Aug. 9, 1960 L. H. SHILS 2,948,026

DOORWAY CORNER CONSTRUCTION

Filed Sept. 9, 1958 3 Sheets-Sheet 1

FIG. 1

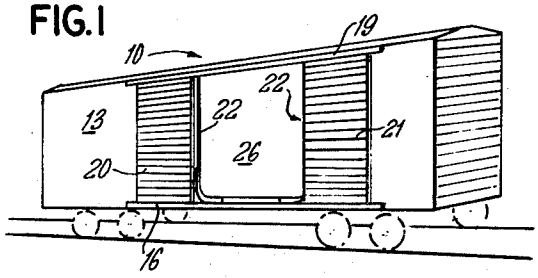
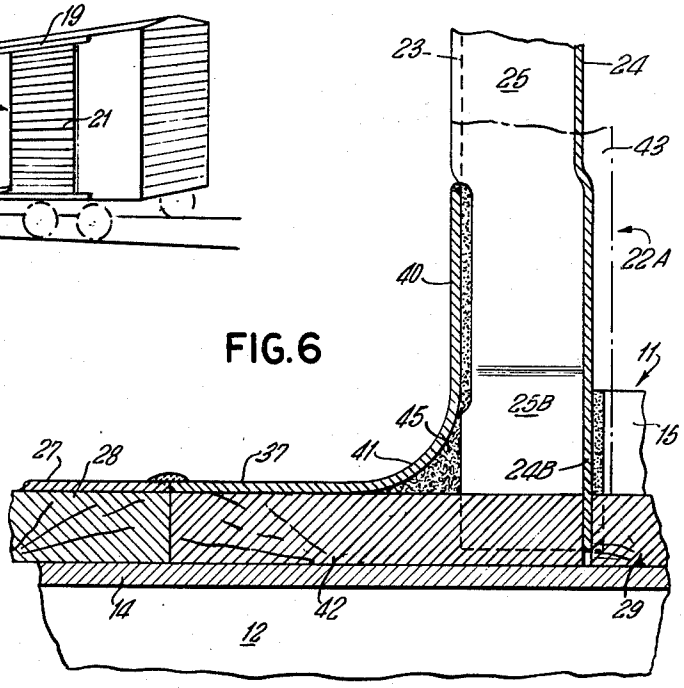


FIG. 6



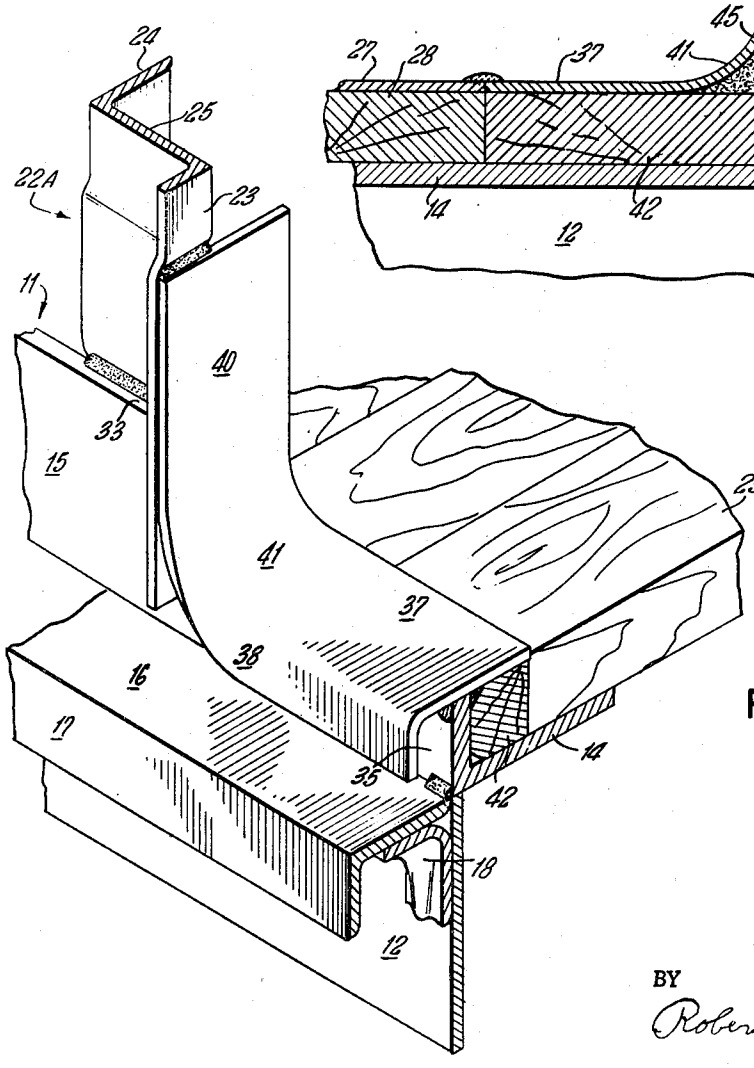


FIG. 2

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DOORWAY CORNER CONSTRUCTION

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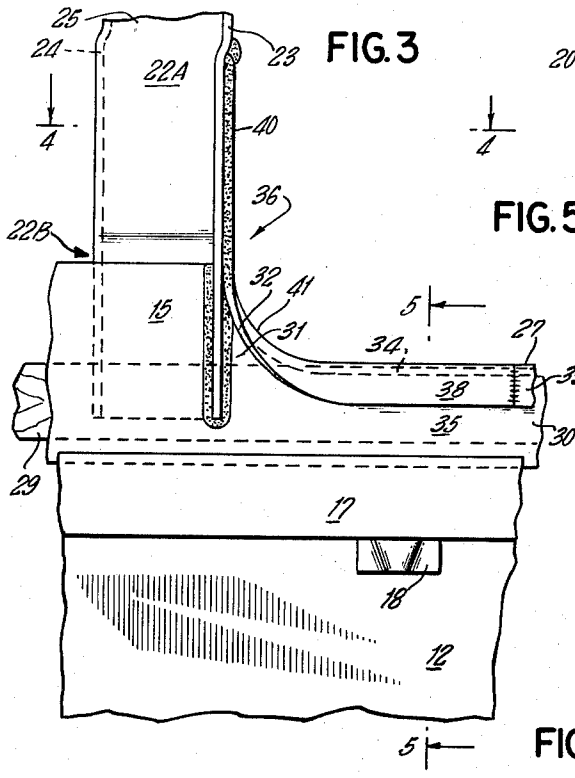


FIG. 3

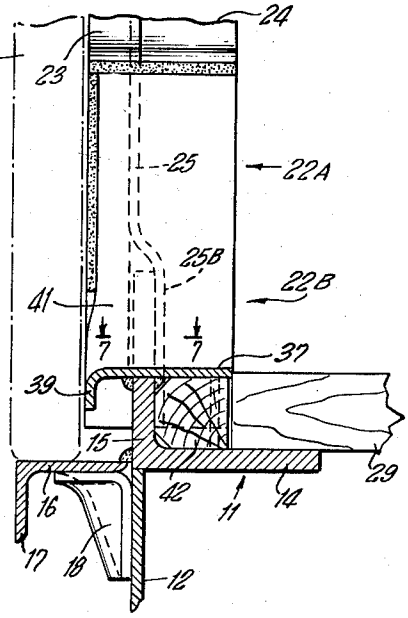


FIG. 5

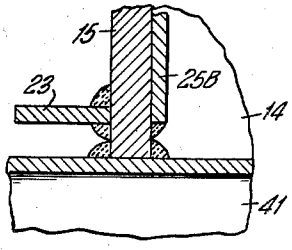
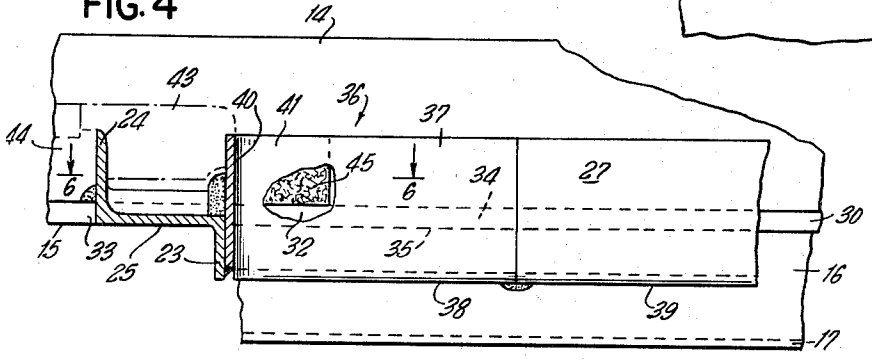


FIG. 7

FIG. 4



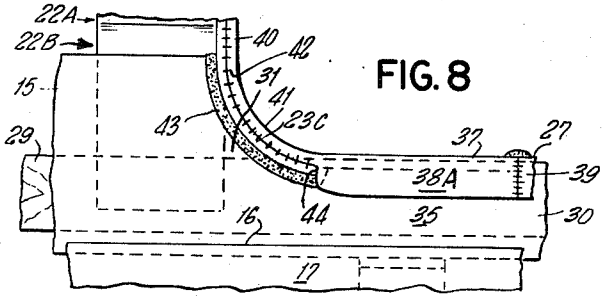


FIG. 8

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DOORWAY CORNER CONSTRUCTION

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FIG. 11

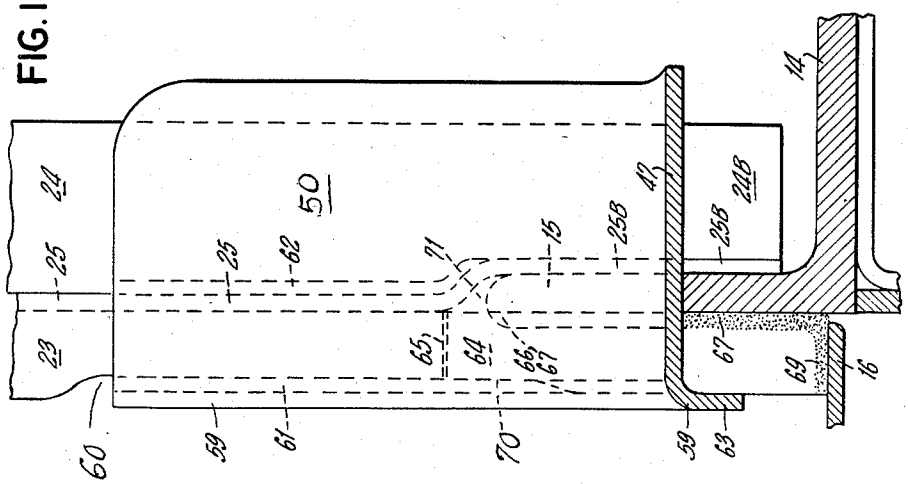


FIG. 10

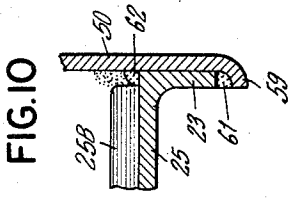


FIG. 9

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United States Patent Office 2,948,026 Patented Aug. 9, 1960

2,948,026

DOORWAY CORNER CONSTRUCTION

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Filed Sept. 9, 1958, Ser. No. 759,940

11 Claims. (Cl. 20—11)

The present invention relates to doorway corner construction and refers more particularly to such construction for railway box car side doors. The invention is equally useful for doorways in any structure subject to stresses which tend to deform the door frame or the sill or other member below the door frame.

In modern railway box cars, door posts defining the sides of a doorway are fixed to side sills of the car underframe, and are also fixed to the plate. Side posts and braces also extend between the plate and sill, constituting the entire car side a girder, of which the weakest part is the sill under the centrally located doorway, due to the lack of bracing and also to the sill being cut down to floor level in order to provide free access at floor level through the doorway. These stresses due to normal use of railway cars cause the sills to crack at the door posts. The problem becomes acute in the so called general purpose box car having door openings fifteen or sixteen feet wide.

An object of the present invention is to provide a doorway construction which will prevent the above-described expensive and dangerous condition.

Another object is to provide a strong doorway construction without adding substantially to the weight of the general structure.

A further object is to provide such a doorway construction at low cost.

In accomplishing the objects of the present invention, when the vertical flange of the side sill is cut down to conform to floor height, the recess formed in the flange has no square inside corners but rather fillets of substantial radius. A corner piece of sheet metal has a flat body portion extending in the plane of the threshold plate, a flat arm portion extending in the plane of or in parallel contact with the transverse flange of the door post defining a side of the door opening, and a fillet portion connecting the other two portions and conforming to the fillet of the vertical flange of the sill. The web of the post is separated from the flange and offset to receive the vertical flange of the sill in the plane of the web, and in one form of the invention the entire lower end portion of the door post is offset to receive the arm of the corner piece in the plane of the post transverse flange. The various contacting elements are welded together along the lines of contact, and an extremely strong corner construction is provided, which tends to reinforce the underlying sill, the latter moreover retaining more of its original strength due to its fillets located around the rounded lower corners of the door opening.

In a modified form of the invention, in addition to all of the above, the lower portion of the said transverse flange of the door post opposite the fillet of the corner piece is bent to conform to the underside of the fillet of the corner piece, and welded thereto as well as to the vertical flange of the sill.

In another modified form of the invention the corner piece has a flange extending downwardly from the body portion, outwardly from the arm portion and radially from the fillet portion. The arm flange is narrow and merely covers the post flange, while the fillet and body flanges are wider and add substantial strength to the doorway corner. The portion of the post transverse flange which has been separated from the web in order to receive the vertical flange of the sill in the plane of the web is removed, and a plate is first welded to the flange of the corner piece as a sub-assembly and the latter then assembled with the plate in the plane of the transverse flange, the plate then being welded to the transverse flange and to the vertical flange of the sill.

The achievement of the above-mentioned and other objects of the invention will be apparent to those skilled in the art from a study of the following description taken with the accompanying drawings, in which:

Figure 1 is a perspective view of a box car embodying the improved doorway construction;

Figure 2 is an enlarged fragmentary perspective view, partially in section;

Figure 3 is a side elevational view of an enlarged fragment, looking into the car;

Figure 4 is a section on the line 4—4 of Figure 3, but omitting the car flooring;

Figure 5 is a section on the line 5—5 of Figure 3;

Figure 6 is a section on the line 6—6 of Figure 4;

Figure 7 is a section on the line 7—7 of Figure 5;

Figure 8 is a section corresponding to Figure 3 of a modified form of the invention;

Figure 9 is a fragmentary side elevation, looking into the car, of a modified form of the invention;

Figure 10 is a section on the line 10—10 of Figure 9;

Figure 11 is a section on the line 11—11 of Figure 9.

Referring now in detail to the drawings, the steel railway box car 10 has an underframe including a side sill 11 and subsill 12. Said sills also constitute the lower chord of the car side wall 13, which also comprises the plate which is the upper chord, and vertical posts and where desired diagonal braces connecting the sill and plate. Sill 11 is a rolled steel angle beam having the horizontal flange 14 and the vertical flange 15 extending upwardly therefrom. Subsill 12 is welded below flange 14 in the plane of flange 15 and the lower door track 16 is welded along the outside of the joint between sill and subsill, with the upper surface of its horizontal flange in the plane of the lower surface of flange 14 and having a depending outer vertical flange 17, and being supported from subsill 12 at intervals by brackets 18. The upper door track 19 is attached to car 10 in any desired manner and the sliding doors 20, 21 are supported from the upper or lower track and guided by both tracks.

Two door posts 22 spaced one from the other longitudinally of car 10 extend vertically between sill and plate on each side of the car and comprise the angle portions or flanges 23, 24 extending transversely of the car and the angle portion or web 25 connecting the flanges and extending vertically and longitudinally of the car. The transverse flanges 23 of the two posts define the sides of the door opening 26, and a major portion of the bottom of opening 26 is defined by the threshold plate 27 resting on flange 15 and filler 28, the latter and flooring 29 resting on flange 14, the portion 30 of flange 15 under plate 27 being reduced in height so as to support plate 27 substantially at floor level. The above-described structure is well known and many of the details mentioned may be varied without directly affecting the invention now to be described.

It is evident from the above description that the reduction in height of vertical flange 15 in order to provide access through opening 26 at the level of flooring 29 has weakened the sill 11, however this weakening is lessened and mitigated according to the present invention by coping or filleting the flange at the lower corners of

opening 26, leaving fillet portions 31 of substantial radius integral with the flange 15. In a preferred embodiment the radius of curvature of the top surface 32 of fillets 31 is three and one quarter inches. This surface 32 extends between and connects the top surface 33 of flange 15 beyond opening 26 with the top surface 34 of the portion 35 of flange 15 to be described, portion 35 being of the same height and continuous with portion 30 underlying threshold plate 27.

Corner piece 36 is a member of metal plate extending between the door post 22 and the threshold plate 27 which terminates short of each post 22. Corner piece 36 is formed with a flat, horizontal body portion 37 resting on portion 35 of flange 15. The portion 30 and the portion 35 at each end thereof at the respective sides of the door opening, together constitute a major portion of vertical flange 15 within the door opening. Body portion 37 has an outer depending flange portion 38. Portions 37, 38 extend in the plane of the threshold plate 27 which has a flange 39 corresponding to flange 38. Body portion 37 abuts threshold plate 27 endwise and is welded thereto and its undersurface is also welded to the inner and outer sides of portion 35 of flange 15 along the lines of contact.

Corner piece 36 also includes the flat, vertically extending arm portion 40 extending in the plane of flange 23 of post 22, the entire lower end portion 22A of post 22 being offset longitudinally of car 10 to receive arm portion 40 in the plane of flange 23. The flange and arm are welded together along the laterally inner and outer boundaries of the flange.

The fillet portion 41 of corner piece 36 connects and is integral with portions 37, 40 and is conformed to and rests on upper surface 32 of fillet portion 31 of flange 15, and is welded to fillet 31 on both sides of the latter along the lines of contact between the two. As best seen in Figures 2 and 5, at any point of contact between the plate and the vertical flange of the side sill there is presented a T-shaped cross section.

The lower terminal portion 22B of portion 22A, including the terminal portions 24B, 25B of flange 24 and web 25, is further separated from flange 23 and offset transversely of car 13 to receive flange 15 in the plane of web 25, as best seen in Figure 5. Flange 23 is welded along both of its sides to flange 15, and web portion 25B is also welded along its side to flange 15, as best seen in Figure 7. Flange portion 24B is also welded to flange 15 along the line of contact, as seen in Figures 4 and 6.

The construction is completed by conventional details including the wooden filler 42 resting on flange 14 and extending under corner piece 36 from filler 28 to portion 24B of flange 24. Nailing pieces 43, 44 of wood are bolted to flange 24 in known fashion and a plastic substance 45 or shaped wooden block is inserted below fillet portion 41 on the inside of web 15 to prevent the accumulation of decomposable material such as grain.

Figure 8 illustrates a modified embodiment of the invention which is identical to that already described except as to details which will be mentioned. The unchanged elements are identified by the same numerals in Figure 8.

The lower terminal portion 23C of flange 23 opposite fillet portion 41 according to the modification is bent to conform to the undersurface of fillet portion 41, and extends in contact therewith, and has its outer side and end margins welded to portion 41 by the weld 42. The inner side margin of portion 23C is further welded to flange 15 by the weld 43. Flange 38A is shorter than flange 38, terminating at the lower end of flange 23C which it abuts endwise and to which it is welded by weld 44.

The advantages of the above-described constructions will be immediately apparent to those skilled in the art. The strengthening effect on the side sill of the fillet portions 31 is augmented by the corner pieces 36 welded throughout their length either to flange 15 or to posts 22 and connecting the posts to the sill in the manner of gussets. The improved construction however takes away very little of the door opening. Power trucks may readily negotiate the opening without obstruction. Furthermore, impact forces due to accidental blows by power trucks against the door posts are distributed by the corner pieces far out into the door opening and more important, the cracking or slitting of the side sill due to the effect of stresses at the square inside corner of the opening as in presently known constructions is eliminated.

In the modification shown in Figure 8, the corner construction of the invention is further strengthened by reinforcing fillet portion 41 with the portion 23C welded to its under surface and increasing the rigidity and strength of the corner piece.

According to another modification of the invention illustrated in Figures 9, 10 and 11, the corner piece 46 is of metal plate and has a body portion 47 which is flat, horizontal, and located in the plane of the threshold plate 27 and welded thereto. Portion 47 rests on the portion 35 of flange 15 and is welded to the inner and outer sides thereof along the lines of contact.

The arm portion 50 of piece 46 is substantially flat and vertical and is in parallel contact with transverse flange 23 of post 22 and is welded thereto as described hereafter.

The fillet portion 51 of corner piece 46 connects and is integral with portions 47, 50, is conformed to and rests on upper surface 32 of fillet portion 31 of flange 15 and is welded to fillet 31 on both sides of the latter along the lines of contact.

The lower terminal portion of flanges 23, including the fillet joining it to web 25, is removed from post 22 in order to facilitate the offsetting of the lower terminal portion 22B so that flange 15 may be located in the plane of web 25.

The flange 58 extends around the outer boundary of piece 46, and includes the substantially quarter cylindrical portion 59 extending outwardly of opening 26 from arm 50. Portion 59 also extends radially outwardly from fillet portion 51 and depends from body portion 47. Flange 23 is trimmed to receive flange 59, as indicated at 60, Figure 11, and the two flanges are then united by a weld 61. Arm portion 50 is further united by a weld 62 to web 25. Flange 24 is welded to flange 15 as shown in Figure 6 previously described.

The substantially flat skirt portion 63 of flange 58 extends radially outwardly from fillet portion 51 in extension of portion 59 and depends from body portion 47 also in extension of portion 59.

A gusset plate 64 extends in the plane of flange 23, extending downwardly therefrom to lower door track 16, and is united to flange 23 by weld 65, to flange 15 by the welds 66, 67 on either side of plate 64, and to track 16 by the welds 68, 69 on either side of plate 64.

Plate 64 is further welded to skirt 63 by the weld 70 and it is recommended that it be thus subassembled with piece 46. The recess 71 should then be filled with a suitable substance to exclude decomposable material such as grain. The sub-assembly may then conveniently be welded into the structure as described above. The recess 72 connecting with recess 71 may either be filled with plastic filler material or by a metal piece and weld metal.

The disclosure of Figures 9, 10 and 11 is presently preferred, as it presents a more finished appearance and also affords economies of manufacture which will be evident to those skilled in the art.

While the invention has been illustrated in connection with the lower corners of a side door frame of a railway box car, it is obviously useful also for upper and lower corners of any door frame in any vehicle or structure subject to powerful stresses, and the claims are to be interpreted within such range of equivalents.

The invention may also be modified in various aspects as will occur to those skilled in the art and the exclusive

use of all modifications as come within the scope of the appended claims is contemplated.

What is claimed is:

1. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a flange extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said vertical flange beyond said opening and said vertical flange between said door posts being reduced in height, said wall having a threshold plate defining a major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate formed with a horizontal body portion extending substantially in the plane of and being integral with said threshold plate, a substantially vertical arm portion extending in parallel contact with said transversely extending flange of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said vertical flange of said side sill having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions.

2. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a flange extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said vertical flange beyond said opening and said vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate formed with a flat horizontal body portion extending substantially in the plane of said threshold plate, the latter terminating short of said door post and substantially abutting said corner piece body portion, said body portion having a substantially vertical flange depending from its outer longitudinal margin, a substantially flat, vertical arm portion extending in parallel contact with said transversely extending flange of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said vertical flange of said side sill having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions.

3. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a flange extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said vertical flange beyond said opening and said vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate formed with a flat horizontal body portion extending substantially in the plane of said threshold plate, the latter terminating short of said door post and substantially abutting said corner piece body portion, said body portion having a substantially vertical flange depending from its outer longitudinal margin, a substantially flat, vertical arm portion extending in parallel contact with said transversely extending flange of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said vertical flange

of said side sill having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions, said corner piece having a flange portion extending outwardly of said door opening from the outer margin of said arm portion and a flange portion extending radially outwardly from the outer margin of said fillet portions, said last two mentioned flange portions being continuous and integral one with the other and with said flange of said body portion of said corner piece.

4. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a flange extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said vertical flange beyond said opening and said vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate formed with a flat horizontal body portion extending substantially in the plane of said threshold plate, the latter terminating short of said door post and substantially abutting said corner piece body portion, said body portion having a substantially vertical flange depending from its outer longitudinal margin, a substantially flat, vertical arm portion extending in parallel contact with said transversely extending flange of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said vertical flange of said side sill having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions, said posts each having a web extending longitudinally of said wall, each said post having its entire lower end portion offset longitudinally to receive said arm in the plane of said transverse flange, and a terminal portion of said lower end portion of said web further being separated from said transverse flange and offset transversely to receive said vertical flange of said side sill in the plane of said web.

5. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a flange extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said vertical flange beyond said opening and said vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate formed with a flat horizontal body portion extending substantially in the plane of said threshold plate, the latter terminating short of said door post and substantially abutting said corner piece body portion, said body portion having a substantially vertical flange depending from its outer longitudinal margin, a substantially flat, vertical arm portion extending in parallel contact with said transversely extending flange of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said vertical flange of said side sill having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions, said posts each having a web extending longitudinally of said wall, the lower terminal portion of said post having said web separated from said transversely extending flange and said lower

terminal portion of said web being offset transversely of said wall to receive said vertical flange of said sill in the plane of said web, and said web and flange of said post being secured to said vertical flange of said sill.

6. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a flange extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said vertical flange beyond said opening and said vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate formed with a flat horizontal body portion extending substantially in the plane of said threshold plate, the latter terminating short of said door post and substantially abutting said corner piece body portion, said body portion having a substantially vertical flange depending from its outer longitudinal margin, a substantially flat, vertical arm portion extending in parallel contact with said transversely extending flange of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said vertical flange of said side sill having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions, said posts each having a web extending longitudinally of said wall, the lower terminal portion of said post having said web separated from said transversely extending flange and said lower terminal portion of said web being offset transversely of said wall to receive said vertical flange of said sill in the plane of said web, and said transversely extending flange of said lower terminal portion of said post being conformed to the undersurface of said fillet portion of said corner piece and secured thereto.

7. In a doorway corner construction for a wall having door posts and a sill, said sill having a horizontal flange supporting a floor and a vertical flange extending upwardly from said horizontal flange, said door posts defining the sides of a door opening and the bottom of said opening being substantially at floor level, said sill vertical flange beyond said door opening extending above floor level and the portion of said sill vertical flange within said opening being reduced in height and having an upper surface lying substantially at floor level, the improvement comprising said sill vertical flange having a fillet portion with an upper surface of substantial radius at one corner of said opening and connecting said portion of said sill vertical flange within said opening to a portion of said sill vertical flange beyond said opening, and means integral with one of said door posts, said means having undersurfaces resting on, in contact with and secured to the upper surfaces of said fillet portion and said portion of said sill vertical flange within said opening.

8. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a first portion extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said sill vertical flange beyond said opening and said sill vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate forming a continuation of the threshold plate and comprising a body portion extending substantially in the plane of said threshold plate, a substantially vertical arm portion extending in parallel contact with said first portion of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said sill vertical flange having an upper surface in continuous contact along the length of the under-surfaces of said fillet and of said body portions and being secured to said fillet and body portions, said first portion of said post terminating above and adjacent the top of said sill vertical flange and said post having a vertical longitudinally extending second portion integral with said first portion, said second portion having its lower terminal portion offset to receive said sill vertical flange in the plane of said second portion, said corner piece further comprising a flange extending outwardly of said door opening from said arm portion, radially outwardly from said fillet portion and depending from said body portion.

9. A doorway corner construction for a wall having a sill, said sill having a horizontal flange and a vertical flange extending upwardly therefrom, said wall having two door posts connected to said vertical flange and each having a first portion extending transversely of said wall and defining a side of a door opening, said door opening extending below the top of the portion of said sill vertical flange beyond said opening and said sill vertical flange between said door posts being reduced in height, said wall having a threshold plate defining the major portion of the bottom of said door opening and resting on the top of said reduced portion of said vertical flange, said construction comprising a corner piece of metal plate forming a continuation of the threshold plate and comprising a body portion extending substantially in the plane of said threshold plate, a substantially vertical arm portion extending in parallel contact with said first portion of one of said posts and firmly connected thereto, and a fillet portion connecting said arm and body portions, said sill vertical flange having an upper surface in continuous contact along the length of the undersurfaces of said fillet and of said body portions and being secured to said fillet and body portions, said first portion of said post terminating above and adjacent the top of said sill vertical flange and said post having a vertical longitudinally extending second portion integral with said first portion, said second portion having its lower terminal portion offset to receive said sill vertical flange in the plane of said second portion, said corner piece further comprising a flange extending outwardly of said door opening from said arm portion, radially outwardly from said fillet portion and depending from said body portion, and said construction further comprising a plate forming an extension below said post first portion and in the plane thereof and secured thereto, said last mentioned plate being secured to said sill vertical flange and to said flange of said corner piece.

10. A construction according to claim 9 and further comprising a door track attached to said wall and extending substantially horizontally below said door opening, said last mentioned plate further being welded to said door track.

11. In a doorway corner construction for a wall having door posts and a sill, said sill having a horizontal flange, supporting a floor, and a vertical flange extending upwardly from said horizontal flange, said door posts defining the sides of a door opening and the bottom of said opening being substantially at floor level, said sill vertical flange beyond said door opening extending above floor level and the portion of said sill vertical flange within said opening being reduced in height and having an upper surface lying substantially at floor level, the improvement comprising said vertical flange having a fillet portion with an upper surface of substantial radius at one corner of said opening and connecting said portion of said vertical flange within said opening to a portion of said vertical flange beyond

said opening, and plate means integral with one of said door posts, said plate means having undersurfaces resting on, in contact with and secured to the upper surfaces of said fillet portion and said portion of said sill vertical flange within said opening, said plate means extending inwardly and outwardly of said sill vertical flange within said door opening whereby a T cross-section is presented at any point of contact between said plate means and said sill vertical flange.

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