Sept. 4, 1934. P. W. ANTILL 1,972,838

REFRACTORY FURNACE WALL

Filed June 26, 1931 3 Sheets-Sheet 1

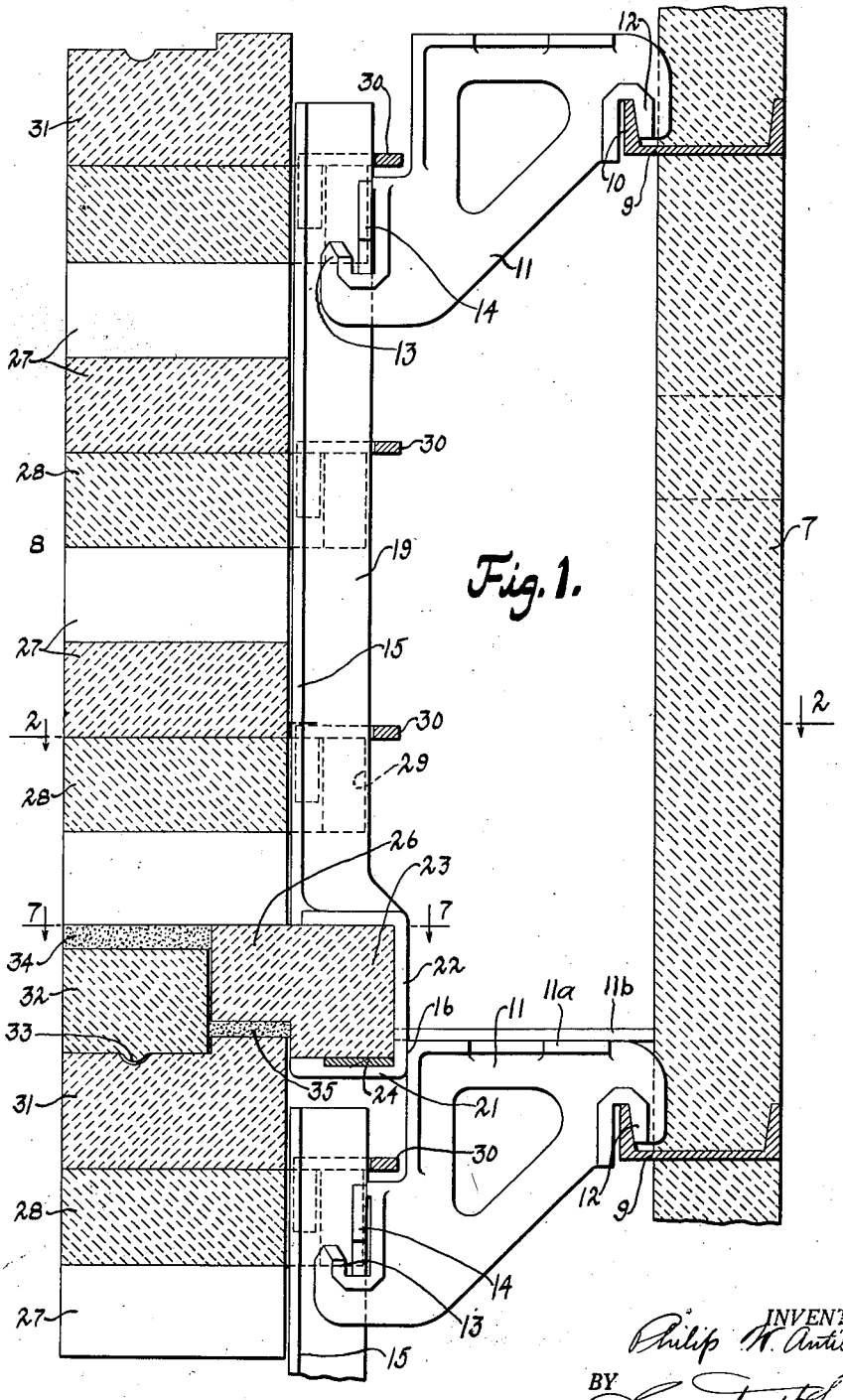


Fig. 1.

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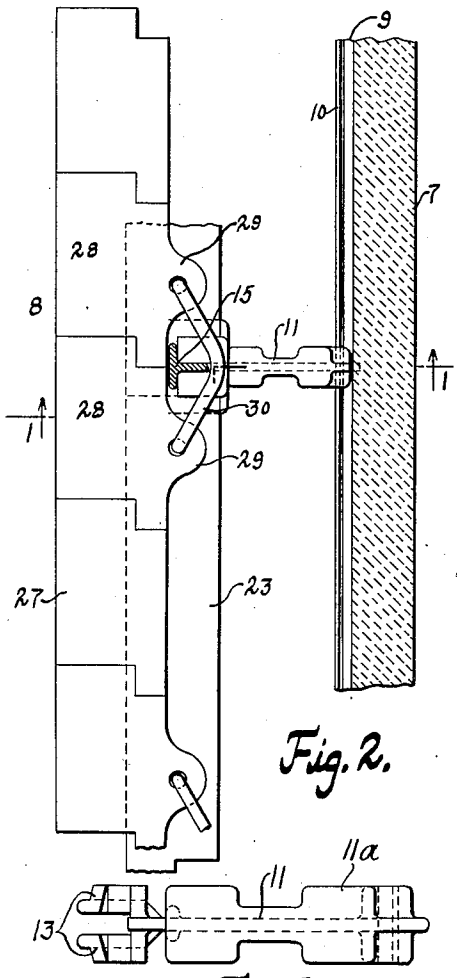


Fig. 2.

Fig. 5.

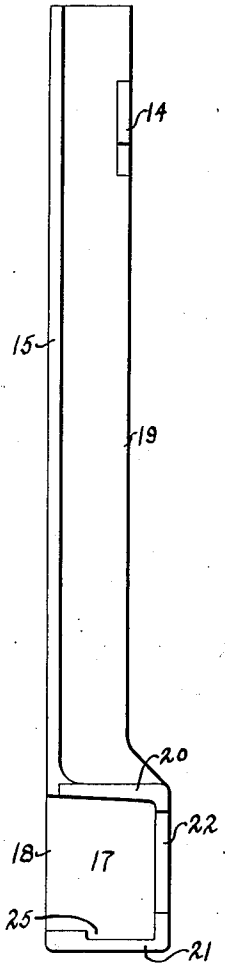


Fig. 3.

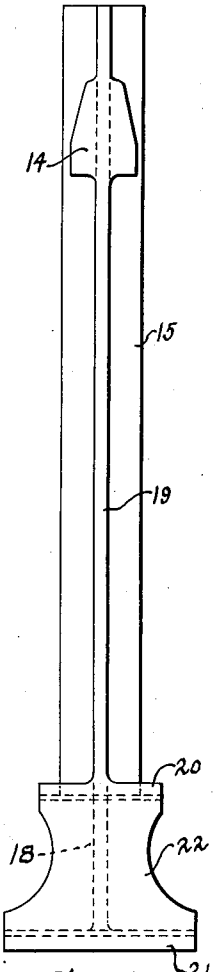


Fig. 4.

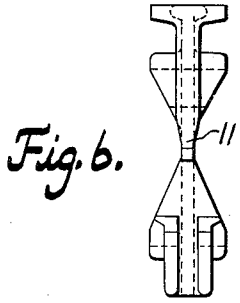


Fig. 6.

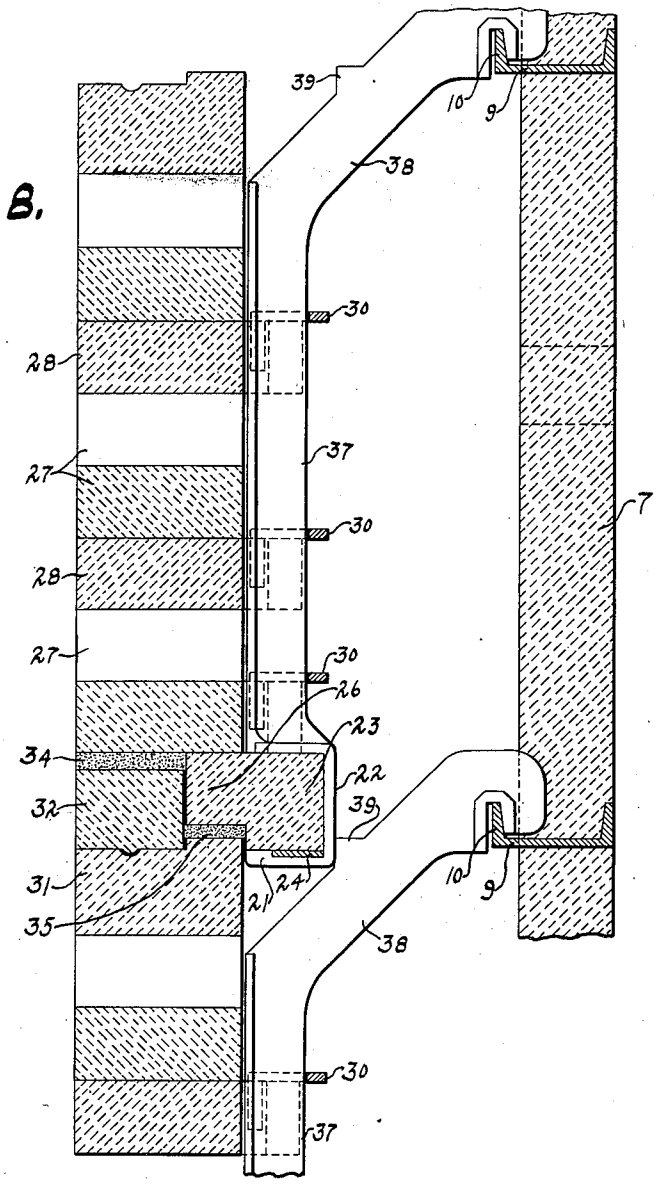
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REFRACTORY FURNACE WALL

Filed June 26, 1931 3 Sheets-Sheet 3

Fig. 8.



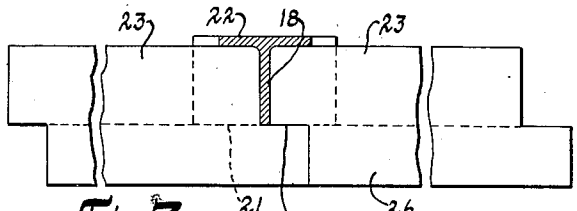


Fig. 7.

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Patented Sept. 4, 1934 1,972,838

UNITED STATES PATENT OFFICE

1,972,838

REFRACTORY FURNACE WALL

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Application June 26, 1931, Serial No. 547,047

19 Claims. (Cl. 72—101)

This invention relates to refractory furnace walls and is especially useful in connection with sectionally supported side walls for a furnace combustion chamber.

As a primary object, this invention has in view the provision of a novel type of supporting or hanger means for the sections of a sectionally supported furnace wall, the supporting means including metallic members which are preferably disposed entirely outside of the wall itself. It should here be noted that the metallic hanger elements, per se, (apart from the novel refractory blocks and general wall structure as herein claimed) are disclosed and claimed in my copending divisional application, Serial No. 680,716, filed July 17, 1933.

The advantage of the present structure will be more apparent upon consideration of prior constructions commonly employed. In such prior constructions the hanger means included metallic supporting elements extended part way through the refractory wall itself, with the result that deterioration thereof was brought about relatively rapidly and the insulating characteristics of the wall were impaired at least in the vicinity of the supporting elements. According to the present invention, the metallic supporting parts are completely removed from the effective burning depth of the wall bricks or tiles, this being accomplished as will appear more fully hereinafter, while providing adequate support and without increasing the total weight of the bricks or supporting structure.

The present invention also has the additional general objects of improving such sectionally supported walls particularly from the standpoint of construction, erection and repair.

Another general and important object of this invention is involved in the provision of a novel type of joint between adjacent wall sections.

How the foregoing together with other objects and advantages are attained will be apparent from a consideration of the following description making reference to the accompanying drawings, in which—

Figure 1 is a vertical sectional view of a furnace side wall constructed to embody various features of the present invention, this view including portions of two wall sections and the supporting or hanger means therefor, the view being taken substantially as indicated by the section line 1—1 on Figure 2;

Figure 2 is a horizontal sectional view on a smaller scale taken substantially as indicated by the section line 2—2 on Figure 1;

Figure 3 is a side elevational view of one of the brick hanger members which I employ;

Figure 4 is a rear elevational view of the hanger member appearing in Figure 3;

Figure 5 is a top plan view of another brick hanger part;

Figure 6 is a front elevation of the part illustrated in Figure 5;

Figure 7 is a fragmentary top plan view of certain of the supporting bricks for a wall section; and

Figure 8 is a view illustrating a modified brick hanger which I may employ.

From inspection of Figures 1 and 2 it will be seen that I have herein illustrated a structure embodying the present invention as applied to a double walled furnace. The outer wall is indicated at 7 as being spaced substantially from the inner wall (indicated in general by the reference numeral 8), in order to provide a space for the circulation of air.

The supporting structure for the inner wall, as shown in Figures 1 to 6, includes vertically spaced and horizontally extended channel beams 9 which may also serve to support or reenforce the outer wall 7 as clearly indicated in Figure 1. One flange 10 of each beam 9 is extended inwardly from the outer wall to support bracket devices such as those indicated at 11. These brackets 11 are provided with hook portions 12 arranged to engage behind the channel flanges 10. At inner and lower portions of the brackets 11 additional hook means 13 are provided in order to engage lugs or abutments 14 provided on the vertically extended hanger members 15. Still further, these bracket devices may be formed with flanges or shelves 11*a* for supporting division or baffle members 11*b* (see Fig. 1) which serve to divide the space between the outer and inner walls into air channels.

Each hanger 15 is supported or positioned laterally of the wall structure by engagement, at its lower end, with a subjacent bracket 11 as indicated at 16 in Figure 1. The brick hanger structure for each wall section, therefore, includes a plurality of the devices 11—15 spaced from each other and supported from a channel member 9 at the outer side of the section.

Each vertically extended hanger 15 is provided at its lower end with brick engaging sockets 17, one socket being formed at each side of the vertical partition or web 18 which forms a continuation of the hanger web 19. The sockets, furthermore, are defined by top, bottom and rear walls 20, 21 and 22.

In building up a wall section on this supporting structure, an elongated brick 23 is disposed between adjacent hangers 15 with its ends received in a socket 17 of each (see Fig. 2). If desired, a metallic supporting strip or plate 24 (see Fig. 1) may be similarly extended between opposed sockets 17 of adjacent hangers in order to lend additional support to the brick 23, suitable cut-out portions 25 being provided in the bottom walls 21 of the sockets to receive and

engage such supporting strips. In addition, with this supplemental supporting means bridging the gap betwen adjacent hangers, a plurality of bricks may be substituted for the single brick 23 illustrated in Figure 2. In order to protect the hanger members, especially the vertical webs 18 thereof, the bricks 23 may be provided with complementary interengaging shouldered portions to form joints such as illustrated at 23*a* in Fig. 7.

The bricks of the section receive vertical support from the inward extensions 26 of the supporting bricks 23, these extensions being terminated at a point between the inner and outer wall surfaces as clearly illustrated in Figure 1. The wall bricks themselves are indicated in Figures 1 and 2 at 27 and 28 and may be disposed in substantially any convenient course arrangement. In order to position the wall laterally, the bricks 28 are provided with outwardly projecting and apertured head portions 29 which cooperate with the tie members 30, the latter being arranged to embrace the hangers 15.

The construction of the joint between adjacent wall sections will be apparent from a consideration of Figure 1 in which I have illustrated additional wall bricks 31 arranged at the top of each wall section. These bricks 31 serve to support the small blocks or bricks 32 which partially overlap the inward extensions 26 of the supporting bricks 23 of a superjacent section. A tongue and groove joint 33 is provided between the blocks 31 and 32 to prevent displacement of the latter.

With these various bricks 23, 31 and 32 arranged in this manner, an expansion joint 34 is provided between the blocks 32 and wall bricks of the upper section, and a second expansion joint 35 is provided between the adjacent and opposed portions of the upper and lower bricks 23 and 31. These joints, of course, may suitably be composed of clay, sand or other like material.

Fig. 8 illustrates the manner in which a number of the features of this invention may be incorporated in hanger devices of one piece form. In this view the wall itself takes the same general form as in Fig. 1, but the supporting bricks 23 are engaged in sockets formed at the lower ends of hangers 37 which have supporting means 38 formed integral therewith. The means 38, of course, engage the horizontal members 9 in a manner similar to that described above in connection with Fig. 1, and, for purposes of lateral support or positioning, a lower portion of each hanger may engage an abutment 39 on a subjacent hanger.

Thus, as shown in Figure 8, I may provide one piece hanger devices having supporting means disposed outside of the outer face of the wall.

According to this invention, therefore, a plurality of expansion joints are provided, such joints being arranged in spaced planes and offset from each other transversely of the wall. Air leakage from the space between the inner and outer furnace walls between adjacent inner wall sections, or gas leakage from the combustion chamber, is reduced to a minimum by this joint arrangement. In this connection note that with the staggered arrangement of expansion joints the bricks 32 and 23 may be disposed closely adjacent to each other because the major portion of relative movement therebetween as a result of expansion normally occurs in a vertical plane. Leakage between the bricks 31 and 32 is also prevented by the interlock 33, which additionally serves to maintain the rear face of the block 32 and the front face of the block 33 in close contact.

From the above it will be apparent that the supporting structure for each wall section is arranged to provide adequate vertical as well as lateral support for the bricks by means of metallic hanger elements which are disposed in their entirety exteriorly of the true normal outer face of the inner wall. This feature is advantageous in reducing replacement of hanger parts to a minimum as all such parts are arranged outwardly beyond the effective burning depth of the wall. At the same time, the heat insulating characteristics of the wall are materially enhanced, and burning out of bricks at the wall joints is prevented.

It should also be observed that single or multipart hanger devices may be employed. The multi-part devices, however, facilitate erection or repair of the wall, and, additionally, provide for replacement of the vertically extended hanger elements, if this should become necessary, without discarding an entire hanger unit or device (composed of the parts 11 and 15).

Finally, it is observed that the staggered expansion joint arrangement results in a double air seal in addition to providing a more complete or unbroken effective refractory or "burning" brick depth.

What I claim is:—

1. In a furnace wall construction, a sectional refractory block wall, substantially vertically extending supporting elements with substantially horizontally extending shelf means thereon located outside the normal outer face of the wall, certain blocks of the wall being extended outwardly beyond said outer face and resting on said shelf means, the thickness of the wall between said shelf means and the inner face being substantially as great as the thickness of the remaining portion of the wall.

2. In combination with a plurality of bricks forming a wall section of a furnace, brick hanger means arranged at the outer surface of said wall section, and a supporting brick for said plurality of bricks, the supporting brick being extended outwardly from the wall to engage the hanger means beyond the outer surface of the wall and receive at least a major portion of its support by such engagement.

3. In a sectionally supported furnace wall, a wall section including a plurality of wall bricks and hanger means therefor arranged at the outer side thereof, at least one of said bricks being extended outwardly to be secured to the hanger means as against lateral displacement and another of said bricks being extended outwardly to engage the hanger means for vertical support of the bricks of the section, said hanger means having brick engaging means for the last mentioned outwardly extended brick disposed entirely outwardly of the outer face of the wall.

4. In a sectionally supported furnace wall, a wall section including a plurality of wall bricks and hanger means therefor arranged at the outer side thereof, at least one of said bricks being extended outwardly of the wall to engage the hanger means for vertical support of the bricks of the section, and said hanger means having cooperating brick engaging and supporting means disposed entirely externally of the wall.

5. In a sectionally supported furnace wall, a wall section including a hanger device having brick engaging means, a brick associated with said means and vertically supported thereby, said brick being extended inwardly beyond said means,

and a plurality of bricks arranged to receive at least a major portion of their vertical support from the inward extension of the first mentioned brick, at least one brick of the section being attached to the hanger means for lateral support.

6. In a sectionally supported furnace wall, a wall joint between bricks of adjacent sections including, in combination with joint bricks of each section arranged to overlap, at least partially, transversely of the wall, an expansion joint between a joint brick of one section and another brick of the other section and an expansion joint between a joint brick of said other section and another brick of the first section.

7. In a sectionally supported furnace wall having a substantially uniform outer face, a hanger device for bricks of a section, said device having opposed upper and lower brick engaging shelf means adapted to receive and embrace a brick therebetween, a supporting brick embraced and engaged by said shelf means and having a portion extended inwardly beyond said shelf means, and wall bricks vertically supported at least in large part on the inward extension of said supporting brick.

8. In a furnace wall, an outer supporting structure, and an inner sectional refractory wall structure of substantially uninterrupted uniform thickness, and having supporting blocks extended outwardly from the normal uniform outer face of the inner wall to engage the supporting structure, the outward extensions of said supporting blocks having shouldered or lapped joints adapted to receive and protect a portion of the supporting structure.

9. For a sectional furnace-wall structure, a refractory base block for a section having end portions toward the rear face adapted to rest on supporting shelf means, and toward the front face a recessed portion at one end and at the other end an extended portion adapted to overlap a part of the shelf means and to interfit with the recessed end of an adjacent similar block.

10. In a furnace, an outer wall, a sectionally supported inner wall spaced from the outer wall, vertically extended hanger members for the inner wall and supporting brackets for said hanger members detachably associated therewith, and a baffle member supported on a plurality of said brackets to divide the space between the walls into a plurality of air channels.

11. In a furnace, an outer wall, a sectionally supported inner wall spaced from the outer wall, vertically extended hanger devices for the inner wall, the sections of the inner wall including supporting bricks extended outwardly into the space between the walls to engage said devices, and a baffle member supported by hanger devices and cooperating with supporting bricks to divide the space between walls into a plurality of air chambers.

12. For a sectional furnace-wall structure, a refractory block having means for lateral support and to prevent gas leakage between adjacent blocks, said means including a recess at a rear corner of one end face of the block with a portion of said recess opening rearwardly through the rear face of the block and a complementarily formed projection at the rear corner of the opposite end face of the block.

13. For a sectional furnace-wall structure, a refractory block having means for lateral support and to prevent gas leakage between adjacent blocks, said means including a recess at a rear corner of one end face of the block with a portion of said recess opening rearwardly through the rear face of the block and a complementarily formed projection at the rear corner of the opposite end face of the block and said block further having lateral-support engaging means projecting from the rear face.

14. For a sectional furnace-wall structure, a refractory base or supporting block for a section, said block having one portion adapted to engage an additional block of the section for the purpose of supporting said additional block and having a rearwardly extending portion of greater vertical thickness or depth for engagement with supporting means for the wall section.

15. For a sectional furnace-wall structure, a refractory supporting or base block for a section having a rear portion thereof formed to engage supporting means for the section and a front portion adapted to engage another block of the section for purposes of support of the latter, the bottom face of the block being shouldered in front of the support-engaging portion to cooperate with another block in forming a lapped joint to protect the supporting means.

16. For a sectional furnace wall structure, a refractory base or supporting block having a portion adapted to engage supporting means for a wall section, the block having a vertically shouldered portion adapted to cooperate with another block to form a vertical lap joint therewith adjacent the portion of the block first mentioned, and the block further having a horizontally shouldered portion adapted to cooperate with another block to provide a lap joint adjacent the portion of the block first mentioned.

17. In a furnace-wall, an outer supporting structure including metallic hanger devices, an inner wall including a plurality of vertically super-imposed refractory wall sections independently supported by said hanger devices for substantially independent vertical expansion and contraction of the sections, each of said sections including a plurality of refractory blocks at least one of which has a portion extending outwardly of the wall to engage a hanger device for vertical support, and said hanger devices having support means constructed to engage the supporting blocks substantially entirely outside of the plane of the outer face of the wall, whereby to provide an effective refractory burning depth of the wall sections at the points of support substantially equal to the depth provided throughout the remaining portion of the wall.

18. In a furnace-wall supporting structure including a plurality of hanger devices, a refractory wall comprising a plurality of superimposed sections independently supported by said hanger devices for substantially independent vertical expansion and contraction, each of said sections including a lower refractory block having a portion projecting outwardly of the outer plane of the wall, and said hanger devices having sockets for receiving and engaging the outwardly projecting portions of said lower refractory blocks to support said sections, the said sockets being disposed outwardly of said plane.

19. In a sectionally-supported furnace wall, a wall section comprising a plurality of bricks including a supporting brick, and hanger means arranged outwardly of the wall, the supporting brick being extended outwardly from the wall to engage the hanger means outwardly beyond the outer plane or surface of the wall to receive the major portion of its support by such engagement.

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