one hanger, when the hook of the hanger below is extended through the shelf, the air draft through the shelf or around the hook is sealed, and at the same time the two hanging elements are firmly locked together, and as the shelves of the hanging elements are built into one part of the air cooled wall, the two parts of the wall are firmly bonded and strengthened.

After the hangers have been applied as stated, and the wall 11 built up as will be presently described, fire brick 53 of the right dimensions are laid on the shelves 18 of adjacent hanging elements so as to close the space 12 horizontally, and thus the fire brick and the arrangement just described, in connection with the shelves 18, form a series of ducts through which the air can circulate, while at the same time the transverse arrangement of the fire brick 53 and the hanging elements combine to make the wall very strong. It will be noticed that the arrangement for hanging the wall sections provides for a series of short

horizontal sections and that the hooks 15 are free to expand vertically so as to cause no disruption of the wall by their expansion.

5 The upper hanging element at the top of the air cooled wall can be shorter than those below as shown in Figure 3, and this element can have a shelf 27 which will extend substantially across the space between the
10 two wall parts to close the same. This shelf or flange 27 is preferably arranged obliquely to the shank 16 at the point just above the part 17. In some cases, however, another form of hanger is better suited to the top
15 of the wall. For example in Figures 2 and 8 we have shown the upper hanging element having the member 17 provided with an essentially vertical hook 28 having in one side an opening 29 to fit over one flange
20 of an I beam 30 which is arranged above the air cooled wall in a manner common to many structures. On the opposite flange of the I beam a clip 31 is arranged, and a bolt 32 clamps the clip 21 and hook 28
25 to the I beam, thus supporting the upper hanging element.

For the most part the usual wall tile or brick can be used in making our improved wall, but at points opposite the shelves 18
30 and between these parts of the hanging elements especially, bridging tiles are used, and also special tiles can be used in the wall 11 to enable it to be easily laid and repaired. For example tiles 33 can be ar-
35 ranged at the top of each section of a wall 11 and just below the shelf 18, and particularly the part 18' thereof, the tiles at this point being reduced in thickness as shown at 34 in Figure 3 so as to leave a clear space
40 between this part of the tile and the shelf 18 to provide for the expansion of the wall. Directly above the tile 33 is an L shaped tile 35 which has the longer leg resting on the part 18' of the shelf 18, and has a part 36
45 overlapping the tile 33 and spaced therefrom as shown at 37 in Figure 8. Between the tiles 33 (see Figures 8 and 9) are tiles 37' having shoulders 38 overlapping the tiles 33, and fitting between the tiles 36 so
50 as to leave a space 39 between the tiles 37' and the tiles 40 and 41. Thus the sections of the wall 11 are spaced apart by the several tiles and the shelves 18, so that the wall can expand without displacing any of the
55 hanging elements, and the brick or tile used above the bridging tiles 40 and 41 referred to and at each section of the wall 11 are and should preferably be as shown in Figures 13 and 14, so that a section of the wall
60 can be easily repaired by taking out some of these brick. As shown in Fig. 9 this arrangement of the tiles or refractory blocks 33, 33', 37 forms a toothed horizontal expansion joint, the horizontal length of the joints
65 is short, and by reason of the toothed or in-

terlocking arrangement it offers strong resistance to heat or fire erosion at this point. In these figures it will be seen that the tile or brick 54' and 55' have each on one side and vertically arranged, a boss 54, and
70 on the opposite side a corresponding socket 55, so that the boss 54 of one brick will fit in the socket 55 of the next. When these are laid in the wall, the alternate courses are reversed, that is to say as shown in
75 Figure 13, the bosses of the several brick are on the left side and the sockets on the right side, but the next course, as in Figure 14, has the bricks turned the other side up so as to bring the bosses 54 at the opposite
80 side and thus joints between the courses are easily broken, while at the same time the brick can be easily laid and as easily removed in case it is necessary to repair the wall.
85

For example in Figure 1, we have shown by heavy lines 9, how by removing two and three tiles or brick from successive layers, and for a vertical space including two
90 ledges 18 of the hanging elements, it is possible to remove said hanging elements and adjacent parts and repair the wall, by disrupting only a small part of it.

The hanging elements and tile can then
95 be easily restored.

We have shown conventional inner and outer walls 10 and 11 except for the special tiles at certain points, and in Figures 10 and 11 we have shown another type to illustrate the fact that the two parts of the wall
100 can be made in any preferred way. As here shown one wall part 42 has supports 43 for the hanging elements, which supports are in the form of H beams or other suitable metal section, with the web horizontally arranged,
105 and the wall instead of being of brick or tile, has only heat insulating sheets outside, to wit: the plates 44 and 45, with a filling 46 of concrete or the like between them, the opposed plates being united by bolts 47.
110 One set of plates 45, for example, is attached to the support 43 as shown at 48, and space 49 is left for the hooks 15 of the hanging elements. After the wall is laid this space can be filled in with plastic insulating material.
115 The wall 42 can be attached to an adjacent I vertical beam 50 by means of plates 51 which are bolted to the I beam and to the wall plate.

From the foregoing description it will be
120 seen that we have devised a simple air cooled wall which can be readily and accurately laid, has the space between the walls divided into air cells or ducts through which air may circulate, and has the hanging elements
125 and current baffling elements arranged so as to make the wall as a whole unusually strong. It will also be noted that this wall can be adapted to any ordinary building
130 purposes.

It will be noticed that the wall which we have shown and described is constructed in such a way that the refractory wall is supported in sections. This is done to allow
 5 for expansion of materials in the wall and to reduce the superimposed weight to a minimum. It will be noted that the first refractory block on the wall supporting hangers has only to support the weight of the few
 10 blocks in the section approximately the height of the hanger. This means that whatever the total height of the wall the first block on the hangers never supports more than the height of its particular section, excepting when these blocks are used to
 15 support the front part of a solid wall above the air cooled portion of the walls; that the refractories, that is the fire bricks of the wall, are free to expand in every direction; that the wall is constructed so that it will
 20 not leak air or gases and that as it is carried in independent sections the refractories can be easily replaced; that the supporting metal parts are cast or shaped so as to anchor the refractories in place; that the hanging elements can be easily removed or displaced
 25 without disturbing other elements; that the efficiency of a boiler enclosed in such a wall is increased because furnace radiation is lessened by wall cooling air passing between
 30 outer and inner wall. In practice this air is used for combustion and there is no loss of heat as it is returned to the furnace.

We claim:—

35 1. An air cooled wall comprising opposed wall parts in spaced parallel relation, vertically aligning hanging elements connecting the two wall parts and supporting sections of one wall part, said elements each
 40 having a hook to engage one wall part, and a shelf with an opening therethrough to receive the hook of a second hanging element.

2. An air cooled wall comprising opposed wall parts in spaced parallel relation, and
 45 hanging elements one above the other connecting the two wall parts, each element having a hook to engage one wall part, a shelf to engage and support the second wall part, said shelf having one opening there-
 50 through for the passage of the hook of the second hanging element, and means for locking the aforesaid shelf of one hanging element to the hook of a second hanging element.

3. An air cooled wall having opposed
 55 parts in spaced parallel relation, and hanging elements connecting the two wall parts, each hanging element having a hook to engage one wall part and a shelf to support and engage a section of the second wall part,
 60 said shelf having an opening therethrough to receive the hook of the second hanging element, and a cover plate to close the opening through said shelf and lock the shelf to the hook of the second hanging element.

65 4. An air cooled wall having opposed

parts in spaced parallel relation, hanging elements supported on one wall and having shelves carrying sections of the opposite wall part, the wall members extending beneath
 70 the shelves in a manner to leave a space and also projecting above the shelves, wall members supported on the shelves and overlapping the first wall members, and bridging tiles between the shelves and connected with
 75 the first mentioned wall members.

5. In a structure of the kind described, the hanging element having a hook to engage one wall part, a shelf suspended from the hook and adapted to engage a second wall part, said shelf also extending trans-
 80 versely beneath the hook and having an opening therethrough, and a ledge on the hook adapted to enter and close the opening in the shelf of an adjacent hook.

6. In a structure of the kind described, 85 the hanging element comprising a hook adapted to be suspended on a wall and carrying a shelf adapted to extend between two wall parts, said shelf having an opening
 90 therethrough and a flange around the opening, and a transverse ledge projecting from the side of the hook whereby the ledge of one hook will enter the opening in the shelf of an adjacent hook, and engage the flange
 95 of said opening thereby locking the engaged parts together.

7. In a structure of the kind described, the hanging element comprising a hook, a shelf suspended from the hook and having a flanged opening therethrough, a ledge on
 100 the hook adapted to enter the opening of an adjacent hook and engage said flange of the opening, and a cover plate adapted to close the opening through said shelf and lock against the hook of a second hanging ele-
 105 ment when the latter is extending through said opening.

8. In a structure of the kind described, the hanging element comprising a hook, a sup-
 110 porting member rigidly connected to the hook but spaced apart therefrom and below said hook, a slotted shelf on the supporting member having abutments on each side of the slot, and a ledge on the hook whereby
 115 when a hook of one element is pushed through the slotted shelf of another, the aforesaid ledge will seat against the said abutments and also serve as a closure for the slot.

9. In a structure of the kind described, 120 the hanging element comprising a hook, a supporting member below and rigidly connected with the hook, a shelf on the supporting member having a slot from one edge inward and a flange around the slot, a ledge
 125 on the hook whereby the ledge will engage the flange and partly close the slot when the hook of one element is thrust through the shelf of another, and a cover plate for the flanged opening of the shelf. 130

10. In a structure of the kind described, the hanging element comprising a hook, a suspended supporting member rigidly connected to the hook and provided with a
5 slotted shelf, and a ledge on the hook extending transversely therefrom.

11. In a structure of the kind described the combination with the hanging element having a shelf with a flanged opening there-
10 through, of a detachable cover partly fitting upon the flange and adapted to partly close the opening through the shelf.

12. The combination with the hook, the supporting plate connected therewith, and
15 the shelf on the supporting plate having a flange around the opening, of a ledge on the hook adapted to abut with the said flange when the hook is thrust through the shelf of a second hanging element, and a cover
20 plate shaped to abut with the aforesaid ledge and lie on the flange of the said opening, thereby closing said shelf opening.

13. In a structure of the kind described, the hanging element comprising a hook hav-
25 ing a downwardly and obliquely extending shank, a supporting member on the shank, a shelf on the supporting member, and a second shelf parallel with the first and extending across the hook shank.

14. An air cooled wall, comprising op-
30 posed wall parts in spaced parallel relation, vertically aligning hanging elements connecting the two wall parts and supporting sections of one wall part, said elements each
35 having a hook to engage one wall part, a shelf with an opening therethrough to receive the hook of a second hanging element, and means for fastening adjacent hanging elements together.

15. An air cooled wall comprising op-
40 posed wall parts in spaced parallel relation, hanging elements supported on one wall part and supporting sections of the second wall part, and interlocking blocks connect-
45 ing the meeting sections of the second wall part and forming expansion joints.

16. In a wall construction, a plurality of hanging elements, each of said elements hav-
ing a shelf adapted to support a section of

said wall, said section consisting of a plu- 50
rality of courses of brick, a brick in each course being interlocked with said element to prevent lateral displacement of said brick, and a second brick in each course interlock-
55 ing with said first mentioned brick and a brick in an adjacent section.

17. A wall as claimed in claim 16, said first mentioned brick having a vertical slot
offset with respect to the center of the brick for locking engagement with said elements, 60
said center being offset with respect to the center of the next lower brick.

18. An air cooled wall having opposed wall parts in spaced relation, a plurality of
65 hanging elements connecting the wall parts, each of said hanging elements having a shelf adapted to support a section of one of said walls, overlapping wall members above and below said shelves, and spacing blocks in-
70 terposed between said members, said blocks being adapted to overlap the lower of said members and abut the upper of said mem-
bers.

19. An air cooled wall having opposed wall parts in spaced relation, a plurality of
75 hanging elements connecting the wall parts, each of said hanging elements being adapted to support a section of one of said wall parts, and means cooperating with adjacent hang-
80 ing elements to hold said elements in locked relation.

20. An air cooled wall having opposed wall parts in spaced relation, a plurality of
hanging elements connecting the wall parts, said hanging elements being in vertical
85 alignment adapted to support sections of one of said walls, each of said elements being provided at one end with a hook portion and at its other end with a laterally offset
90 shelf, whereby the hook portion of one of said elements is positioned contiguous and in horizontal alignment with the shelf of an adjacent element.

In testimony whereof, we have signed our names to this specification this 28th day of
April, 1927. 95

GEORGE ALLEN JR.
FREDRICK C. SIMPSON.