Aug. 29, 1961 K. RAAB ET AL 2,997,753

RAILWAY CAR DOOR STRUCTURE

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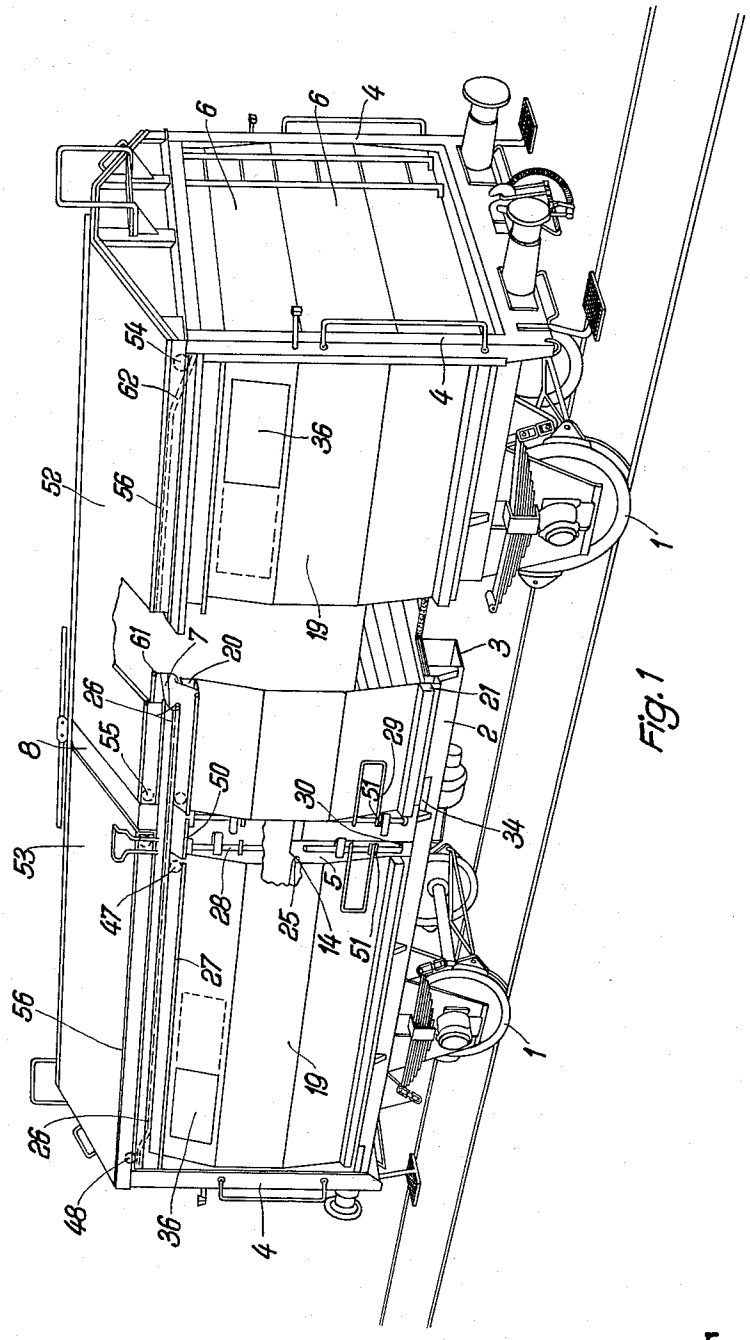

Fig. 1

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RAILWAY CAR DOOR STRUCTURE

Filed Sept. 4, 1957 7 Sheets-Sheet 2

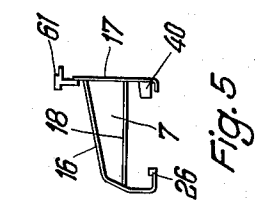

Fig. 5

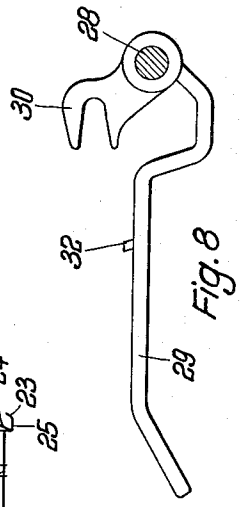

Fig. 8

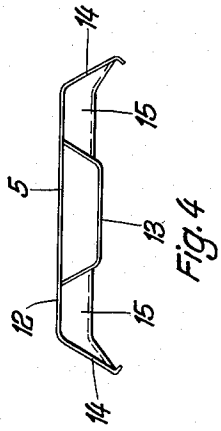

Fig. 4

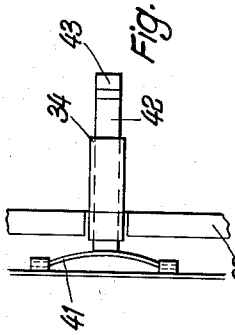

Fig. 3

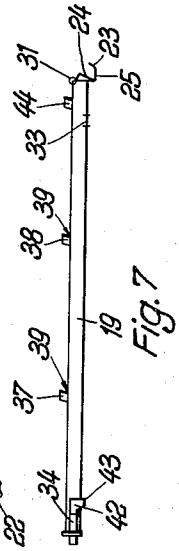

Fig. 7

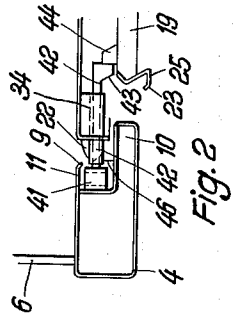

Fig. 2

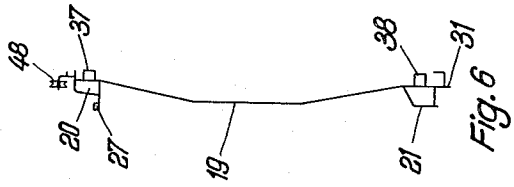

Fig. 6

Fig. 6a

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RAILWAY CAR DOOR STRUCTURE

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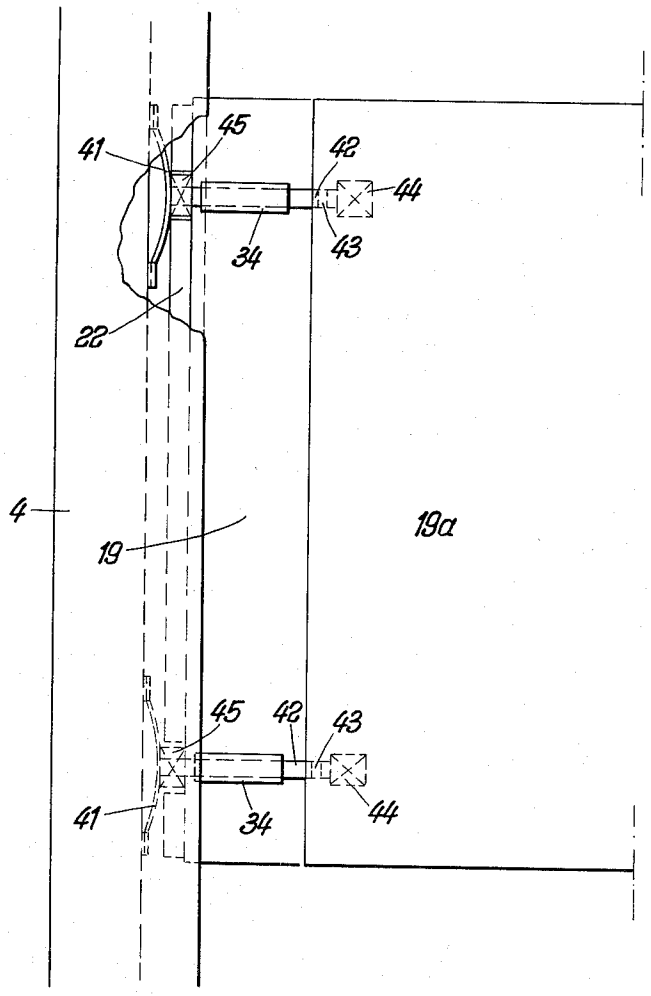

Fig. 9

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RAILWAY CAR DOOR STRUCTURE

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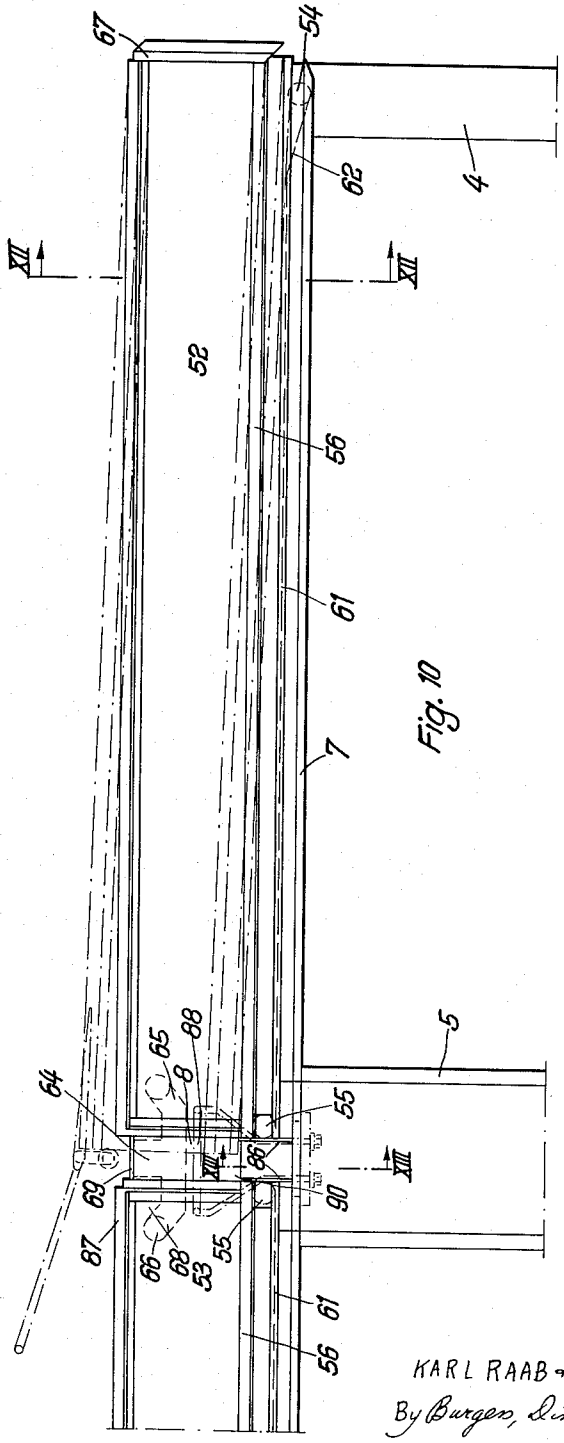

Fig. 10

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RAILWAY CAR DOOR STRUCTURE

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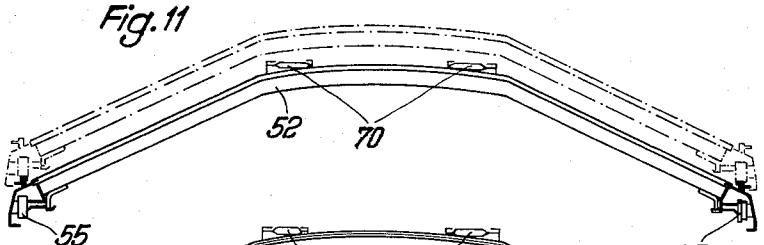
Fig. 11



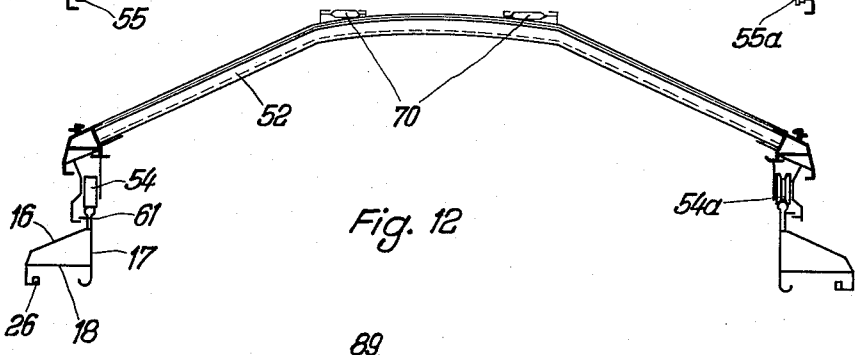


Fig. 12

Fig. 13

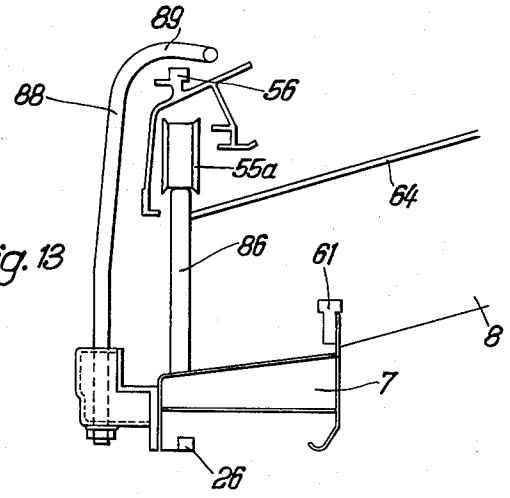
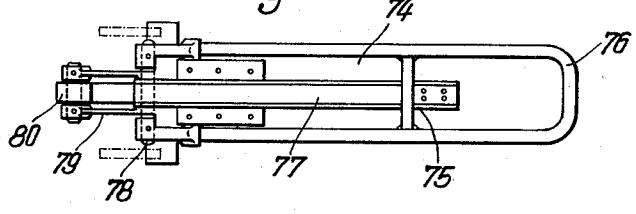


Fig. 14



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RAILWAY CAR DOOR STRUCTURE

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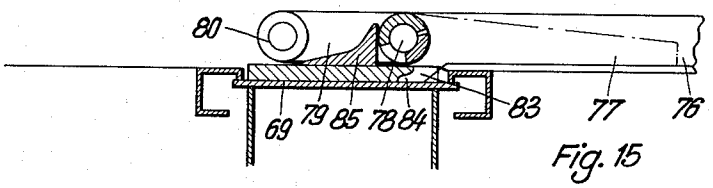

Fig. 15

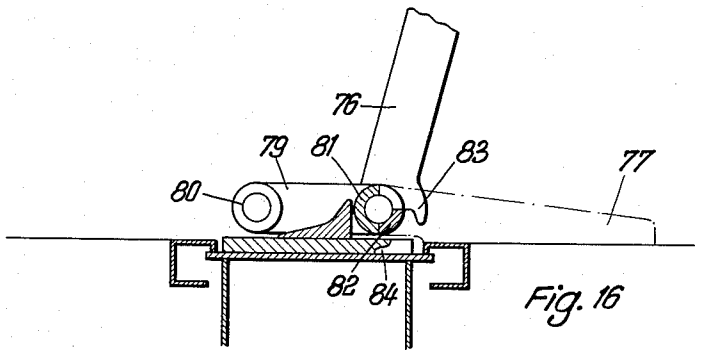

Fig. 16

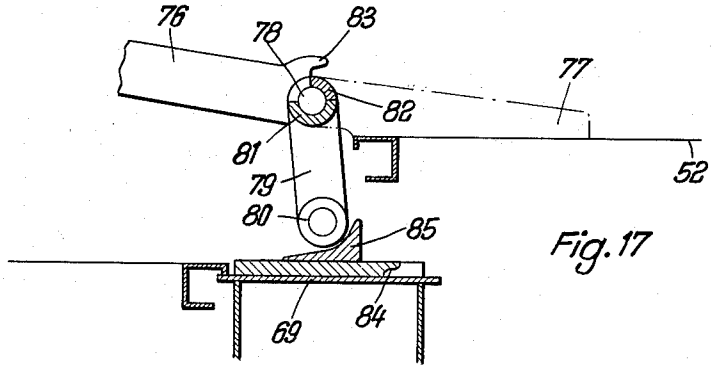

Fig. 17

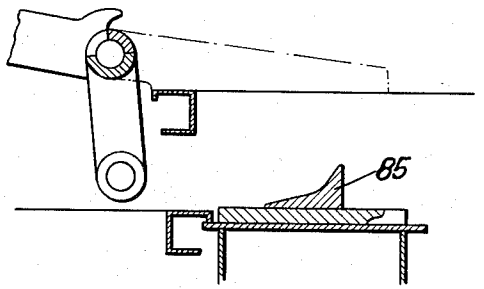

Fig. 18

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RAILWAY CAR DOOR STRUCTURE

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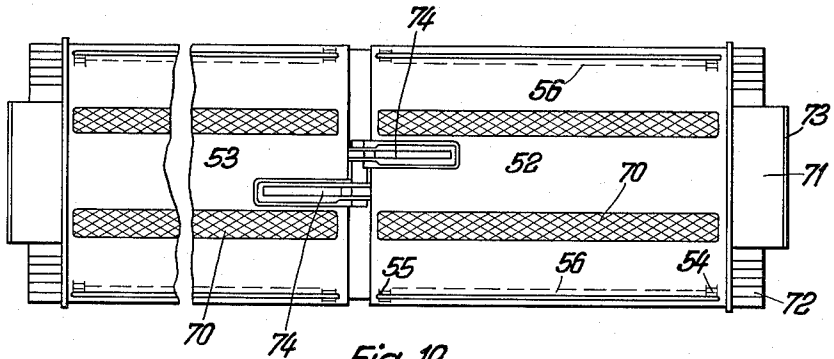

Fig. 19

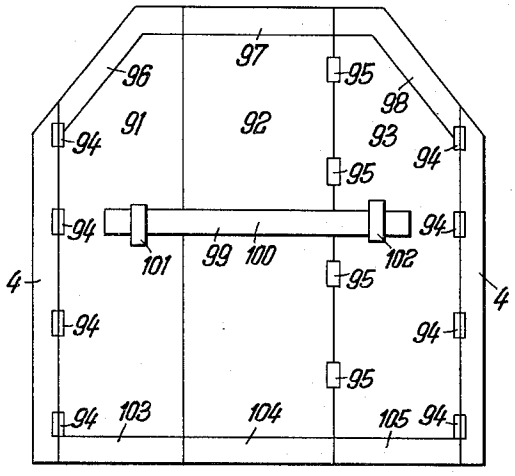

Fig. 20

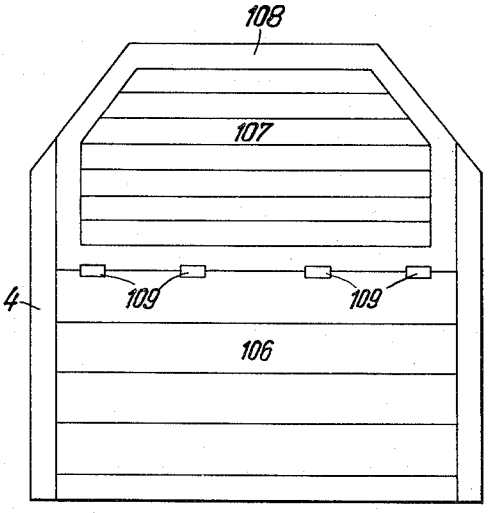

Fig. 21

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United States Patent Office 2,997,753 Patented Aug. 29, 1961

2,997,753

RAILWAY CAR DOOR STRUCTURE

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Claims priority, application Germany Sept. 11, 1956
10 Claims. (Cl. 20—23)

This invention relates to an improved railroad freight car construction. The invention more particularly relates to an improved construction of a railroad freight car of the type having sliding wall panels which lie in a common plane when in the closed position.

Freight cars, and in particular, closed freight cars, as for example, box cars, are generally provided with fixed walls having an opening or doorway which may be closed by a door, as for example, a sliding door. Freight cars with these fixed door openings often present difficulties in loading, and for this reason, closed freight cars have been proposed which are provided with sliding wall panels, as for example two or three individual sliding wall panels which may slide past each other as desired in order to provide an opening in the car at a desired position for lateral loading or unloading.

Sliding door arrangements were known, as for example in connection with motor vehicles, in which the sliding doors are aligned with each other and with the side wall in the closed position and which are swung out of alignment upon their opening. These known constructions, however, require too much force for their opening actuation or for their closing and locking or required too expensive or complicated mechanisms to allow the same to be satisfactorily used in connection with freight cars, particularly when considering the rough treatment to which freight cars are normally subject.

Therefore, in spite of the known arrangement for sliding doors in which the sliding doors can be maintained in alignment with each other and the car wall in a closed position, freight cars with sliding wall panels were generally so constructed that the panels would remain, in all positions of operation, fixed in the planes of their movement which was generally in front of the wall line of the vehicle. Since the maximum of the dimensions which the freight car may have on being moved are rigidly determined and cannot be exceeded, the inside of the car must be made correspondingly smaller, which results in a loss of space which is not inconsiderable.

One object of this invention is a novel construction for a railroad freight car provided with sliding wall panels which allows the panels to be positioned in a common plane in their closed position in a simple and reliable manner and without the above mentioned disadvantages.

A further object of this invention is a railroad freight car having sliding roof panels in order to facilitate loading and unloading.

These and still further objects will become apparent from the following description read in conjunction with the drawings in which:

FIG. 1 is a diagrammatic perspective view partially in section of an embodiment of a freight car in accordance with the invention;

FIG. 2 is a diagrammatic plan view of one of a corner post and a sliding panel edge of the embodiment shown in FIG. 1;

FIG. 3 is a diagrammatic side elevation showing the spring arrangement of the embodiment shown in FIG. 1;

FIG. 4 is a diagrammatic plan view of the central post of the embodiment shown in FIG. 1;

FIG. 5 is a diagrammatic end elevation of one of the upper beams of the car shown in FIG. 1;

FIG. 6 is a diagrammatic vertical section through the rear partition of one of the sliding panels of the car shown in FIG. 1.

FIG. 6*a* is a diagrammatic vertical section through the front portion of the sliding panel shown in FIG. 6;

FIG. 7 is a diagrammatic plan view of a sliding panel of the car shown in FIG. 1;

FIG. 8 is a plan view of the closure lever arm of the car in FIG. 1;

FIG. 9 is a diagrammatic side elevation, partially in section, showing a further embodiment of the construction of a sliding panel edge and corner support post for a freight car in accordance with the invention;

FIG. 10 is a diagrammatic side elevation showing the roof panel of the car of FIG. 1, in its raised and lowered positions;

FIG. 11 is a diagrammatic front elevation corresponding to FIG. 10 and viewed from the left to the right;

FIG. 12 is a diagrammatic vertical section corresponding to FIG. 10;

FIG. 13 is a diagrammatic vertical section of a portion of FIG. 10;

FIG. 14 is a plan view showing the lever actuating device for lifting and locking the sliding roof panels of the embodiment shown in FIG. 1;

FIGS. 15–18 are diagrammatic side elevations showing the lever device for lifting and locking the sliding roof panel in various positions of operation;

FIG. 19 is a plan view of the car shown in FIG. 1;

FIG. 20 is a diagrammatic front elevation, showing a further embodiment of an end wall construction of the freight car in accordance with the invention and;

FIG. 21 is a diagrammatic front elevation showing a still further embodiment of the end of wall construction in accordance with the invention.

The railroad freight car in accordance with the invention has a supporting framework which includes corner support posts, and at least one intermediate such as a central support post on at least one longitudinal side thereof. At least two sliding wall panels are provided extending in a common plane between said corner and intermediate support posts and enclosing the longitudinal side of the freight car. The sliding wall panels may be slid past the intermediate support posts and the other sliding wall panel on overhead support rails by means of rollers which are connected to the upper portion of the sliding wall panels and which engage the overhead support rails and roll there along. Lever means are provided for engaging and swinging the end portions of the sliding wall panels adjacent the intermediate support posts in the closed position, between a first position in said common plane and a second position outside of the common plane with the rollers in rolling engagment with said overhead support rails.

The sliding wall panels are thus swung by the levers from their closed position in the common plane with each other to their sliding position swinging about their end portion which is opposite to the intermediate support post in the closed position of panels.

The framework of the freight car preferably includes an upper beam connecting the upper ends of the support posts. The overhead support rail is preferably positioned along the upper outer portion of the sliding wall panels themselves, and a second overhead support rail is positioned along the upper support beam out-board of the common plane, and bending inward to the common plane at its ends adjacent to the corner support posts. The rollers include a first roller connected to each panel at the end portion thereof adjacent to the intermediate support posts with the panel closed, positioned to engage the first mentioned overhead support rail, when swung out-board to the second position by the lever means, and a second

roller at the opposite end portion of each of the panels in rolling engagement with the second overhead support rail.

The railroad freight car additionally or alternately, preferably has upper longitudinally extending beams on each side with an upper intermediate cross beam, connecting the longitudinal beams, and at least two sliding roof panels forming the roof of the car and extending in a common plane on each side of the cross beam. Roller tracks extend above and substantially parallel to the longitudinal beams for sliding each of the roof panels over the cross beams and the other roof panels. Rollers are connected to the roof panels for engaging the tracks and rolling therealong, and lever means are provided for swinging the end portions of the roof panels adjacent the cross beams in the closed position, between a first position in the common plane with each other and a second position above the common plane with said rollers in rolling engagement with the tracks.

Referring to the embodiments shown in the drawing the freight car in accordance with the invention has the conventional lower chassis provided with the wheels **1**, and chassis frame **2**, having the longitudinal beams **3**.

In accordance with the invention, the frame work of the upper enclosed portion of the freight car comprises the corner support posts **4**, the intermediate or central posts **5** which are connected together at their upper end by the longitudinal upper beams **7**, and the transverse intermediate cross beam **8** which connects the longitudinal upper beams at the position of the intermediate support post **5**. The ends of the freight car are closed by the end wall panels **6** which extend between the corner support post **4**, in a transverse direction. The number of intermediate support posts **5** on each side of the car is determined by the number of sliding wall panels provided on that side of the car and is one less than the number of sliding wall panels. In the embodiment shown in FIG. 1, two sliding wall panels are provided so that there is but a single intermediate support post **5** centrally positioned between the corner support post **4**. The lower longitudinal beams **3**, corner posts **4**, the intermediate posts **5**, the end wall **6**, the upper longitudinal beam **7** and the cross beam **8** form a three-dimensionally rigid structure which take up all the stresses occurring in the operation of the freight car in a dependable manner without an impermissible deformation. For greater strength and in order to achieve this function, the longitudinal lower beams of **3**, the longitudinal upper beams **7**, the support posts **4** and **5** and the cross beam **8** are formed as hollow structural girders, so as to resist bending.

Another embodiment of the invention as shown in FIG. 20 replaces the end wall **6** by a multi-panel, for instance three-panel door **91**, **92**, **93**. The panels **91** and **93** are in this connection connected by hinges **94** to the corner posts **4**. The door **93** bears the central door **92** by means of hinges **95**. In order, when opening this door, to avoid interference with loading by hoists or cranes, the transverse upper beam is divided into individual parts **96**, **97** and **98**, which are rigidly fastened to the doors **91**, **92** and **93** respectively at their upper edges and in closed condition of the door, structurally serve to receive all compressive forces from the load acting against the door, as well as the load of the roof.

The panel doors can be braced by a bracing device which combines the entire system into a single rigid end wall and consists for instance of a bar **99** having the pivot point **100** and closure straps **101** and **102**. Beam-like stiffeners **103**, **104** and **105** are advisedly arranged on the lower side of the doors.

In FIG. 21 there is shown a different embodiment of the end wall, the lower part **106** of the end wall being in this case arranged rigid between the corner posts **4**, while the upper part **107**, which bears a beam like edge stiffener **108**, is swingably connected to the lower part **106** by means of hinges **109** and is held in closed position by any suitable holding devices, not shown, such as bars or stiffeners. This arrangement, to be sure, does not allow opening of the entire end wall, but nevertheless considerably facilitates the loading of long objects, such as for instance pipes or the like, over the end wall, since the load need not be raised over the entire end wall but only over its stationary part. In this way there is obtained the same advantage as in the embodiment shown in FIG. 20 namely, that when the sliding roof is open and the flat **107** swung down, there is no longer any transverse upper beam in the way.

The crossbeam or yoke **8**, when a sliding roof is provided, is preferably in the form of a hollow girder which serves to rigidly connect the central posts with each other as well as for sealing purposes and to receive the closing levers of the roof parts, as well as to brace them.

As may best be seen in FIG. 2, the corner posts **4** are so developed that the sliding wall panel in closed condition, has its edge portion **22**, which is of cap-shape in horizontal section, engage in a vertical recessor channel **9** in contact with the surface **10** so that the surface **10** forms a thrust bearing for the load acting on the sliding wall which may be produced for example by the pressure of bulk material in the car. A flange **11**, together with the edge **22** of the sliding wall forms a labyrinth seal. There is furthermore also provided a vertical flange or stop **46** for the door in order to limit its path without damaging the flange **11** and to improve the seal.

In the recesses of corner posts **4**, preferably approximately near the upper and lower edges of the wall, there are arranged springs **41** (FIG. 3) which, as shown in the drawings, may be developed as leaf springs. It is also possible, however, to provide more than two springs or else only one spring which then advisedly would have to lie about halfway up the post. The amount of bending of the springs **41** must be at least equal to the degree of lateral displacement of the wall panel which is necessary in order to swing clear of the central post **5** when the panel is moved in and out of alignment with the other panel. When the panel is brought into its closed position the sleeves **34** strike against the springs **41**, these sleeves being rigidly connected with the wall panel and having the rams **42** slidably positioned in them, the purpose of which will be explained below. The sleeves **34** can also be so developed that they do not extend past the rearward edge of the panel, but as shown in FIG. 9, serve only to guide the rams **42**. In this case intermediate buffer members **45** provided with openings for the rams **42** are positioned on the rear edge of the wall panel to strike the springs **41**.

As shown in FIG. 4 the central post or posts **5** consist of a V-beam **12**, the legs **14** of which are oblique to the main wall panels and form the closing surfaces for the sliding wall panels. In the central posts **5**, there is arranged a bracing beam **13**, which, together with the beam **12**, forms a hollow girder. The oblique legs **14** of the beam **12** are connected by ribs **15** with the central portion of the beam **12** and the bracing beam **13**, whereby the rigidity of the entire unit is considerably increased. The upper longitudinal beam as shown in FIG. 5 consists of the outer roof plate **16**, the inner plate **17** and the horizontal closure plate **18**. The plate **16** is extended downwardly bent toward the inside, and bears at its end the rail **26**. The plate **17** is also continued downward and bent toward the inside and bears the cam stops **40** which will be described in further detail below.

The sliding wall panel **19** (FIGS. 6, 6*a* and 7) itself consists of a single-walled shell, the upper beam **20** and lower beam **21** of which are developed with hollow cross-sections. The sliding panel **19** closes against the corner-post on one side with the edge **22** of cap or T-cross-section engaging a labyrinth-like manner into the channel **9** of the corner posts **4**. The sliding wall panel **19** closes on the other side with a closure plate which has an inclined surface **24** and a sealing flange **25** parallel to the wall, the nose **23** of which is bent nearly parallel to the

flange 24. The sealing flange 25 engages by means of the nose 23 around the leg 14 of the central posts, while the surface 24 rests against the leg 14. In this manner there is formed a labyrinth seal having excellent sealing properties. By the supporting of the flange 24 of the panel against the parallel surface 14 of the central posts there is formed a supporting surface which transmits forces, which strike the panel, for instance during the loading, to the central posts without any vertical bending stresses on the panel.

A pin or bolt 31 is provided at the lower wall panel edge adjacent the flange 24.

The sliding panels 19 are suspended on the rollers 47 and 48, the rollers 48, which are arranged at the corner-post-end of the panels being referred to as the rear rollers and the rollers 47 arranged on the opening-side end of the sliding panel being termed the front rollers. The rear rollers 48 of the sliding wall panel travel on the overhead supporting rails 26 of the beam, while the front rollers 47 travel on the overhead supporting rails 27 on the upper beam 20 of the sliding panels 19 or travel first of all a short distance on intermediate rails 50 which are arranged on the central post 5 in alignment with the rails 27. The supporting rails 26 on the beam 7 are bent at their ends near the corner posts 4 inwardly toward the common plane in which the panels are positioned in their closed position. The bend in the rails 26 is such that as the rear rollers roll along the bent portion upon closure of the wall panel, the wall panels move inwardly from a position which they can slide past the other wall panel to a position in a common plane with the other wall panel.

The intermediate support posts 5 and the cross beam 8 are preferably centrally positioned when the wall and roof panels are divided into two parts in order, on one hand to obtain a dependable transverse connection of the frame work which is not subject to being twisted and which on the other hand allowed equal openings to be formed on either side of the car for side and crane loading.

If the roof is divided into two panels and the walls into three panels there is naturally only provided a single cross-beam 8 which is centrally positioned, but two intermediate support posts 5 must be provided which are connected at their upper ends to longitudinal beam 7.

In order upon the closure of the sliding wall panel 19 to swing the edge portion adjacent the intermediate post 5 to the position in the common plane with the other panel from the position outside this common plane which allows sliding actuation past the intermediate post and the other panel a lever arrangement is provided for each panel. This lever arrangement consists of lever arm 29 which is mounted adjacent the intermediate support post 5 for pivoting about a vertical axis of pivot on the supporting shaft 28. The lever arm 29 is mounted upon and pivots with this shaft so that as the lever arm is moved the shaft will rotate. A claw 30 (FIG. 8) is connected for pivoting with the lever arm 29 by being connected to the shaft 28 and preferably at the lower end of the shaft 28. A pin or bolt 31, connected to the lower forward edge portion of the sliding wall panel is so positioned that when the sliding panel is slid toward its closed position adjacent the corner support post 4 the claw 30 may engage the pin 31. As the lever arm 29 is then rotated to a position flat against the wall panel the claw 30 describes an arc carrying the pin 31 and thus the forward edge of the door panel 19 therewith, moving this edge from the outward position to the lock position in the common plane with the other door panel. Due to the actuate path of motion and the positioning of the claw 30 as the lever arm 29 is pivoted in the opposite direction for opening of the wall panel, the panel is first pressed rearwardly, pressing the springs 41 and clearing the leg 14 and then swung outwardly out of the common plane so that the roller 47 engages the track 50 which will allow the panel

to be slid past the intermediate post 5 and the other wall panel.

Idle rollers 51 are preferably mounted for free rotation on the shaft 28 for guiding contact with the wall panel in order to guide lower edge of the wall panel upon opening and to prevent scraping. In order to secure the wall panels in their closed position and prevent accidental opening, as for example, caused by jerky movements of the car, or the like, locking means are provided on the lever arms 29. As shown, these locking means are in the form of a projection 32 which engages a corresponding opening in the wall panel 19 with the lever arm 29 against the panel in its closed position. Additionally conventional locking or latch means as for example, a hasp or catch lock may be provided for this purpose.

In order to further secure the sliding wall panels 19 against pressure of loaded material, as for example, bulk goods, there may be provided on the upper beam 20 and/or lower beam 21 of the sliding wall panels 19 the locking cams 37 and 38 which are provided in the plan view with a reversed wedge surface which will engage with and lock with a corresponding reverse wedge surface 40 arranged on the upper longitudinal beam 9 of the body frame work. Due to the reverse shapes of these wedge surfaces the resilient force of the spring 41 locks the same in the closed position which is released upon a sliding door panel toward the corner post 4 against the resilient force of the spring 41 upon opening actuation. The wedge surfaces must be so dimensioned and positioned with respect to each other that upon the final closure and opening of the wall panel upon actuation of the lever arms 29 the wedge surfaces slide past each other, and only engage as the wall panels move slightly away from the post 4 in the final closed position.

As shown the panels 19 are provided with loading and ventilation partial doors or windows 36 which are developed in a form of sliding doors.

In operation in order to open the sliding wall panel 19 from its closed position the corresponding lever arm 29 is pivoted manually so that the projection 32 is pulled out of the recess 33 and the sliding panel 19 is no longer secured against displacement in the longitudinal direction of the car. At the same time this manual pivoting of the lever arm 29 causes a corresponding rotation of the shaft 28 and a pivoting of the claw 30 which carries the pin 31 in the forward edge of the door panel with it. As the pin 31 and the forward edge of the wall panel are rotated about the arc with the claw 31, the panel is first moved slightly rearwardly against resilient force of the springs 41 so that the wedges 37 and 38 are released from the wedges 40 and the flange 24 may clear the leg 14 of the intermediate post in which the same was in contact. Upon further pivoting of the claw 30 the forward edge of the wall panel swings outwardly in an arc out of the common plane with the other wall panel and into position outward of the other wall panel and the intermediate post 5 so that its forward roller 47 passes into alignment with and engages the rail 50. The wall panel may then be slid past the intermediate post 5 and past the other wall panel 19 outward thereof. In this connection the roller 47 first rolls along the rail 50 passing from the rail 50 on to the rail 27 and the rear roller 48 moves along the rail 26 moving outwardly as the same passes over the inwardly bent end portion of the rail 26. The rail 26, except for the inwardly bent end portions, extends longitudinally parallel to the wall panels and outward to their common closed plane.

Within the broad scope of the invention the rails need not be positioned on the longitudinal upper beam 7 or along the door panels themselves, but may be positioned in any other desired position. Thus, for example, the rail 27 instead of being connected to the door panel may be connected to the beam 7.

It is preferable, however, that lower rails are not provided as the same would be subjected to damage from rough loading and unloading and the operation thereof

could be impeded by the accumulation of dirt or soil.

As shown, the lever arm 29 is pivoted about 180° so that the opening in the claw 30 when the lever arm is in its completely open position is directed in the direction of travel of the panel 19. Conversely as the panel 19 is slid toward its closed position the pin 31 will slide directly into the opening in the claw 30.

During sliding actuation the door panel's lower free edge is prevented from scraping against intermediate post and other door panel by means of the guide rollers 51 which assure the necessary spacing between the lower portions of the wall panels unless one is being slid past the other.

In place of the lever arm arrangement 29 it is also possible, of course, to use other constructions, as for example, double acting lever arms or lever arms which may pivot about an intermediate articulation.

As the sliding panel 29 is slid to its closed position its rear edge is guided into the recess 9 by means of the rollers 43 rolling on the inwardly bent portion of the rail 26. The sleeves 34 or the intermediate buffers 45 strike springs 41 taking up the shock and the pin 31 enters in the groove on the claw. As the lever arms 29 are then pivoted in the opposite direction, the lower edge of the wall panel is swung inwardly and the wall panel is pushed rearwardly compressing the springs 41 until just before the final position of the lever arm 29 against the wall panel at which position the tension on the springs 41 is partially released with the door moving slightly forward and the wedges 37 and 40 engaging. In the final position the flange 24 comes in sealing contact with the leg 14 being resiliently held secure in this position by means of the springs 41 and by means of the projection 32 extending in the opening 33 and a labyrinth seal is formed with the edge 23.

In its closed position the panel is dependably sealed and the closure is a complete dead center closure which holds the panel very securely closed.

In the opening position as one of the wall panels 19*a* (FIG. 9) slid past the other closed wall panel 19 towards its widest open position, its forward edge will strike a projection on the ram 42 of the other wall panel 19 (FIG. 9). The striking of the forward edge of the wall panel 19 with this projection will tend to carry the ram 42 in the same direction as the direction of motion of the wall panel 19, causing the same to slide in the sleeve 34 and project from the sleeve 34 thus striking the springs 41 and taking up the shock caused by the arresting of the motion of the wall panel 19*a*. In this manner the sliding motion of both wall panels is limited in both directions and buffered and the shocks of impact absorbed preventing damage.

If the freight car in accordance with the invention should be constructed and loaded as a double story car a fixed roof may be provided and the sliding wall panels may extend past the curvature of the roof forming a portion of the roof thus allowing greater height for side loading on the upper story.

In accordance with a preferred embodiment of the invention, however, the freight car is provided with a sliding opening roof. Roller tracks 61 are provided along the upper side of the upper beams 7. These tracks 61 extend horizontally but are bent downwardly at their end portions adjacent the corner support posts 4 at 62 so that a ramp or running-on surface is formed. Further, horizontal roller tracks 56 are positioned along the upper outer edges of the roof panels 52 and 53. The roof panels are provided with rear rollers 54 which roll along the tracks 61 and forward rollers 55 which may be moved in engagement with and roll along the tracks 56. As shown, the rollers 54 and 55 are not in alignment but the front rollers 55 are further spaced apart than the rear rollers 54. This spacing, however, is not significant and merely depends upon the positioning of the roller tracks.

The cross beam 8 extends transversely across the car and is centrally positioned between the two roof panels 52 and 53 in their closed position. The cross beam 8 has an upper surface in the form of a plate which corresponds in cross sectional shape to the shape of the roof panels. As may best be seen in FIG. 10 deflectors 65 provided with guard rails 66 are positioned on either side of the cross beam in order to protect the same and the rear roof panel edge 67, when in the open position, from injury during loading and unloading operation, as for example, with a crane. If material being lowered into the opened roof by means of a crane should accidentally swing out of position the same will strike guard rails 66 rather than the roof edge 67 or the crossbeam. Additionally, a water-collection gutter 68 is formed between the deflectors 65 and the plate 64. This water-collection gutter will collect rain which might possibly penetrate at the seam between the roof panel and the crossbeam and will discharge this collected water toward the side.

In the closed position the roof panels tightly contact the plate 64 or a covering plate 69, provided over this plate. The sides of the roof rest against the upper longitudinal beams 7 sealed from the influences of the weather and the rollers 54—55 are relieved of pressure.

The roof panels are preferably of light construction, as for example, formed of aluminum plates and as shown in FIG. 19 are provided with catwalks and the hand actuating levers 74 for their opening and closing. The hand levers 74 may be reached by climbing up to the roof by means of the ladders 72 and platform 71 and by walking along the catwalk 70.

A swingable hand railing 73 may also be provided to facilitate access.

The hand levers also serve to lock the roof panels closed, to unlock the same and to allow raising and shifting over the roof panels.

The hand levers as may best be seen in FIGS. 14 through 18 each consists of the hand lever arm 76 which is pivotedly connected to the roof panel by means of a bracket 77 and a shaft 78, for pivoting between a horizontal position against the roof panel as shown in FIG. 15 and a raised position as shown in FIGS. 17 and 18. Also pivotably mounted on the shaft 78 is the intermediate support lever 79 which may be pivoted between a horizontal position as shown in FIGS. 15 and 16 to a substantially vertical position as shown in FIGS. 17 and 18.

Stops 81 are provided on the hand lever arm 77 and co-operative stops 82 are provided on the intermediate support lever 79, which allows the hand lever arm 76 and the intermediate lever 79 to be pivoted with respect to each other on shaft 78 over a smaller arc than the arc pivot of the hand lever 76. When the hand lever 76 is raised from the position shown in FIG. 15 to the position shown in FIG. 16 it pivots about the shaft 78 with respect to the intermediate lever 79. Stops 81—82 will then contact each other so that further pivoting of the hand lever arm 76 will cause the intermediate lever 79 to pivot about the axis 78 from the horizontal to the vertical position, i.e. from position shown in FIG. 16 to position shown in FIG. 17. The immediate support lever has the roller 80 connected at its free end which moves in engagement with the upper surface of the plate 69 on the cross beam 8. The contact of the roller 8 with the plate on the pivoting of the intermediate lever 70 causes a raising of the shaft 78 and thus of the roof panel 52 as shown in FIG. 17. The hand lever 76 is additionally provided with a catch 83 which engages a corresponding opening 84 in the crossbeam in the closed position with the hand lever as shown in FIG. 15 surely locking roof panel against motion.

For additionally locking the panels to the beam and preventing accidental opening, the openings 75 may be provided for securing the hand lever 76 in its closed position. A running on cam 85 against which the roller 80 may roll is additionally secured to the plate 69.

The crossbeam 8 is additionally provided with short vertical guides 86 as may be seen in FIGS. 10 and 13

which control and guide front edge **87** to the roof panels during the lifting thereof. Short poles **88** are provided on both sides, the projections of the upper curvature **89** of which are of such a nature that they prevent the front edge of the roof panel **87** from being lifted too high by striking against the rails **56** provided along the roof edges.

The height to which roof panel raises upon actuation of the hand lever **76** as shown in FIGS. 15, 16, 17, 18, is sufficient to bring the rollers **55** in alignment with the tracks **66** for rolling therealong.

If the roof panel **52** is to be opened, the operator who has reached the roof panel **53** via a ladder **72**, the platform **71** and the catwalk **70**, while standing on the roof panel **53** raises the hand lever **76** of the hand actuating device **74**. In this connection the hand lever will emerge from the locked position shown in FIG. 15 and the catch **83** will release the opening **84**. First of all, the hand lever will turn about the pin **78** without the supporting lever **79** being carried along. When the stops **81** of the hand lever **76** finally come against the stops **82** of the supporting lever **79** (as shown in FIG. 16), the supporting lever will be carried along upon the further swinging of the hand lever **76** and will raise the roof part **52** through the holder **77** (FIG. 17). In order to have a guide for the roof part during the raising process, the front supporting rollers **55** travel onto the vertical guides **86** on the crossbeam **8**. These vertical guides **86** are only so long that after the raising process has been completed, they again release the rollers **55**. In order to obtain, both during the raising process and during the raising motion, a guiding of the roof part against lateral displacements, one of the rollers **55**, namely roller **55***a* is developed as a grooved roller. The other roller **55** is smooth so that slight changes in the span resulting for instance from sudden loads on the relatively light roof do not lead to jamming or to the rails going off their tracks. The same arrangement is utilized in the case of the rear rollers **54** in connection with which, for the same reasons, the roller **54** is smooth while the roller **54***a* is grooved.

Upon the commencement of the lifting process proper, during which no shifting of the roof panels has yet occurred, the roller **80** upon the swinging of the supporting lever **79** will roll on the plate **69** until it comes against the running-on cam **85** which limits it rearward motion and assures the full utilization of the swing for the raising of the roof part to be lifted.

After the lifting process has been concluded, i.e., after the front roller **55** has reached the height of the rails **56** on the opposite roof panel (approximately the situation shown in dotted line in FIG. 10), then upon further pulling the rollers **55** will slide via the intermediate rails **90** which connect the vertical guides **86** onto the rails **56** on the roof panel which is in closed position. During this pushing motion, the rear rollers **54** run onto the inclined ramps **62** and lift the rear roof panel **67** until it reaches the height which is necessary in order to be able to shove it freely over the other roof panel. By simply pulling on the hand lever **76**, the opening process is now terminated until the rear roof edge **67** assumes a position at which it is protected by the deflector **65** against damage from hoist cables, hooks or the like. In the final phase of the opening process, the operator will stand on the platform **71**.

Even when the roof panel and the sliding wall panels are open, no part of the car will extend beyond the car clearance line if, for instance, the railing **73** is swingable and swung over in each case before the car starts up or else if the railing **73** is stationary but of low profile.

While the invention has been described in detail with reference to the specific embodiments shown, various changes and modifications will become apparent to the skilled artisan which fall into the spirit of the invention and scope of the appended claims.

We claim:

1. A railroad freight car having a supporting framework defining a cargo containing space including a corner support post and at least one intermediate support post on at least one longitudinal side of said car, an opening being defined between said posts in said side, at least two sliding wall panels closing the opening in said side, said panels extending in a common plane with said corner and intermediate posts, overhead support rails for said panels positioned along said side for sliding each of said sliding wall panels out of said common plane and past said intermediate post and the other sliding wall panel, rollers connected to the upper portion of said sliding wall panels which engage said overhead support rails for supporting said panels and for rolling said panels therealong, and separate lever means pivotally positioned on support means on said car adjacent to said intermediate post out of the rolling path of said panels for engaging and swinging the end portions of said sliding wall panels adjacent to said intermediate post in their closed position between a first position in said common plane and a second position out of said common plane with said rollers in rolling engagement with said overhead support rails.

2. Railroad freight car according to claim 1, in which said frame work includes two corner support posts on said side, an upper beam connecting the upper ends of said support posts, said overhead support rails including a first overhead support rail positioned along the upper outer portion of said sliding wall panels, and a second overhead support rail positioned along said upper beam out of said common plane and bending inward to said common plane at the ends adjacent to said corner support posts, said rollers including a first roller connected to each panel at the end portion thereof adjacent said intermediate support post with the panel closed, said first roller being positioned for engaging said first mentioned overhead support rail, and a second roller at the opposite end portion of each of said panels in rolling engagement with said second overhead support rail.

3. Railroad freight car according to claim 2, in which said lever means include a lever arm for each panel pivotably mounted on a supporting shaft attached to said car out of the rolling path of said panels adjacent to said intermediate support post for pivoting about a vertical axis of pivot, a claw connected to said supporting shaft for pivoting with said lever arm and a pin connected to each said panel positioned for engagement with the corresponding claw and for swinging said end portion of the corresponding panel between said first and second positions upon pivoting of said lever arm.

4. Railroad freight car according to claim 3, in which said corner support posts each define a vertically extended recess to receive said panels in said closed position and form a labyrinth seal therewith.

5. Railroad freight car according to claim 4, including spring means positioned between said corner posts and the corresponding end portions of said panels, said spring means being mounted on one of said posts for resiliently forcing said panels in the direction of said recess in closure contact with said intermediate post in said closed position.

6. Railroad freight car according to claim 4, including spring means positioned on said corner posts in said recesses for contact with the edges of said panels.

7. Railroad freight car according to claim 6, including cam means connected to the inner side of said panels, and cooperating cam means connected to the outer side of said upper beam for holding engagement with each other in the closed position of said panels.

8. Railroad freight car according to claim 7, including locking means on said lever arms for locking said lever arms with said panel end portions swung to said first position.

9. Railroad freight car according to claim 8, including guide roller means mounted for rotation about a vertical axis for guiding contact with said sliding wall panels.

10. Railroad freight car according to claim 9, in which said panels having slideable ram means positioned at the edge portions thereof adjacent to said corner support posts in the closed position, each of said ram means being in alignment with said spring means and having a projection contact with the opposite edge of the other panel.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,997,753 August 29, 1961

Karl Raab et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 61, for "roller 8" read -- roller 80 --; column 9, line 45, for "it" read -- its --.

Signed and sealed this 17th day of April 1962.

(SEAL)
Attest:

ESTON G. JOHNSON
Attesting Officer

DAVID L. LADD
Commissioner of Patents