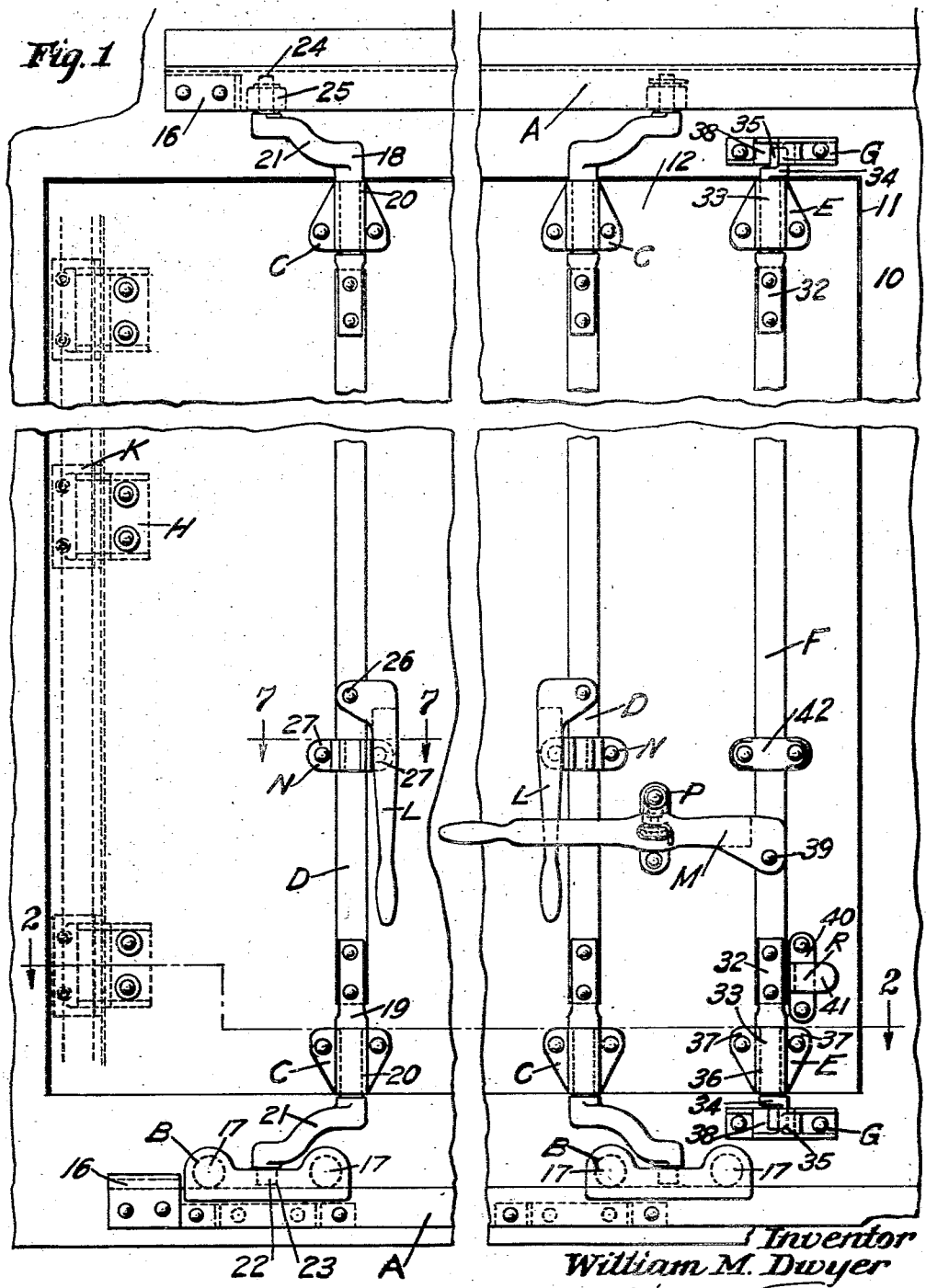
March 14, 1939. W. M. DWYER 2,150,271

REFRIGERATOR CAR DOOR

Filed Aug. 4, 1937 4 Sheets-Sheet 1

Fig. 1



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REFRIGERATOR CAR DOOR

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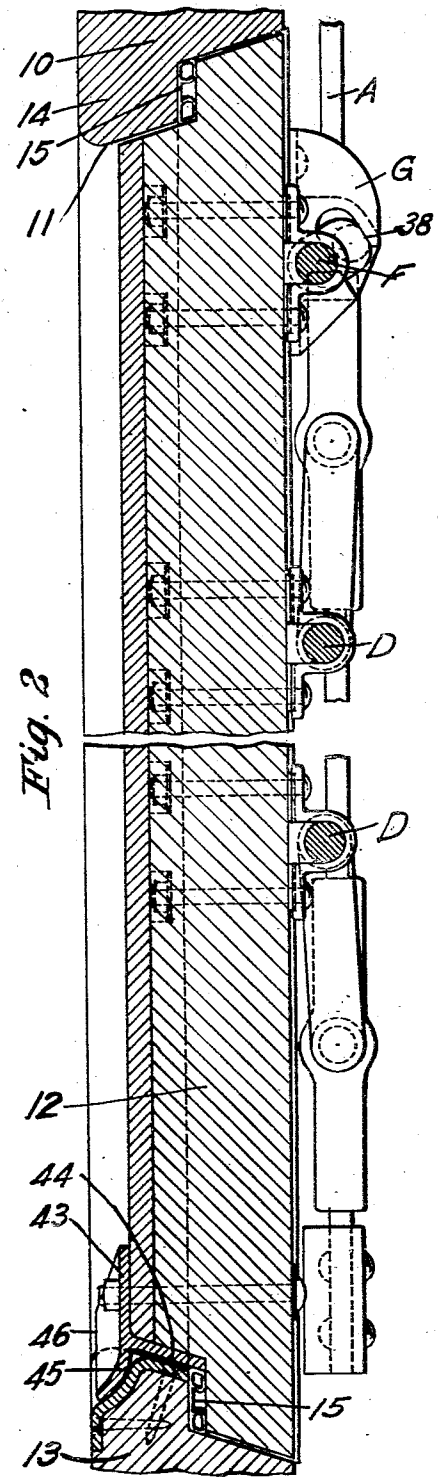


Fig. 2

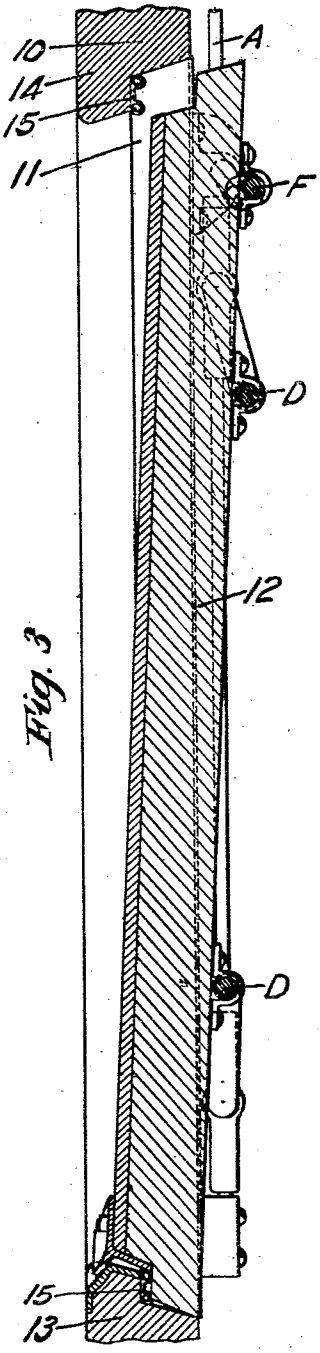


Fig. 3

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REFRIGERATOR CAR DOOR

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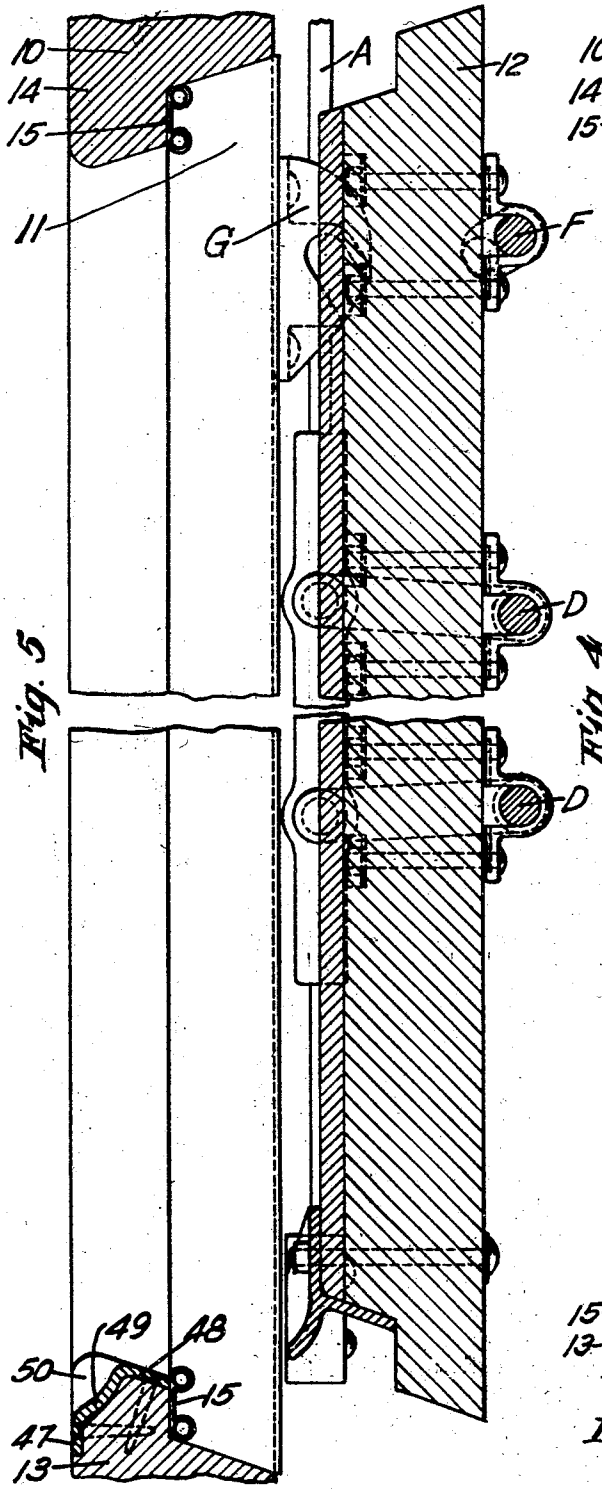


Fig. 5

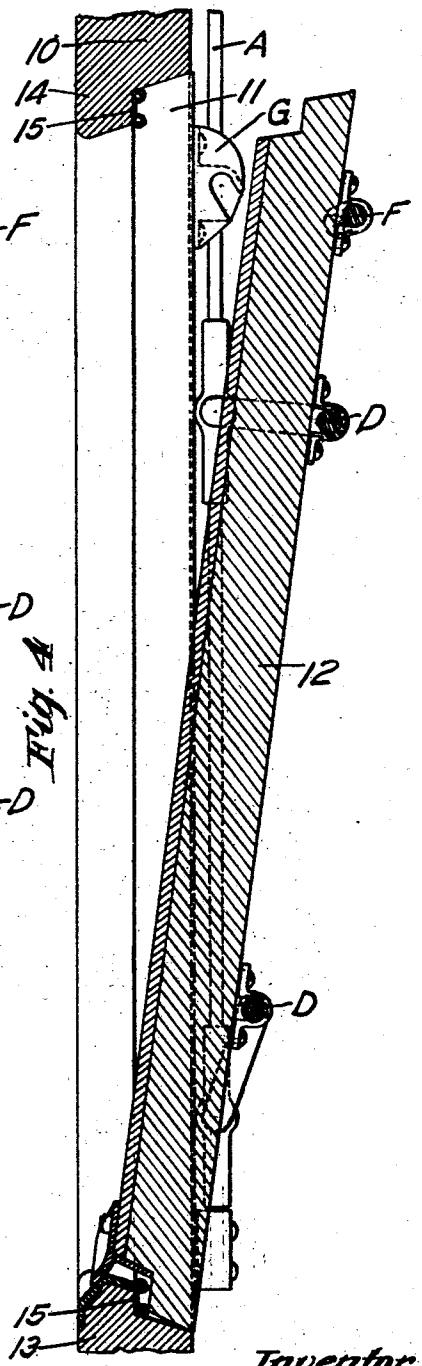


Fig. 4

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REFRIGERATOR CAR DOOR

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Fig. 6

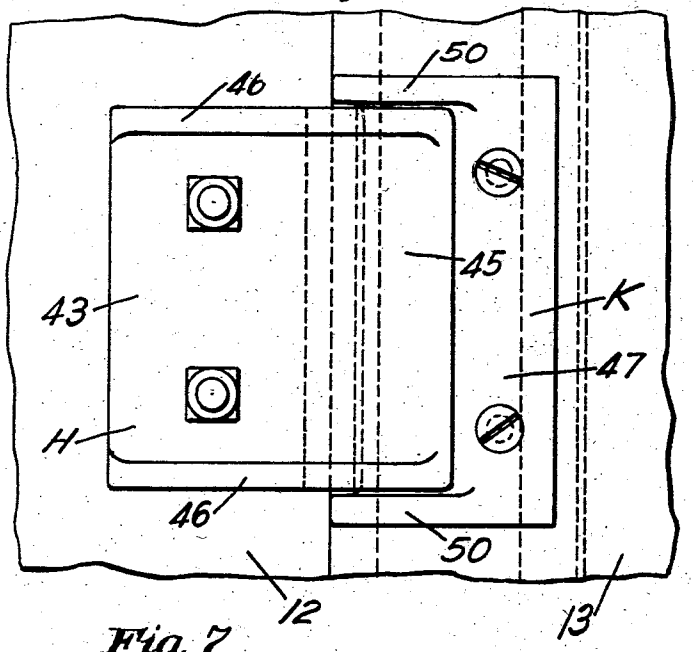
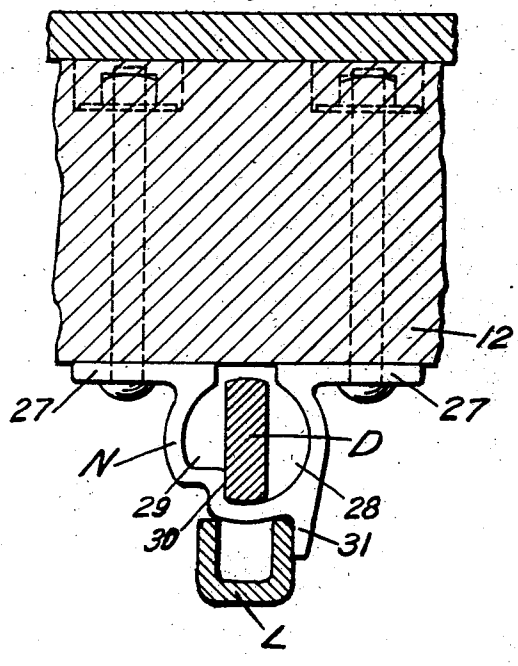


Fig. 7



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Patented Mar. 14, 1939

2,150,271

UNITED STATES PATENT OFFICE

2,150,271

REFRIGERATOR CAR DOOR

William M. Dwyer, Chicago, Ill., assignor to W. H. Miner, Inc., Chicago, Ill., a corporation of Delaware

Application August 4, 1937, Serial No. 157,307

15 Claims. (Cl. 20—23)

This invention relates to improvements in refrigerator car doors, and more particularly to doors of the sliding type.

One object of the invention is to provide a door construction for refrigerator cars comprising a sliding door member for closing the door opening having means associated therewith for supporting said door and moving the same toward and away from the side of the car, together with means for either finally forcing the same tightly into the door opening or initially prying the same out of said opening, wherein simple and efficient, manually actuated, mechanism is employed for independently actuating said door moving means and forcible closing and opening means.

A further object of the invention is to provide means of the character described in the preceding paragraph which is so mounted and arranged that the projection of the parts thereof will not exceed certain predescribed limits so that the mechanism will clear the usual loading platform structures and all other obstructions encountered in standard railway practice.

A more specific object of the invention is to provide a sliding door opening and closing mechanism comprising manually actuated operating bars by which the door is supported on sliding carriers and which operating bars serve to move the same into and out of the door opening, together with a locking bar at one end of the door for either forcing the door tightly closed or prying the same partly open and cooperating separable cam acting members on the car and the other end of the door which function as hinge members for said last named end of the door during the time that the door is being actuated by said locking bar.

Other objects of the invention will more clearly appear from the description and claims hereinafter following.

In the drawings forming a part of this specification, Figure 1 is a broken elevational view of one of the side walls of a refrigerator car and the sliding door for closing the usual door opening illustrating my improvements in connection therewith. Figure 2 is a broken horizontal sectional view on an enlarged scale, corresponding substantially to the line 2—2 of Figure 1. Figure 3 is a horizontal sectional view on a reduced scale on substantially the same line as Figure 2, illustrating the door in partly open position. Figure 4 is a view similar to Figure 3, but showing the door in another position. Figure 5 is a view similar to Figure 2, but showing the door moved entirely out of the door opening in position parallel to the car side wall. Figure 6 is a rear elevational view of a portion of the door structure shown in Figure 1, on an enlarged scale, illustrating in detail one set of separable cooperating hinge acting cam members. Figure 7 is a horizontal sectional view on an enlarged scale, corresponding substantially to the line 7—7 of Figure 1.

In said drawings, 10 indicates the side wall of a car which is provided with the usual door opening 11 closed by a single door 12. The door 12 is slidable lengthwise of the car and is displaceable laterally to either move the door into or withdraw the same from the door opening 11. The frame of the door opening may be of any well-known construction, and is provided with the usual door jambs 13 and 14 at the front and rear ends of said opening. As shown, the cooperating engaging faces of the door and walls of the door opening are stepped and beveled in a well-known manner and the usual insulating packing material, indicated by 15, is employed to seal the joint between the door and the walls of the door opening.

My improvements comprise broadly top and bottom tracks A—A; carriers B—B cooperating with the bottom track; two pairs of top and bottom combined supporting and journal brackets C—C and C—C; a pair of combined supporting and operating crank bars D—D journaled in said brackets; a pair of combined supporting and journal brackets E—E; a locking bar F journaled in the brackets E—E and having keeper engaging means thereon; top and bottom keepers G—G on the car wall above and below the door opening; three sets of cooperating cam members H—K, H—K, and H—K on the door and frame of the door opening; pivoted operating levers L—L on the bars D—D; a pivoted operating lever M for the locking bar F; two combined bearing and latch brackets N—N for the bars D—D; and latch members P and R for the locking bar F.

The tracks A—A are arranged respectively above and below the door opening, extend lengthwise of the car, and are fixed to the side wall in any well-known manner. The top track A is of inverted trough-shaped form in cross section, having the opening thereof directed downwardly, and the lower track A is in the form of a rail or bar. The structure of the tracks A—A is well known in this art, and therefore no further detailed description thereof is needed. Adjacent to the front end of the door opening, each track is provided with a stop block 16 of well-known

design. These stop blocks serve to limit sliding movement of the door 12 as the door is moved in front of the door opening 11.

The carriers B—B are in the form of blocks or slides and are supported on the lower track A by anti-friction rollers 17—17, which ride on said track and are suitably journaled in the carriers.

The combined door supporting and operating crank bars D—D are of like construction, are mounted at the front and rear ends of the door, and spaced inwardly from said ends a considerable distance, as clearly shown in Figures 1 to 5 inclusive. Each bar D is vertically disposed and is preferably of rectangular cross section. As shown most clearly in Figure 1, each bar D is provided with top and bottom end members 18 and 19 which are fixed thereto by rivets or similar securing elements. Each end member 18 and 19 is provided with a cylindrical shaftlike section 20 between the inner and outer ends thereof. The shaftlike sections 20—20 of said end members are journaled in the corresponding pair of top and bottom combined supporting and journal brackets C—C which are fixed to the door near the top and bottom edges thereof. Each end member 18 and 19 has a crank arm 21 at the outer end of the shaft section 20 thereof. These crank arms are arranged clear of the upper and lower edges of the door 12 so that they may swing without interference. The arm 21 of the bottom end member 19 is provided with a crank pin 22 at the outer end thereof which is journaled in a suitable bearing opening 23 in the corresponding carrier B. The arm 21 of the top end member 18 is also provided with a crank pin at the outer end thereof, which is indicated by 24, and, as shown, is of smaller diameter than the pin 22. A roller 25, which is journaled for rotation on the pin 24, is guided in the troughlike opening or channel of the top track A. As will be evident, the door 12 is thus supported for sliding movement on the tracks A—A by the crank portions of the end members 18 and 19 of each bar D, and is adapted to be moved laterally toward or away from the car wall upon rotation of the bars D—D. The arrangement is preferably such that the maximum rotation of said bars required to move the door the proper distance either into or out of the door opening is limited to an angle of approximately 90°. Each bar D is provided with an operating lever handle L between its ends pivotally supported for swinging movement at its inner end on said bar by a pivot 26, the pivoted end of the lever preferably being forked to embrace said bar. To place the lever L in position to rotate the bar D, the former is swung from the pendant position shown in Figure 1 to a horizontal position at right angles to said bar. Between the top and bottom ends, each bar D is braced by the combined bearing and latch bracket N which is fixed to the outer side of the door 12 by rivets or similar securing elements. The bracket N, as shown in Figures 1 and 7, comprises a pair of securing flanges 27—27 and an enlarged central bar receiving portion 28 between said flanges. The bar receiving portion presents a partly circular opening 29 in which the bar is rotatable. The interior wall of the opening 29 is offset inwardly at the front of said enlarged portion 28 to provide a radial stop shoulder 30 which has its stop face in a plane at right angles to the plane of the door and serves to arrest rotation of the bar D in the position shown in Figure 7, for a purpose hereinafter pointed out. On the outer side, the enlarged portion 28 of the bracket N is provided with an outstanding lip or tongue 31 laterally offset with respect to the shoulder 30 and forming a stop shoulder behind which the handle lever L may be dropped to latch said lever in position when the door has been moved entirely out of the door opening.

The locking bar F, which is vertically arranged on the door adjacent the right hand or rear edge thereof, as seen in Figure 1, is of rectangular cross section and has top and bottom end members 32—32 fixed thereto by rivets or similar securing elements. Each member 32 includes a short shaftlike section 33 between the ends thereof and a horizontally disposed crank arm 34 at the outer end of said shaftlike section. The crank arm 34 has a crank pin 35 at its outer end adapted to cooperate with one of the keepers G as hereinafter pointed out.

The combined supporting and journal brackets E—E are arranged at the top and bottom edges of the door 12 and serve to support the locking bar F on said door. Each bracket E is provided with a cylindrical bearing opening 36 in which the shaft section 33 of the corresponding end member 32 of the bar F is journaled. Each bracket E has a pair of ears 37—37 by which it is fixed to the door, rivets or similar securing elements extending through said ears being employed to attach said brackets to the door.

The keepers G—G are in the form of castings secured to the side wall of the car respectively above and below the door opening. These keepers are of well-known form, each being provided with an inclined cam slot 38 within which the crank pin 35 is engageable to forcibly move the door completely closed or pry the same partly open. As will be evident, when the bar F is rotated the crank pins 35—35 will travel along the cam slots 38—38 of the keepers G—G to effect such action.

The operating lever handle member M serves as means for effecting rotation of the bar F and is pivoted thereto, as indicated at 39, so that the lever may be either dropped to pendant position parallel to the bar F or raised to horizontal position at right angles to said bar.

The latch member P is of a type commonly employed to lock the operating handle of a locking bar in a horizontal position, and, as shown in Figure 1, serves to lock the lever M in such a manner as to prevent rotation of the bar F, thereby locking the door tightly closed. This latch is adapted to receive the usual car seal as is well known in this art.

The latch member R is in the form of a bracket secured to the outer side of the door adjacent to the lower end of the bar F and serves to hold the lever M against swinging movement about the axis of rotation of the bar F when the handle lever is dropped to pendant position after the bar has been rotated through an arc of 180°. The bracket R comprises a base portion 40 in the form of a plate secured to the outer face of the door, and a finger or arm 41 offset outwardly from said base portion and disposed parallel thereto. The finger 41 is joined to the base portion by a web at the left hand side of said plate, as seen in Figure 1. The handle lever M is engageable in back of said finger 41 to hold the handle and the bar F against accidental rotation while the door is being slid along the tracks A—A.

To properly brace the bar F, a bearing bracket 42 is also provided for said bar, said bracket being disposed between the top and bottom ends of the

bar and fixed to the door as clearly shown in Figure 1.

The cam members H, which are three in number, as shown in Figure 1, are secured to the door 12 at the front or left hand end thereof and cooperate respectively with the cam members K which are fixed to the door jamb 13, as shown in Figures 2, 3, 4, 5, and 6. Although three sets of cam members are shown in the drawings, it will be evident that a greater or lesser number may be employed as conditions require.

As shown in Figures 2, 3, 4, 5, and 6, each cam member H is in the form of a casting secured to the inner side of the door adjacent the front end thereof. The member H includes a base portion comprising two flanges 43 and 44 at an angle to each other and respectively overlying the rear face of the door and the adjacent beveled face of the end edge of said door. The member H further includes an inwardly curved cam portion 45 which forms a continuation of the flange 43 and projects outwardly beyond the flange 44 and the rear portion of the front edge of the door 12. The flange 43 and the cam portion 45 are suitably reenforced by top and bottom ribs or webs 46—46, as clearly shown in Figure 6.

Each cam member K is in the form of a plate of the horizontal cross section shown in Figures 2, 3, 4, and 5, having spaced, substantially flat, sections 47 and 48 secured respectively to the rear and side faces of the jamb 13, and an intermediate, inwardly curved, connecting section 49 seated in an opening in said jamb. The section 49 is suitably reenforced by top and bottom ribs 50—50 which are spaced apart vertically a greater distance than the height of the cooperating cam member H to accommodate the latter therebetween.

The operation of my improved door mechanism is as follows: Assuming the door to be closed, as shown in Figures 1 and 2, with the lever M of the locking bar F locked and sealed by the latch means P, the lever M after being unlocked by disengaging the latch means P therefrom is swung from left to right through an angle of 180°, thereby imparting rotation to the same extent to the bar F and the keeper engaging crank arms 34—34. The crank pins 35—35 being engaged within the cam slots 36—36 of the keepers, rotation of the crank arms effects camming action in said slots, thereby prying the rear end of the door out of the door opening with great force, swinging the door from the position shown in Figures 1 and 2 to that shown in Figure 3. In this movement the door swings about its front edge by rocking sliding movement of the cam members H—H—H of the door on the fixed cam members K—K—K on the door jamb, the cam members H and K of each set acting as separable hinge members. When the bar F has thus been rotated through an arc of 180°, the handle lever M is disposed on the right of the bar, as viewed in Figure 1. The bar F is then locked against rotation by dropping the lever to pendant position and engaging the same in back of the finger 41 of the latch member or bracket R. As will be evident upon reference to Figure 3, when the door has been thus far opened, the crank pins 35—35 of the bar F are so positioned that they clear the ends of the outer walls of the slots 36—36 of the keepers G—G to permit further free opening movement of the door. To further open the door to completely remove the same from the door opening, the operating bars D—D are rotated successively, the right hand bar, as shown in Figure 1, being the first rotated. To actuate this right hand bar D, the handle L thereof is first raised to horizontal position and then swung from left to right, as viewed in Figure 1. Rotation of this bar effects similar rotation of the supporting crank arms 21—21 thereof, thereby moving the door from the position shown in Figure 3 to that shown in Figure 4. Rotation of the bar D is limited to 90° and said bar is positively stopped when this limit of rotation is reached by engagement of the side face of said bar with the shoulder 30 of the bracket N. The handle lever L is then dropped to pendant position into engagement with the lip 31 of the bracket N, thereby locking the bar D against rotation in either direction, the shoulder 30 preventing rotation in one direction and the lip 31 preventing rotation in the reverse direction. The second bar D is then operated in a similar manner but in a reverse direction, thus moving the door 12 from the position shown in Figure 4 to that shown in Figure 5. In the position in Figure 5, the door is entirely clear of the side wall of the car and may be slid along the tracks to completely clear the door opening.

In this connection it is pointed out that, inasmuch as the shafts D—D are positively locked against rotation, there is no possibility of the door swinging on its arms while being slid along the tracks. Interference with proper sliding movement of the door is thus entirely avoided.

In closing the door, the operation is substantially the reverse of that hereinbefore described. The door 12 is first positioned in front of the door opening, as shown in Figure 5, by sliding said door along the rails A—A. The operating lever L of the left hand bar D is then unlocked from the lip 31 of the corresponding bracket N by raising the lever to horizontal position. This lever is then swung from left to right to rotate the bar D and swing the crank arms 21—21 thereof, thereby moving the door inwardly toward the position shown in Figure 4. While the front end of the door is thus being swung inwardly, the attendant slides the same to engage the cam members H—H—H in back of the cam members K—K—K, thus bringing the door to the position shown in Figure 4. The other bar D is then operated in a similar manner but in a reverse direction, moving the door from the position shown in Figure 4 to that shown in Figure 3. As will be seen upon reference to Figure 3, the crank pins 35—35 of the locking bar F are thus brought into alignment with the entrance openings of the cam ways or slots 36—36 of the keepers G—G. The locking bar is then unlocked by raising the handle lever M thereof from the pendant position to horizontal position, thus disengaging the lever from the latch member R. The bar F is then rotated by swinging the handle lever M from the right to left through an arc of 180°, thereby moving the door from the position shown in Figure 3 to that shown in Figure 2 and camming the same tightly closed by operation of the cooperating keeper engaging crank members 34—34 of the bar F and the keepers G—G and sliding and wedging action of the cooperating cam members of the sets H—K, H—K, and H—K. The operating handle lever M is then latched and sealed by the locking member P to lock the door in closed position.

I have herein shown and described what I now consider the preferred manner of carrying out my invention, but the same is merely illustrative and I contemplate all changes and modifications

that come within the scope of the claims appended hereto.

I claim:

1. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of guide means on said car extending lengthwise of the same; a pair of rotary operating bars on said door having sliding and rotary connection with said guide means; cooperating separable cam acting hinge members on said car and one end of said door; keeper means on the car; and a rotary cam acting locking bar at the other end of said door engageable with said keepers for forcing the door into said door opening and wedging said cam acting members together.

2. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of means for supporting and guiding the door for movement lengthwise of the car and laterally toward and away from said door opening; cooperating cam members on one end of the door and on the inner side of the car wall at said door opening; keeper means on the car; and a cam acting rotary locking bar on the other end of the door engageable with said keeper means for either forcing the door tightly closed and wedging said cam means together or prying the door partly open.

3. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of means for supporting the door and guiding the same lengthwise of the car, said last named means including a pair of rotary operating bars having supporting crank means thereon, said bars being disposed vertically and spaced inwardly from opposite ends of the door; cooperating cam members on one end of the door and on the inner side of the wall member of the car, said cam members being relatively slidable into overlapping wedging engagement; keeper means on the car; and a rotary locking bar on the other end of said door having crank means thereon engageable with said keeper means for either forcing the corresponding end of the door into the door opening and sliding said cam members relatively to each other to wedge the other end of the door tightly closed, or prying said corresponding end of the door open and withdrawing said cam members from wedging engagement with each other.

4. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of keeper means at the rear end of the door opening; a rotary locking bar at the rear end of the door engageable with said keeper means for either forcing the rear end of said door tightly into said opening or prying said end of the door partly open; cam means on the front end of the door engageable in back of the wall member of said car at the front end of said opening; operating means on said door located between said front and rear ends and inwardly of said locking bar and cam means for moving the door laterally outwardly and inwardly with respect to the side wall of the car; and means for supporting said operating means for sliding movement lengthwise of the car.

5. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of keeper means having cam faces inclined with respect to the side wall of the car; a rotary locking bar at the rear end of the door having crank means thereon engageable with said cam faces of the keeper means; a cam projection on the front end of the door engageable in back of the wall of the car at the front end of said door opening; rotary actuating bars on said door between said locking bar and cam projection; supporting crank arms on said bars having crank pins at the outer ends thereof; and means to which said crank pins are pivotally connected for guiding said pins for movement lengthwise of the car.

6. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of tracks above and below said door opening; a pair of vertically disposed operating bars on said door, said bars having crank arms at the top and bottom ends thereof supporting said door on said tracks for sliding movement lengthwise of the car, the outer ends of said arms being pivotally mounted for swinging movement with respect to said tracks; projecting cam means at one end of said door engageable in back of the wall of the car at the corresponding end of the door opening; a rotary actuating locking bar at the other end of the door having keeper engaging crank means at the upper and lower ends thereof; and slotted keepers above and below said door openings with which said keeper engaging crank means cooperates.

7. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of means for supporting the door and guiding the same for movement lengthwise of the car and laterally toward and away from the side wall of the car, said means including a rotary operating bar on said door having supporting crank means thereon; means for limiting rotation of said bar to not more than 90°; cam means on one end of said door; a rotary locking bar on the other end of the door; cam means on the car cooperating with said first named cam means for forcing the corresponding end of the door inwardly; and keeper means on the car with which said locking bar is engageable for forcing the corresponding end of the door inwardly and outwardly of said door opening.

8. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of a rotary operating bar on said door having crank arms thereon pivotally supported at their outer ends for swinging movement; means for limiting rotation of said bar to not more than 90°; means for locking said bar against rotation when the door is fully withdrawn from said door opening; means for supporting the pivoted ends of said arms for sliding movement lengthwise of the car; and means for forcing said door either tightly closed or prying the same partly open including cooperating cam means on the car and one end of said door and a keeper engaging locking bar at the other end of the door and cooperating keeper means on the car.

9. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door adapted to close said opening; of means for prying the same partly open or forcing said door tightly closed from said partly open position; means for moving said door from fully open position to said partly open position and from said partly open

position to fully open position including a pair of rotary crank bars rotatable through an angle of 90 degrees; a bearing on said door rotatably supporting each bar; stop means on said bearing for arresting rotation of said crank bar when the door is moved to fully open position; a stop finger on said bearing having a projecting stop face normal to the plane of the door; and a pivoted operating handle on said bar swingable on said bar in a vertical plane to pendant position in back of said finger in shouldered engagement with the stop face thereof to lock said bar against rotation when said door is in said fully open position.

10. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a sliding door adapted to close said opening; of means for supporting said door for lateral movement toward and away from said door opening; means for forcing one end of said door into and out of said opening; a projecting cam member on the other end of the door; and a cooperating cam member on the car in back of which said projecting member is engagable, said cam members having rocking and sliding engagement with each other.

11. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a sliding door adapted to clase said opening; of means for supporting said door for lateral movement toward and away from said door opening; means for forcing one end of said door into and out of said opening; a projecting cam member on the other end of the door; and a cooperating cam member on the car in back of which said projecting member is engageable, said cam members having cooperating curved faces slidable and rockable on each other.

12. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a sliding door adapted to close said opening; of means for supporting said door for lateral movement toward and away from said door opening; means for forcing one end of said door into and out of said opening; a projecting cam member on the other end of the door; and a cooperating cam member on the car in back of which said projecting member is engageable, said first named cam member having a convex cam face and said second named cam member having a concave face on which said convex face is rockable and slidable.

13. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a sliding door adapted to close said opening; of supporting tracks; means for moving said door laterally toward and away from the door opening, including a pair of rotary operating bars rotatable through an angle of substantially ninety degrees and crank arms on said bars pivotally and slidably connected to said tracks; an operating handle lever on each bar; means on said door for locking said operating handle in position parallel to the door to hold the corresponding operating bar locked in position; and additional means on the door for locking each handle in position with the bar rotated through an angle of ninety degrees from said first named position.

14. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a sliding door adapted to close said opening; of guide tracks on the car; means for moving said door laterally toward and away from said door opening, including rotary operating bars mounted on the door, crank arms on the ends of said bar having swinging and sliding connection with said tracks; an operating handle lever for rotating said bar, said lever being pivotally connected to the bar for swinging movement with respect to said bar in a plane radial to the axis of rotation of said bar to permit dropping said handle parallel to the bar; a latch on the door for locking the operating handle in position parallel to the door and radial to said bar; and additional latch means on the door, comprising a flange at right angles to the plane of the door, in back of which the handle lever is engageable when dropped to pendant position to lock said handle in position with the bar rotated through an angle of ninety degrees from the position of said bar when the handle is locked by said first named latch means.

15. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a sliding door adapted to close said opening, said door being laterally movable into the opening; of a cam plate projecting from the leading end of the door; and a cooperating cam plate in back of which said first named plate is engageable, said second named plate being fixed to the inner side of the door jamb.

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