

March 14, 1944.

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2,344,222

DOUBLE WALLED SHEET METAL STRUCTURE

Filed June 28, 1940

4 Sheets-Sheet 1

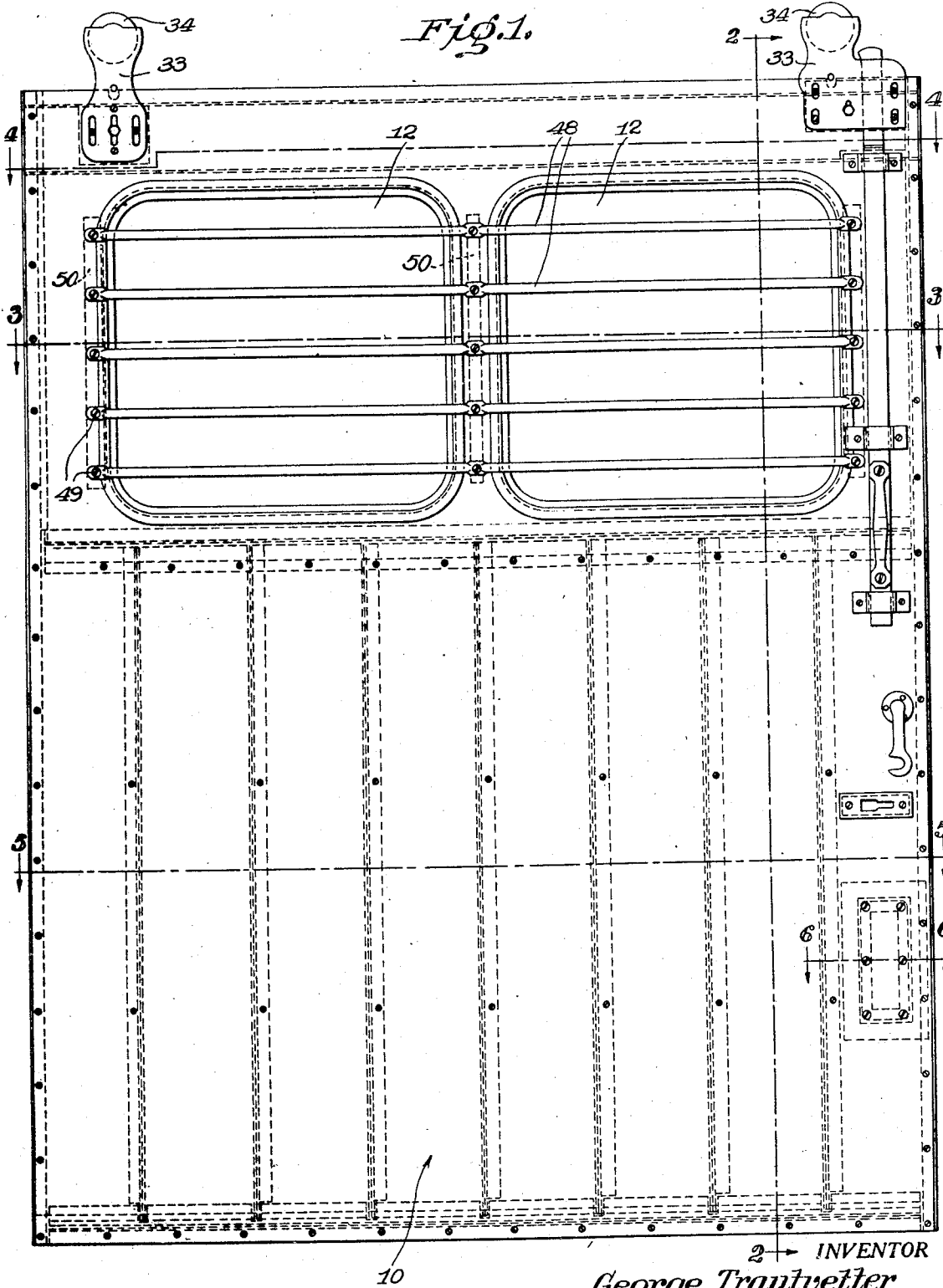


Fig. 1.

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4 Sheets-Sheet 2

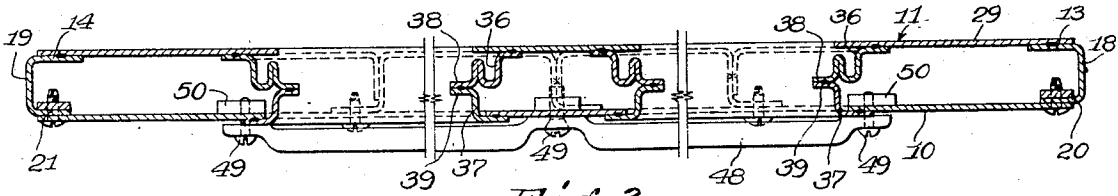


Fig. 3.

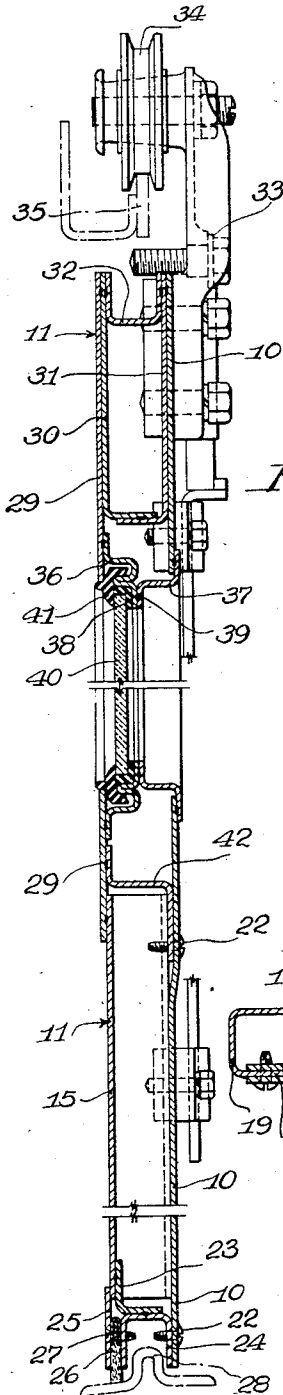


Fig. 2.

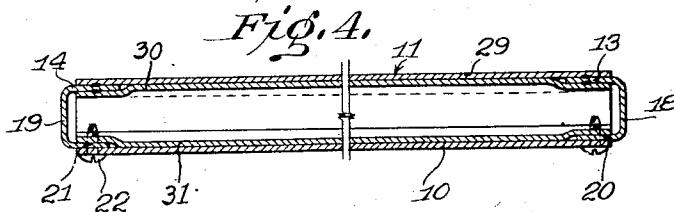


Fig. 4.

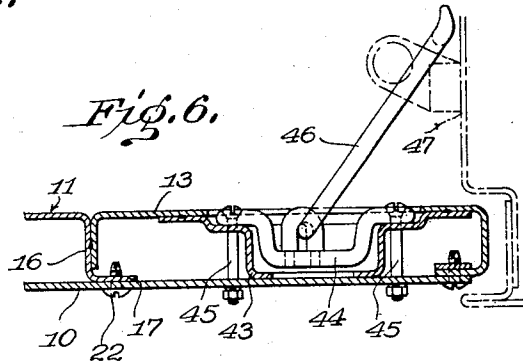


Fig. 6.

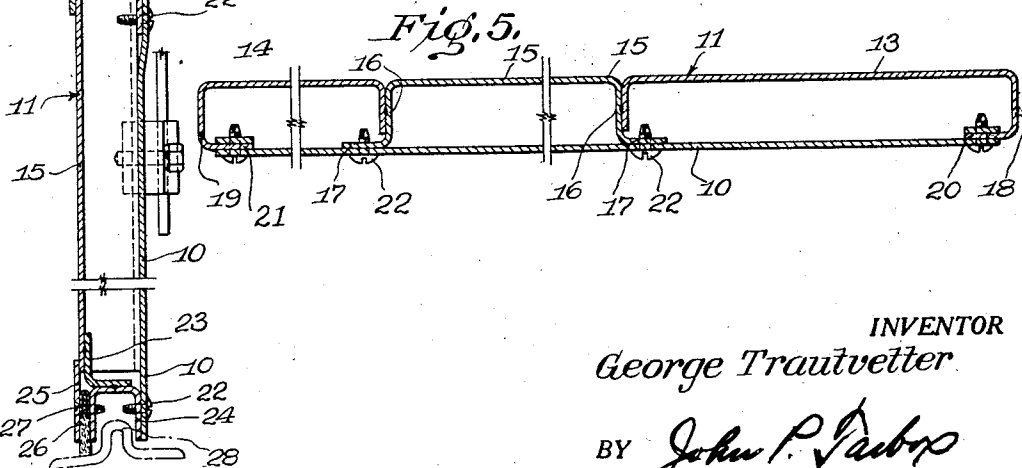


Fig. 5.

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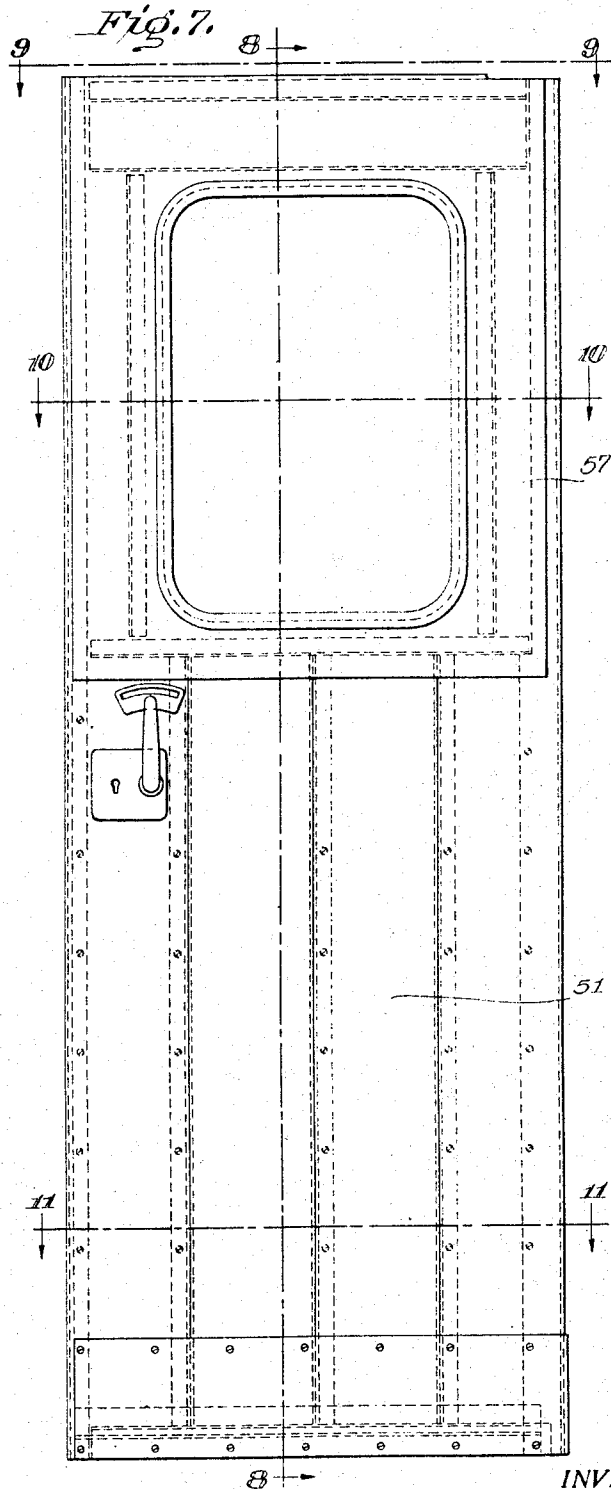
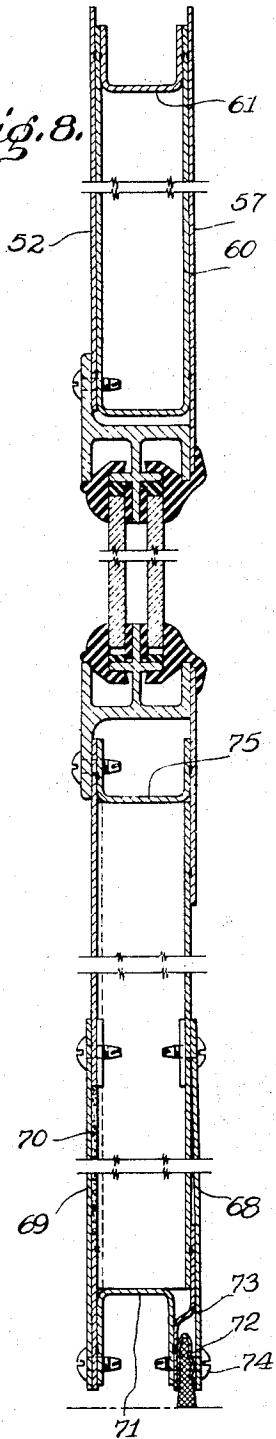
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Fig. 8.



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Fig. 9.

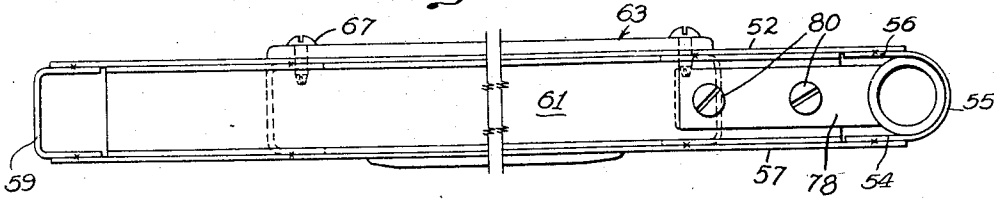


Fig. 10.

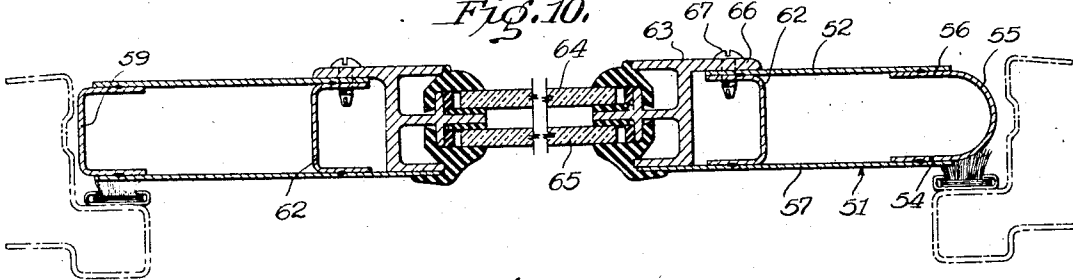


Fig. 11.

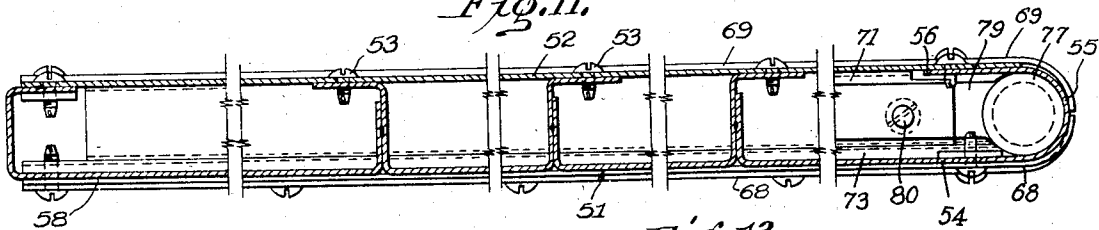


Fig. 12.

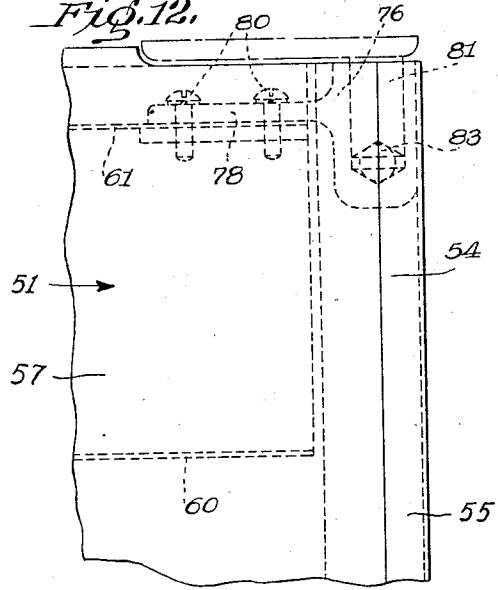
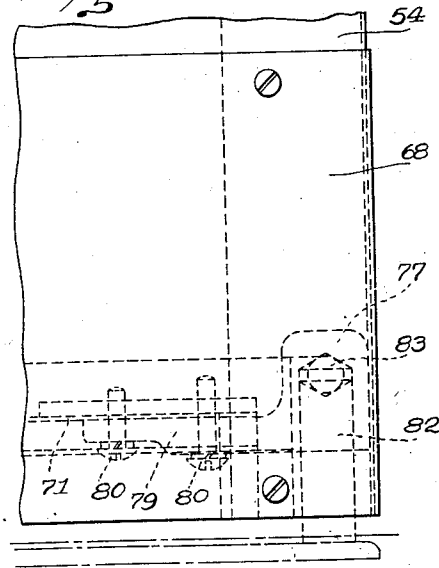


Fig. 13.



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# UNITED STATES PATENT OFFICE

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## DOUBLE WALLED SHEET METAL STRUCTURE

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11 Claims. (Cl. 189—46)

The invention relates to a wall panel construction, and more particularly to a door structure built of sheet metal.

It is among the objects of the invention to provide a door structure of this class which is very strong and rugged, yet light in weight and easy to fabricate, whereby it can be produced at low cost.

These objects are attained by fabricating the door of light-gauge, high strength sheet metal such as stainless steel, the parts entering into the door structure being largely constituted by strip material which is pre-formed into the desired configuration by die forming operations either by the use of draw rolling dies or otherwise. The parts entering into the structure are so formed in their margins that they can be readily joined together in subassembly and final assembly, in the main, by simple spot welding operations. The structure is adapted for subassembly into inner and outer panels, one of which is built up of channel members the bottom walls of which form one face of the door and the adjacent side walls of which overlap and are secured together. Certain of these side walls are laterally flanged, these flanges being disposed parallel to the opposite face of the door, and the other panel is secured in final assembly to these flanges so as to constitute the main body of the door by a structure comprising a plurality of parallel box cross-sectional elements secured together in their margins. The door is further constructed to facilitate the assembly of the marginal and window frame members with the outer and inner panels and to stiffen and strengthen the door structure in these and other regions.

Other and further objects and advantages, and the manner in which they are attained, will become apparent from the following detailed description when read in connection with the drawings forming a part hereof.

In the drawings:

Fig. 1 is an inside elevational view of a door according to the invention adapted more particularly for use as a sliding baggage compartment door for railway vehicles;

Figs. 2, 3, 4, 5 and 6 are sectional views on an enlarged scale, parts being broken away, the sections being taken substantially along the correspondingly numbered section lines indicated on Fig. 1 and looking in the direction of the arrows at the ends of the section lines;

Fig. 7 is a view similar to Fig. 1 showing the

invention applied to a hinged door adapted for use on railway vehicles;

Figs. 8, 9, 10 and 11 are, in the case of Figs. 8, 10 and 11, enlarged sectional views, and, in the case of Fig. 9, an enlarged plan view, these views being taken along the correspondingly numbered section lines of Fig. 7 looking in the direction of the arrows at the ends of the section lines;

Figs. 12 and 13 are, respectively, enlarged fragmentary views of the top and bottom corners of the hinged side of the door showing the manner of application of the hinges.

Referring now to Figs. 1 to 6, inclusive, it will be seen that the door comprises inner and outer panels designated generally by the reference numerals 10 and 11. These panels extend from side to side and top to bottom of the door except where they are interrupted by the window openings, designated 12, in this case two in number and arranged side by side in the upper portion of the door.

The inner panel 10 may comprise a substantially smooth sheet conforming to the inner face of the door, while the outer panel 11 is a composite structure designed to provide both framing and paneling and adapted to be assembled as a subassembly unit prior to its final assembly with the inner panel.

As clearly appears from Figs. 1 and 5, the outer panel 11 is built up, in its main body in the region below the window openings, of a plurality of vertically extending channels, the lateral ones designated, respectively, 13 and 14 and the intermediate ones 15. These channels are arranged with their bottom walls lying in and forming the outer face of the door, and with their side walls overlapping and secured together as by spot welding. At least one of the two adjacent overlapping side walls of the channels, as 16, Fig. 5, is formed with the lateral flange 17 paralleling the inner face of the door.

The lateral channels 13 and 14 have their outer side walls 18 and 19 formed with flanges 20 and 21 extending inwardly from the side margins of the door, these flanges being also arranged parallel to the inner face of the door and in the planes of the flanges 17. In the final assembly, however, the inner panel 10 is applied in overlapping relation with the flanges 17, 20 and 21, and is secured thereto as by self-tapping screws 22, thus forming the main body of the door below the window openings into a plurality of adjacent vertically extending box section elements which makes for a very strong and sturdy structure.

In its lower margin, the door is further strengthened by a transverse frame member. This frame member may comprise a composite structure which is shown in Fig. 2 to comprise an angle 23 having one arm secured to the bottom walls of the channels 13, 14 and 15 forming the outer panel, and its other arm extended laterally toward the inner panel 10. It will be noted that the channel members of the outer panel terminate short of the bottom of the inner panel. The composite transverse frame member comprises also the downwardly facing channel 24 having its bottom wall welded to the transverse arm of the angle 23 and its inner side wall secured in final assembly to the inner panel 10 as by screws 22. In order to provide for a weather-proof seal in the lower margin of the door, the channel 24 is made of less width than the thickness of the door, and, between its outer side wall and a metal strip 25 extending the outer panel to the same degree as the inner panel, there is secured a weather strip 26 held in place by the screws 27 extending through the strip 25 and 26 and the outer side wall of the channel 24. The downwardly facing bottom channel 24 also provides a guide means engaging over an upwardly projecting rib in the threshold of the door, as indicated at 28.

At the top, the outer panel is formed by a separate plate, designated 29, extended around the window openings and having its bottom margin overlapping the bottom walls of the channels 13, 14 and 15 which terminate below the window opening, see Fig. 2, and secured thereto. The lateral channels 13 and 14 have their marginal channel portions 13, 18, 20 and 14, 19, 21 extended up to the top of the door as clearly appears from Figs. 1, 3 and 4.

Across the top, the door is strongly reinforced by a box section reinforcing structure shown as comprising a deep channel which may, for convenience of manufacture, be formed by angles 30 and 31 secured together, this channel being telescoped between the outer panel 11 and the inner panel 10, and secured to both. It is preferably secured to the outer panel prior to the final assembly and prior to the assembly of a second shallow transverse channel 32 which is telescoped between the side walls of the channel formed by angles 30 and 31 and secured thereto, as clearly appears in Fig. 2. As clearly shown in Fig. 4, the ends of the side walls of the channel formed by angles 30 and 31 are offset the thickness of the metal and overlap and are secured to the sides of the lateral channels 13, 18, 20 and 14, 19, 21. Thus a strongly reinforced top frame member strongly tied into the side frame members is provided for the door through which the door is suspended by brackets, as 33, carrying rollers 34 running upon the track 35.

Around the window openings the door is reinforced by window frames clearly appearing in Figs. 2 and 3. These window frames may comprise angular strips 36 and 37 secured, respectively, through one of their arms to the outer panel plate 29 and the inner panel plate 10. These strips have arms 38 and 39, respectively, which extend toward the center of the window opening in overlapping relation and are secured together in final assembly. The transparent window panel 40, which is received in an angle formed by the outer strips 36, is held in place by a resilient weatherstrip indicated at 41, as shown in Fig. 2.

Below the window openings, the door may be further reinforced by a transverse member 42 of

Z cross-section, see Fig. 2, having one arm secured in subassembly to the outer panel plate 29 and the other arm secured in final assembly by the screws 22 securing the inner panel 10 in place.

As shown in Figs. 1 and 6, the channel 13 has its bottom wall cut away near the bottom of the door and, secured to the margins of this cut-away portion, is a sheet metal cup-shaped member 43 forming a recess for receiving a bracket 44 secured to the door by bolts 45 and carrying a locking link 46 for cooperation with means on the jamb 47 of the door for holding the door closed. As shown in Fig. 1, other means is provided for securing and moving the door, but, since they form no part of this invention, further description thereof seems superfluous and is omitted.

The windows are protected on the inside, as clearly shown in Figs. 1 and 3, by a plurality of transverse parallel bars 48 secured to the inner panel by the screws 49. In the region of this securement, the inner panel may be reinforced on its inner side by vertical bars 50, as appears in Figs. 1 and 3. Similar reinforcements may be provided, as shown in Figs. 3 and 5, where the inner panel is secured to the marginal flanges 20 and 21 of the outer panel.

A modified application of the invention is shown in Figs. 7 to 13, in which it is applied to a hinge-type door having a single window opening in its upper portion. In this modification, the outside panel, designated generally by reference numeral 51, is fabricated similarly to the outer panel in the construction already described, and the inner panel, designated 52, is secured thereto in a manner similar to the securement of the inner panel of the preceding construction as by the screws 53. At the hinged side of the door, however, the marginal channel 54 is rounded at 55 and formed with a very deep flange 56 to which the inner panel is secured at a point remote from the margin. This rounded channel portion 54, 55, 56 is extended upwardly to the top of the door, and is secured in this region to the outer panel portion 57 and the inner panel 52 by spot welding. Similarly the opposite marginal channel 58 of the outer panel may be extended upwardly by a reduced channel section 59 and is secured to the outer and inner panels in the same manner.

The top of the door in this case may be reinforced similarly to the reinforcement in the previous modification by a box-section reinforcing member consisting of a deep channel 60, and a shallow channel 61 telescoped within it and secured thereto. The deep channel is secured also to the outer and inner panels 57 and 52. The bottom of this channel forms the framing for the top of the window. At the sides, the window opening is framed by channels 62, the side walls of which are secured, respectively, to the outer and inner panels.

Below the window opening, the door is reinforced by a transverse channel 75 secured to the outer and inner panels in a manner similar to the channel 62 at the sides of said opening.

According to this construction, the outer panel extends into the window opening further than the inner panel, and the window assembly, consisting of a sash 63 of substantially the full depth of the door and provided with means for mounting two spaced transparent panels 64 and 65, may be removably assembled as a unit with the door so that its body seats against the outer panel, see Fig. 10. It has a peripheral flange 66 which overlaps the double flange formed by the inner panel

53 and the channels 60, 62 and 75, and may be secured thereto by screws 61.

At the bottom, the door may be reinforced on the outer and inner sides by kick plates designated, respectively, 58 and 59, these plates being secured by screws to the outer and inner panels. By reason of the use of these kick plates, a portion of the inner panel is shown omitted near the bottom, and its place is taken by a suitable sound insulating sheet 70 in this region. At the extreme bottom of the door, however, the two thicknesses of metal are provided. In this region, the door is reinforced by a transverse frame member of downwardly-facing channel section 71. As in the previous construction, this channel is of less width than the thickness of the door, and the weather-strip 72 is secured between a Z-member 23 connecting the bottom of the outer panel with the outer wall of the channel, and the bottom of the kick plate 68 by screws 74.

The open rounded construction of the hinged frame member 54, 55, 56 provides a recess for the mounting of the hinge sockets 76 and 77, indicated in dotted lines in Figs. 12 and 13 of the drawings, which are secured through extensions 78 and 79 to the reinforced top and bottom channels 61 and 71 of the door by screws indicated at 80, these sockets cooperating with vertical trunnions, indicated at 81 and 82, suitably secured to the top and bottom of the door frame. Between the coned top of the trunnion 82 and the oppositely coned bottom of the socket 77 is inserted a ball 83 to carry the door for easy swinging movement. A similar arrangement may be provided at the top, as shown, although this is not essential and may be omitted if desired.

While the invention has been described in several detailed modifications, it will be understood that further changes and modifications may be made by those skilled in the art without departing from the spirit of the invention, and such changes and modifications are intended to be covered by the appended claims.

What is claimed is:

1. A hollow sheet metal wall structure such as a door structure having its body built up of inner and outer panels, one of said panels being fabricated of strips of channel cross section secured together through their abutting side walls, certain of said channel side walls being flanged such that one only of two abutting side walls is provided with a flange which extends away from the center of its channel, and the other panel overlapping and being secured to said flanges.
2. A hollow sheet metal door structure having its body built up of inner and outer panels, one of said panels being fabricated of vertical strips of channel cross section secured together through their abutting side walls, certain of said channel side walls, including the side walls forming the lateral margins of the door, being provided with flanges in such a manner that only one of two abutting side walls carries a flange which flange extends away from the center of the channel on which it is formed, and the other panel overlapping and being secured to said flanges.
3. A hollow sheet metal door structure having its body built up of inner and outer panels, one of said panels being built up of vertical strips of channel cross section secured together through their abutting side walls, certain of said channel side walls including the side walls of the lateral margins of the door being provided with flanges in such a manner that only one of two abutting side walls carries a flange which flange extends

away from the center of the channel on which it is formed, the side walls along the latter margin of the door being flanged laterally inwardly to form the lateral marginal portions of the door, and the other panel overlapping and being secured to said flanges.

4. A hollow sheet metal door structure having a window opening therein and built up of inner and outer panels, one of said panels being fabricated of vertical strips of channel cross section secured together in their overlapping side walls, certain of said channel side walls being flanged, and the other panel overlapping and secured to said flanges, each of said panels having an angular section window framing strip secured thereto in subassembly, said strips in final assembly having overlapping portions extending toward the window opening and secured together.

5. A hollow sheet metal door structure built up of inner and outer panels, one of said panels being fabricated of vertical strips of channel cross section secured together in their overlapping side walls, certain of said side walls being flanged, the side wall at a hinged lateral margin of the door being deeply flanged and providing pockets opening toward the ends of the door at the hinge side of the door to receive parts of the hinge structure.

6. A hollow sheet metal door having a window opening in its upper portion, its body being built up of inner and outer panels, one of said panels being fabricated of vertical strips of channel cross section secured together through their abutting side walls, the lateral of said channels being formed in their margins of laterally inwardly presenting channel section and extended in their margins to the top of the door, and a separate sheet including the window opening extending said one panel to the top of the door between the lateral margins and overlapping and secured to the bottom walls of said vertical channel strips at bottom and sides of the window opening, certain of the intermediate strips of channel cross-section being flanged in their margins, and the other of said panels being a unitary sheet overlapping said flanges and the adjacent side walls of the inwardly presenting channel section margins of the lateral channels and secured thereto in the overlap.

7. A hollow sheet metal door having its body built up of inner and outer panels and having a window opening in its top portion, the door being reinforced across the top by a box-section member spacing the inner and outer panels and secured thereto, along its sides by laterally inwardly facing channels spacing the panels and secured thereto, and at the bottom of the window opening by an angular transverse member having arms overlapped by the outer and inner panels and secured thereto.

8. A hollow sheet metal door structure having its body built up of inner and outer panels, one of said panels being fabricated of strips of channel cross section secured together through their abutting side walls so that their bottom walls form one face of the door, certain of said side walls being flanged, said channels terminating short of one edge of the door, the other panel overlapping and secured to the flanges of said first-named panel and extending beyond said channels along said door edge, means constituting a similar extension of said first panel of the door beyond said channels along said edge, and an outwardly facing channel joining the extended portions of the panels in said edge.

9. A hollow sheet metal door structure having its body built up of inner and outer panels, one of said panels being fabricated of strips of channel cross-section secured together through their abutting side walls so that their bottom walls form one face of the door, means constituting an extension of the bottom walls for some distance beyond the side walls and the bottom walls proper of the channels in one edge of the door, certain of the side walls of the channel strips being flanged, the other panel overlapping and secured to said flanges and being extended a like distance beyond the side walls of the channels in said edge, a channel interconnecting the extended portions of said outer and inner panels, said channel being of less width than the space between the panels to provide a recess between it and one of said panels to receive a weather-strip for securement to said edge.

10. A hollow sheet metal door structure having spaced inner and outer panels spaced in their opposite vertical margins by laterally inwardly facing marginal channels secured to said outer and inner panels through their side walls, top and bottom transverse channels spacing the outer and inner panels and secured thereto adjacent

the top and bottom of the door, said transverse members terminating short of the hinged side of the door to provide pockets opening toward the ends of the door, and the ends of said transverse members adjacent said pockets providing means for attaching hinge sockets located in the pockets so formed between sides of the marginal channel at the hinge side of the door.

11. A hollow sheet metal door structure having spaced inner and outer panels spaced at least in one of their opposite vertical margins by a laterally inwardly facing marginal channel secured to said outer and inner panels through its side walls, a transverse member such as a channel at least along one of the top and bottom margins spacing the outer and inner panels and secured thereto, said transverse member terminating short of the hinged side of the door to provide a pocket opening toward the end of the door, and the end of said transverse member adjacent said pocket providing means for attaching a hinge socket located in the pocket so formed between the sides of the marginal channel at the hinge side of the door.

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