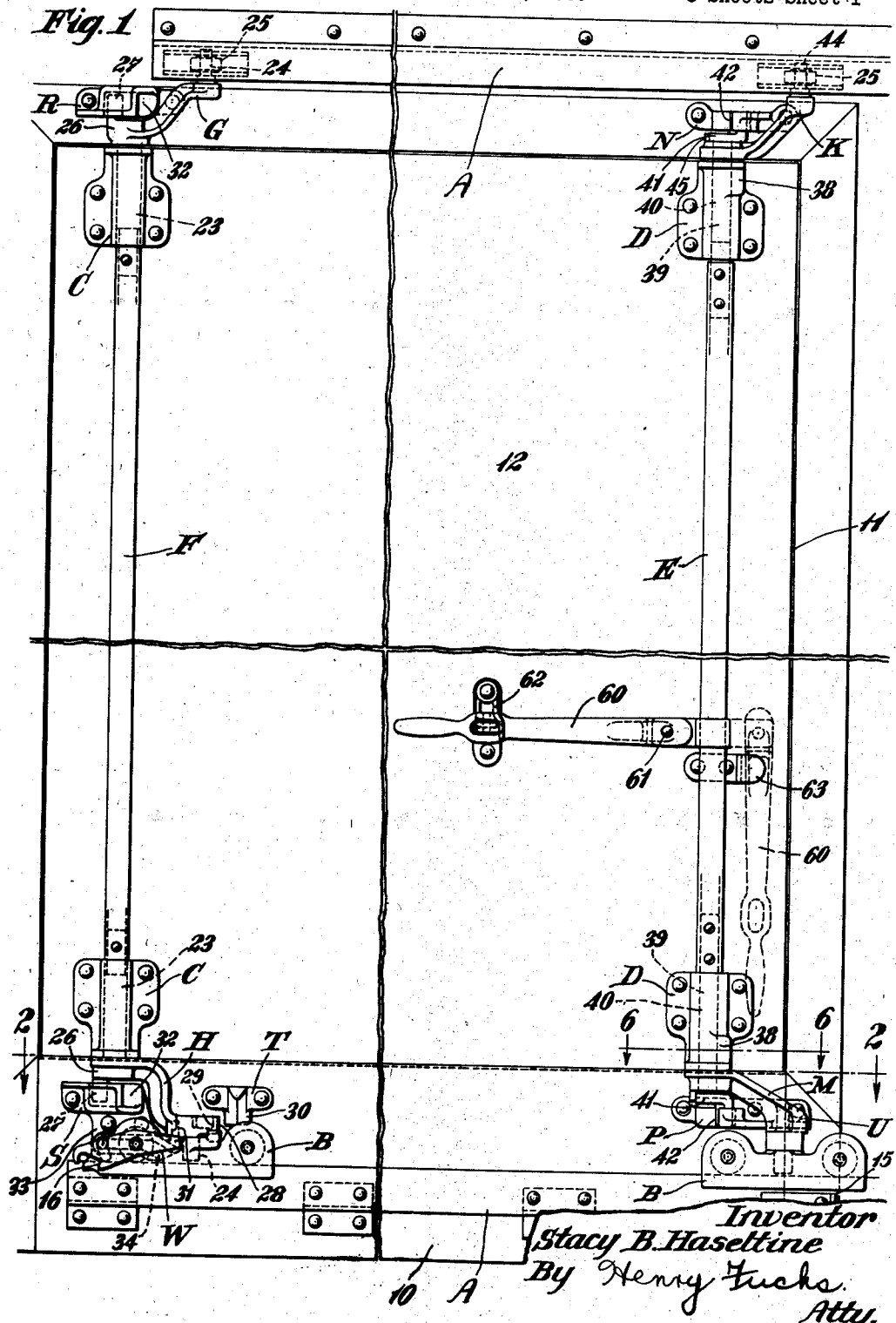
April 21, 1942. S. B. HASELTINE 2,280,232

REFRIGERATOR CAR DOOR

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Fig. 1

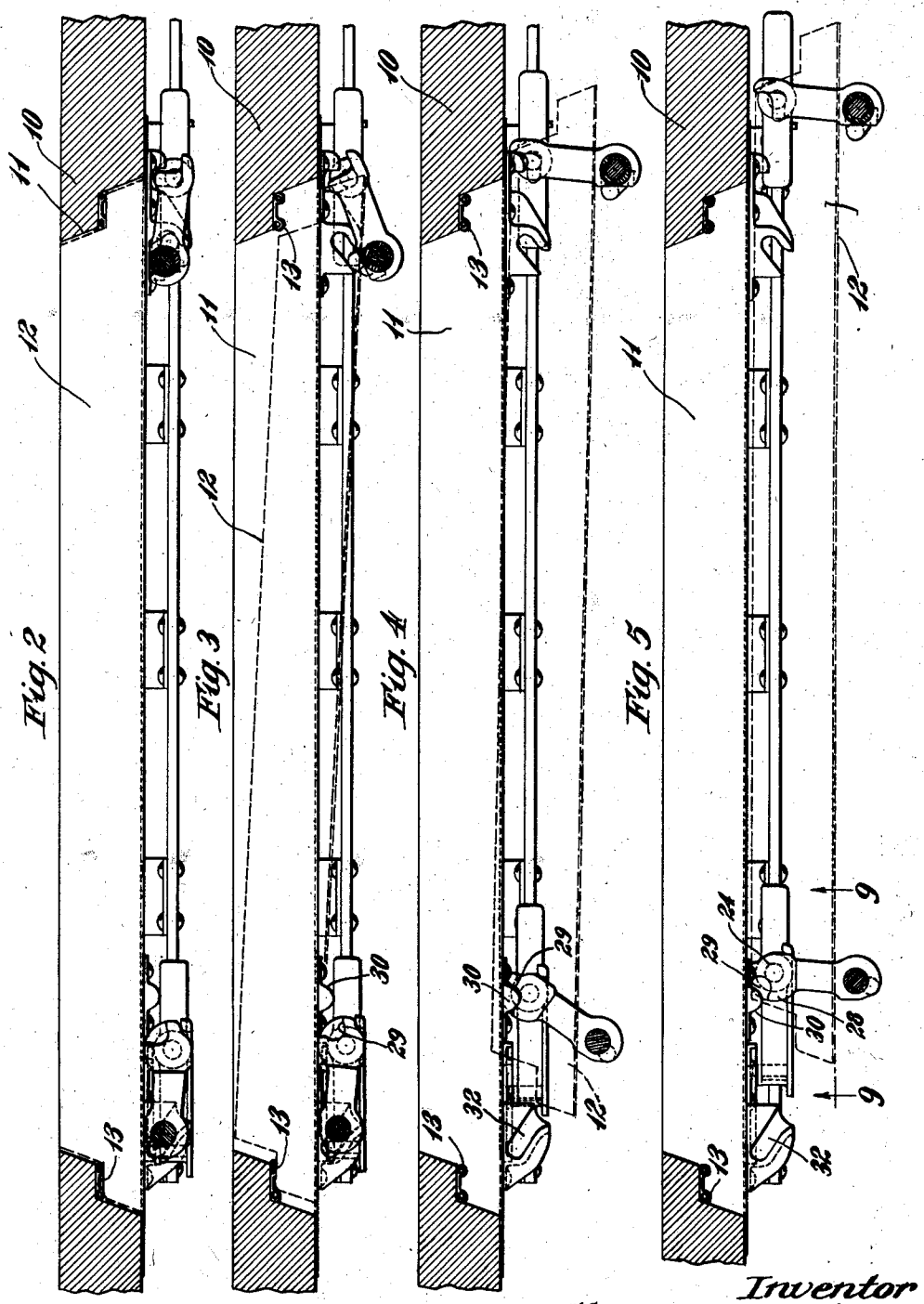


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REFRIGERATOR CAR DOOR

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Fig. 6

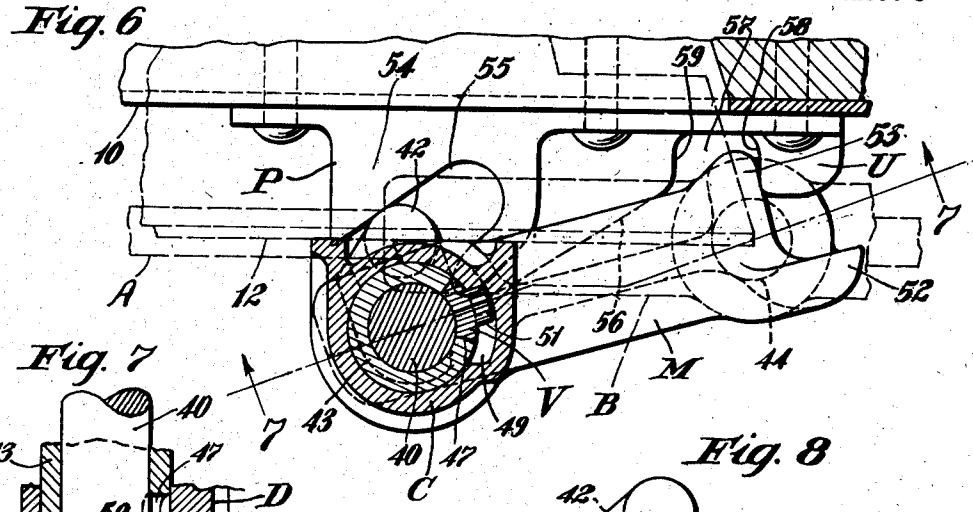


Fig. 7

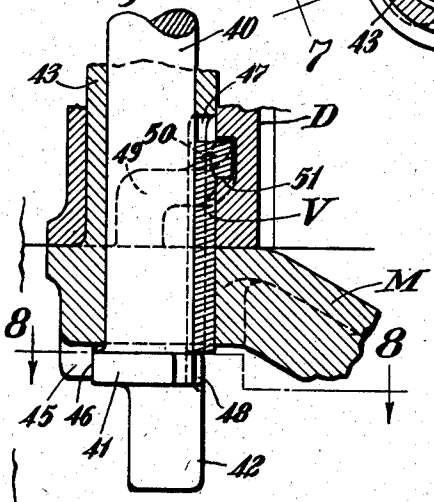


Fig. 8

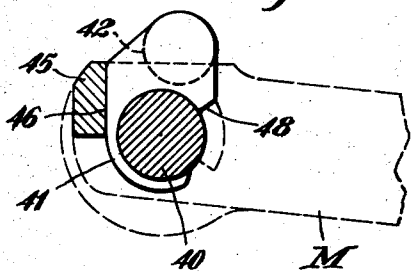
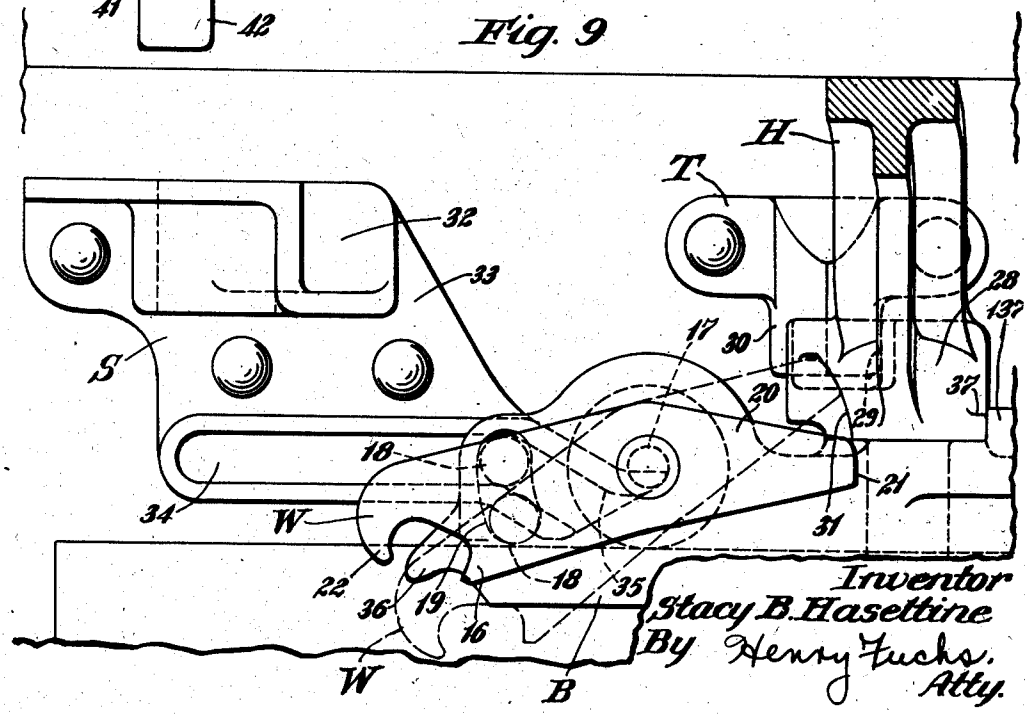


Fig. 9



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UNITED STATES PATENT OFFICE

2,280,232

REFRIGERATOR CAR DOOR

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Application December 27, 1938, Serial No. 247,737

20 Claims. (Cl. 20—23)

This invention relates to improvements in refrigerator car doors.

One object of the invention is to provide a door construction for refrigerator cars comprising a sliding door member for closing the door opening and means for supporting the door for lateral movement toward and away from the side of the car into and out of the door opening, wherein simple and efficient means is provided for automatically displacing the door laterally as it is slid to and from closed position to seat the same in its opening and withdraw it therefrom.

Another object of the invention is to provide in a sliding door structure for refrigerator cars, means for automatically moving one end of the door laterally into and out of the door opening as the door is slid to and from closed position together with means which is manually actuated for forcing the other end of the door into the door opening to tightly close the same or pry said last named end out of the door opening to effect opening movement of the door.

A still further object of the invention is to provide a sliding door structure as set forth in the preceding paragraph, wherein means is provided for positively effecting displacement of the door in endwise direction as the same is forced into and out of the door opening to and from closed position by the manually actuated means, thereby rendering said automatically operated means effective to perform its operation.

Yet another object of the invention is to provide a sliding door structure comprising means for automatically moving both ends of the door into and out of the door opening as the door is slid toward and away from closed position, together with manually actuated means at one end of the door for positively forcing the door to final tightly closed position and initially prying the same partly open.

Still another object of the invention is to provide in a door construction for refrigerator cars comprising a door member mounted on swinging arms pivotally supported on carriers slidable lengthwise of the car, fixed cam means engageable by said arms as the door is slid lengthwise of the car to swing said arms to move the door laterally into and out of the door opening, together with manually actuated means for forcibly moving said door to tightly closed position after the same has been moved into the door opening, and for initiating the opening movement of the door by forcibly prying the same partly open.

A more specific object of the invention is to provide a door construction for refrigerator cars comprising a door member supported on a swinging arm pivoted on a carrier slidable lengthwise of the car, manually operated rotary means on the door having keeper engaging means thereon cooperable with a fixed keeper on the car to force the door tightly closed and pry the same partly open, latch means for operatively connecting the swinging supporting arm to the rotary means and disconnecting the same therefrom to thereby positively effect rotation of said arm to move the door into and out of the door opening and permit free rotation of said manually operated rotary means with respect to said swinging arm while the keeper engaging means is operatively engaged with the keeper, and means for positively actuating said latch means and properly timing the operation thereof during rotation of said swinging arm and controlling rotation of the latter.

Still another more specific object of the invention is to provide in a door construction for refrigerator cars comprising a sliding door member supported by a crank arm pivoted for swinging movement on a sliding carrier, means for automatically swinging the arm to move the door into and out of the door opening as the same is slid toward and away from closed position, and means for positively and automatically latching said arm against rotary movement when the door is in position free of the door opening and clear of the side wall of the car, to hold the door against accidental lateral displacement during sliding movement thereof toward and away from the door opening, thereby holding the door clear of the side wall of the car at all times during sliding movement thereof and preventing dragging of said door on the side wall of the car, which would materially interfere with its proper operation.

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 horizontal sectional view, on an enlarged scale, corresponding substantially to the line 2—2 of Figure 1, the door being indicated in dotted lines. Figures 3, 4, and 5 are views similar to Figure 2, but respectively showing the door and associated means in different positions. Figure 6 is a detailed horizontal sectional view, partly broken away, and on a still

further enlarged scale, corresponding substantially to the line 6—6 of Figure 1, but said view showing the parts in a different position. Figure 7 is a vertical sectional view, corresponding substantially to the line 7—7 of Figure 6. Figure 8 is a horizontal sectional view, corresponding substantially to the line 8—8 of Figure 7. Figure 9 is an enlarged view, broken away, of the mechanism at the lower left hand corner of the door, as shown in Figure 1, said view showing the door supporting crank arm in vertical section and illustrating the parts in a somewhat different position from that shown in Figure 1.

In said drawings, 10 indicates the side wall of the 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 both laterally toward and away from the side of the car to be moved into or withdrawn from the door opening 11. 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 13, 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 sets of top and bottom journal brackets C—C and D—D on the door; an operating bar E at the rear end of the door having keeper engaging crank members thereon; a rotary connecting bar F at the front end of the door having keeper engaging means thereon; supporting sets of crank members or arms G—H and K—M at the front and rear ends of the door, the arms G and H being fixed to the bar F and the arms K and M being connected to the bar E; keeper castings N and P at the top and bottom of the door opening cooperating with the keeper engaging crank portions of the bar E; keeper castings R and S also at the top and bottom of the door cooperating with the keeper engaging means of the bar F; a fixed cam member T on the car wall cooperating with the supporting crank arm H; a fixed cam member U on the keeper casting P cooperating with the arm M; latch means V—V for connecting the bar E to the crank arms K and M; and a latch means W engageable with the arm H of the bar F to hold the latter together with the arm G against rotary movement.

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 preferably 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.

The carriers B—B are in the form of slides supported on the lower track A by the usual anti-friction rollers which ride on the track and are suitably journaled in the carriers. The front carrier B supports the latch plate or locking dog W adapted to cooperate with a stop projection 15 on the track at the right hand end of the door opening, as shown in Figure 1, to latch the door in open position. The stop 15 may be of any well-known form to cooperate with the tooth 16 of the dog W to hold the door against sliding movement in closing direction when the door has been moved to fully open position clear of the door opening 11. The dog or latch W also cooperates with the lower door supporting crank arm H of the bar F, as hereinafter described, to lock said arm against rotation under certain conditions. The latch plate W is swingingly mounted on the left hand carrier B for rocking movement in a vertical plane, as most clearly shown in Figure 9, a pivot pin 17 being employed for this purpose, which pin also serves as the bearing for the anti-friction roller at the forward end of the carrier. The plate W is mounted on the outer side of the carrier and is provided with a laterally, inwardly projecting boss or pin 18 extending through and working in an arc-shaped slot 19 provided in the carrier B. The pin 18 projects beyond the inner side of the carrier and is adapted to be raised or lowered by the cam means hereinafter described to actuate the latch plate W. The rear end portion or tail 20 of the latch plate W is tapered, as shown, and the extremity of said tapered portion is rounded off, as indicated at 21. The tail 20 of the latch plate W cooperates with the lower arm H of the bar E, as hereinafter pointed out, to lock said arm against rotation. The latch plate W is extended outwardly beyond the tooth 16 and has a hook 22 at the free end thereof by which it may be manipulated to disengage the tooth thereof from the stop projection 15.

The bar F is vertically disposed and mounted inwardly of the front or leading end of the door, as clearly shown in Figures 1 to 5 inclusive, and has the supporting crank arms G and H respectively at the top and bottom ends thereof. These crank arms or members G and H are in the form of end members riveted or otherwise secured to the top and bottom ends of the bar. Each crank member has a vertically disposed, shaftlike section 23 journaled in the corresponding bracket C. The shaftlike portions 23—23 of the top and bottom crank arms G and H are thus supported for rotary movement. Inasmuch as these arms are connected by the bar F, they swing in unison. Each crank arm G and H has a cylindrical bearing or pivot pin 24 at its outer end, the pin of the crank arm H, which arm is at the bottom of the bar F, being journaled in the front carrier B to provide for swinging movement of said arm with respect to the carrier. The crank arm G at the top of the bar F has a roller 25 journaled on the crank pin 24 thereof, the roller being guided in the troughlike way of the upper track A. As will be evident, the front end of the door 12 is thus swingingly supported on the tracks by the crank arms G and H and guided into the door opening by said crank members in their swinging movement. Each end member has a lateral, relatively short extension 26, diametrically opposite to the corresponding crank arm thereof, provided with a keeper engaging lug or pin 27 which is eccentric to the bar F and adapted to cooperate with the corresponding keeper R or S. The pin 27 of the arm H depends therefrom and that of the arm G is upstanding to properly engage with the respective keepers. As will be seen upon reference to Figure 1, these arms G and H are of slightly different design, the arm G being upwardly inclined from the end of the bar F, while the arm H has its outer end angularly offset in a downward direction with respect to the lower end of said bar. The arm H further differs from the arm G in that the pivoted end of the former is provided with an enlarged hublike portion 28

slightly eccentric to the pivot pin 24 thereof. This hublike portion has a cam opening or recess 29 in one side thereof, as clearly shown in Figures 1 to 5 inclusive and Figure 9, adapted to cooperate with the cam member T to swing the arm H on its pivot, as hereinafter described.

The cam member T is in the form of a casting secured to the side wall of the car in proper position to cooperate with said arm to actuate the same, said casting having a laterally outwardly projecting rounded cam portion 30 of substantially the contour shown in Figures 2 to 5 inclusive. The hub 28 of the arm H is further provided with an upwardly curved latch shoulder 31 with which the tail 20 of the latch plate W is adapted to engage to lock said arm against rotation. As will be evident upon reference to Figure 9, the rounded end face 21 of the tail 20 of the latch W and the curved surface of the latch shoulder 31 are substantially concentric so that the latch may swing on its pivot to a limited extent without becoming disengaged from the arm H to thereby permit the tooth 16 of the latch W to ride over and drop into engagement with the stop projection 15 as the door is brought to fully open position.

The top and bottom keepers R and S, which cooperate respectively with the pins 27—27 of the arms G and H are of similar design, except as hereinafter pointed out. Each keeper is in the form of a casting secured to the side wall of the car having an inwardly inclined slot 32 within which the pin 27 of the corresponding door supporting arm is adapted to engage to cam the door laterally inwardly as the same is displaced lengthwise of the car in closing direction. As will be evident, the keepers are inverted with respect to each other, that is, the slot of the lower keeper S opens upwardly while that of the upper keeper R opens downwardly. The keeper casting S differs from the casting R in that it has a depending portion 33 provided with a laterally opening guide slot 34. The major portion of the slot 34 is substantially horizontally disposed, as shown most clearly in Figures 1 and 9, and has a mouth or entrance opening at the right hand end thereof as seen in Figure 9. A relatively short portion of said slot at the mouth thereof is upwardly inclined, as indicated at 35. The slot 34 is adapted to slidingly receive and guide the end of the pin 18 of the latch plate W to effect movement of the latch plate, the inclined portion 35 of said slot forming a cam way which lowers and raises the pin as it passes along the slot to thereby engage the tail of the latch plate with the shoulder 31 of the arm H or disengage the same therefrom. Downward movement of the pin 18 is limited by engagement of the same with the lower end wall of the slot 19 of the front carrier B, thereby limiting swinging movement of said latch plate and assuring alignment of the pin with the mouth of the slot 34 to freely enter said slot as the door is slid toward closed position. To control upward movement of the toothed end of the latch plate W and prevent unlocking of the arm H, at the time the latch is being manually manipulated to disengage the tooth 16 thereof from the stop 15, a depending lip 36 is provided on the carrier B, which serves as an obstruction in the path of attendant's finger when engaged with the hook 22 to lift the latch.

The fixed cam member T is spaced such a distance from the keeper casting S that the pin 18 of the plate W enters the slot 34 and rides up the inclined section 35 thereof as the door is being slid to closing position, and before the crank arm H reaches its position of engagement with the cam projection 30 of the member T. In riding up the inclined portion 35 of the slot 34, the pin 18 swings the latch plate W from dotted to the full line position shown in Figure 9, thus disengaging the latch plate from the shoulder 31 of the arm H and permitting free swinging movement of the latter. As will be evident, the arm is thus free to swing during the time that the pin is moving along the horizontal portion of the slot 34. As soon as the arm H is unlatched, the cam opening 29 of the arm engages over the cam lug 30 and rides on the latter, thus effecting swinging movement of the arm to move the door laterally into the door opening. Inasmuch as the arm H is fixed to the bar F, which in turn is fixed to the upper crank G, the latter will be swung inwardly to the same extent as the arm H, thereby effecting equal inward displacement of the door at the top and bottom thereof. As the arms G and H swing inwardly, the keeper engaging pins 27—27 thereof are registered with and enter the inclined slots 32—32 of the keepers R and S. As will be evident, after engagement of the pins 27—27 with the keeper engaging slots, further sliding movement of the door toward closed position causes the pins 27—27 to be cammed laterally inwardly along the inclined walls of the slots to force the leading end of the door tightly into the door opening.

In opening the door, the movement of the same being in the reverse direction to that just described, the operation of the parts is also reversed, the leading end of the door being forced laterally outwardly by the camming action of the pins 27—27 in the slots 32—32 of the keepers R and S until they leave the slots and the cam opening 29 of the arm H comes into operative engagement with the cam projection 30 of the member T to further swing said arm outwardly during sliding movement of the door. This action continues until the arm H reaches substantially the position shown in Figure 5. When this arm reaches that position, the pin 18 has traveled down the inclined portion 35 of the slot 34 of the keeper casting and swung the latch W from the full to the dotted line position shown in Figure 9 to lock the arm H against inward swinging movement. In this connection attention is called to the fact that swinging movement of the arm in a reverse direction is also positively limited by a stop shoulder 37 on the hub 28 of said arm coming into engagement with a stop shoulder 137 on the carrier B.

The brackets D—D are similar to the brackets C—C with the exception that each bracket D is provided with an enlargement 38 at one side to accommodate the latch V. These two brackets D—D are located adjacent the right hand end of the door as seen in Figure 1 at the top and bottom edges thereof and serve to rotatably support the crank arms K and M and the operating bar E. The operating bar E is provided with end members 39—39 which are secured thereto by rivets or similar fastening elements. Each end member 39 includes a cylindrical shaft portion 40 having a keeper engaging crank arm member 41 at its outer end provided with a keeper engaging crank pin 42 at its extremity.

The door supporting crank arms K and M are of similar design, except as hereinafter pointed out, each arm having a hollow cylindrical sleevelike shaft portion 43 at its inner end jour-

naled in the corresponding bearing bracket D, as shown most clearly in Figure 7. This sleeve-like shaft 43 serves as a bearing for the shaft 40 of the corresponding end member 39, the shaft 40 of the latter extending entirely through the sleeve 43. Each crank arm K and M is provided with a cylindrical bearing pin 44 at the outer end thereof by which the same is swingingly supported, the pin of the arm M being journaled in the right hand carrier B, as seen in Figure 1, and the pin of the arm K carrying a roller similar to the roller 25 of the arm G, also indicated by 25, and guided in a similar manner in the channel of the upper track A. At the inner end of each arm K and M, that is, the end thereof which carries the bearing sleeve 43, an outstanding stop lug 45 is provided. As shown in Figure 7, the lug 45 depends from the arm M. As will be evident, the arm K, which is at the top of the door, is inverted with respect to the arm M and has its lug upstanding. Each keeper engaging crank arm 41 has a flat face 46 on the side thereof, as clearly shown in Figures 7 and 8, adapted to engage the lug 45 of the corresponding crank arm K or M to effect swinging movement of said arm when the bar E is rotated in contraclockwise direction, as viewed in Figure 8. To effect swinging movement of the arms K and M in reverse direction with the bar E, identical latch means is provided for each of said arms. This latch means in each instance includes the latch member V which is in the form of a plate of arc-shaped, transverse cross section, slidably mounted for vertical movement in a guideway 47 in the sleevelike shaft portion 43 of the door supporting crank arm. As most clearly shown in Figure 6, the guideway 47 is formed by cutting away a portion of the wall of the sleeve 43. The sliding latch plate V preferably corresponds in thickness to the thickness of the wall of the sleeve 43, and in width fills the guide opening 47. The arm 41 of the keeper engaging crank member is notched or cut away on the side opposed to the abutment face 46, as most clearly shown in Figure 8, to provide a radial abutment shoulder 48 with which the latch plate V is adapted to cooperate. This notched or cut away portion accommodates the end of the latch plate when projected so that the side of this end portion of the plate is positioned to be engaged by the shoulder 48 when the crank arm 41 is rotated in clockwise direction by the bar E. Inasmuch as the latch plates V are mounted in the sleevelike shafts 43—43 of the crank arms K and M, the latter are operatively connected to the bar E by the latches when projected. Reciprocating movement in a vertical direction is imparted to each latch V to bring the same to projected latching position and retract the same from said position. To effect this movement, a cam groove 49 having an inclined portion 50 is provided in the cylindrical wall of the bearing opening of the bracket D and a radially projecting lug 51 is provided on the latch plate V which rides in said groove. Rotation of the crank arms K and M with respect to the bearing brackets D—D thus imparts the required reciprocation to the latch plate.

The crank arm M, as most clearly shown in Figures 2 to 6 inclusive, is provided at its pivoted end with a projecting finger 52 extending lengthwise from said arm. At the base of the finger 52 the arm M is provided with a second finger 53 substantially at right angles to the finger 52 and projecting laterally from said arm. Between these fingers the metal of the arm is cut away, as shown. These fingers 52 and 53 cooperate with the cam projection or lug U, as hereinafter pointed out to swing the arm M.

The keeper casting P is secured to the wall 10 of the car below the door opening 11 at the right hand end of the latter, as shown in Figure 1, and cooperates with the keeper engaging crank member 41 at the lower end of the bar E and also carries the cam lug U which cooperates with the door supporting crank arm M. This casting comprises an elongated, base-like portion secured to the car wall by rivets or any other similar securing elements. At the left hand end, as seen in Figures 1 and 6, the keeper casting P is provided with an enlargement 54 which has an inwardly inclined cam slot 55 within which the pin 42 of the arm 41 is adapted to engage. At the right hand end the base of the casting P carries the fixed cam member or lug U, which is in the form of an outward projection on said base. The lug U is rounded off at the right, as shown most clearly in Figure 6. A horizontal web 56 projects outwardly from the base of the casting P in horizontal alignment with the lug and extends to and is formed integral with the enlargement 54. As will be seen upon reference to Figure 6, the right hand end of the web 56 is spaced from the lug U, thus providing a recess 57 having spaced side walls 58 and 59 at right angles to the base of said keeper casting.

The keeper casting N, which is located above the door opening has a cam slot similar to the cam slot 55 of the casting P adapted to receive the crank pin 42 of the keeper engaging crank arm 41 at the upper end of the bar E. The slot of the keeper N faces downwardly and is in vertical alignment with the slot 55 of the keeper P. In other words, the keeper N is of the usual slotted type commonly employed with keeper engaging crank bars of door fasteners. In this connection it is pointed out that although the keeper N and the door supporting crank arm K, which are at the top of the door, are not provided with cooperating cam means similar to that of the lower keeper P and the crank arm M, fixed cam means may be provided on the car which cooperates with each of said supporting crank arms for operating the same, if found desirable, and such a structure is clearly within the scope of my invention.

As will be evident, during sliding movement of the door the fingers 52 and 53 of the arm M will engage the cam lug U to throw the arm either inwardly or outwardly depending on the direction of sliding movement of the door, thus moving the door laterally inwardly or outwardly as the case may be. Similarly when the bar E is rotated in contraclockwise direction, as viewed in Figure 6, the arm M will be thrown outwardly by engagement of the abutment face 46 with the lug 45, and will be thrown inwardly by rotation of the bar in clockwise direction at the time the arm is latched to the bar by the plate V.

The bar E is adapted to be manually rotated by an operating handle lever 60 pivoted, as indicated at 61, so that it may be dropped to pendant position. A latch 62 of well-known form mounted on the door and adapted to receive the usual car seal, is employed to lock the handle in position when the door is closed, as illustrated in Figure 1. A second latch means, comprising a latch plate 63 is fixed to the door in such a position that the handle lever 60 may be dropped behind the same, as shown in dotted lines in Figure

1, after rotation of the bar E through an arc of 180° to hold the door supporting crank arms K and M against swinging movement, so that the door will be held against lateral movement when being slid along the tracks.

In opening the door the operation of my improved mechanism is as follows: Assuming the door to be in the tightly closed position shown in Figures 1 and 2 with the operating handle lever 60 locked against the door by the latch 62, as indicated in full lines in Figure 1, the latch is first disengaged from the handle lever and the latter is then swung from left to right through an arc of approximately 180°, thereby rotating the bar E to the same extent. As will be evident, the bar will thus be rotated in contra-clockwise direction, as viewed in Figures 2 to 5 inclusive. The keeper engaging crank arms 41—41 of the bar E, the pins 42—42 of which are engaged within the slots 55—55 of the keepers N and P, will thus cam the door outwardly during the initial rotation of said bar, bringing the parts to the position shown in Figure 3. When the parts reach this position, the keeper engaging pins 42—42 will have reached the outer ends of the slots 55—55 of the keepers N and P and will be free to leave said slots as the door supporting crank arms K and M swing further outwardly with the door. At the same time the lug 45 on the arm M and the corresponding lug of the arm K are engaged by the abutment faces 46—46 of the upper and lower keeper engaging arms 41—41, thus compelling the arms K and M to be rotated in unison with the bar. At this stage of the operation, the latches V—V of the arms K and M will be actuated through relative rotation of the arms with respect to their bearing brackets D—D, the lugs 51—51 of said latches entering the inclined sections 50—50 of the slots 49—49 of the bearing brackets. Thus, during any further rotation of the bar E, the latches V—V will be projected outwardly to engage the shoulders 48—48 of the keeper engaging crank arms 41—41. Referring to Figure 3, it will be noted that during the initial operation of the bar E just described, the swinging movement of the supporting crank arms M and K on the corresponding carriers B—B will also effect slight displacement of the door 12 from left to right, thus drawing the leading or left hand end of the door away from the left hand end wall of the door opening. The pins 27—27 of the supporting crank arms G and H of the bar F will thus move outwardly in the slots of the keepers R and S, causing these crank arms to be cammed outwardly to a slight extent. During further rotation of the bar E beyond the initial rotation referred to, the parts will be moved from the position shown in Figure 3 to the position shown in Figure 4, the door supporting arms K and M being positively rotated by the bar E through engagement of the lugs 45—45 of said arms by the shoulders on the keeper engaging crank arms 41—41. At the same time the cam lug U of the keeper P will be engaged by the finger 52 of the arm M, thus positively camming the door to the right while it is being swung outwardly on the arms K and M. During this outward movement of the door, and displacement thereof to the right, the door supporting arms G and H at the leading end of the door are swung outwardly, firstly by sliding movement of the pins 27—27 of these arms in the inclined slots 32—32 of the keepers R and S, and secondly by engagement of the cam opening 29 of the arm H over and with the cam projection 30 of the member T. When the handle lever 60 has been swung through an angle of 180°, the same is dropped to pendant position, as indicated in dotted lines in Figure 1 and engaged in back of the latch plate 63 to lock the operating bar E and the door supporting crank arms K and M against rotation, these crank arms being at this time securely locked to the bar by the lugs 45—45 and the latch plates V—V. The attendant now pushes the door to the right to slide the same open until it completely clears the door opening. At the start of this sliding movement, the door supporting arms G and H at the leading end of the door will be cammed outwardly to fully open position by the fixed cam member T. This is approximately the position shown in Figure 5 where the cam will clear the walls of the opening 29 of the arm H. While the door is being moved from the position shown in Figure 2 through the position shown in Figures 3 and 4 to the position shown in Figure 5, the pin 18 of the latch plate W will travel along the slot 34 and down the inclined portion 35 thereof, thereby swinging the tail of the latch plate into locking engagement with the arm H to hold the same and the upper arm G against swinging movement. The door will thus be rigidly held against lateral movement at both ends while it is being slid to fully open position. When the door approaches its fully open position, the latch plate W rides over the stop 15 and the tooth 16 thereof drops behind the stop to lock the door when it reaches said open position.

To close the door, the latch plate W is first disengaged from the stop 15 by lifting the hooked end thereof, the hook serving as a convenient finger grip for manipulating the same. The door is then pushed to the left to slide it in front of the door opening. As the door is being pushed along the tracks, the cam portion of the door supporting arm H at the leading end of the door comes into operative engagement with the fixed cam T before the cam finger 52 of the supporting crank arm M at the rear end of the door comes into engagement with the fixed cam U, as will be clear upon reference to Figure 5. However, before the cam portion of the arm H actually comes into engagement with the lug 30 of the fixed cam T, the pin 18 of the latch plate W enters the slot 34 of the keeper casting S and travels through the inclined portion 35 of said slot to swing the latch to unlock the arm H. The arm H, which is thus free to swing, moves approximately to the position shown in Figure 4 by engagement with the cam lug 30 of the cam member T when the door has been slid to an extent to engage the finger 52 of the door supporting crank arm M with the cam lug U. Inasmuch as the bar E is held against rotation by engagement of the operating handle lever 60 with the latch plate 63, further sliding movement of the door cannot be effected until the handle lever 60 has been released because of engagement of the finger 52 with the cam lug U. At this stage of the operation, the operating handle lever 60 is unlatched from the plate 63, thereby permitting rotation of the bar E and the door supporting crank arms K and M. After unlatching the lever 60, the same is swung to horizontal position and then from left to right through approximately 180° to rotate the bar E and effect closing of the door. Rotation of the bar E imparts swinging movement to the door supporting crank arms K and M, which, at this

time, are locked to the bar by the latches V—V. As the arms K and M are swung on their pivots the door is moved laterally inwardly and displaced to the left. During this displacement to the left, the door supporting crank arms G and H at the leading end of the door will be forced to swing in a clockwise direction, as viewed in Figures 5, 4, 3, and 2, first by camming action between the cam portion 29 of the arm H and the cam projection 30 of the fixed cam T and finally by wedging engagement of the keeper engaging pins 27—27 of the arms G and H within the inclined slots of the keepers R and S. Manual rotation of the bar E to swing the door supporting crank arms in clockwise direction to close the door, as hereinbefore pointed out, will swing the arm M through the position shown in Figure 6, thereby bringing the finger 53 of said arm in shouldered engagement with the wall 58 of the cam member U and positively camming the door to the left, thus forcibly moving the pins or lugs 27—27 into the ends of the slots of the keepers R and S, and camming the leading end of the door tightly closed. As the arm M moves toward the position shown in Figure 6 and the arm K moves in a like manner, the latch V of each arm is moved inwardly by sliding action of the lug 51 of said latch in the inclined portion 50 of the slot 49 to withdraw the latch from active engagement with the shoulder 48 of the corresponding arm, thereby freeing said arm so it may rotate with respect to the shaft E. When the arm M reaches the position shown in Figure 6 and the upper arm K reaches a like position, the latches of both arms are completely disengaged so that they merely support the door. As shown in said figure, the operating bar E has been rotated to a sufficient extent to engage the pins 42—42 of the keeper engaging crank arms 41—41 with the slots 55—55 of the keepers N and P, and further rotation of the bar E forces the rear end of the door tightly closed through camming action of the keeper engaging ends of the bars in the slots of said keepers. During this final inward camming action, through rotation of the bar E, the arms K and M are swung inwardly with the door to the position shown in Figure 2, thereby effecting complete closing of the door. The operating handle lever 60 is then locked by the latch 62 and sealed in the usual manner.

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; means slidable lengthwise along said guide means for supporting the door including movable door supporting members, said members being movable with respect to the slidable means to displace the door laterally toward and away from the door opening; a fixed projection on said car wall; and means having engagement with one side of said projection when said door is slid in one direction for moving said supporting members in a direction to move said door laterally into the door opening, and having engagement with the opposite side of said projection, when said door is slid in a reverse direction, for moving said door supporting members in a reverse direction to move said door laterally out of the door opening.

2. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door slidable lengthwise of the car in front of and away from said door opening; of swinging supporting arms for said door; a projecting abutment lug on the car; and projecting cam means on one of said arms engageable with one side of said lug when the door is moved in one direction and with the other side of said lug when the door is moved in a reverse direction for automatically swinging said arms inwardly and outwardly as the door is moved lengthwise of the car in reverse directions to move said door laterally into and out of said door opening.

3. In a door construction for refrigerator cars having a wall member provided with a door opening, the combination with a door slidable lengthwise of the car in front of and away from said door opening, said door being movable laterally into said opening to close the same; of guide means on said car extending lengthwise thereof; means slidable lengthwise of the car along said guide means for supporting the door including door supports movable laterally with respect to said slidable means and said guide means; fixed projecting means on the car wall; and movable means associated with said supports intermeshing with said projecting means when the door is slid in reverse directions to and away from closed postion for automatically actuating said door supports to move the same in respectively reverse directions laterally through sliding movement of said door when positioned at said door opening to move said door laterally into and out of the door opening.

4. 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 door opening; of door supporting means movable to project said door into said opening and withdraw the same therefrom; a fixed projection on the car wall; and cam means engaged with said projection when the door is being moved toward and away from closed position and actuated through sliding movement of the door for positively actuating said first named means in reverse directions for closing and opening said door.

5. 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 means on said car extending lengthwise of the same; means slidable on said guide means for supporting the door including swinging arms; and fixed cam means on the car engaged by said arms during sliding movement of said door, toward and away from said door opening for positively actuating said arms to swing the same in and out and move said door laterally into and out of the door opening.

6. 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 means on said car extending lengthwise thereof; means slidable on said guide means for supporting the door at one end including a reversely movable rotary member for displacing said door laterally toward and away from the side wall of the car; and means for positively actuating said movable

member in reverse directions to move the first named end of the door laterally into and out of the door opening, comprising intermeshing projecting means on the car and said movable member, said projecting means on the car being fixed and in the path of movement of said projecting means on the movable member during sliding movement of the door to and from closed position to operatively engage said intermeshing means and actuate said movable member as the door is slid along the guide means.

7. 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 means on said car extending lengthwise thereof; means slidable on said guide means for supporting the door at one end including a swinging crank arm rotatably connected to the door; cam means on the car engageable by said arm when said door is slid toward and away from closed position for swinging said arm in reverse directions to move said door laterally toward and away from the side of the car; additional means slidable on said guide means for supporting the other end of the door including a crank arm rotatably connected to the door; a rotary operating bar on the door at said second named end having keeper engaging means thereon; keeper means with which said engaging means coacts for forcing said second named end of the door tightly closed and prying the same partly open; means automatically operated for connecting said bar to said second named crank arm to rotate with said bar; and cooperating interengaging cam means on the car and said second named crank arm for sliding said door in opening direction lengthwise of the car.

8. 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 means on said car extending lengthwise thereof; means slidable on said guide means for supporting the door at one end including a swinging crank arm; keeper engaging means on said arm; cam means on the car engageable by said arm when said door is slid toward and away from closing position for swinging said arm in reverse directions to move said door laterally toward and away from the side of the car; a keeper with which said keeper engaging means has camming engagement for forcing said end of the door tightly into the door opening and withdrawing the same therefrom as the door is displaced in endwise direction; additional means slidable on said guide means for supporting the other end of the door including a second crank arm rotatably connected to the door; a rotary operating bar on the door at said second named end having keeper engaging crank members thereon; an additional keeper with which said keeper engaging crank members cooperate to force said second named end of the door tightly closed and prying the some open; a cam member on said car; and means on said second named crank arm engaging with said cam member during swinging movement of the former in door closing direction to cam said door endwise in closing direction to slide said keeper engaging means relatively to said first named keeper means to force said first named end of the door into the door opening.

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 guide means on said car extending lengthwise of the same; means slidable lengthwise on said guide means for supporting the door including swinging crank members connected to the door at opposite ends thereof swingable toward and away from the side of the car; cam means on the car coacting with one of said crank members to effect swinging movement thereof to move the door laterally into and out of the door opening when said door is slid along said guide means; and automatically operated latch means engaging with said cam operated arm to lock the same against rotation when said door is open.

10. 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; means slidable lengthwise on said guide means for supporting the door including a crank arm rotatably mounted on the door and swinging with respect to said guide means; cam means on the car coacting with said crank arm during sliding movement of the door to swing said arm to move the door laterally into the door opening and remove the same from said opening; latch means actuated by sliding movement of the door for locikng said crank arm against rotation when said door is in position removed from said opening; and a stop with which said latch means is engageable for holding the door against sliding movement when in fully open position.

11. 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; means slidable lengthwise along said guide means for supporting the door including a crank arm rotatably mounted on the door and having swinging movement toward and away from the side of the car; a cam lug on the car; and a projecting portion on said ram having shoulders engageable with said cam lug in both opening and closing sliding movements of the door to swing said arm to displace the door laterally.

12. 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: means slidable lengthwise along said guide means for supporting the door including a vertically disposed rotary bar journaled on the door and having top and bottom crank arms swingable with respect to said guide means toward and away from the side of the car; a fixed cam member on the car; and means on said bottom crank arm having shouldered engagement with said cam member during both opening and closing sliding movement of the door to swing said arms to move the door laterally.

13. 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 thereof; keeper means on the car; a rotary operating bar mounted on said door; keeper engaging means on said bar engageable with the keeper means to either force the door tightly closed or pry the same open; swinging supporting means sliding with respect to said guide means and swingable with respect thereto, said supporting means being journaled

on said bar; and latch means actuated through rotation of said supporting means with respect to the door for positively actuating said latch means to lock the supporting means to said bar and unlock the same therefrom.

14. 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 thereof; keeper means on the car; a rotary operating bar mounted on said door; keeper engaging means on the bar engageable with said keeper means to force the door into and out of the door opening; bearing members on the door; swinging supporting arms rotatably mounted in said bearing members and journaled on said bar; means swingingly and slidingly supporting said arms on said guide means; sliding latch means for locking said arms to said bar for rotation in unison therewith and disconnecting the same therefrom; and cooperating cam means on said bearing members and sliding latch means for positively actuating the latter.

15. 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 thereof; a keeper on the car; a rotary operating bar mounted on the door; a keeper engaging crank arm on said bar engageable with said keeper to force the door open and closed; a supporting arm rotatably mounted at one end on said door for rotation about an axis concentric with the axis of rotation of said bar, the other end of said arm being swingingly mounted with respect to the guide means and slidably guided thereon; a releasable latch member for locking said arm to the bar for rotation therewith; and means operative through rotation of said arm with respect to the door for moving said latch to locking and unlocking positions.

16. 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 thereof; a keeper on the car; a rotary operating bar mounted on the door; keeper engaging means on said bar; means for slidably supporting said door on said guide means including an arm swingingly mounted at one end with respect to said guide means and rotatably connected to the door at its other end; shoulders on said arm and bar engageable to effect rotation of said arm with said bar in one direction; and disengageable latch means for locking said arm to the bar for rotation therewith in a reverse direction.

17. 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 a guide track on said car extending lengthwise thereof; means slidable on said guide track for supporting the door including a swinging crank arm; keeper engaging means on said arm; cam means on the car engageable by said arm when the door is slid toward and away from closing position for swinging said arm in reverse directions to move the door laterally into and out of the door opening; and a keeper having a cam slot within which said keeper engaging means has camming engagement for forcing the door tightly into the door opening and withdrawing the same therefrom as the door is moved endwise to and from closing position.

18. 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 means on said car extending lengthwise thereof; swinging crank arms for supporting said door guided on said track for sliding and swinging movement; fixed projecting means on the car; and cooperating means on said door intermeshing with said projecting means and adapted to travel thereover and be positively actuated through sliding movement of the door with respect to the car for camming the door tightly closed when slid in one direction and for camming the door open when slid in a reverse direction.

19. 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 top and bottom guide tracks extending lengthwise of the car; top and bottom supporting crank arms journaled on the door; means slidable on said tracks to which the outer ends of said crank arms are pivoted for swinging movement; top and bottom keepers having inwardly inclined cam slots; and projecting top and bottom keeper engaging lugs on said crank arms eccentric to the axis of rotation thereof, engageable within the slots of the keepers to wedge said door laterally inwardly as it is slid toward closed position and wedge the same outwardly as it is slid away from closed position.

20. 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 top and bottom guide tracks extending lengthwise of the car; top and bottom keepers on the car; a cam projection on the car at the bottom of the door opening; a rotary operating bar on the door; fixed keeper engaging crank arms at the top and bottom of said bar engageable with said keepers; fixed top and bottom bearing brackets on said door, each bearing bracket having an interior cam groove; top and bottom door supporting crank arms having bearing sleeves at their inner ends journaled in said brackets and rotatably journaled on said bar, each bearing sleeve having a longitudinal guideway; a latch plate slidably guided in each guideway and having a guide lug thereon engaged within the cam groove of the corresponding bearing bracket for reciprocating the latch to project and retract the same, as the door supporting crank arms are rotated in said bearing brackets, said latch plate when projected having shouldered engagement with the corresponding keeper engaging crank arm to operatively connect the same to said bar for rotation therewith in one direction, said keeper engaging crank arms having shouldered engagement with said door supporting crank arms to operatively connect the same to said bar for rotation therewith in a reverse direction; and fingers on the lower door supporting arm engageable with said cam projection to control sliding movement of the door as it is swung laterally into and out of the door opening.

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