

Aug. 26, 1930.

J. LEDWINKA

1,774,020

PRESSED METAL VEHICLE DOOR

Filed Jan. 8, 1927

2 Sheets-Sheet 1

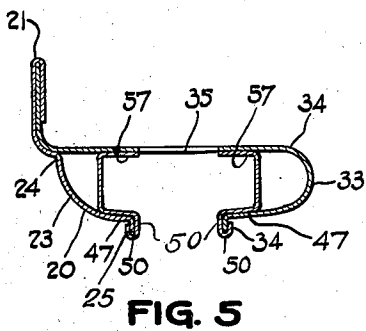


FIG. 5

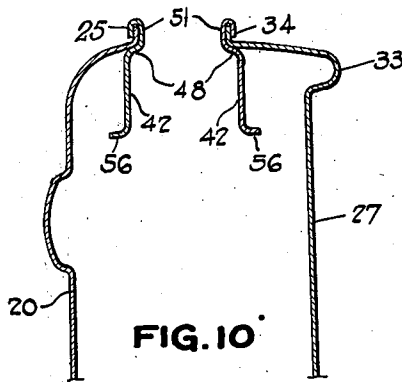


FIG. 10

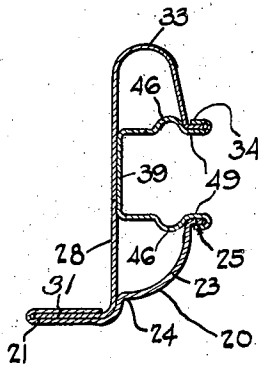


FIG. 6

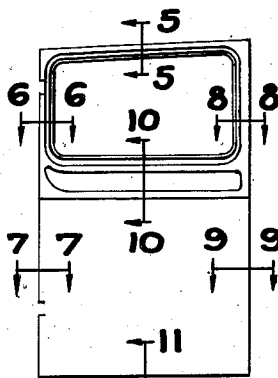


FIG. 1

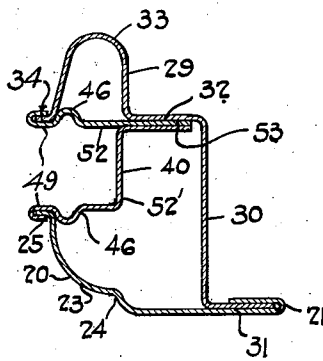


FIG. 8

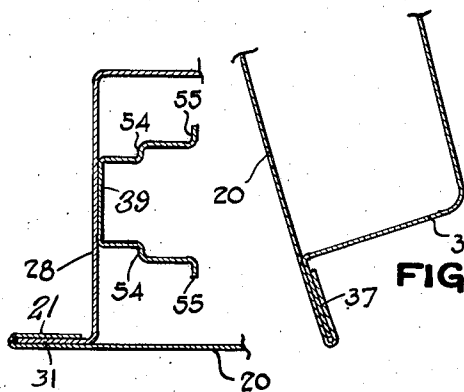


FIG. 7

FIG. 11

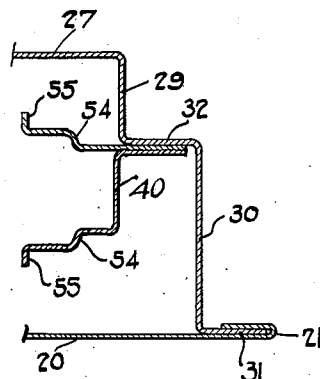


FIG. 9

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Aug. 26, 1930.

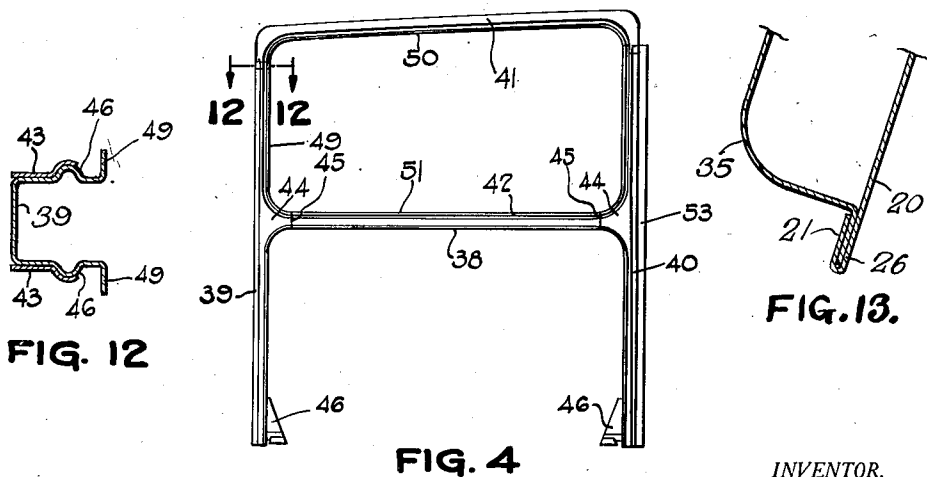
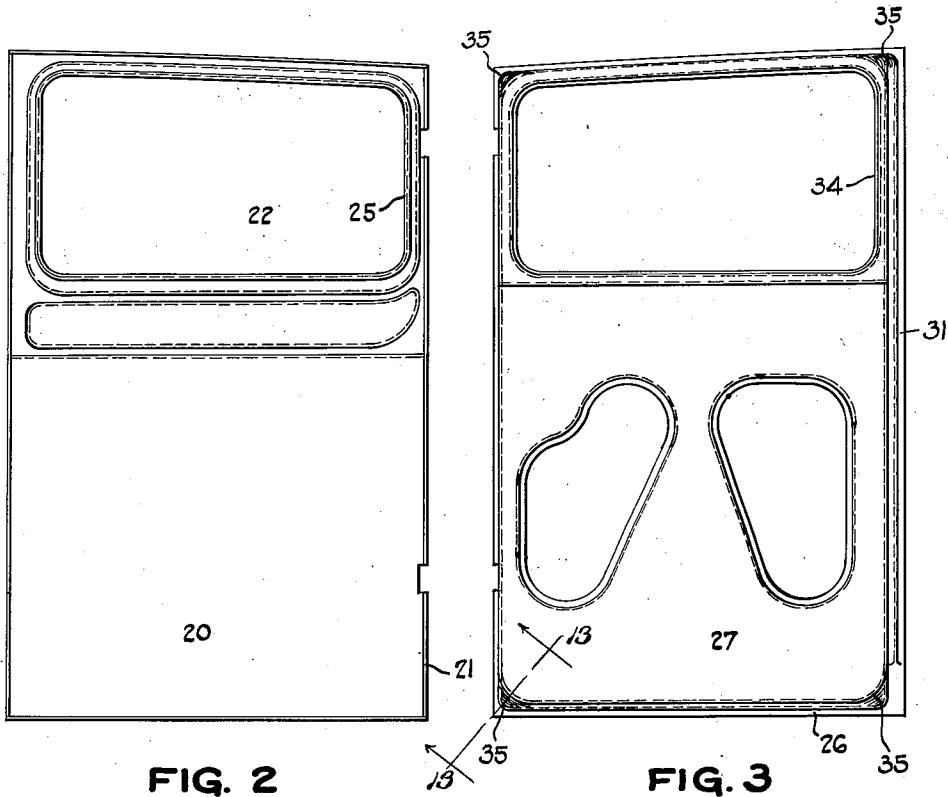
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PRESSED METAL VEHICLE DOOR

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2 Sheets-Sheet 2



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PRESSED-METAL VEHICLE DOOR

Application filed January 8, 1927. Serial No. 159,829.

This invention relates to doors for closed vehicle bodies and more particularly such a door made out of pressed steel stampings.

It is an object of my invention to construct such a door along lines and contours especially adapted for construction in steel, as distinguished from a door primarily designed for construction in wood, to construct it with a minimum number of parts, and to provide a door having unitary sub-assembly parts which may be readily united in the final assembly with a minimum of time and labor. It is a further object of my invention to produce a door which is as light as may be consistent with adequate strength and that is particularly adapted to be reduced to its final form with greater accuracy of dimension than has heretofore been attained in the quantity production of metal doors, and, furthermore, a door which is constructed to cooperate without a special formation on the lock rail of the door to center itself in the door frame or the body to which it is applied.

These objects I attain by constructing a door in such manner that the principal parts thereof are formed by a relatively few stamping operations; for example, I find it most convenient to form the outer and the inner portions of the doors of two main stampings of relatively light gauge sheet metal. These main stampings constitute not only, respectively, the outer and the inner panels of the doors, but what is more, they constitute also the major portions of the side, top and bottom rails, and in the case of both outer and inner panel stampings and particularly, the inner stamping, I form thereon an integral garnish rail around the window openings. I am, of course, aware that it has heretofore been proposed to form the outer and the inner panels of one-piece stampings, but in such constructions it has usually been necessary to perform a number of welding operations at the corners of the doors to reinforce and strengthen them and to provide separate garnish rails. By making the angles in the corners of the windows on arcs of relatively large radius and by sloping these corners of the doors inwardly, I am able by deep die

drawing and stamping operations, without tearing the metal and therefore, without any piecing or welding operations, to form the inner panel stamping so as to provide a large part of the door structure which ordinarily is constituted by a number of separate elements suitably joined together. In fact, the total number of parts entering into the door of my invention is reduced to about from one-half to one-third of the parts heretofore required. In this way, I not only can save a substantial portion of the usual cost of production by decreasing the number of parts and operations, but I enhance the appearance of the door by thus eliminating substantially all welding marks and by providing a continuous unitary beading or garnishment around the window opening on both sides of the door. The outer panel need not depart widely from the accepted manner of forming it, but it also forms one of the sub-assembly units of the door and has a few novel features. The third sub-assembly unit comprises the glass run channels and transverse connecting elements therefor above and below the window opening of the door. The manner in which this unit is constructed and used, in the final assembly of the door, to join together the outer and inner panel constructions particularly above the belt line, is another radical departure from the present accepted practice, and permits the final assembly to be effected with a negligible number of welding operations, yet the final result is an unusually strong, rugged door, one which is light in weight, accurate in dimension and presents a most pleasing appearance. The door forming the subject of this invention is particularly adapted for use with the novel body shown and described and claimed in my application filed of even date herewith, Serial No. 159,827, and entitled Pressed metal vehicle body.

With the hereinbefore mentioned and other objects in view, my invention resides in the constructions and arrangement of parts disclosed in the drawings forming a part of this specification, described in the following detailed description, and pointed out in the appended claims:

Fig. 1 is an outside elevation on a very much reduced scale of the complete door of my invention.

Fig. 2 is an inside view of the outside panel stamping or unit.

Fig. 3 is an outside view of the inside panel stamping or unit.

Fig. 4 is an elevation of the glass run channel unit.

Figs. 5, 6, 7, 8, 9, 10 and 11 are, respectively, detail sectional views on an enlarged scale, the sections being taken on the correspondingly numbered section lines of Fig. 1.

Fig. 12 is a detail sectional view on the line 12—12 of Fig. 4.

Fig. 13 is a detail sectional view through a corner of the assembled door taken as indicated by the lines 13—13 of Fig. 3.

In the drawings, similar reference characters refer to similar parts in the several views and the sections are viewed in the direction indicated by arrows at the ends of the section lines.

The various sub-assembly units which go to make up the completed door will first be described as they appear before final assembly, and as shown detached in Figs. 2, 3 and 4.

The outer panel 20 is substantially flat in contour throughout its main body and is provided around its periphery with an inwardly-extending flange 21. In its upper portion it is formed with the window opening 22 and around this window opening it is formed with an inward-sweeping curve, as at 23, broken near its outer portion by a shallow depression 24 which, while adding to the appearance of the door, forms also a useful function, especially along the hinge side and top of the door, as will presently be described. The inner portion of the curve 23 extends almost at right angles to the plane of the door and terminates in a lateral flange 25 extending parallel to the plane of the door.

The inner panel stamping 26 is a deep drawn stamping, the main body 27 of which is offset inwardly substantially the thickness of the door from its peripheral edge. At the hinge side, this peripheral or side rail portion is formed of substantial Z-section, the web 28 of the Z forming the jamb face of the door, the main body of the panel, the inner arm of the Z, and the outer arm of the Z provides the door overlap. At the lock side, the corresponding peripheral or side rail portion of the inner panel stamping is of double Z shape, and the webs 29 and 30 of the Z's extend at right angles to the plane of the door and is constituted by the jamb face thereof. The inner arm of the inner Z constitutes the main body 27 of the panel, and the outer arm 31 of the outer Z constitutes the door overlap; the inter-

mediate arm 32, common to the two Z's, forms a door stop shoulder adapted to engage a corresponding shoulder on the adjacent door frame of the vehicle.

In its upper portion, the inner or frame panel 26 is, like the outer panel 20, formed with a window opening of corresponding dimensions, and it is around this window opening that the inner panel is modified to garnish or trim it completely around the opening without the necessity of providing a separate garnish rail or rails for the purpose. To this end the side rail portions, both on the hinge and on the lock sides, are formed at their inner portions with a smoothly-rounded inner bend 33, the inner side of which extends inwardly (with respect to the plane of the door) and terminates in a lateral flange 34 similar to flange 25 of the outer panel and, like it, extending substantially parallel to the plane of the door. The top rail portion 34 of the inner panel stamping is formed like the side rail portion thereof above the belt line, as will be evident from a comparison of Figs. 5 and 6, but the horizontal or web portion of the Z is formed at its middle portion with a slot 35 to permit the insertion and removal of the window glass. At the bottom of the window opening the upper edge of the main body 27 of the stamping 26 is likewise formed with the bend 33 and the laterally-extending edge flange 34, it being thus apparent that this bend or bending or integral garnish rail 33 and the edge flange 34 are continuous around the window opening.

To permit the deep stamping to be the more readily formed at the corners, the rails are, at these points, joined by curves of relatively large radius, the radius of curvature of which varies, being largest adjacent the inner face of the door and decreasing toward the outer face, thereby providing an inclined curved outer surface, as 35', at the upper corners of the stamping. Similar inclined surfaces 35' are formed at the lower corners of the door stamping 26.

When the door is finally assembled and mounted in place on the body with which it is adapted to be used, the inclined rounded corners 35' at the top and bottom of the door coact with means arranged in the similarly rounded corners of the door frame of the body, which means are more fully described and claimed in my application filed of even date herewith and hereinbefore referred to, to center the door in the frame and to prevent rattling. This obviates the necessity of providing a special dovetail, as usual, on the lock side of the door.

At its lower edge, the stamping 26 is formed into a bottom rail of Z-section, the web of the Z 36 inclining downwardly and outwardly to match up with a corresponding threshold frame on the body on which the door is adapt-

ed to be mounted, and the outer arm 37 of the Z forming the door overlap.

The glass run channel frame unit 38, which forms the third and last sub-assembly unit entering into the final assembly, is made like the inner and outer panel units 20 and 26 of light gauge sheet metal stampings. The glass run channels themselves form the vertical side portions 39 and 40 of this frame, the opposite side walls of the channels 39 and 40 being joined above and below the window opening by the pairs of spaced cross members numbered, respectively, 41 and 42. The members of each pair are formed as separate stampings spaced apart a distance equal substantially to the width of the glass run channels so as to permit free movement of the window glass between them. The pair of cross members 41 above the window opening are carried around the corners of the frame and terminate, as shown in Fig. 12, in substantially flat ends 43, 43, which lap over and are welded to the sides of the channels 39 and 40. The corners of the frame are, of course, rounded on arcs of relatively large radius in a manner corresponding to the corners of the openings in the outer and inner panel stampings 20 and 26. The pair of cross members 42 are also joined at their ends to the sides of the channels 39 and 40 which are widened at 44 to provide the rounded corners of the window opening of the frame and joined at the ends of the cross members by welding along the lines 45, 45.

At their lower ends the channels 39 and 40 are provided with the window stop stampings 46 secured thereto by spot welding.

As is clearly shown in Figures 6, 8 and 12, the sides of the channels 39 and 40 are provided, at some distance removed from their edges, with outwardly-bulging beads or shoulders 46 which extend along the sides of the window opening. These beads or shoulders or their equivalents are continuous around the window opening of the frame, being continued around the upper corners and across the top of the pair of cross members 41 which are, as is clearly shown in Fig. 5, of channel cross section, and arranged facing each other, the lower side 47 of the channels corresponding to the shoulders 46. The beads or shoulders 46 are carried around the lower corners of the frame and continued across the bottom of the frame by the shoulders 48 formed by offsets in the angle cross members 42.

Prior to final assembly, the edges of the continuous frame members surrounding the window opening on opposite sides of the plane of the glass runway are provided at a point inwardly removed from the continuous beads or shoulders 46, 47, 48; with laterally-extending flanges 49, 50 and 51. In the final assembly of the door the continuous flanges 25 and 34 of the outer and inner panels are placed into the space between the beads or

shoulders 46, 47 and 48, and the laterally-extending flanges 49, 50 and 51 are crimped over the edges of these continuous flanges, the beads or shoulders co-acting with the crimped-over flanges to form a very secure, locked, crimped joint for securing the edges of the panels 20 and 26 to the glass run frame 38. The glass run channel frame is further secured in the final assembly to the hinge and lock rail portions of the inner panel stamping by welding the glass run channels to the said portions. Along the hinge rail I weld the bottom of the channel 39 directly to the web 28 of the rail. Along the lock rail, which is of double Z-section, I form the channel 40 by welding together a generally flat stamping 52 forming one side of the channel and a generally Z-shaped stamping 52' forming the other side and the bottom of the channel, the welded together portion 53 of two thicknesses of metal projecting outwardly of the channel proper and being secured as by welding to the common arm 32 of the double Z-section rail. Below the window opening the sides of the glass run channels are formed with an outward offset 54 which adds strength to the channels in this region, just as the beads 46 reinforce the channels in their upper positions. The sides of the channel are also formed in this region with lateral-reinforcing flanges 55 along their edges, which flanges are connected at the top by the corresponding flanges 56 on the cross members 42. The upper cross members 41 are secured to the top rail 34 respectively on opposite sides of the slot 35 by spot welding their upper sides 57 thereof to the top rail 34.

Having thus described the manner of joining of the glass run channel frame 38 to the outer and inner panel, stampings 20 and 26, it remains merely to state that the door is completely assembled by joining the outer panel to the inner panel stamping by crimping the lateral flange 21 on its outer periphery over the outer door overlap arms of the Z-section top, bottom and side rail portions of the inner panel stampings as shown clearly in the various sectional views through the edges of the door.

Thus the steps in the final assembly of the door are, first, the joinder of the glass run channel frame 38 to the inner panel stamping 26 by spot welding the frame to the side and top rail portions of the stamping 26 (relatively few spot welds sufficing for this purpose) and crimping the continuous laterally-extending flange 49 at the inner side of the flange of the inner panel stamping in the manner already described; then, the application of the outer panel stamping 20 to the combined inner panel stamping and the glass run channel frame and securing it to these units by crimping its outer peripheral flange 21 over the outer peripheral flange of the inner panel stamping and crimping the con-

tinuous laterally-extending flange 49, at the window opening, over the continuous flange 25 around the window opening in the outer panel. The shallow depression 24, formed in the outer panel to enhance the appearance of the door, has also a useful mechanical function in that it provides an interior shoulder which coacts along the hinge and top rails of the door with the crimped-over edge of the panel to provide a secure, locked, crimped joint similar to the joint at the edge of the window opening.

From the foregoing description it will be noted that the pressed metal door of my invention can be constructed of relatively few parts, thus saving in die cost and in the number of operations both in forming the parts and in final assembly; that the assembly of the parts is a relatively simple operation involving, as it does, for the main part, merely clinching operations as distinguished from welding; that, by reason of the small amount of welding in the assembly, outside weld spots are very few or entirely absent and the cost of removing them, therefore, negligible or non-existent; that the door presents a most pleasing external appearance and that it can be made very accurately to dimension; that it is so formed at the corners by deep drawing that no welding is necessary and that it can be centered without special means being provided either on the hinge rail of the door or the adjacent door frame member.

I claim as my invention the novel manner of forming and assembling the door and the novel construction and arrangement of parts, as well as the various unitary sub-assemblies entering into the construction of the door, as exemplified by the embodiment of my invention disclosed herein, and such further modification and alterations thereof as fall within the spirit and scope of the appended claims.

I claim:

1. In a pressed metal vehicle door, a unitary inner panel stamping forming the transverse jamb face of the door extending entirely around said door and having a window opening in its upper portion and formed with a continuous beading or garnish, arched in cross-section, around said window opening providing a finish for the door around said opening.

2. In a pressed metal vehicle door having a window opening therein, a side rail structure at said window opening comprising a stamping having a transversely extending web portion forming the jamb face of the door, a glass run channel secured directly to the inner face of said web portion, and a panel secured along one edge to the outer edge of said stamping and along its other edge to the adjacent side of the glass run channel, the joiner in both cases being by crimping one edge over the other.

3. In a pressed metal vehicle door having

a window opening therein, an inner panel member comprised of a unitary sheet metal stamping having a continuous peripheral transversely extending jamb face portion, a glass run channel secured to the inside surface of the sides of said transversely extending portion, the inner portion of said stamping being formed around the window opening with a continuous integral garnish rail outwardly arched in section, and the inner edge of the panel around the window opening being secured to the adjacent side of said glass run channel by crimping the edge of one over the edge of the other.

4. In a pressed metal vehicle door having a window opening in its upper portion, a door rail structure at the side of said opening comprised of an inner panel, an outer panel, and a glass run channel, the inner panel forming the jamb face of the door and the glass run channel having its base secured directly to the inside surface of said panel, the inner portion of the inner panel being bent over and secured to the adjacent side of the glass run channel, and the outer portion forming the door overlap, the outer panel being secured along one edge to said door overlap edge of the inner panel and along its other edge to the adjacent side of the glass run channel, whereby the door rail structure is, in effect, of a double box section construction.

5. In a pressed metal vehicle door having a window opening therein, a door rail structure at a side of said window opening comprising an inner panel member shaped to form the jamb face of the door and the door overlap arranged at substantially a right angle thereto, a frame member secured to the inner surface of the portion of said panel member forming the jamb face of the door and extending laterally therefrom, an outer panel member having one edge thereof crimped over the door overlap portion of the inner panel member and bent to form a contour depression therein which also serves as a clinch-locking shoulder by coacting with the adjacent portion of the jamb face portion of the inner panel and having its other edge secured to said frame member.

6. In a pressed metal vehicle door having a window opening therein, a door rail structure at a side of said opening comprising a stamping having a portion forming the jamb face of the door, a glass run channel secured to the inner side of the jamb face portion, said stamping further having a portion shaped to form a garnishment at the edge of the window opening and having its inner edge turned to extend substantially parallel to the plane of the door and to lie against the adjacent side of the glass run channel and secured thereto by crimping the edge of the side of the glass run channel over said turned edge, and a shoulder formed in the side of the

glass run channel co-acting with the crimped edge thereof to lock said turned edge against movement.

7. A pressed metal door having a window opening therein comprising a unitary outer panel stamping, a unitary inner panel stamping and a glass run channel frame unit, each of said elements surrounding said window opening and being joined together in final assembly entirely around said opening by a joinder of the edges of said panel stampings with the adjacent edges of the glass run channel frame unit.

8. An inner panel unit for closed vehicle doors formed of a unitary sheet metal stamping to provide the laterally-extending peripheral portions forming the jamb faces of the door and the outer peripheral flanges extending laterally from said jamb face portions, the corner portions joining adjacent jamb face portions being formed on curves increasing in radius from the outer edges of the jamb faces to the inner.

9. An inner panel unit for closed vehicle doors formed of a unitary sheet metal stamping and provided around the window opening with a deep drawn portion arched in cross section providing, in the completed door, a continuous garnish rail forming a finish for the inner portion of the window opening.

10. An outer panel unit for closed vehicle doors formed of a single sheet metal stamping and having an arched section around the window opening formed with a depression to provide garnishment for the outside of the completed door, said depression providing a shoulder on the opposite side adapted, in the completed door, to abut a portion of an adjoining unit over the edge of which the edge of said panel is crimped in the final assembly.

11. A glass run channel frame unit sub-assembly for pressed metal doors comprising opposed glass run channels, the sides of the channels being united by pairs of cross members defining, respectively, the upper and the lower edges of the window opening, the sides of the glass run channels and the connecting members being formed with lateral flanges which are continuous around the window opening and serve as final assembly joint formations adapted to coact with complementary formations on adjacent sub-assembly units in the final assembly of the door.

12. In a pressed metal door for closed vehicle bodies, a top rail having a web portion slotted to permit the insertion or removal of the window glass at the top, and reinforcing frame members of channel form on opposite sides of the slot having a side of the channel secured to the web portion of the rail and the opposite side of the channel flanged and arranged to form a clinched joinder with the adjacent edge, respectively, of an outer and inner panel portion.

13. A glass run channel frame sub-assembly for pressed metal vehicle doors comprising opposed glass run channels and cross connecting members joining the sides of said channels through rounded corners and defining the upper and lower edges of the window opening and forming with the sides of the channels continuous inner and outer edge portions extending around the window opening on opposite sides of the central plane of the window runway, said edge portions forming final assembly joints, respectively, with complementary edge portions of adjacent sub-assembly units.

14. A door for vehicle bodies having a window opening in its upper portion, comprised of inner and outer panels, each a unitary stamping extending entirely around the window opening and formed around said opening with a garnish or beading to form a finish entirely around said opening on both sides of the door.

15. A door for vehicle bodies having a window opening in its upper portion, comprised of inner and outer panels, each a unitary stamping extending entirely around the window opening and curved inwardly around the window opening toward the central plane of the door and terminating in edge portions forming portions of the window glass guiding means on opposite sides of said glass.

16. A door for vehicle bodies having a window opening in its upper portion comprising a unitary inner panel stamping, a unitary outer panel stamping and a glass run channel frame, each extending entirely around said window opening and being joined in the margin of said opening by a crimped joinder of each panel edge with a corresponding edge of the glass run channel frame, the inner panel stamping being formed in its peripheral portion with a transversely extending jamb face portion provided in the outer plane of the door with a door overlap flange, the peripheral portion of the outer panel stamping making a crimped joinder with said flange.

17. In a pressed metal vehicle door having a window opening therein, a door rail structure at the side of said opening comprising a stamping having a portion form the jamb face of the door, a glass run secured to the inner face of said jamb face portion, said stamping further having a portion arched in section and forming garnishment at the edge of the window opening and having its inner edge portion extending substantially parallel to the plane of the door and lying against the adjacent side of the glass run and secured thereto by crimping the edge of one over the edge of the other, and a shoulder on one of said members cooperating with said crimped over edge to lock the crimped edges against relative shifting movement.

18. A glass run channel frame sub-assembly

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- bly for pressed metal vehicle doors comprising opposed glass run channels united by cross members extending between at least one of the sides of said channels and forming with said channel sides a continuous edge flange extending around a window opening, said continuous flange being further adapted to serve as a final assembly joint formation arranged to cooperate with complemental edge formations on an adjacent sub-assembly panel unit in the final assembly of the door.
19. A pressed metal door having a jamb rail provided with an offset forming a shoulder intermediate the outer and inner faces of the door, and a glass run channel comprising two angular strips secured together through adjacent arms of the respective strips and to the rail through said shoulder.
20. In a pressed metal door for vehicle bodies, a top rail having a web portion slotted to permit the insertion or removal of the window glass at the top, and a reinforcing frame member of angular form having one arm secured to the web portion of the rail along one side of the slot and having its opposite edge flanged and adapted to be secured by a clinched joinder to an adjacent panel portion.
21. A vehicle door comprising a frame panel having a window opening therein, integral side and end faces perpendicular to the main surface thereof, and integral flanges perpendicular to the outer surfaces of said faces, the metal of said frame panel at the sides of said window opening being bent inwardly and then perpendicularly to said side faces to form an abutment face, and a facing panel for said door having a window opening therein in matching relation with said opening in said frame panel provided with inturned marginal edges secured to the flanges on said frame panel, the metal of said facing panel at the sides of said window opening being bent inwardly and then parallel to the abutment face on said frame member to provide with said abutment face a channel for receiving a window.
22. A vehicle door comprising an inner panel having a window opening therein, integral side and end portions substantially perpendicular to the main body thereof, and integral flanges perpendicular to said side and end portions, an outer panel for said door having its marginal edges secured to said flanges of the inner panel and inturned edges forming a finish around said window opening in spaced relation to said inner panel, the upper end face of said inner panel having a slot formed therein substantially the full length thereof to allow a window to be assembled to said door in the space between said inner and outer panels.
23. A vehicle door comprising an inner panel having a window opening therein, integral side and end portions substantially perpendicular to the main body thereof, and integral flanges perpendicular to the side and end faces, the metal of said panel at the top being bent inwardly and then laterally parallel to the body of said panel to provide a window rail, and an outer panel having a window rail in matching relation to said opening in said inner panel having its marginal edges clinched over the flanges of said inner panel, the metal of said outer panel at the top of said window opening being bent inwardly and then laterally parallel to the main body of said panel to provide a window rail parallel to and spaced from said window rail of said inner panel, whereby a window glass may be assembled to said door in the space between said rails.
24. An inner panel unit for closed vehicle doors formed of a unitary sheet metal stamping and provided with a square cornered edge flange portion for joinder to an outer panel, and transversely extending side and end jamb face portions joined by rounded corners.
25. An inner panel unit for closed vehicle doors having a window opening therein and formed of a unitary sheet metal stamping and provided with a square-cornered edge flange portion for joinder to an outer panel and a transversely extending round-cornered jamb face portion, the jamb face portion being reversely bent at the sides and top of the window opening.
26. A door for vehicle bodies having a window opening comprised of inner and outer panels, each a unitary stamping extending entirely around the window opening and turned inwardly around the window opening toward the central plane of the door, at least one of said panels terminating in an edge portion providing portions of the window glass guiding means.
- In testimony whereof I hereunto affix my signature.
- JOSEPH LEDWINKA.

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